UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, DC 20549

FORM 10-Q

(Mark One)

☒ **QUARTERLY REPORT UNDER SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the quarterly period ended June 30, 2020

☐ **TRANSITION REPORT UNDER SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

Commission file number 001-38042

ARROWHEAD PHARMACEUTICALS, INC.

(Exact name of registrant as specified in its charter)

Delaware	**46-0408024**
(State of incorporation)	**(I.R.S. Employer Identification No.)**

177 E. Colorado Blvd, Suite 700
Pasadena, California 91105
(626) 304-3400
(Address and telephone number of principal executive offices)

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

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 13(a) of the Exchange Act. ☐

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	**Trading Symbol(s)**	**Name of each exchange on which registered**
Common Stock, Par Value $0.001 per share	**ARWR**	**The Nasdaq Global Select Market**

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The number of shares of the registrant’s common stock outstanding as of July 27, 2020 was 102,291,803.

PART I. FINANCIAL INFORMATION

ITEM 1. FINANCIAL STATEMENTS

Arrowhead Pharmaceuticals, Inc.
Consolidated Balance Sheets

	(unaudited) June 30, 2020	September 30, 2019
ASSETS		
CURRENT ASSETS		
Cash and cash equivalents	$ 219,322,617	$ 221,804,128
Accounts receivable	21,692,564	661,361
Prepaid expenses	4,096,473	3,317,999
Other current assets	2,411,937	2,563,435
Short term investments	67,709,263	36,899,894
TOTAL CURRENT ASSETS	315,232,854	265,246,817
Property and equipment, net	30,389,707	23,214,899
Intangible assets, net	15,788,258	17,063,580
Long term investments	177,529,881	44,175,993
Right-of-use assets	16,522,013	-
Other assets	265,359	144,148
TOTAL ASSETS	**$ 555,728,072**	**$ 349,845,437**
LIABILITIES AND STOCKHOLDERS' EQUITY		
CURRENT LIABILITIES		
Accounts payable	$ 4,073,869	$ 7,649,921
Accrued expenses	9,414,696	6,504,729
Accrued payroll and benefits	1,991,001	4,955,887
Lease liabilities	1,011,951	-
Deferred rent	-	173,952
Deferred revenue	26,274,362	77,769,629
Other current liabilities	17,262	16,561
TOTAL CURRENT LIABILITIES	42,783,141	97,070,679
LONG-TERM LIABILITIES		
Lease liabilities, net of current portion	20,359,726	-
Deferred rent, net of current portion	-	3,703,364
Deferred revenue, net of current portion	-	5,035,142
TOTAL LONG-TERM LIABILITIES	20,359,726	8,738,506
Commitments and contingencies (Note 7)		
STOCKHOLDERS' EQUITY		
Arrowhead Pharmaceuticals, Inc. stockholders' equity:		
Common stock, $0.001 par value; 145,000,000 shares authorized; 102,250,872 and 95,506,271 shares issued and outstanding as of June 30, 2020 and September 30, 2019, respectively	194,620	187,876
Additional paid-in capital	948,532,470	664,086,155
Accumulated other comprehensive income (loss)	(175,219)	(391,624)
Accumulated deficit	(455,411,478)	(419,290,967)
Total Arrowhead Pharmaceuticals, Inc. stockholders' equity	493,140,393	244,591,440
Noncontrolling interest	(555,188)	(555,188)
TOTAL STOCKHOLDERS' EQUITY	492,585,205	244,036,252
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	**$ 555,728,072**	**$ 349,845,437**

The accompanying notes are an integral part of these unaudited consolidated financial statements.

Arrowhead Pharmaceuticals, Inc.
Consolidated Statements of Operations and Comprehensive Income (Loss)
(unaudited)

	Three Months Ended June 30,		Nine Months Ended June 30,	
	2020	2019	2020	2019
REVENUE	**$ 27,375,778**	**$ 42,696,636**	**$ 80,359,211**	**$ 125,502,807**
OPERATING EXPENSES				
Research and development	32,573,134	19,291,710	85,390,086	57,662,381
General and administrative expenses	10,748,506	4,809,177	38,008,836	16,287,841
TOTAL OPERATING EXPENSES	**43,321,640**	**24,100,887**	**123,398,922**	**73,950,222**
OPERATING INCOME (LOSS)	(15,945,862)	18,595,749	(43,039,711)	51,552,585
OTHER INCOME (EXPENSE)				
Interest income (expense), net	2,334,649	1,739,959	6,919,200	4,717,359
TOTAL OTHER INCOME (EXPENSE)	**2,334,649**	**1,739,959**	**6,919,200**	**4,717,359**
INCOME (LOSS) BEFORE INCOME TAXES	**(13,611,213)**	**20,335,708**	**(36,120,511)**	**56,269,944**
Provision for income taxes	-	-	-	-
NET INCOME (LOSS)	**(13,611,213)**	**20,335,708**	**(36,120,511)**	**56,269,944**
NET INCOME (LOSS) PER SHARE - BASIC	$ (0.13)	$ 0.21	$ (0.36)	$ 0.60
NET INCOME (LOSS) PER SHARE - DILUTED	$ (0.13)	$ 0.21	$ (0.36)	$ 0.58
Weighted average shares outstanding - basic	101,843,436	94,935,471	100,184,216	93,364,102
Weighted average shares outstanding - diluted	101,843,436	98,884,744	100,184,216	97,814,019
OTHER COMPREHENSIVE INCOME (LOSS), NET OF TAX:				
Foreign currency translation adjustments	453,895	(31,172)	216,405	(81,514)
COMPREHENSIVE INCOME (LOSS)	**$ (13,157,318)**	**$ 20,304,536**	**$ (35,904,106)**	**$ 56,188,430**

The accompanying notes are an integral part of these unaudited consolidated financial statements.

Arrowhead Pharmaceuticals, Inc.
Consolidated Statement of Stockholders' Equity
(unaudited)

	Common Stock	Amount ($)	Additional Paid-In Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Non-controlling Interest	Totals
Balance at March 31, 2019	**94,665,718**	**$ 187,035**	**$ 652,411,876**	**$ (71,906)**	**$ (451,331,580)**	**$ (555,188)**	**$ 200,640,237**
Stock-based compensation	-	-	1,957,993	-	-	-	1,957,993
Exercise of stock options	541,919	542	2,766,732	-	-	-	2,767,274
Foreign currency translation adjustments	-	-	-	(31,172)	-	-	(31,172)
Net income (loss) for the three months ended June 30, 2019	-	-	-	-	20,335,708	-	20,335,708
Balance at June 30, 2019	**95,207,637**	**$ 187,577**	**$ 657,136,601**	**$ (103,078)**	**$ (430,995,872)**	**$ (555,188)**	**$ 225,670,040**

	Common Stock	Amount ($)	Additional Paid-In Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Non-controlling Interest	Totals
Balance at March 31, 2020	**101,748,107**	**$ 194,117**	**$ 936,353,920**	**$ (629,114)**	**$ (441,800,265)**	**$ (555,188)**	**$ 493,563,470**
Stock-based compensation	-	-	10,046,208	-	-	-	10,046,208
Exercise of stock options	302,765	303	2,132,542	-	-	-	2,132,845
Common stock - restricted stock units vesting	200,000	200	(200)	-	-	-	-
Foreign currency translation adjustments	-	-	-	453,895	-	-	453,895
Net income (loss) for the three months ended June 30, 2020	-	-	-	-	(13,611,213)	-	(13,611,213)
Balance at June 30, 2020	**102,250,872**	**$ 194,620**	**$ 948,532,470**	**$ (175,219)**	**$ (455,411,478)**	**$ (555,188)**	**$ 492,585,205**

	Common Stock	Amount ($)	Additional Paid-In Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Non-controlling Interest	Totals
Balance at September 30, 2018	**88,505,302**	**$ 180,875**	**$ 582,902,694**	**$ (21,564)**	**$ (487,265,816)**	**$ (555,188)**	**$ 95,241,001**
Stock-based compensation	-	-	7,276,875	-	-	-	7,276,875
Exercise of stock options	1,244,161	1,244	6,440,761	-	-	-	6,442,005
Common stock - restricted stock units vesting	2,197,305	2,197	(2,197)	-	-	-	-
Common stock - issued for cash	3,260,869	3,261	60,518,468	-	-	-	60,521,729
Foreign currency translation adjustments	-	-	-	(81,514)	-	-	(81,514)
Net income (loss) for the nine months ended June 30, 2019	-	-	-	-	56,269,944	-	56,269,944
Balance at June 30, 2019	**95,207,637**	**$ 187,577**	**$ 657,136,601**	**$ (103,078)**	**$ (430,995,872)**	**$ (555,188)**	**$ 225,670,040**

	Common Stock	Amount ($)	Additional Paid-In Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Non-controlling Interest	Totals
Balance at September 30, 2019	**95,506,271**	**$ 187,876**	**$ 664,086,155**	**$ (391,624)**	**$ (419,290,967)**	**$ (555,188)**	**$ 244,036,252**
Stock-based compensation	-	-	27,509,663	-	-	-	27,509,663
Exercise of stock options	989,197	989	6,463,433	-	-	-	6,464,422
Common stock - restricted stock units vesting	1,155,404	1,155	(1,155)	-	-	-	-
Common stock - issued for cash	4,600,000	4,600	250,474,374	-	-	-	250,478,974
Foreign currency translation adjustments	-	-	-	216,405	-	-	216,405
Net income (loss) for the nine months ended June 30, 2020	-	-	-	-	(36,120,511)	-	(36,120,511)
Balance at June 30, 2020	**102,250,872**	**$ 194,620**	**$ 948,532,470**	**$ (175,219)**	**$ (455,411,478)**	**$ (555,188)**	**$ 492,585,205**

The accompanying notes are an integral part of these unaudited consolidated financial statements.

Arrowhead Pharmaceuticals, Inc.
Consolidated Statements of Cash Flows
(unaudited)

	Nine Months Ended June 30,	
	2020	**2019**
CASH FLOWS FROM OPERATING ACTIVITIES:		
Net income (loss)	$ (36,120,511)	$ 56,269,944
Stock-based compensation	27,509,663	7,276,875
Depreciation and amortization	4,167,873	3,356,769
Amortization/(accretion) of note premiums	652,747	682,243
Changes in operating assets and liabilities:		
Accounts receivable	(21,031,203)	(1,716,736)
Prepaid expenses and other current assets	(863,287)	(2,393,230)
Deferred revenue	(56,530,409)	97,940,261
Accounts payable	(3,576,053)	1,824,146
Accrued expenses	(54,217)	(3,477,235)
Other	1,303,852	(538,020)
NET CASH PROVIDED BY (USED IN) OPERATING ACTIVITIES	(84,541,545)	159,225,017
CASH FLOWS FROM INVESTING ACTIVITIES:		
Purchases of property and equipment	(10,067,360)	(4,170,285)
Purchases of marketable securities	(193,964,290)	(90,266,001)
Proceeds from sale of marketable securities	29,148,287	29,861,219
NET CASH PROVIDED BY (USED IN) INVESTING ACTIVITIES	(174,883,363)	(64,575,067)
CASH FLOWS FROM FINANCING ACTIVITIES:		
Principal payments on notes payable	-	(2,415,150)
Proceeds from the exercises of stock options	6,464,423	6,442,005
Proceeds from the issuance of common stock	250,478,974	60,521,729
NET CASH PROVIDED BY (USED IN) FINANCING ACTIVITIES	256,943,397	64,548,584
NET INCREASE (DECREASE) IN CASH	(2,481,511)	159,198,534
CASH AND CASH EQUIVALENTS AT BEGINNING OF PERIOD	221,804,128	30,133,213
CASH AND CASH EQUIVALENTS AT END OF PERIOD	$ 219,322,617	$ 189,331,747
Supplementary disclosures:		
Interest paid	$ -	$ (27,437)
Income Taxes Paid	$ -	$ (2,400)

The accompanying notes are an integral part of these unaudited consolidated financial statements.

Unless otherwise noted, (1) the term "Arrowhead" refers to Arrowhead Pharmaceuticals, Inc., a Delaware corporation and its Subsidiaries, (2) the terms "Company," "we," "us," and "our," refer to the ongoing business operations of Arrowhead and its Subsidiaries, whether conducted through Arrowhead or a subsidiary of Arrowhead, (3) the term "Subsidiaries" refers collectively to Arrowhead Madison Inc. ("Arrowhead Madison"), Arrowhead Australia Pty Ltd ("Arrowhead Australia") and Ablaris Therapeutics, Inc. ("Ablaris"), (4) the term "Common Stock" refers to Arrowhead's Common Stock, (5) the term "Preferred Stock" refers to Arrowhead's Preferred Stock and (6) the term "Stockholder(s)" refers to the holders of Arrowhead Common Stock.

NOTE 1. *ORGANIZATION AND SIGNIFICANT ACCOUNTING POLICIES*

Nature of Business and Recent Developments

Arrowhead Pharmaceuticals, Inc. develops medicines that treat intractable diseases by silencing the genes that cause them. Using a broad portfolio of RNA chemistries and efficient modes of delivery, Arrowhead therapies trigger the RNA interference mechanism to induce rapid, deep and durable knockdown of target genes. RNA interference, or RNAi, is a mechanism present in living cells that inhibits the expression of a specific gene, thereby affecting the production of a specific protein. Arrowhead's RNAi-based therapeutics leverage this natural pathway of gene silencing. The Company's pipeline includes ARO-AAT for liver disease associated with alpha-1 antitrypsin deficiency (AATD), ARO-APOC3 for hypertriglyceridemia, ARO-ANG3 for dyslipidemia, ARO-HSD for liver disease, ARO-ENaC for cystic fibrosis, ARO-HIF2 for renal cell carcinoma, ARO-LUNG2 as a candidate to treat chronic obstructive pulmonary disorder (COPD) and ARO-COV for treatment for the current novel coronavirus that causes COVID-19 and other possible future pulmonary-borne pathogens. ARO-JNJ1 is being developed for an undisclosed liver-expressed target under a collaboration agreement with Janssen Pharmaceuticals, Inc. ("Janssen"). ARO-HBV (JNJ-3989) for chronic hepatitis B virus was out-licensed to Janssen in October 2018. ARO-LPA (AMG 890) for cardiovascular disease was out-licensed to Amgen Inc. ("Amgen") in 2016.

Arrowhead operates a lab facility in Madison, Wisconsin, where the Company's research and development activities, including the development of RNAi therapeutics, are based. The Company's principal executive offices are located in Pasadena, California. In March 2020, the Company entered into a sublease for additional research and development facility space in San Diego, California as discussed further in Note 8 below.

During fiscal year 2020, the Company has continued to develop its pipeline and partnered candidates. The Company has began dosing in an adaptive design phase 2/3 trial, called SEQUOIA, with the potential to serve as a pivotal registration study of ARO-AAT. The Company also began dosing in its ARO-AAT 2002 study, a pilot open-label, multi-dose Phase 2 study to assess changes in novel histological activity scale in response to ARO-AAT over time in patients with alpha-1 antitrypsin deficiency associated liver disease. In addition, the Company also dosed the first patients in AROHSD1001, a Phase 1/2 clinical study of ARO-HSD, the Company's investigational RNA interference therapeutic being developed as a treatment for patients with alcohol related and nonalcohol related liver diseases, such as nonalcoholic steatohepatitis (NASH). The Company also presented new clinical data on its two cardiometabolic candidates, ARO-APOC3 and ARO-ANG3, in two late-breaking oral presentations at the American Heart Association Scientific Sessions 2019. In addition, the Company filed an investigational new drug ("IND") application to begin a phase 1b study of ARO-HIF2 and filed a clinical trials application ("CTA") to begin a phase 1 study of ARO-ENaC.

The Company's partnered candidates under its collaboration agreements with Janssen and Amgen also continue to progress. Janssen began dosing patients in a phase 2b triple combination study called REEF-1, designed to enroll up to 450 patients with chronic hepatitis B infection, and in connection with the start of this study Arrowhead earned a $25 million milestone payment under the License Agreement ("Janssen License Agreement"). Janssen has also nominated the first of 3 potential candidates under the Research Collaboration and Option Agreement ("Janssen Collaboration Agreement"), ARO-JNJ1, and the Company is currently performing discovery, optimization and preclinical research and development for this candidate. Under the terms of the Janssen agreements taken together, the Company has received $175 million as an upfront payment, $75 million in the form of an equity investment by JJDC in Arrowhead common stock, two $25 million milestone payments and may receive up to $1.6 billion in development and sales milestones payments for the Janssen License Agreement, and up to $1.9 billion in development and sales milestone payments for the three additional targets covered under the Janssen Collaboration Agreement. The Company is further eligible to receive tiered royalties up to mid teens under the Janssen License Agreement and up to low teens under the Janssen Collaboration Agreement on product sales. The Company's collaboration agreement with Amgen for AMG 890 (ARO-LPA), (the "Second Collaboration and License Agreement" or "AMG 890 (ARO-LPA) Agreement"), continues to progress. The Company has received $35 million in upfront payments, $21.5 million in the form of an equity investment by Amgen in the Company's Common Stock, a $10 million milestone payment, and may receive up to $420 million in development, regulatory and sales milestone payments. The Company is eligible to receive up to low double-digit royalties for sales of products under the AMG 890 (ARO-LPA) Agreement. In July 2020, Amgen initiated a Phase 2 clinical study, which will result in a $20 million milestone payment to the Company.

The revenue recognition for these collaboration agreements is discussed further in Note 2 below.

The Company is actively monitoring the ongoing COVID-19 pandemic. The financial results for the three and nine months ended June 30, 2020 were not significantly impacted by COVID-19. The Company temporarily paused enrollment in its two ARO-AAT studies, SEQUOIA and the ARO-AAT 2002 study, but resumed the process of screening and enrolling patients during the three months ended June 30, 2020. During the pause in enrollment, patients already enrolled in these studies continued to be dosed per protocol and continued to come in for their follow up visits. Additional delays have occurred in the Company's earlier stage programs, but we do not expect a material impact to any program's anticipated timelines. Several of the Company's other clinical candidates are in the start-up stage (ARO-HSD, ARO-HIF2 and ARO-ENaC), during which significant clinical costs will continue to be incurred. Additionally, the Company's operations at its research and development facilities in Madison, Wisconsin and San Diego, California, and its corporate headquarters in Pasadena, California have continued to operate with limited impact, other than for enhanced safety measures, including work from home policies. However, the Company cannot predict the impact of the progression of COVID-19 will have on future financial results due to a variety of factors including the ability of the Company's clinical sites to continue to enroll subjects, the ability of the Company's suppliers to continue to operate, the continued good health and safety of the Company's employees, and ultimately the length of the COVID-19 pandemic.

Liquidity

The Consolidated Financial Statements have been prepared in conformity with the accounting principles generally accepted in the United States of America, which contemplate the continuation of the Company as a going concern. Historically, the Company's primary source of financing has been through the sale of its securities. Research and development activities have required significant capital investment since the Company's inception. The Company expects its operations to continue to require cash investment to pursue its research and development goals, including clinical trials and related drug manufacturing.

At June 30, 2020 the Company had $219.3 million in cash and cash equivalents (including $1.8 million in restricted cash), $67.7 million in short-term investments, and $177.5 million in long-term investments to fund operations. During the nine months ended June 30, 2020, the Company's cash and investments balance increased by $161.7 million, which was primarily the result of the December 2019 securities offering that generated $250.5 million in net cash proceeds for the Company, as discussed further in Note 6 below. These cash inflows were partially offset by cash outflows primarily related to operating activities.

Summary of Significant Accounting Policies

There have been no changes to the significant accounting policies disclosed in the Company's most recent Annual Report on Form 10-K, except as a result of the Financial Accounting Standards Board's ("FASB") Accounting Standards Update ("ASU") No. 2016-02, Leases (ASC 842), as discussed below.

Leases — The Company determines whether a contract is, or contains, a lease at inception. The Company classifies each of its leases as operating or financing considering factors such as the length of the lease term, the present value of the lease payments, the nature of the asset being leased, and the potential for ownership of the asset to transfer during the lease term. Leases with terms greater than one-year are recognized on the Consolidated Balance Sheets as Right-of-use assets and Lease liabilities and are measured at the present value of the fixed payments due over the expected lease term less the present value of any incentives, rebates or abatements expected to be received from the lessor. Options to extend a lease are typically excluded from the expected lease term as the exercise of the option is typically not reasonably certain. The interest rate implicit in lease contracts is typically not readily determinable. As such, the Company utilizes the appropriate incremental borrowing rate, which is the rate incurred to borrow on a collateralized basis an amount equal to the lease payments over a similar term and in a similar economic environment. The Company records expense to recognize fixed lease payments on a straight-line basis over the expected lease term. Costs determined to be variable and not based on an index or rate are not included in the measurement of the lease liability and are expensed as incurred.

Recent Accounting Pronouncements

In March 2016, the FASB issued ASU No. 2016-02, Leases (Topic ASC 842). Under ASC 842, lessees are required to recognize a right-of-use asset and a right-of-use lease liability for virtually all leases other than those that meet the definition of a short-term lease. For income statement purposes, a dual model was retained, requiring leases to be classified as either operating or finance. Operating leases will result in straight-line expense while finance leases will result in a front-loaded expense pattern (similar to current capital leases). The Company adopted this standard effective October 1, 2019 and elected the package of three practical expedients that permits an entity to a) not reassess whether expired or existing contracts contain leases, b) not reassess lease classification for existing or expired leases, and c) not consider whether previously capitalized initial direct costs would be appropriate under the new standard. At June 30 2020, the Company has recorded right-of-use assets of $16.5 million and right-of-use liabilities of

$21.4 million on its Consolidated Balance Sheets for its research and development facility leases in Madison, Wisconsin and San Diego, California, as well as its corporate headquarters lease in Pasadena, California, as discussed further in Note 8 below. The adoption of this standard did not have a material impact on the Company's Consolidated Statement of Comprehensive Income (Loss) and the Company's Consolidated Statement of Cash Flows.

In November 2018, the FASB issued ASU No. 2018-18 Collaborative Arrangements (Topic 808). This update provides clarification on the interaction between Revenue Recognition (Topic 606) and Collaborative Arrangements (Topic 808) including the alignment of unit of account guidance between the two topics. ASU 2018-18 becomes effective for the Company in the first quarter of fiscal 2021 with early adoption permitted. The Company does not expect the adoption of this update to have a material effect on its Consolidated Financial Statements.

NOTE 2. *COLLABORATION AND LICENSE AGREEMENTS*

Amgen Inc.

On September 28, 2016, the Company entered into two Collaboration and License agreements, and a Common Stock Purchase Agreement with Amgen Inc., a Delaware corporation ("Amgen"). Under one of the license agreements (the "Second Collaboration and License Agreement" or "AMG 890 (ARO-LPA) Agreement"), Amgen has received a worldwide, exclusive license to Arrowhead's novel, RNAi ARO-LPA program. These RNAi molecules are designed to reduce elevated lipoprotein(a), which is a genetically validated, independent risk factor for atherosclerotic cardiovascular disease. Under the other license agreement (the "First Collaboration and License Agreement" or "ARO-AMG1 Agreement"), Amgen received an option to a worldwide, exclusive license for ARO-AMG1, an RNAi therapy for an undisclosed genetically validated cardiovascular target. In both agreements, Amgen is wholly responsible for clinical development and commercialization. Under the terms of the agreements taken together, the Company has received $35 million in upfront payments, $21.5 million in the form of an equity investment by Amgen in the Company's Common Stock, and a $10 million milestone payment, and may receive up to $420 million in development, regulatory and sales milestone payments. The Company is further eligible to receive up to low double-digit royalties for sales of products under the AMG 890 (ARO-LPA) Agreement. In July 2019, Amgen informed the Company that it would not be exercising its option for an exclusive license for ARO-AMG1, and as such, there will be no further milestone or royalty payments under the ARO-AMG1 Agreement.

The Company substantially completed its performance obligations under the AMG 890 (ARO-LPA) Agreement and the ARO-AMG1 Agreement. Future milestones and royalties achieved will be recognized in their entirety when earned. In July 2020, Amgen initiated a Phase 2 clinical study, which will result in a $20 million milestone payment to the Company. During the three months ended June 30, 2020 and 2019, the Company recognized $20.0 million and $0 million of Revenue associated with its agreements with Amgen, respectively. During the nine months ended June 30, 2020 and 2019, the Company recognized $20.0 million and $0.3 million of Revenue associated with its agreements with Amgen, respectively. As of June 30, 2020, there were $20.0 million in contract assets recorded as accounts receivable, and $0 contract liabilities recorded as current deferred revenue on the Company's Consolidated Balance Sheets.

Janssen Pharmaceuticals, Inc.

On October 3, 2018, the Company entered into a License Agreement ("Janssen License Agreement") and a Research Collaboration and Option Agreement ("Janssen Collaboration Agreement") with Janssen Pharmaceuticals, Inc. ("Janssen") part of the Janssen Pharmaceutical Companies of Johnson & Johnson. The Company also entered into a Stock Purchase Agreement ("JJDC Stock Purchase Agreement") with Johnson & Johnson Innovation-JJDC, Inc. ("JJDC"), a New Jersey corporation. Under the Janssen License Agreement, Janssen has received a worldwide, exclusive license to the Company's JNJ-3989 (ARO-HBV) program, the Company's third-generation subcutaneously administered RNAi therapeutic candidate being developed as a potentially curative therapy for patients with chronic hepatitis B virus infection. Beyond the Company's ongoing Phase 1/2 study of JNJ-3989 (ARO-HBV), Janssen will be wholly responsible for clinical development and commercialization. Under the Janssen Collaboration Agreement, Janssen will be able to select three new targets against which Arrowhead will develop clinical candidates. These candidates are subject to certain restrictions and will not include candidates in the Company's current pipeline. The Company will perform discovery, optimization and preclinical research and development, entirely funded by Janssen, sufficient to allow the filing of a U.S. Investigational New Drug application or equivalent, at which time Janssen will have the option to take an exclusive license. If the option is exercised, Janssen will be wholly responsible for clinical development and commercialization of each optioned candidate. Under the terms of the agreements taken together, the Company has received $175 million as an upfront payment, $75 million in the form of an equity investment by JJDC in Arrowhead common stock under the JJDC Stock Purchase Agreement, and two $25 million milestone payments, and may receive up to $1.6 billion in development and sales milestones payments for the Janssen License Agreement, and up to $1.9 billion in development and sales milestone payments for the three additional targets covered under the Janssen Collaboration Agreement. The Company is further eligible to receive tiered royalties up to mid teens under the Janssen License Agreement and up to low teens under the Janssen Collaboration Agreement on product sales.

The Company has evaluated these agreements in accordance with the new revenue recognition standard that became effective for the Company on October 1, 2018. The adoption of the new revenue standard did not have a material impact on the balances reported when evaluated under the superseded revenue standard. At the inception of these agreements, the Company has identified one distinct performance obligation. Regarding the Janssen License Agreement, the Company determined that the key deliverables included the license and certain R&D services including the Company's responsibility to complete the ongoing Phase 1/2 study of JNJ-3989 (ARO-HBV) and the Company's responsibility to ensure certain manufacturing of JNJ-3989 (ARO-HBV) drug product is completed and delivered to Janssen (the "Janssen R&D Services"). Due to the specialized and unique nature of these Janssen R&D services, and their direct relationship with the license, the Company determined that these deliverables represent one distinct bundle and thus, one performance obligation. The Company also determined that Janssen's option to require the Company to develop up to three new targets is not a material right, and thus, not a performance obligation at the onset of the agreement. The consideration for this option will be accounted for if and when it is exercised.

The Company determined the transaction price totaled approximately $252.6 million which includes the upfront payment, the premium paid by JJDC for its equity investment in the Company, the two $25 million milestone payments earned and estimated payments for reimbursable Janssen R&D services to be performed. The Company has allocated the total $252.6 million initial transaction price to its one distinct performance obligation for the JNJ-3989 (ARO-HBV) license and the associated Janssen R&D Services. This revenue will be recognized using a proportional performance method (based on actual labor hours versus estimated total labor hours) beginning in October 2018 and ending as the Company's efforts in overseeing the ongoing phase 1/2 clinical trial are completed. During the three months ended June 30, 2020 and 2019, the Company recognized approximately $6.9 million and $42.3 million of Revenue associated with its agreements with Janssen and JJDC, respectively. During the nine months ended June 30, 2020 and 2019, the Company recognized approximately $57.9 million and $124.8 million of Revenue associated with its agreements with Janssen and JJDC, respectively. As of June 30, 2020, there were $0 in contract assets recorded as accounts receivable, and $26.3 million of contract liabilities recorded as current deferred revenue on the Company's Consolidated Balance Sheets. The $26.3 million of current deferred revenue is driven by the upfront payment, the premium paid by JJDC for its equity investment in the Company, and the two $25 million milestone payments earned, net of revenue recognized to date.

Janssen has also selected the first of the three targets under the Janssen Collaboration Agreement, now referred to as ARO-JNJ1, and the Company has begun to conduct its discovery, optimization and preclinical research and development of ARO-JNJ1. All costs and labor hours spent by the Company will be entirely funded by Janssen. During the three months ended June 30, 2020 and 2019, the Company recognized approximately $0.4 million and $0.4 million of Revenue associated with its efforts on the ARO-JNJ1 candidate, respectively. During the nine months ended June 30, 2020 and 2019, the Company recognized $2.4 million and $0.4 million of Revenue associated with these efforts on the ARO-JNJ1 candidate, respectively. As of June 30, 2020, there were $1.7 million of contract assets recorded as accounts receivable, and $0 of contract liabilities recorded as current deferred revenue on the Company's Consolidated Balance Sheets.

NOTE 3. ***PROPERTY AND EQUIPMENT***

The following table summarizes the Company's major classes of property and equipment:

	June 30, 2020	September 30, 2019
Computers, office equipment and furniture	$ 661,927	$ 637,577
Research equipment	19,514,871	12,932,304
Software	293,189	147,254
Leasehold improvements	24,883,656	21,579,415
Total gross fixed assets	45,353,643	35,296,550
Less: Accumulated depreciation and amortization	(14,963,936)	(12,081,651)
Property and equipment, net	$ 30,389,707	$ 23,214,899

Depreciation and amortization expense for property and equipment for the three months ended June 30, 2020 and 2019 was $1,111,293 and $578,342, respectively. Depreciation and amortization expense for property and equipment for the nine months ended June 30, 2020 and 2019 was $2,892,551 and $2,081,447, respectively.

NOTE 4. ***INVESTMENTS***

The Company invests a portion of its excess cash balances in short-term and long-term debt securities. Investments at June 30, 2020 consisted of corporate bonds with maturities remaining of less than 36 months. The Company may also invest excess cash balances in certificates of deposits, money market accounts, government-sponsored enterprise securities, corporate bonds and/or commercial paper. The Company accounts for its investments in accordance with FASB ASC 320, Investments – Debt and Equity Securities. At June 30, 2020, all investments were classified as held-to-maturity securities.

The following tables summarize the Company's short-term and long-term investments as of June 30, 2020 and September 30, 2019.

	As of June 30, 2020			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
Commercial notes (due within one year)	$ 67,709,263	$ 1,188,416	$ —	$ 68,897,679
Commercial notes (due within one through three years)	$ 177,529,881	$ 5,845,177	$ (14,833)	$ 183,360,225
Total	$ 245,239,144	$ 7,033,593	$ (14,833)	$ 252,257,904

	As of September 30, 2019			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
Commercial notes (due within one year)	$ 36,899,894	$ 222,584	$ —	$ 37,122,478
Commercial notes (due within one through three years)	$ 44,175,993	$ 875,258	$ —	$ 45,051,251
Total	$ 81,075,887	$ 1,097,842	$ —	$ 82,173,729

NOTE 5. ***INTANGIBLE ASSETS***

Intangible assets subject to amortization include patents and a license agreement capitalized as part of the Novartis RNAi asset acquisition in March 2015. The license agreement associated with the Novartis RNAi asset acquisition is being amortized over the estimated life remaining at the time of acquisition, which was 21 years, and the accumulated amortization of the asset is $791,495. The patents associated with the Novartis RNAi asset acquisition are being amortized over the estimated life remaining at the time of acquisition, which was 14 years, and the accumulated amortization of the assets is $8,277,460. Amortization expense for the three months ended June 30, 2020 and 2019 was $425,107 and $425,107, respectively. Amortization expense for the nine months ended June 30, 2020 and 2019 was $1,275,322 and $1,275,322, respectively. Amortization expense is expected to be $425,107 for the remainder of fiscal 2020, $1,700,429 in 2021, $1,700,429 in 2022, $1,700,429 in 2023, $1,700,429 in 2024, and $8,561,435 thereafter.

The following table provides details on the Company's intangible asset balances:

	Intangible assets subject to amortization
Balance at September 30, 2019	$ 17,063,580
Impairment	—
Amortization	(1,275,322)
Balance at June 30, 2020	$ 15,788,258

NOTE 6. ***STOCKHOLDERS' EQUITY***

At June 30, 2020, the Company had a total of 150,000,000 shares of capital stock authorized for issuance, consisting of 145,000,000 shares of Common Stock, par value $0.001 per share, and 5,000,000 shares of Preferred Stock, par value $0.001 per share.

At June 30, 2020, 102,250,872 shares of Common Stock were outstanding. At June 30, 2020, 8,252,796 shares of Common Stock were reserved for issuance upon exercise of options and vesting of restricted stock units granted or available for grant under Arrowhead's 2004 Equity Incentive Plan and 2013 Incentive Plan, as well as for inducement grants made to new employees.

In December 2019, the Company sold 4,600,000 shares of its Common Stock in a public offering at a price of $58.00 per share. The aggregate purchase price paid by the investors for the Common Stock was $266.8 million, and the Company received net proceeds of $250.5 million after deducting advisory fees and offering expenses.

Effective August 5, 2020, the Company entered into an Open Market Sale Agreement (the "ATM Agreement"), pursuant to which the Company may, from time to time, sell up to $250,000,000 in shares of the Company's common stock through Jefferies LLC, acting as the sales agent and/or principal, in an at-the-market offering ("ATM Offering"). The Company is not required to sell shares under the ATM Agreement. The Company will pay Jefferies LLC a commission of up to 3.0% of the aggregate gross proceeds received from all sales of the common stock under the ATM Agreement. Unless otherwise terminated, the ATM Agreement continues until the earlier of selling all shares available under the ATM Agreement or December 2, 2022. No sales have been made under the ATM Agreement.

NOTE 7. *COMMITMENTS AND CONTINGENCIES*

Litigation

On occasion, the Company may be subject to various claims and legal proceedings in the ordinary course of business. If the potential loss from any claim, asserted or unasserted, or legal proceeding is considered probable and the amount is reasonably estimable, the Company will accrue a liability for the estimated loss. There were no contingent liabilities recorded as of June 30, 2020.

Purchase Commitments

In the normal course of business, the Company enters into various purchase commitments for the manufacture of drug components, for toxicology studies, and for clinical studies. As of June 30, 2020, these future commitments were estimated at approximately $83.0 million, of which approximately $20.5 million is expected to be incurred in fiscal 2020, and $62.5 million is expected to be incurred beyond fiscal 2020.

Technology License Commitments

The Company has licensed from third parties the rights to use certain technologies for its research and development activities, as well as in any products the Company may develop using these licensed technologies. These agreements and other similar agreements often require milestone and royalty payments. Milestone payments, for example, may be required as the research and development process progresses through various stages of development, such as when clinical candidates enter or progress through clinical trials, upon NDA and upon certain sales level milestones. These milestone payments could amount to the mid to upper double-digit millions of dollars. During the three months ended June 30, 2020, the Company did not accrue any milestone payment. During the nine months ended June 30, 2020, the Company accrued a $0.9 million milestone payment related to the progression of the ARO-ENaC program. During the three and nine months ended June 30, 2019, the Company did not accrue for any milestone payments. In certain agreements, the Company may be required to make mid to high single-digit percentage royalty payments based on a percentage of the sales of the relevant products.

NOTE 8. *LEASES*

Leases

In April 2019, the Company entered into a lease for its corporate headquarters in Pasadena, California. The 91 month office building lease between the Company and 177 Colorado Owner, LLC is for approximately 24,000 square feet of office space located at 177 E. Colorado Blvd, Pasadena, California. The increased capacity of this new office space compared to the Company's prior corporate headquarters will accommodate increased personnel as the Company's pipeline of drug candidates expands and moves closer to market. Lease payments began on September 30, 2019 and are estimated to total approximately $8.7 million over the term. The lease expires on April 30, 2027. The Company has paid approximately $3.5 million for leasehold improvements, net of tenant improvement allowances. The lease contains an option to renew for one term of five years. The exercise of this option was not determined to be reasonably certain and thus was not included in lease liabilities on the Company's Consolidated Balance Sheet at June 30, 2020.

In January 2016, the Company entered into a lease for its research facility in Madison, Wisconsin. The lease was for approximately 60,000 square feet of office and laboratory space and had an expiration date of September 30, 2026. The lease was amended in January 2019 to expand the rentable square feet by an additional 14,000 square feet and to extend the lease expiration date to September 2029. In May 2020, the Company further amended the lease to increase the rentable square feet by an additional 26,000 square feet and extended the lease expiration date to September 30, 2031. Lease payments are estimated to total approximately $26.2 million for the term. The lease contains two options to renew for two terms of five years. The exercise of these options were not determined to be reasonably certain and thus was not included in lease liabilities on the Company's Consolidated Balance Sheet at June 30, 2020.

In March 2020, the Company entered into a sublease agreement (the "Sublease") with Halozyme, Inc. for additional research and development facility space in San Diego, California. The Sublease provides additional space needed to accommodate the recent growth of the Company's personnel and discovery efforts. The lease is for approximately 21,000 rentable square feet. The term of the Sublease commenced on April 1, 2020 and will end on January 14, 2023. Lease payments are estimated to total approximately $2.0 million over the term.

Operating lease cost during the three and nine months ended June 30, 2020 was $0.8 million and $1.7 million, respectively. Variable lease costs during the three and nine months ended June 30, 2020 were $0.2 million and $0.6 million, respectively. There was no short-term lease cost during the three and nine months ended June 30, 2020.

The following table presents maturities of operating lease liabilities on an undiscounted basis as of June 30, 2020:

2020 (remainder of fiscal year)	$	681,214
2021		3,091,900
2022		3,853,290
2023		3,406,754
2024		3,269,674
2025 and thereafter		18,689,588
Total lease payments		32,992,420
Less imputed interest		(11,620,743)
Total operating lease liabilities (includes current portion)	$	21,371,677

Cash paid for the amounts included in the measurement of the operating lease liabilities on the Company's Consolidated Balance Sheet and included in Other changes in operating assets and liabilities within cash flows from operating activities on the Company's Consolidated Statement of Cash Flow for the three and nine months ended June 30, 2020 was $0.5 million and $1.1 million, respectively. The weighted-average remaining lease term and weighted-average discount rate for all leases as of June 30, 2020 was 9.6 years and 8.4%, respectively.

As of September 30, 2019, future minimum lease payments due in fiscal years under operating leases were as follows:

2020	$	1,521,451
2021		2,256,379
2022		2,521,446
2023		2,590,558
2024		2,661,512
2025 and thereafter		10,834,206
Total	$	22,385,552

NOTE 9. ***STOCK-BASED COMPENSATION***

Arrowhead has two plans that provide for equity-based compensation. Under the 2004 Equity Incentive Plan and 2013 Incentive Plan, as of June 30, 2020, 744,250 and 5,652,008 shares, respectively, of Arrowhead's Common Stock are reserved for the grant of stock options, stock appreciation rights, restricted stock awards and performance unit/share awards to employees, consultants and others. No further grants may be made under the 2004 Equity Incentive Plan. As of June 30, 2020, there were options granted and outstanding to purchase 744,250 and 2,672,851 shares of Common Stock under the 2004 Equity Incentive Plan and the 2013 Incentive Plan, respectively, and there were 2,583,000 restricted stock units granted and outstanding under the 2013 Incentive Plan. Also, as of June 30, 2020, there were 1,112,463 shares reserved for options and 744,075 shares reserved for restricted stock units issued as inducement grants to new employees outside of equity compensation plans. During the three months ended June 30, 2020, 0 options and 0 restricted stock units were granted under the 2013 Incentive Plan, and 134,000 options and 153,000 restricted stock units were granted as inducement awards to new employees outside of equity incentive plans. During the nine months ended June 30, 2020, 310,500 options and 1,749,071 restricted stock units were granted under the 2013 Incentive Plan, and 477,000 options and 737,575 restricted stock units were granted as inducement awards to new employees outside of the equity incentive plans.

The following table summarizes information about stock options:

	Number of Options Outstanding	Weighted-Average Exercise Price Per Share	Weighted-Average Remaining Contractual Term	Aggregate Intrinsic Value
Balance At September 30, 2019	4,773,670	$ 8.16		
Granted	787,500	50.42		
Cancelled	(42,409)	25.04		
Exercised	(989,197)	6.54		
Balance At June 30, 2020	4,529,564	$ 15.71	6.2 years	$ 133,654,814
Exercisable At June 30, 2020	2,928,765	$ 7.66	4.8 years	$ 104,700,213

Stock-based compensation expense related to stock options for the three months ended June 30, 2020 and 2019 was $2,659,265 and $1,016,206, respectively. Stock-based compensation expense related to stock options for the nine months ended June 30, 2020 and 2019 was $6,796,175 and $2,823,706, respectively. For non-qualified stock options, the expense creates a timing difference, resulting in a deferred tax asset, which is fully reserved by a valuation allowance.

The grant date fair value of the options granted by the Company for the three months ended June 30, 2020 and 2019 was $3,421,181 and $1,316,220, respectively. The grant date fair value of the options granted by the Company for the nine months ended June 30, 2020 and 2019 was $30,020,524 and $9,453,469, respectively.

The intrinsic value of the options exercised during the three months ended June 30, 2020 and 2019 was $9,529,237 and $9,349,226, respectively. The intrinsic value of the options exercised during the nine months ended June 30, 2020 and 2019 was $39,775,062 and $17,471,520, respectively.

As of June 30, 2020, the pre-tax compensation expense for all outstanding unvested stock options in the amount of $35,021,715 will be recognized in the Company's results of operations over a weighted average period of 3.3 years.

The fair value of each stock option award is estimated on the date of grant using the Black-Scholes option pricing model. The Black-Scholes option valuation model was developed for use in estimating the fair value of traded options, which do not have vesting restrictions and are fully transferable. The determination of the fair value of each stock option is affected by the Company's stock price on the date of grant, as well as assumptions regarding a number of highly complex and subjective variables. Because the Company's employee stock options have characteristics significantly different from those of traded options, and because changes in the subjective input assumptions can materially affect the fair value estimate, in management's opinion, the existing models do not necessarily provide a reliable single measure of the fair value of its employee stock options.

The assumptions used to value stock options are as follows:

	Nine Months Ended June 30,	
	2020	2019
Dividend yield	—	—
Risk-free interest rate	0.4 – 1.8%	1.9 – 3.1%
Volatility	90.5 – 91.9%	115%
Expected life (in years)	6.25	6.25
Weighted average grant date fair value per share of options granted	$38.12	$12.21

The dividend yield is zero as the Company currently does not pay a dividend.

The risk-free interest rate is based on that of the U.S. Treasury bond.

Volatility is estimated based on volatility average of the Company's Common Stock price.

Restricted Stock Units

Restricted stock units (RSUs), including time-based and performance-based awards, were granted under the Company's 2013 Incentive Plan and as inducements grants granted outside of the Plan. During the three months ended June 30, 2020, the Company issued 0 RSUs under the 2013 Incentive Plan and 153,000 RSUs as inducement awards. During the nine months ended June 30, 2020, the Company issued 1,749,071 RSUs under the 2013 Incentive Plan and 737,575 RSUs as inducement awards. At vesting, each outstanding RSU will be exchanged for one share of the Company's Common Stock. RSU recipients may elect to net share settle upon vesting, in which case the Company pays the employee's income taxes due upon vesting and withholds a number of shares of Common Stock of equal value. RSU awards generally vest subject to the satisfaction of service requirements or the satisfaction of both service requirements and achievement of certain performance targets.

The following table summarizes the activity of the Company's RSUs:

	Number of RSUs	Weighted-Average Grant Date Fair Value
Unvested at September 30, 2019	2,062,833	$ 9.43
Granted	2,486,646	57.04
Vested	(1,155,404)	9.65
Forfeited	(67,000)	31.78
Unvested at June 30, 2020	3,327,075	$ 44.49

During the three months ended June 30, 2020 and 2019, the Company recorded $7,386,943 and $941,788 of expense related to RSUs, respectively. During the nine months ended June 30, 2020 and 2019, the Company recorded $20,713,488 and $4,453,169 of expense related to RSUs, respectively. Such expense is included in stock-based compensation expense in the Company's Consolidated Statement of Operations and Comprehensive Income (Loss). For RSUs, the expense creates a timing difference, resulting in a deferred tax asset, which is fully reserved by a valuation allowance.

For RSUs, the grant date fair value of the award is based on the Company's closing stock price at the grant date, with consideration given to the probability of achieving performance conditions for performance-based awards.

As of June 30, 2020 the pre-tax compensation expense for all unvested RSUs in the amount of $87,634,315 will be recognized in the Company's results of operations over a weighted average period of 3.3 years.

NOTE 10. ***FAIR VALUE MEASUREMENTS***

The Company measures its financial assets and liabilities at fair value. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability (i.e., exit price) in an orderly transaction between market participants at the measurement date. Additionally, the Company is required to provide disclosure and categorize assets and liabilities measured at fair value into one of three different levels depending on the assumptions (i.e., inputs) used in the valuation. Level 1 provides the most reliable measure of fair value while Level 3 generally requires significant management judgment. Financial assets and liabilities are classified in their entirety based on the lowest level of input significant to the fair value measurement. The fair value hierarchy is defined as follows:

Level 1—Valuations are based on unadjusted quoted prices in active markets for identical assets or liabilities.

Level 2—Valuations are based on quoted prices for similar assets or liabilities in active markets, or quoted prices in markets that are not active for which significant inputs are observable, either directly or indirectly.

Level 3—Valuations are based on prices or valuation techniques that require inputs that are both unobservable and significant to the overall fair value measurement. Inputs reflect management's best estimate of what market participants would use in valuing the asset or liability at the measurement date.

The following table summarizes fair value measurements at June 30, 2020 and September 30, 2019 for assets and liabilities measured at fair value on a recurring basis:

June 30, 2020:

	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	$ 219,322,617	$ —	$ —	$ 219,322,617
Short-term investments	$ 68,897,679	$ —	$ —	$ 68,897,679
Long-term investments	$ 183,360,225	$ —	$ —	$ 183,360,225
Contingent consideration	$ —	$ —	$ —	$ —

September 30, 2019:

	Level 1	Level 2	Level 3	Total
Cash and cash equivalents	$ 221,804,128	$ —	$ —	$ 221,804,128
Short-term investments	$ 37,122,478	$ —	$ —	$ 37,122,478
Long-term investments	$ 45,051,251	$ —	$ —	$ 45,051,251
Contingent consideration	$ —	$ —	$ —	$ —

The Company had a liability for contingent consideration related to its acquisition of the Roche RNAi business completed in 2011. The fair value measurement of the contingent consideration obligations is determined using Level 3 inputs. The fair value of contingent consideration obligations is based on a discounted cash flow model using a probability-weighted income approach. The measurement is based upon unobservable inputs supported by little or no market activity based on the Company's assumptions and experience. Estimating timing to complete the development and obtain approval of products is difficult, and there are inherent uncertainties in developing a product candidate, such as obtaining FDA and other regulatory approvals. In determining the probability of regulatory approval and commercial success, the Company utilizes data regarding similar milestone events from several sources, including industry studies and its own experience. These fair value measurements represent Level 3 measurements as they are based on significant inputs not observable in the market. Significant judgment is employed in determining the appropriateness of these assumptions as of the acquisition date and for each subsequent period. Accordingly, changes in assumptions could have a material impact on the amount of contingent consideration expense the Company records in any given period. In November 2016, the Company announced the discontinuation of its clinical trial efforts for ARC-520, ARC-AAT and ARC-521. Given this development, the Company assessed the fair value of its contingent consideration obligation to be $0 at June 30, 2020 and September 30, 2019.

ITEM 2. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

This Quarterly Report on Form 10-Q contains certain forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934, and we intend that such forward-looking statements be subject to the safe harbors created thereby. For this purpose, any statements contained in this Quarterly Report on Form 10-Q except for historical information may be deemed to be forward-looking statements. Without limiting the generality of the foregoing, words such as "may," "will," "expect," "believe," "anticipate," "intend," "could," "estimate," or "continue" or the negative or other variations thereof or comparable terminology are intended to identify forward-looking statements. In addition, any statements that refer to projections of our future financial performance, trends in our businesses, or other characterizations of future events or circumstances are forward-looking statements.

The forward-looking statements included herein are based on current expectations of our management based on available information and involve a number of risks and uncertainties, all of which are difficult or impossible to predict accurately and many of which are beyond our control. As such, our actual results may differ significantly from those expressed in any forward-looking statements. Readers should carefully review the factors identified in our most recent Annual Report on Form 10-K under the caption "Risk Factors" as well as the additional risks described in other documents we file from time to time with the Securities and Exchange Commission ("SEC"), including subsequent quarterly reports on Form 10-Q. In light of the significant risks and uncertainties inherent in the forward-looking information included herein, the inclusion of such information should not be regarded as a representation by us or any other person that such results will be achieved, and readers are cautioned not to place undue reliance on such forward-looking information. Except as may be required by law, we disclaim any intent to revise the forward-looking statements contained herein to reflect events or circumstances after the date hereof or to reflect the occurrence of unanticipated events.

Overview

Arrowhead Pharmaceuticals, Inc. develops medicines that treat intractable diseases by silencing the genes that cause them. Using a broad portfolio of RNA chemistries and efficient modes of delivery, Arrowhead therapies trigger the RNA interference mechanism to induce rapid, deep and durable knockdown of target genes. RNA interference, or RNAi, is a mechanism present in living cells that inhibits the expression of a specific gene, thereby affecting the production of a specific protein. Arrowhead's RNAi-based therapeutics leverage this natural pathway of gene silencing. The Company's pipeline includes ARO-AAT for liver disease associated with alpha-1 antitrypsin deficiency (AATD), ARO-APOC3 for hypertriglyceridemia, ARO-ANG3 for dyslipidemia, ARO-HSD for liver disease, ARO-ENaC for cystic fibrosis, ARO-HIF2 for renal cell carcinoma, ARO-LUNG2 as a candidate to treat chronic obstructive pulmonary disorder (COPD) and ARO-COV for treatment for the current novel coronavirus that causes COVID-19 and other possible future pulmonary-borne pathogens. ARO-JNJ1 is being developed for an undisclosed liver-expressed target under a collaboration agreement with Janssen Pharmaceuticals, Inc. ("Janssen"). ARO-HBV (JNJ-3989) for chronic hepatitis B virus was out-licensed to Janssen in October 2018. ARO-LPA (AMG 890) for cardiovascular disease was out-licensed to Amgen Inc. ("Amgen") in 2016.

Arrowhead operates a lab facility in Madison, Wisconsin, where the Company's research and development activities, including the development of RNAi therapeutics, are based. The Company's principal executive offices are located in Pasadena, California. In March 2020, the Company entered into a sublease for additional research and development facility space in San Diego, California.

Arrowhead has focused its resources on therapeutics that exclusively utilize the company's Targeted RNAi Molecule (TRiM™) platform technology. Therapeutics built on the TRiM™ platform have demonstrated high levels of pharmacologic activity in multiple animal models spanning several therapeutic areas. TRiM™ enabled therapeutics offer several potential advantages over prior generation and competing technologies, including: simplified manufacturing and reduced costs; multiple routes of administration including subcutaneous injection and inhaled administration; the ability to target multiple tissue types including liver, lung, and tumors; and the potential for improved safety and reduced risk of intracellular buildup, because there are less metabolites from smaller, simpler molecules.

During fiscal year 2020, the Company has continued to develop its pipeline and partnered candidates. The Company has began dosing in an adaptive design phase 2/3 trial, called SEQUOIA, with the potential to serve as a pivotal registration study of ARO-AAT. The Company also began dosing in its ARO-AAT 2002 study, a pilot open-label, multi-dose Phase 2 study to assess changes in novel histological activity scale in response to ARO-AAT over time in patients with alpha-1 antitrypsin deficiency associated liver disease. In addition, the Company also dosed the first patients in AROHSD1001, a Phase 1/2 clinical study of ARO-HSD, the Company's investigational RNA interference therapeutic being developed as a treatment for patients with alcohol related and nonalcohol related liver diseases, such as nonalcoholic steatohepatitis (NASH). The Company also presented new clinical data on its two cardiometabolic candidates, ARO-APOC3 and ARO-ANG3, in two late-breaking oral presentations at the American Heart Association Scientific Sessions 2019. In addition, the Company filed an investigational new drug ("IND") application to begin a phase 1b study of ARO-HIF2 and filed a clinical trials application ("CTA") to begin a phase 1 study of ARO-ENaC.

The Company's partnered candidates under its collaboration agreements with Janssen and Amgen also continue to progress. Janssen began dosing patients in a phase 2b triple combination study called REEF-1, designed to enroll up to 450 patients with chronic hepatitis B infection, and in connection with the start of this study Arrowhead earned a $25 million milestone payment under the License Agreement ("Janssen License Agreement"). Janssen has also nominated the first of 3 potential candidates under the Research Collaboration and Option Agreement ("Janssen Collaboration Agreement"), ARO-JNJ1, and the Company is currently performing discovery, optimization and preclinical research and development for this candidate. Under the terms of the Janssen agreements taken together, the Company has received $175 million as an upfront payment, $75 million in the form of an equity investment by Johnson & Johnson Innovation-JJDC, Inc. ("JJDC") in Arrowhead common stock under the Stock Purchase Agreement ("JJDC Stock Purchase Agreement"), two $25 million milestone payments and may receive up to $1.6 billion in development and sales milestones payments for the Janssen License Agreement, and up to $1.9 billion in development and sales milestone payments for the three additional targets covered under the Janssen Collaboration Agreement. The Company is further eligible to receive tiered royalties up to mid teens under the Janssen License Agreement and up to low teens under the Janssen Collaboration Agreement on product sales. The Company's collaboration agreement with Amgen for AMG 890 (ARO-LPA), (the "Second Collaboration and License Agreement" or "AMG 890 (ARO-LPA) Agreement"), continues to progress. The Company has received $35 million in upfront payments, $21.5 million in the form of an equity investment by Amgen in the Company's Common Stock, a $10 million milestone payment, and may receive up to $420 million in development, regulatory and sales milestone payments. The Company is eligible to receive up to low double-digit royalties for sales of products under the AMG 890 (ARO-LPA) Agreement. In July 2020, Amgen initiated a Phase 2 clinical study, which will result in a $20 million milestone payment to the Company.

The Company continues to develop other clinical candidates for future clinical trials. Clinical candidates are tested internally and through GLP toxicology studies at outside laboratories. Drug materials for such studies and clinical trials are either contracted to third-party manufactures or manufactured internally. The Company engages third-party contract research organizations (CROs) to manage clinical trials and works cooperatively with such organizations on all aspects of clinical trial management, including plan design, patient recruiting, and follow up. These outside costs, relating to the preparation for and administration of clinical trials, are referred to as "program costs". If the clinical candidates progress through human testing, program costs will increase.

The Company is actively monitoring the COVID-19 pandemic. The financial results for the three and nine months ended June 30, 2020 were not significantly impacted by COVID-19. The Company temporarily paused enrollment in its two ARO-AAT studies, SEQUOIA and the ARO-AAT 2002 study, but resumed the process of screening and enrolling patients during the three months ended June 30, 2020. During the pause in enrollment, patients already enrolled in these studies continued to be dosed per protocol and continued to come in for their follow up visits. Additional delays have occurred in the Company's earlier stage programs, but we do not expect a material impact to any program's anticipated timelines. Several of the Company's other clinical candidates are in the start-up stage (ARO-HSD, ARO-HIF2 and ARO-ENaC), during which significant clinical costs will continue to be incurred. Additionally, the Company's operations at its research and development facilities in Madison, Wisconsin and San Diego, California, as well as its corporate headquarters in Pasadena, California have continued to operate with limited impact, other than for enhanced safety measures, including work from home policies. However, the Company cannot predict the impact of the progression of COVID-19 will have on future financial results due to a variety of factors including the ability of the Company's clinical sites to continue to enroll subjects, the ability of the Company's suppliers to continue to operate, the continued good health and safety of the Company's employees, and ultimately the length of the COVID-19 pandemic.

Net losses were $13.6 million for the three months ended June 30, 2020 as compared to net income of $20.3 million for the three months ended June 30, 2019. Net losses were $36.1 million for the nine months ended June 30, 2020 as compared to net income of $56.3 million for the nine months ended June 30, 2019. Net losses per share – diluted were $0.13 for the three months ended June 30, 2020 as compared to net income per share - diluted of $0.21 for the three months ended June 30, 2019. Net losses per share – diluted were $0.36 for the nine months ended June 30, 2020 as compared to net income per share – diluted of $0.58 for the nine months ended June 30, 2019. An increase in research and development and general and administrative expenses coupled with a decrease in revenue from the license and collaboration agreements with Janssen were the drivers of the increase in net losses and net losses per share, as discussed further below.

The Company strengthened its liquidity and financial position through the Janssen License Agreement, Janssen Collaboration Agreement and JJDC Stock Purchase Agreement, executed in October 2018. Under the terms of the agreements taken together, the Company has received $175 million as an upfront payment, $75 million in the form of an equity investment by JJDC in Arrowhead common stock, and two $25 million milestone payments. Additionally, in December 2019, the Company completed a securities offering which generated approximately $250.5 million in net cash proceeds. Moreover, effective August 5, 2020, the Company entered into an Open Market Sale Agreement with Jefferies LLC (the "ATM Agreement"), which provides that, subject to the conditions and limitations set forth in the ATM Agreement, the Company may elect, from time to time, to issue and sell shares of the Company's common stock up to $250 million. These cash proceeds secure the funding needed to continue to advance our pipeline candidates. The Company had $219.3 million of cash and cash equivalents, $67.7 million in short-term investments, $177.5 million of long term investments and $555.7 million of total assets as of June 30, 2020, as compared to $221.8 million, $36.9 million, $44.2 million and $349.8 million as of September 30, 2019, respectively. Based upon the Company's current cash and investment resources and operating plan, the Company expects to have sufficient liquidity to fund operations for at least the next twelve months.

Critical Accounting Policies and Estimates

Management makes certain judgments and uses certain estimates and assumptions when applying generally accepted accounting principles in the United States ("GAAP") in the preparation of our Consolidated Financial Statements. We evaluate our estimates and judgments on an ongoing basis and base our estimates on historical experience and on assumptions that we believe to be reasonable under the circumstances. Our experience and assumptions form the basis for our judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Actual results may vary from what we anticipate and different assumptions or estimates about the future could change our reported results. We believe the following accounting policies are the most critical to us, in that they require our most difficult, subjective or complex judgments in the preparation of our consolidated financial statements. For further information, see *Note 1, Organization and Significant Accounting Policies*, to our Consolidated Financial Statements, which outlines our application of significant accounting policies.

There have been no changes to the significant accounting policies disclosed in the Company's most recent Annual Report on Form 10-K, except as a result of the Financial Accounting Standards Board's ("FASB") Accounting Standards Update ("ASU") No. 2016-02, Leases (ASC 842), as discussed below:

Leases - The Company determines whether a contract is, or contains, a lease at inception. The Company classifies each of its leases as operating or financing considering factors such as the length of the lease term, the present value of the lease payments, the nature of the asset being leased, and the potential for ownership of the asset to transfer during the lease term. Leases with terms greater than one-year are recognized on the Consolidated Balance Sheets as Right-of-use assets and Lease liabilities and are measured at the present value of the fixed payments due over the expected lease term minus the present value of any incentives, rebates or abatements expected to be received from the lessor. Options to extend a lease are typically excluded from the expected lease term as the exercise of the option is typically not reasonably certain. The interest rate implicit in lease contracts is typically not readily determinable. As such, the Company utilizes the appropriate incremental borrowing rate, which is the rate incurred to borrow on a collateralized basis an amount equal to the lease payments over a similar term and in a similar economic environment. The Company records expense to recognize fixed lease payments on a straight-line basis over the expected lease term. Costs determined to be variable and not based on an index or rate are not included in the measurement of the lease liability and are expensed as incurred.

Results of Operations

The following data summarizes our results of operations for the following periods indicated:

	Three Months Ended June 30, 2020	Three Months Ended June 30, 2019
Revenue	$ 27,375,778	$ 42,696,636
Operating Income (Loss)	(15,945,862)	18,595,749
Net Income (Loss)	(13,611,213)	20,335,708
Net Income (Loss) per Share (Diluted)	$ (0.13)	$ 0.21

	Nine Months Ended June 30, 2020	Nine Months Ended June 30, 2019
Revenue	$ 80,359,211	$ 125,502,807
Operating Income (Loss)	(43,039,711)	51,552,585
Net Income (Loss)	(36,120,511)	56,269,944
Net Income (Loss) per Share (Diluted)	$ (0.36)	$ 0.58

The decrease in our Revenue during the three and nine months ended June 30, 2020 was driven by the timing of progress achieved in completing our performance obligation from our agreements with Janssen and JJDC, which were executed in October 2018; partially offset by the $20 million milestone revenue from Amgen for the initiation of phase 2 clinical study for AMG 890 (ARO-LPA). The increase in our Net Loss during the three and nine months ended June 30, 2020 was driven by this decrease in Revenue and also increases in Research and Development and General and Administrative Expenses as our pipeline of clinical candidates has continued to increase.

Revenue

Total revenue was $27,375,778 for the three months ended June 30, 2020 and $42,696,636 for the three months ended June 30, 2019. Total revenue was $80,359,211 for the nine months ended June 30, 2020 and $125,502,807 for the nine months ended June 30, 2019. Revenue in the both periods is primarily related to the recognition of a portion of the $252.6 million initial transaction price associated with our agreements with Janssen and JJDC as we achieved progress toward completing our performance obligation within those agreements.

Amgen Inc.

On September 28, 2016, the Company entered into two Collaboration and License agreements, and a Common Stock Purchase Agreement with Amgen Inc., a Delaware corporation ("Amgen"). Under one of the license agreements (the "Second Collaboration and License Agreement" or "AMG 890 (ARO-LPA) Agreement"), Amgen has received a worldwide, exclusive license to Arrowhead's novel, RNAi ARO-LPA program. These RNAi molecules are designed to reduce elevated lipoprotein(a), which is a genetically validated, independent risk factor for atherosclerotic cardiovascular disease. Under the other license agreement (the "First Collaboration and License Agreement" or "ARO-AMG1 Agreement"), Amgen received an option to a worldwide, exclusive license for ARO-AMG1, an RNAi therapy for an undisclosed genetically validated cardiovascular target. In both agreements, Amgen is wholly responsible for clinical development and commercialization. Under the terms of the agreements taken together, the Company has received $35 million in upfront payments, $21.5 million in the form of an equity investment by Amgen in the Company's Common Stock, and a $10 million milestone payment, and may receive up to $420 million in development, regulatory and sales milestone payments. The Company is further eligible to receive up to low double-digit royalties for sales of products under the AMG 890 (ARO-LPA) Agreement. In July 2019, Amgen informed the Company that it would not be exercising its option for an exclusive license for ARO-AMG1, and as such, there will be no further milestone or royalty payments under the ARO-AMG1 Agreement.

The Company substantially completed its performance obligations under the AMG 890 (ARO-LPA) Agreement and the ARO-AMG1 Agreement. Future milestones and royalties achieved will be recognized in their entirety when earned. In July 2020, Amgen initiated a Phase 2 clinical study, which will result in a $20 million milestone payment to the Company. During the three months ended June 30, 2020 and 2019, the Company recognized $20 million and $0 million of Revenue associated with its agreements with Amgen, respectively. During the nine months ended June 30, 2020 and 2019, the Company recognized $20 million and $0.3 million of Revenue associated with its agreements with Amgen, respectively. As of June 30, 2020, there were $20 million in contract assets recorded as accounts receivable, and $0 contract liabilities recorded as current deferred revenue on the Company's Consolidated Balance Sheets.

Janssen Pharmaceuticals, Inc.

On October 3, 2018, the Company entered into a License Agreement ("Janssen License Agreement") and a Research Collaboration and Option Agreement ("Janssen Collaboration Agreement") with Janssen Pharmaceuticals, Inc. ("Janssen") part of the Janssen Pharmaceutical Companies of Johnson & Johnson. The Company also entered into a Stock Purchase Agreement ("JJDC Stock Purchase Agreement") with Johnson & Johnson Innovation-JJDC, Inc. ("JJDC"), a New Jersey corporation. Under the Janssen License Agreement, Janssen has received a worldwide, exclusive license to the Company's JNJ-3989 (ARO-HBV) program, the Company's third-generation subcutaneously administered RNAi therapeutic candidate being developed as a potentially curative therapy for patients with chronic hepatitis B virus infection. Beyond the Company's ongoing Phase 1 / 2 study of JNJ-3989 (ARO-HBV), Janssen will be wholly responsible for clinical development and commercialization. Under the Janssen Collaboration Agreement, Janssen will be able to select three new targets against which Arrowhead will develop clinical candidates. These candidates are subject to certain restrictions and will not include candidates in the Company's current pipeline. The Company will perform discovery, optimization and preclinical research and development, entirely funded by Janssen, sufficient to allow the filing of a U.S. Investigational New Drug application or equivalent, at which time Janssen will have the option to take an exclusive license. If the option is exercised, Janssen will be wholly responsible for clinical development and commercialization of each optioned candidate. Under the terms of the agreements taken together, the Company has received $175 million as an upfront payment, $75 million in the form of an equity investment by JJDC in Arrowhead common stock, two $25 million milestone payments and may receive up to $1.6 billion in development and sales milestones payments for the Janssen License Agreement, and up to $1.9 billion in development and sales milestone payments for the three additional targets covered under the Janssen Collaboration Agreement. The Company is further eligible to receive tiered royalties up to mid teens under the Janssen License Agreement and up to low teens under the Janssen Collaboration Agreement on product sales.

The Company has evaluated these agreements in accordance with the new revenue recognition requirements that became effective for the Company on October 1, 2018. The adoption of the new revenue standard did not have a material impact on the balances reported when evaluated under the superseded revenue standard. At the inception of these agreements, the Company has identified one distinct performance obligation. Regarding the Janssen License Agreement, the Company determined that the key deliverables included the license and certain R&D services including the Company's responsibility to complete the ongoing Phase 1 /

2 study of JNJ-3989 (ARO-HBV) and the Company's responsibility to ensure certain manufacturing of ARO-HBV drug product is completed and delivered to Janssen (the "Janssen R&D Services"). Due to the specialized and unique nature of these Janssen R&D services, and their direct relationship with the license, the Company determined that these deliverables represent one distinct bundle and thus, one performance obligation. The Company also determined that Janssen's option to require the Company to develop up to three new targets is not a material right, and thus, not a performance obligation at the onset of the agreement. The consideration for this option will be accounted for if and when it is exercised.

The Company determined the transaction price totaled approximately $252.6 million which includes the upfront payment, the premium paid by JJDC for its equity investment in the Company, the two $25 million milestone payments earned and estimated payments for reimbursable Janssen R&D services to be performed. The Company has allocated the total $252.6 million initial transaction price to its one distinct performance obligation for the JNJ-3989 (ARO-HBV) license and the associated Janssen R&D Services. This revenue will be recognized using a proportional performance method (based on actual labor hours versus estimated total labor hours) beginning in October 2018 and ending as the Company's efforts in overseeing the ongoing phase 1/2 clinical trial are completed. During the three months ended June 30, 2020 and 2019, the Company recognized approximately $6.9 million and $42.3 million of Revenue associated with its agreements with Janssen and JJDC, respectively. During the nine months ended June 30, 2020 and 2019, the Company recognized approximately $57.9 million and $124.8 million of Revenue associated with its agreements with Janssen and JJDC, respectively. As of June 30, 2020, there were $0 in contract assets recorded as accounts receivable, and $26.3 million of contract liabilities recorded as current deferred revenue on the Company's Consolidated Balance Sheets. The $26.3 million of current deferred revenue is driven by the upfront payment, the premium paid by JJDC for its equity investment in the Company, and the two $25 million milestone payments earned, net of revenue recognized to date.

Janssen has also selected the first of the three targets under the Janssen Collaboration Agreement, now referred to as ARO-JNJ1, and the Company has begun to conduct its discovery, optimization and preclinical research and development of ARO-JNJ1. All costs and labor hours spent by the Company will be entirely funded by Janssen. During the three months ended June 30, 2020 and 2019, the Company recognized approximately $0.4 million and $0.4 million of Revenue associated with its efforts on the ARO-JNJ1 candidate, respectively. During the nine months ended June 30, 2020 and 2019, the Company recognized $2.4 million and $0.4 million of Revenue associated with these efforts on the ARO-JNJ1 candidate, respectively. As of June 30, 2020, there were $1.7 million of contract assets recorded as accounts receivable, and $0 of contract liabilities recorded as current deferred revenue on the Company's Consolidated Balance Sheets.

Operating Expenses

The analysis below details the operating expenses and discusses the expenditures of the Company within the major expense categories. Certain reclassifications have been made to prior-period operating expense categories to conform to the current period presentation. For purposes of comparison, the amounts for the three and nine months ended June 30, 2020 and 2019 are shown in the tables below.

Research and Development Expenses

R&D expenses are related to the Company's research and development efforts, and related program costs which are comprised primarily of outsourced costs related to the manufacturing of clinical supplies, toxicity/efficacy studies and clinical trial expenses. Internal costs primarily relate to operations at our research facilities in Madison, Wisconsin and San Diego, California, including facility costs and laboratory-related expenses. Salaries and stock compensation expense consist of salary, bonuses, payroll taxes and related benefits and stock compensation for our R&D personnel. Depreciation and amortization expense relates to depreciation on lab equipment and leasehold improvements at our Madison research facility. The following table provides details of research and development expenses for the periods indicated:

(in thousands)

	Three Months Ended June 30, 2020	% of Expense Category	Three Months Ended June 30, 2019	% of Expense Category	Increase (Decrease) $	Increase (Decrease) %
Salaries	$ 4,861	15%	$ 3,456	18%	$ 1,405	41%
Stock compensation	5,296	16%	931	5%	4,365	469%
In Vivo studies	810	3%	766	4%	44	6%
Drug manufacturing	6,607	20%	4,907	25%	1,700	35%
Toxicity/efficacy studies	3,019	9%	1,858	10%	1,161	62%
Clinical trials	6,129	19%	4,310	22%	1,819	42%
License, royalty & milestones	-	0%	-	0%	-	N/A
Facilities related	1,209	4%	652	3%	557	85%
Depreciation/amortization	1,382	4%	998	5%	384	38%
Other R&D	3,260	10%	1,414	7%	1,846	131%
Total	$ 32,573	100%	$ 19,292	100%	$ 13,281	69%

	Nine Months Ended June 30, 2020	% of Expense Category	Nine Months Ended June 30, 2019	% of Expense Category	Increase (Decrease) $	Increase (Decrease) %
Salaries	$ 13,173	15%	$ 10,121	18%	$ 3,052	30%
Stock compensation	9,411	11%	2,453	4%	6,958	284%
In Vivo studies	2,557	3%	1,661	3%	896	54%
Drug manufacturing	19,092	22%	18,141	32%	951	5%
Toxicity/efficacy studies	9,142	11%	6,679	12%	2,463	37%
Clinical trials	15,764	19%	9,756	17%	6,008	62%
License, royalty & milestones	903	1%	-	0%	903	N/A
Facilities related	2,653	3%	2,018	4%	635	31%
Depreciation/amortization	3,712	4%	3,340	6%	372	11%
Other R&D	8,983	11%	3,493	6%	5,490	157%
Total	$ 85,390	100%	$ 57,662	100%	$ 27,728	48%

Salaries expense increased by $1,405,000 from $3,456,000 during the three months ended June 30, 2019 to $4,861,000 during the current period. Salaries expense increased by $3,052,000 from $10,121,000 during the nine months ended June 30, 2019 to $13,173,000 during the current period. The increase in the expense is primarily due to an increase in R&D headcount that has occurred as the Company has expanded its pipeline of candidates.

Stock compensation expense, a non-cash expense, increased by $4,365,000 from $931,000 during the three months ended June 30, 2019 to $5,296,000 during the current period. Stock compensation expense, a non-cash expense, increased by $6,958,000 from $2,453,000 during the nine months ended June 30, 2019 to $9,411,000 during the current period. Stock compensation expense is based upon the valuation of stock options and restricted stock units granted to employees, directors, and certain consultants. Many variables affect the amount expensed, including the Company's stock price on the date of the grant, as well as other assumptions. The increase in the expense is primarily due to the increased headcount discussed above and a mix of higher grant date fair values of awards amortizing during the periods due to the Company's stock price at the time of the grants.

In vivo studies expense increased by $44,000 from $766,000 during the three months ended June 30, 2019 to $810,000 during the current period. In vivo studies expense increased by $896,000 from $1,661,000 during the nine months ended June 30, 2019 to $2,557,000 during the current period. In vivo studies expense can vary depending on the stage of preclinical candidates, the nature and amount of testing required and the cost variation of different in vivo testing models. The increase in vivo studies expense is the result of the timing of discovery studies being completed between periods.

Drug manufacturing expense increased by $1,700,000 from $4,907,000 during the three months ended June 30, 2019 to $6,607,000 during the current period. Drug manufacturing expense increased by $951,000 from $18,141,000 during the nine months ended June 30, 2019 to $19,092,000 during the current period. The increase in the expense primarily relates to the timing of manufacturing campaigns in preparation for our candidate clinical trials and toxicology studies. We anticipate this expense to increase as the volume of candidates in our pipeline increases and as each candidate progresses through clinical trial phases.

Toxicity/efficacy studies expense increased by $1,161,000 from $1,858,000 during the three months ended June 30, 2019 to $3,019,000 during the current period. Toxicity/efficacy studies expense increased by $2,463,000 from $6,679,000 during the nine months ended June 30, 2019 to $9,142,000 during the current period. This category includes IND-enabling toxicology studies as well as post-IND toxicology studies, such as long-term toxicology studies, and other efficacy studies. The change in the expense primarily relates to toxicology studies for ARO-ANG3, ARO-APOC3, ARO-HIF2 and ARO-HSD as each candidate progresses through and into clinical trials. We anticipate this expense to increase as we prepare to enter clinical trials with our other drug candidates.

Clinical trials expense increased by $1,819,000 from $4,310,000 during the three months ended June 30, 2019 to $6,129,000 during the current period. Clinical trials expense increased by $6,008,000 from $9,756,000 during the nine months ended June 30, 2019 to $15,764,000 during the current period. The increase in the expense is primarily due to the ongoing ARO-AAT and JNJ-3989 (ARO-HBV) clinical trials, the progression of the ARO-ANG3 and ARO-APOC3 clinical trials, and the start up of the ARO-HSD, ARO-HIF2 and ARO-ENaC clinical trials. We anticipate this expense to increase as our current clinical candidates progress through clinical trials and as we enter clinical trials with our other drug candidates.

License, royalty and milestones expense did not change from $0 during the three months ended June 30, 2019 to $0 during the current period. License, royalty and milestones expense increased by $903,000 from $0 during the nine months ended June 30, 2019 to $903,000 during the current period. This category includes milestone payments which can vary from period to period depending on the nature of our various license agreements, and the timing of reaching various development milestones requiring payment. During the nine months ended June 30, 2020, the Company accrued a $0.9 million milestone payment related to the progression of the ARO-ENaC program. During the nine months ended June 30, 2019, the Company did not accrue for any milestone payments.

Facilities expense increased by $557,000 from $652,000 during the three months ended June 30, 2019 to $1,209,000 during the current period. Facilities expense increased by $635,000 from $2,018,000 during the nine months ended June 30, 2019 to $2,653,000 during the current period. This category includes rental costs for our research and development facilities in Madison, Wisconsin and San Diego, California. The increase in the expense is primarily due the commencement of our sublease in San Diego, California in April 2020.

Depreciation and amortization expense, a non-cash expense, increased by $384,000 from $998,000 during the three months ended June 30, 2019 to $1,382,000 during the current period. Depreciation and amortization expense, a non-cash expense, increased by $372,000 from $3,340,000 during the nine months ended June 30, 2019 to $3,712,000 during the current period. The majority of depreciation and amortization expense relates to depreciation on lab equipment and leasehold improvements at our Madison research facility.

Other research expense increased by $1,846,000 from $1,414,000 during the three months ended June 30, 2019 to $3,260,000 during the current period. Other research expense increased by $5,490,000 from $3,493,000 during the nine months ended June 30, 2019 to $8,983,000 during the current period. This category includes the following costs to support discovery efforts and the advancement of current drug candidates: in-house laboratory supplies, outsourced labs services, and other miscellaneous research and development expenses. The increase in other research expense is due to additional in-house laboratory supplies for our increased headcount and partially due to equipment purchased for the new San Diego research and development facility.

General & Administrative Expenses

The following table provides details of our general and administrative expenses for the periods indicated:

(in thousands)

	Three Months Ended June 30, 2020	% of Expense Category	Three Months Ended June 30, 2019	% of Expense Category	Increase (Decrease) $	Increase (Decrease) %
Salaries	$ 2,633	25%	$ 1,241	26%	$ 1,392	112%
Stock compensation	4,750	44%	1,027	21%	3,723	363%
Professional/outside services	2,020	19%	1,670	35%	350	21%
Facilities related	446	4%	241	5%	205	85%
Depreciation/amortization	154	1%	5	0%	149	2980%
Other G&A	746	7%	625	13%	121	19%
Total	$ 10,749	100%	$ 4,809	100%	$ 5,940	123%

	Nine Months Ended June 30, 2020	% of Expense Category	Nine Months Ended June 30, 2019	% of Expense Category	Increase (Decrease) $	Increase (Decrease) %
Salaries	$ 9,747	26%	$ 4,909	30%	$ 4,838	99%
Stock compensation	18,099	48%	4,824	30%	13,275	275%
Professional/outside services	5,519	15%	4,252	26%	1,267	30%
Facilities related	1,657	4%	803	5%	854	106%
Depreciation/amortization	456	1%	16	0%	440	2750%
Other G&A	2,531	7%	1,484	9%	1,047	71%
Total	$ 38,009	100%	$ 16,288	100%	$ 21,721	133%

Salaries expense increased by $1,392,000 from $1,241,000 during the three months ended June 30, 2019 to $2,633,000 during the current period. Salaries expense increased by $4,838,000 from $4,909,000 during the nine months ended June 30, 2019 to $9,747,000 during the current period. The increase in the expense is primarily driven by annual merit increases, performance bonuses and increased headcount.

Stock compensation expense, a non-cash expense, increased by $3,723,000 from $1,027,000 during the three months ended June 30, 2019 to $4,750,000 during the current period. Stock compensation expense, a non-cash expense, increased by $13,275,000 from $4,824,000 during the nine months ended June 30, 2019 to $18,099,000 during the current period. Stock compensation expense is based upon the valuation of stock options and restricted stock units granted to employees, directors, and certain consultants. Many variables affect the amount expensed, including the Company's stock price on the date of the grant, as well as other assumptions. The increase in expense is primarily due to the timing of the achievement of certain performance-based awards in each period and a mix of higher grant date fair values of awards amortizing during the periods due to the Company's stock price at the time of the grants.

Professional/outside services include legal, accounting, consulting, patent expenses, business insurance expenses and other outside services retained by the Company. Professional/outside services expense increased by $350,000 from $1,670,000 during the three months ended June 30, 2019 to $2,020,000 during the current period. Professional/outside services expense increased by $1,267,000 from $4,252,000 during the nine months ended June 30, 2019 to $5,519,000 during the current period. The increases in the expense in the three and nine month periods are primarily related certain patent-related expenses.

Facilities-related expense increased by $205,000 from $241,000 during the three months ended June 30, 2019 to $446,000 during the current period. Facilities-related expense increased by $854,000 from $803,000 during the nine months ended June 30, 2019 to $1,657,000 during the current period. This category primarily includes rental costs for our corporate headquarters in Pasadena, California. The increase in the expense is primarily related to costs incurred as we moved into our new corporate headquarters during the current period.

Depreciation and amortization expense, a noncash expense, increased by $149,000 from $5,000 during the three months ended June 30, 2019 to $154,000 during the current period. Depreciation and amortization expense, a noncash expense, increased by $440,000 from $16,000 during the nine months ended June 30, 2019 to $456,000 during the current period. The increase in the expense is primarily related to amortization of leasehold improvements for our new corporate headquarters.

Other G&A expense increased by $121,000 from $625,000 during the three months ended June 30, 2019 to $746,000 during the current period. Other G&A expense increased by $1,047,000 from $1,484,000 during the nine months ended June 30, 2019 to $2,531,000 during the current period. This category consists primarily of travel, communication and technology, office expenses, and franchise and property tax expenses. The increase in the expense was due to increased communication and technology and office expenses associated with our new corporate headquarters.

Other Income / Expense

Other income / expense was income of $2,334,649 and $1,739,959 during the three months ended June 30, 2020 and 2019, respectively. Other income / expense was income of $6,919,200 and $4,717,359 during the nine months ended June 30, 2020 and 2019, respectively. Other income / expense in the both periods was interest income earned on the Company's investments. This interest income has increased in the current periods as our investment holdings have grown.

Liquidity and Cash Resources

Arrowhead has historically financed its operations through the sale of its equity securities. Research and development activities have required significant capital investment since the Company's inception and are expected to continue to require significant cash expenditure in the future.

At June 30, 2020, the Company had cash on hand of approximately $219.3 million as compared to $221.8 million at September 30, 2019. Excess cash invested in short-term fixed income securities was $67.7 million at June 30, 2020, compared to $36.9 million at September 30, 2019. Excess cash invested in long-term fixed income securities was $177.5 million at June 30, 2020, compared to $44.2 million at September 30, 2019. The Company believes its current financial resources are sufficient to fund its operations through at least the next twelve months.

A summary of cash flows for the nine months ended June 30, 2020 and 2019 is as follows:

	Nine Months Ended June 30, 2020	Nine Months Ended June 30, 2019
Cash Flow from Continuing Operations:		
Operating Activities	$ (84,541,545)	$ 159,225,017
Investing Activities	(174,883,363)	(64,575,067)
Financing Activities	256,943,397	64,548,584
Net Increase (Decrease) in Cash	(2,481,511)	159,198,534
Cash and Cash Equivalents at Beginning of Period	221,804,128	30,133,213
Cash and Cash Equivalents at End of Period	$ 219,322,617	$ 189,331,747

During the nine months ended June 30, 2020, the Company used $84.5 million in cash from operating activities, which was primarily related to the ongoing expenses of the Company's research and development programs and general and administrative expenses. Cash used in investing activities was $174.9 million, which was primarily related to the purchase of fixed-income investments of $194.0 million and property and equipment of $10.1 million, partially offset by maturities of fixed-income securities of $29.1 million. Cash provided by financing activities of $256.9 million was driven by the securities financing in December 2019, which generated $250.5 million in net cash proceeds, as well as $6.5 million in cash received from stock option exercises.

During the nine months ended June 30, 2019, the Company generated $159.2 million in cash from operating activities, which was primarily related to the $175.0 million upfront payment and the $25.0 million milestone payment received from Janssen, and the premium JJDC paid on the Company's common stock during the period. These inflows were partially offset by approximately $55 million of cash used for the ongoing expenses of the Company's research and development programs and general and administrative expenses. Cash used in investing activities was $64.6 million, which was primarily related to purchases of fixed-income investments of $90.3 million partially offset by maturities of fixed-income investments of $30.0 million. Cash provided by financing activities of $64.5 million was driven by the equity investment the Company received from JJDC during the period.

Off-Balance Sheet Arrangements

We do not have any off-balance sheet arrangements or relationships.

ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

There has been no material change in our exposure to market risk from that described in Item 7A of our Annual Report on Form 10-K for the year ended September 30, 2019.

ITEM 4. CONTROLS AND PROCEDURES

Our Chief Executive Officer and our Chief Financial Officer, after evaluating our “disclosure controls and procedures” (as defined in Rules 13a-15(e) and 15d-15(e)) of the Securities Exchange Act of 1934, as amended (the “Exchange Act”) as of the end of the period covered by this Quarterly Report on Form 10-Q (the “Evaluation Date”), have concluded that, as of the Evaluation Date, our disclosure controls and procedures are effective to ensure that information we are required to disclose in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in SEC rules and forms, and to ensure that information required to be disclosed by us in such reports is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer where appropriate, to allow timely decisions regarding required disclosure.

No change in the Company’s internal controls over financial reporting (as defined in Rule 13a-15(f) and 15d-15(f) of the Exchange Act) occurred during the Company’s most recent fiscal quarter that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

PART II—OTHER INFORMATION

ITEM 1. LEGAL PROCEEDINGS

From time to time, we may be involved in routine legal proceedings, as well as demands, claims and threatened litigation, which arise in the normal course of our business. Litigation can be expensive and disruptive to normal business operations. Moreover, the results of legal proceedings, particularly complex legal proceedings, cannot be predicted with any certainty. We disclosed information about certain of our legal proceedings in Part I, Item 3 of our Annual Report on Form 10-K for the year ended September 30, 2019.

ITEM 1A. Risk Factors

The disclosure below supplements the risk factors described in our Annual Report on Form 10-K for the year ended September 30, 2019. Please carefully consider the information set forth in this Quarterly Report on Form 10-Q and the risk factors discussed in Part I, "Item 1A. Risk Factors" in our Annual Report on Form 10-K for the year ended September 30, 2019, which could materially affect our business, financial condition or future results. The risks described in our Annual Report on Form 10-K, as well as other risks and uncertainties, could materially and adversely affect our business, results of operations and financial condition, which in turn could materially and adversely affect the trading price of shares of our Common Stock. Additional risks not currently known or currently material to us may also harm our business.

Our results of operations and financial condition may be adversely affected by the novel coronavirus (COVID-19) pandemic and other public health epidemics.

Our business and its operations, including but not limited to our research and development activities and our supply chain, could be adversely affected by health epidemics in regions where we have business operations, and such health epidemics could cause significant disruption in the operations of third parties upon whom we rely. In December 2019, a novel strain of coronavirus, SARS-CoV-2, causing a disease referred to as COVID-19, was reported to have surfaced in Wuhan, China. Since then, COVID-19 has spread to other countries, including the United States, and has been declared a pandemic by the World Health Organization. In response to public health directives and orders related to COVID-19, we have implemented work-from-home policies for substantially all of our employees to the extent work can be performed effectively at home. The effects of executive and similar government orders, shelter-in-place orders and our work-from-home policies may negatively impact our productivity, disrupt our business, increase our expenses, including costs associated with preventive and precautionary measures that we, companies with which we conduct business, and governments are taking, and delay our clinical trials and timelines, the magnitude of which will depend, in part, on the length and severity of the restrictions and other limitations on our ability to conduct our business in the ordinary course. These and similar, and perhaps more severe, disruptions in our operations could negatively impact our business, results of operations and financial condition.

Quarantines, shelter-in-place, executive and similar government orders, or the perception that such orders, shutdowns or other restrictions on the conduct of business operations could occur, related to COVID-19 or other infectious diseases, have impacted and may continue to impact personnel at our business partners in the United States and other countries, or our access to raw materials for our research and development facility discovery efforts, which would disrupt our supply chain.

In addition, our clinical trials have been and may continue to be affected by the COVID-19 pandemic. For example, during fiscal year 2020, we temporarily paused enrollment in our two ARO-AAT studies: SEQUOIA and the ARO-AAT 2002 study. As of June 30, 2020, enrollment in both of these studies has resumed. Additional delays have occurred in the Company's earlier stage programs, but we do not expect a material impact to any program's anticipated timelines. Several of the Company's other clinical candidates are in the start-up stage (ARO-HSD, ARO-HIF2 and ARO-ENaC), during which significant clinical costs will continue to be incurred. If COVID-19 continues to spread in the United States and elsewhere, we may experience additional disruptions that could severely impact our business, preclinical studies and clinical trials, including:

- delays in receiving authorization from local regulatory authorities to initiate any planned clinical trials;
- delays or difficulties in enrolling patients in our clinical trials;
- delays or difficulties in clinical site initiation, including difficulties in recruiting clinical site investigators and clinical site staff;
- delays in clinical sites receiving the supplies and materials needed to conduct our clinical trials, including interruption in global shipping that may affect the transport of clinical trial materials;
- changes in local regulations as part of a response to the COVID-19 pandemic which may require us to change the ways in which our clinical trials are conducted, which may result in unexpected costs, or to discontinue the clinical trials altogether;

- diversion of healthcare resources away from the conduct of clinical trials, including the diversion of hospitals serving as our clinical trial sites and hospital staff supporting the conduct of our clinical trials;
- interruption of key clinical trial activities, such as clinical trial site monitoring and data entry and verification, due to limitations on travel imposed or recommended by federal or state governments, employers and others, or interruption of clinical trial subject visits and study procedures, the occurrence of which could affect the completeness and integrity of clinical trial data and, as a result, the determine the outcomes of the trial;
- risk that participants enrolled in our clinical trials will acquire COVID-19 while the clinical trial is ongoing, which could impact the results of the clinical trial, including by increasing the number of observed adverse events;
- risk that participants enrolled in our clinical trials will not be able to travel to our clinical trial sites as a result of quarantines or other restrictions resulting from COVID-19;
- risk that participants enrolled in our clinical trials will not be able to comply with clinical trial protocols if quarantines impede patient movement or interrupt healthcare services;
- interruptions or delays in preclinical studies due to restricted or limited operations at our research and development laboratory facilities;
- delays in necessary interactions with local regulators, ethics committees and other important agencies and contractors due to limitations in employee resources or forced furlough of government employees;
- limitations in employee resources that would otherwise be focused on the conduct of our clinical trials, including because of sickness of employees or their families or the desire of employees to avoid contact with large groups of people;
- refusal of the FDA to accept data from clinical trials in affected geographies; and
- interruption or delays to our clinical activities.

The spread of COVID-19, which has caused a broad impact globally, may materially affect us economically. While the potential economic impact brought by COVID-19, and the duration of such impact, may be difficult to assess or predict, the widespread pandemic has resulted in significant disruption of global financial markets, which could reduce our ability to access capital and negatively affect our future liquidity. In addition, a recession or market correction resulting from the spread of COVID-19 and related government orders and restrictions could materially affect our business and the value of our common stock.

The COVID-19 pandemic continues to evolve rapidly. The ultimate impact of the COVID-19 pandemic or a similar public health emergency is highly uncertain and subject to change. We do not yet know the full extent of potential delays or impacts on our business, our clinical trials, healthcare systems, or the global economy as a whole. However, any one or a combination of these events could have an adverse effect on our results of operations and financial condition.

ITEM 2. UNREGISTERED SALES OF EQUITY SECURITIES AND USE OF PROCEEDS

None.

ITEM 3. DEFAULTS UPON SENIOR SECURITIES

None.

ITEM 4. MINE SAFETY DISCLOSURES

Not Applicable.

ITEM 5. OTHER INFORMATION

At-The-Market Offering

Effective August 5, 2020, we entered into an Open Market Sale Agreement (the “ATM Agreement”), pursuant to which we may, from time to time, sell up to $250,000,000 in shares of our common stock through Jefferies, acting as the sales agent and/or principal, in an ATM Offering. We are not required to sell shares under the ATM Agreement. We will pay Jefferies a commission of up to 3.0% of the aggregate gross proceeds we receive from all sales of our common stock under the ATM Agreement. Unless otherwise terminated, the ATM Agreement continues until the earlier of selling all shares available under the ATM Agreement or December 2, 2022. No sales have been made under the ATM Agreement.

The ATM Offering is being made under a prospectus supplement filed on August 5, 2020, and related prospectus filed with the SEC pursuant to our automatically effective shelf registration statement on Form S-3 (File No. 333-235324), filed with the SEC on December 2, 2019.

A copy of the ATM Agreement is attached as Exhibit 1.1 to this Quarterly Report. The foregoing description of the ATM Agreement does not purport to be complete and is qualified in its entirety by reference to Exhibit 1.1. A copy of the opinion of Gibson, Dunn & Crutcher LLP relating to the validity of the securities issued in the ATM Offering is filed as Exhibit 5.1 to this Quarterly Report.

ITEM 6. EXHIBITS

Exhibit Number	Document Description
1.1	Open Market Sale Agreement, dated as of August 5, 2020, by and between Arrowhead Pharmaceuticals, Inc. and Jefferies LLC*
5.1	Opinion of Gibson, Dunn, and Crutcher, LLP*
31.1	Certification of Chief Executive Officer pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002*
31.2	Certification of Chief Financial Officer pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002*
32.1	Certification of Chief Executive Officer pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002**
32.2	Certification of Chief Financial Officer pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002**
101.SCH	XBRL Taxonomy Extension Schema Document*
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document*
101.LAB	XBRL Taxonomy Extension Label Linkbase Document*
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document*
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document*
104	The cover page from the Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2020, formatted in Inline XBRL (included as Exhibit 101)*

* Filed herewith
** Furnished herewith

SIGNATURE

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this Quarterly Report on Form 10-Q to be signed on its behalf by the undersigned, thereunto duly authorized.

Dated: August 5, 2020

ARROWHEAD PHARMACEUTICALS, INC.

By: /s/ Kenneth A. Myszkowski
Kenneth A. Myszkowski
Chief Financial Officer

OPEN MARKET SALE AGREEMENT[SM]

August 5, 2020

JEFFERIES LLC
520 Madison Avenue
New York, New York 10022

Ladies and Gentlemen:

Arrowhead Pharmaceuticals, Inc., a Delaware corporation (the "**Company**"), proposes, subject to the terms and conditions stated herein, to issue and sell from time to time through Jefferies LLC, as sales agent and/or principal (the "**Agent**"), shares of the Company's common stock, par value $0.001 per share (the "**Common Shares**"), having an aggregate offering price of up to $250,000,000 on the terms set forth in this agreement (this "**Agreement**").

Section 1. DEFINITIONS

(a) Certain Definitions. For purposes of this Agreement, capitalized terms used herein and not otherwise defined shall have the following respective meanings:

"**Affiliate**" of a Person means another Person that directly or indirectly, through one or more intermediaries, controls, is controlled by, or is under common control with, such first- mentioned Person. The term "control" (including the terms "controlling," "controlled by" and "under common control with") means the possession, direct or indirect, of the power to direct or cause the direction of the management and policies of a Person, whether through the ownership of voting securities, by contract or otherwise.

"**Agency Period**" means the period commencing on the date of this Agreement and expiring on the earliest to occur of (x) the date on which the Agent shall have placed the Maximum Program Amount pursuant to this Agreement and (y) the date this Agreement is terminated pursuant to Section 7.

"**Commission**" means the U.S. Securities and Exchange Commission.

"**Exchange Act**" means the Securities Exchange Act of 1934, as amended, and the rules and regulations of the Commission thereunder.

"**Floor Price**" means the minimum price set by the Company in the Issuance Notice below which the Agent shall not sell Shares during the applicable period set forth in the Issuance Notice, which may be adjusted by the Company at any time during the period set forth in the Issuance Notice by delivering written notice of such change to the Agent and which in no event shall be less

[SM] "Open Market Sale Agreement" is a service mark of Jefferies LLC

than $1.00 without the prior written consent of the Agent, which may be withheld in the Agent's sole discretion.

"**Issuance Amount**" means the aggregate Sales Price of the Shares to be sold by the Agent pursuant to any Issuance Notice.

"**Issuance Notice**" means a written notice delivered to the Agent by the Company in accordance with this Agreement in the form attached hereto as Exhibit A that is executed by its Chief Executive Officer, President or Chief Financial Officer.

"**Issuance Notice Date**" means any Trading Day during the Agency Period that an Issuance Notice is delivered pursuant to Section 3(b)(i).

"**Issuance Price**" means the Sales Price less the Selling Commission.

"**Maximum Program Amount**" means Common Shares with an aggregate Sales Price of the lesser of (a) the number or dollar amount of Common Shares registered under the effective Registration Statement (as defined below) pursuant to which the offering is being made, (b) the number of authorized but unissued Common Shares (less Common Shares issuable upon exercise, conversion or exchange of any outstanding securities of the Company or otherwise reserved from the Company's authorized capital stock), (c) the number or dollar amount of Common Shares permitted to be sold under Form S-3 (including General Instruction I.B.6 thereof, if applicable), or (d) the number or dollar amount of Common Shares for which the Company has filed a Prospectus (as defined below).

"**Person**" means an individual or a corporation, partnership, limited liability company, trust, incorporated or unincorporated association, joint venture, joint stock company, governmental authority or other entity of any kind.

"**Principal Market**" means the Nasdaq Global Select Market or such other national securities exchange on which the Common Shares, including any Shares, are then listed.

"**Sales Price**" means the actual sale execution price of each Share placed by the Agent pursuant to this Agreement.

"**Securities Act**" means the Securities Act of 1933, as amended, and the rules and regulations of the Commission thereunder.

"**Selling Commission**" means up to three percent (3%) of the gross proceeds of Shares sold pursuant to this Agreement, or as otherwise agreed between the Company and the Agent with respect to any Shares sold pursuant to this Agreement.

"**Settlement Date**" means the second business day following each Trading Day during the period set forth in the Issuance Notice on which Shares are sold pursuant to this Agreement, when the Company shall deliver to the Agent the amount of Shares sold on such Trading Day and the Agent shall deliver to the Company the Issuance Price received on such sales.

"**Shares**" means the Company's Common Shares issued or issuable pursuant to this Agreement.

"**Trading Day**" means any day on which the Principal Market is open for trading.

Section 2. REPRESENTATIONS AND WARRANTIES OF THE COMPANY

The Company represents and warrants to, and agrees with, the Agent that as of (1) the date of this Agreement, (2) each Issuance Notice Date, (3) each Settlement Date, (4) each Triggering Event Date (as defined below) and (5) as of each Time of Sale (as defined below) (each of the times referenced above is referred to herein as a "**Representation Date**"), except as may be disclosed in the Prospectus (including any documents incorporated by reference therein and any supplements thereto) on or before a Representation Date:

(a) Registration Statement. The Company has prepared and filed with the Commission a shelf registration statement on Form S-3 (File No. 333-235324) that contains a base prospectus. Such registration statement registers the issuance and sale by the Company of the Shares under the Securities Act. The Company may file one or more additional registration statements from time to time that will contain a base prospectus and related prospectus or prospectus supplement, if applicable, with respect to the Shares. Except where the context otherwise requires, such registration statement(s), including any information deemed to be a part thereof pursuant to Rule 430B under the Securities Act, including all financial statements, exhibits and schedules thereto and all documents incorporated or deemed to be incorporated therein by reference pursuant to Item 12 of Form S-3 under the Securities Act as from time to time amended or supplemented, is herein referred to as the "**Registration Statement**," and the prospectus constituting a part of such registration statement(s), together with any prospectus supplement filed with the Commission pursuant to Rule 424(b) under the Securities Act relating to a particular issuance of the Shares, including all documents incorporated or deemed to be incorporated therein by reference pursuant to Item 12 of Form S-3 under the Securities Act, in each case, as from time to time amended or supplemented, is referred to herein as the "**Prospectus**," except that if any revised prospectus is provided to the Agent by the Company for use in connection with the offering of the Shares that is not required to be filed by the Company pursuant to Rule 424(b) under the Securities Act, the term "**Prospectus**" shall refer to such revised prospectus from and after the time it is first provided to the Agent for such use. The Registration Statement at the time it originally became effective is herein called the "**Original Registration Statement**." As used in this Agreement, the terms "amendment" or "supplement" when applied to the Registration Statement or the Prospectus shall be deemed to include the filing by the Company with the Commission of any document under the Exchange Act after the date hereof that is or is deemed to be incorporated therein by reference.

All references in this Agreement to financial statements and schedules and other information which is "contained," "included" or "stated" in the Registration Statement or the Prospectus (and all other references of like import) shall be deemed to mean and include all such financial statements and schedules and other information which is or is deemed to be incorporated by reference in or otherwise deemed under the Securities Act to be a part of or included in the Registration Statement or the Prospectus, as the case may be, as of any specified date; and all references in this Agreement to amendments or supplements to the Registration Statement or the Prospectus shall be deemed to mean and include, without limitation, the filing of any document under the Exchange Act which is

or is deemed to be incorporated by reference in or otherwise deemed under the Securities Act to be a part of or included in the Registration Statement or the Prospectus, as the case may be, as of any specified date.

At the time the Registration Statement originally became effective and at the time the Company's most recent annual report on Form 10-K was filed with the Commission, if later, the Company met the then-applicable requirements for use of Form S-3 under the Securities Act. During the Agency Period, each time the Company files an annual report on Form 10-K the Company will meet the then-applicable requirements for use of Form S-3 under the Securities Act.

(b) Compliance with Registration Requirements. The Original Registration Statement and any Rule 462(b) Registration Statement have each become effective under the Securities Act. The Company has complied to the Commission's satisfaction with all requests of the Commission for additional or supplemental information. No stop order suspending the effectiveness of the Registration Statement or any Rule 462(b) Registration Statement is in effect and no proceedings for such purpose have been instituted or are pending or, to the best knowledge of the Company, are contemplated or threatened by the Commission.

The Prospectus when filed complied in all material respects with the Securities Act and, if filed with the Commission through its Electronic Data Gathering, Analysis and Retrieval system (except as may be permitted by Regulation S-T under the Securities Act), was identical to the copy thereof delivered to the Agent for use in connection with the issuance and sale of the Shares. Each of the Registration Statement, any Rule 462(b) Registration Statement and any post-effective amendment thereto, at the time it became effective and at all subsequent times, complied and will comply in all material respects with the Securities Act and did not and will not contain any untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading. As of the date of this Agreement, the Prospectus and any Free Writing Prospectus (as defined below) considered together (collectively, the "**Time of Sale Information**") did not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading. The Prospectus, as amended or supplemented, as of its date and at all subsequent times, did not and will not contain any untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading. The representations and warranties set forth in the three immediately preceding sentences do not apply to statements in or omissions from the Registration Statement, any Rule 462(b) Registration Statement, or any post-effective amendment thereto, or the Prospectus, or any amendments or supplements thereto, made in reliance upon and in conformity with information relating to the Agent furnished to the Company in writing by the Agent expressly for use therein, it being understood and agreed that the only such information furnished by the Agent to the Company consists of the information described in Section 6 below. There are no contracts or other documents required to be described in the Prospectus or to be filed as exhibits to the Registration Statement which have not been described or filed as required. The Registration Statement and the offer and sale of the Shares as contemplated hereby meet the requirements of Rule 415 under the Securities Act and comply in all material respects with said rule.

(c) Ineligible Issuer Status. The Company is not an "ineligible issuer" in connection with the offering of the Shares pursuant to Rules 164, 405 and 433 under the Securities Act. Any Free Writing Prospectus that the Company is required to file pursuant to Rule 433(d) under the Securities Act has been, or will be, filed with the Commission in accordance with the requirements of the Securities Act. Each Free Writing Prospectus that the Company has filed, or is required to file, pursuant to Rule 433(d) under the Securities Act or that was prepared by or on behalf of or used or referred to by the Company complies or will comply in all material respects with the requirements of Rule 433 under the Securities Act including timely filing with the Commission or retention where required and legending, and each such Free Writing Prospectus, as of its issue date and at all subsequent times through the completion of the issuance and sale of the Shares did not, does not and will not include any information that conflicted, conflicts with or will conflict with the information contained in the Registration Statement or the Prospectus, including any document incorporated by reference therein. Except for the Free Writing Prospectuses, if any, and electronic road shows, if any, furnished to you before first use, the Company has not prepared, used or referred to, and will not, without your prior consent, prepare, use or refer to, any Free Writing Prospectus.

(d) Incorporated Documents. The documents incorporated or deemed to be incorporated by reference in the Registration Statement and the Prospectus, at the time they were filed with the Commission, complied in all material respects with the requirements of the Exchange Act, as applicable, and, when read together with the other information in the Prospectus, do not contain an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein, in light of the circumstances under which they were made, not misleading.

(e) Exchange Act Compliance. The documents incorporated or deemed to be incorporated by reference in the Prospectus, at the time they were or hereafter are filed with the Commission, and any Free Writing Prospectus or amendment or supplement thereto complied and will comply in all material respects with the requirements of the Exchange Act, and, when read together with the other information in the Prospectus, at the time the Registration Statement and any amendments thereto become effective and at each Time of Sale, as the case may be, will not contain an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the fact required to be stated therein or necessary to make the statements therein, in the light of the circumstances under which they were made, not misleading.

(f) This Agreement. This Agreement has been duly authorized, executed and delivered by the Company.

(g) Authorization of the Shares. The Shares have been duly authorized for issuance and sale pursuant to this Agreement and, when issued and delivered by the Company against payment therefor pursuant to this Agreement, will be validly issued, fully paid and nonassessable, and the issuance and sale of the Shares is not subject to any preemptive rights, rights of first refusal or other similar rights to subscribe for or purchase the Shares.

(h) No Applicable Registration or Other Similar Rights. There are no persons with registration or other similar rights to have any equity or debt securities registered for sale under the Registration Statement or included in the offering contemplated by this Agreement.

(i) No Material Adverse Change. Except as otherwise disclosed in the Registration Statement and the Prospectus, subsequent to the respective dates as of which information is given in the Registration Statement and the Prospectus: (i) there has been no material adverse change, or any development that could reasonably be expected to result in a material adverse change, in the condition, financial or otherwise, or in the earnings, business, properties, operations, assets, liabilities or prospects, whether or not arising from transactions in the ordinary course of business, of the Company and its subsidiaries, considered as one entity (any such change being referred to herein as a "**Material Adverse Change**"); (ii) the Company and its subsidiaries, considered as one entity, have not incurred any material liability or obligation, indirect, direct or contingent, including without limitation any losses or interference with its business from fire, explosion, flood, earthquakes, accident or other calamity, whether or not covered by insurance, or from any strike, labor dispute or court or governmental action, order or decree, that are material, individually or in the aggregate, to the Company and its subsidiaries, considered as one entity, or has entered into any material transactions not in the ordinary course of business; and (iii) there has not been any material decrease in the capital stock or any material increase in any short-term or long-term indebtedness of the Company or its subsidiaries, and there has been no dividend or distribution of any kind declared, paid or made by the Company or, except for dividends paid to the Company or other subsidiaries, by any of the Company's subsidiaries on any class of capital stock, or any repurchase or redemption by the Company or any of its subsidiaries of any class of capital stock.

(j) Independent Accountants. Rose, Snyder & Jacobs, LLP, which has expressed its opinion with respect to the financial statements (which term as used in this Agreement includes the related notes thereto) filed with the Commission as a part of the Registration Statement and the Prospectus, is (i) an independent registered public accounting firm as required by the Exchange Act, and the rules of the Public Company Accounting Oversight Board ("PCAOB"), (ii) in compliance with the applicable requirements relating to the qualification of accountants under Rule 2-01 of Regulation S-X under the Securities Act and (iii) a registered public accounting firm as defined by the PCAOB whose registration has not been suspended or revoked and who has not requested such registration to be withdrawn.

(k) Financial Statements. The financial statements filed with the Commission as a part of the Registration Statement and the Prospectus present fairly the consolidated financial position of the Company and its subsidiaries as of the dates indicated and the results of their operations, changes in stockholders' equity and cash flows for the periods specified. Such financial statements have been prepared in conformity with generally accepted accounting principles as applied in the United States applied on a consistent basis throughout the periods involved, except as may be expressly stated in the related notes thereto. The interactive data in eXtensible Business Reporting Language included or incorporated by reference in the Registration Statement fairly presents the information called for in all material respects and has been prepared in accordance with the Commission's rules and guidelines applicable thereto. No other financial statements or supporting schedules are required to be included in the Registration Statement or the Prospectus. All disclosures, if any, contained in the Registration Statement, the Prospectus and any Free Writing Prospectus that constitute non-GAAP financial measures (as defined by the rules and regulations under the Securities Act and the Exchange Act) comply with Regulation G under the Exchange Act and Item 10 of Regulation S-K under the Securities Act, as applicable. To the Company's knowledge, no person who has been suspended or barred from being associated with a registered public accounting firm, or who has failed to comply with any sanction pursuant to Rule 5300

promulgated by the PCAOB, has participated in or otherwise aided the preparation of, or audited, the financial statements, supporting schedules or other financial data filed with the Commission as a part of the Registration Statement and the Prospectus.

(l) Company's Accounting System. The Company and each of its subsidiaries make and keep accurate books and records and maintain a system of internal accounting controls sufficient to provide reasonable assurance that: (i) transactions are executed in accordance with management's general or specific authorization; (ii) transactions are recorded as necessary to permit preparation of financial statements in conformity with generally accepted accounting principles as applied in the United States and to maintain accountability for assets; (iii) access to assets is permitted only in accordance with management's general or specific authorization; (iv) the recorded accountability for assets is compared with existing assets at reasonable intervals and appropriate action is taken with respect to any differences; and (v) the interactive data in eXtensible Business Reporting Language included or incorporated by reference in the Registration Statement and the Prospectus fairly presents the information called for in all material respects and is prepared in accordance with the Commission's rules and guidelines applicable thereto.

(m) Disclosure Controls and Procedures; Deficiencies in or Changes to Internal Control Over Financial Reporting. The Company has established and maintains disclosure controls and procedures (as defined in Rules 13a-15 and 15d-15 under the Exchange Act), which (i) are designed to ensure that material information relating to the Company, including its consolidated subsidiaries, is made known to the Company's principal executive officer and its principal financial officer by others within those entities, particularly during the periods in which the periodic reports required under the Exchange Act are being prepared; (ii) have been evaluated by management of the Company for effectiveness as of the end of the Company's most recent fiscal quarter; and (iii) are effective in all material respects to perform the functions for which they were established. Since the end of the Company's most recent audited fiscal year, there have been no significant deficiencies or material weaknesses in the Company's internal control over financial reporting (whether or not remediated) and no change in the Company's internal control over financial reporting that has materially affected, or is reasonably likely to materially affect, the Company's internal control over financial reporting. The Company is not aware of any change in its internal control over financial reporting that has occurred during its most recent fiscal quarter that has materially affected, or is reasonably likely to materially affect, the Company's internal control over financial reporting.

(n) Incorporation and Good Standing of the Company. The Company has been duly incorporated and is validly existing as a corporation in good standing under the laws of the jurisdiction of its incorporation and has the corporate power and authority to own, lease and operate its properties and to conduct its business as described in the Registration Statement and the Prospectus and to enter into and perform its obligations under this Agreement. The Company is duly qualified as a foreign corporation to transact business and is in good standing in the State of California and each other jurisdiction in which such qualification is required, whether by reason of the ownership or leasing of property or the conduct of business, except where the failure to be so qualified and in good standing could not be expected, individually or in the aggregate, to result in a Material Adverse Change.

(o) Subsidiaries. Each of the Company's "subsidiaries" (for purposes of this Agreement, as defined in Rule 405 under the Securities Act) has been duly incorporated or organized, as the case may be, and is validly existing as a corporation, partnership or limited liability company, as applicable, in good standing, if applicable, under the laws of the jurisdiction of its incorporation or organization and has the power and authority (corporate or other) to own, lease and operate its properties and to conduct its business as described in the Registration Statement and the Prospectus. Each of the Company's subsidiaries is duly qualified as a foreign corporation, partnership or limited liability company, as applicable, to transact business and is in good standing in each jurisdiction in which such qualification is required, whether by reason of the ownership or leasing of property or the conduct of business, except where the failure to be so qualified and in good standing could not be expected, individually or in the aggregate, to result in a Material Adverse Change. All of the issued and outstanding capital stock or other equity or ownership interests of each of the Company's subsidiaries have been duly authorized and validly issued, are fully paid and nonassessable and, except as disclosed in the Registration Statement and the Prospectus, are owned by the Company, directly or through subsidiaries, free and clear of any security interest, mortgage, pledge, lien, encumbrance or adverse claim. The Company does not own or control, directly or indirectly, any corporation, association or other entity other than the subsidiaries listed in Exhibit 21.1 to the Company's most recent Annual Report on Form 10-K.

(p) Capitalization and Other Capital Stock Matters. The authorized, issued and outstanding capital stock of the Company is as set forth in the Registration Statement and the Prospectus under the captions "The Offering" and "Description of Securities" (other than for subsequent issuances, if any, pursuant to employee benefit plans, upon the exercise of outstanding options or warrants or the vesting of restricted stock units, in each case as described in the Registration Statement and the Prospectus). The Common Shares (including the Shares) conform in all material respects to the description thereof contained in the Prospectus. All of the issued and outstanding Common Shares have been duly authorized and validly issued, are fully paid and nonassessable and have been issued in compliance with all federal and state securities laws. None of the outstanding Shares was issued in violation of any preemptive rights, rights of first refusal or other similar rights to subscribe for or purchase securities of the Company. There are no authorized or outstanding options, warrants, preemptive rights, rights of first refusal or other rights to purchase, or equity or debt securities convertible into or exchangeable or exercisable for, any capital stock of the Company or any of its subsidiaries other than those described in the Registration Statement and the Prospectus. The descriptions of the Company's stock option, stock bonus and other stock plans or arrangements, and the options or other rights granted thereunder, set forth in the Registration Statement and the Prospectus accurately and fairly presents the information required to be shown with respect to such plans, arrangements, options and rights.

(q) Stock Exchange Listing. The Common Shares are registered pursuant to Section 12(b) of the Exchange Act and are listed on the Principal Market, and the Company has taken no action designed to, or likely to have the effect of, terminating the registration of the Common Shares under the Exchange Act or delisting the Common Shares from the Principal Market, nor has the Company received any notification that the Commission or the Principal Market is contemplating terminating such registration or listing. To the Company's knowledge, it is in compliance with all applicable listing requirements of the Principal Market.

(r) Non-Contravention of Existing Instruments; No Further Authorizations or Approvals Required. Neither the Company nor any of its subsidiaries is in violation of its charter or by-laws, partnership agreement or operating agreement or similar organizational documents, as applicable, or is in default (or, with the giving of notice or lapse of time, would be in default) ("**Default**") under any indenture, loan, credit agreement, note, lease, license agreement, contract, franchise or other instrument (including, without limitation, any pledge agreement, security agreement, mortgage or other instrument or agreement evidencing, guaranteeing, securing or relating to indebtedness) to which the Company or any of its subsidiaries is a party or by which it or any of them may be bound, or to which any of their respective properties or assets are subject (each, an "**Existing Instrument**"), except for such Defaults as could not be expected, individually or in the aggregate, to have a material adverse effect on the condition (financial or other), earnings, business, properties, operations, assets, liabilities or prospects of the Company and its subsidiaries, considered as one entity (a "**Material Adverse Effect**") or as otherwise disclosed in the Registration Statement and the Prospectus. The Company's execution, delivery and performance of this Agreement, consummation of the transactions contemplated hereby and by the Registration Statement and the Prospectus and the issuance and sale of the Shares (i) have been duly authorized by all necessary corporate action and will not result in any violation of the provisions of the charter or by-laws, partnership agreement or operating agreement or similar organizational documents, as applicable, of the Company or any subsidiary (ii) will not conflict with or constitute a breach of, or Default or a Debt Repayment Triggering Event (as defined below) under, or result in the creation or imposition of any lien, charge or encumbrance upon any property or assets of the Company or any of its subsidiaries pursuant to, or require the consent of any other party to, any Existing Instrument and (iii) will not result in any violation of any law, administrative regulation or administrative or court decree applicable to the Company or any of its subsidiaries, except, in case of each of clauses (ii) and (iii) (but only in respect of laws other than federal securities laws and of administrative regulations or administrative or court decrees other than under federal securities laws) above, for any such conflict, breach, violation, Default, lien, charge or encumbrance that could not be expected, individually or in the aggregate, to result in a Material Adverse Effect or materially and adversely affect the consummation of the transactions contemplated by this Agreement or the performance by the Company of its obligations hereunder. No consent, approval, authorization or other order of, or registration or filing with, any court or other governmental or regulatory authority or agency, is required for the Company's execution, delivery and performance of this Agreement and consummation of the transactions contemplated hereby and by the Registration Statement and the Prospectus, except such as have been obtained or made by the Company and are in full force and effect under the Securities Act and such as may be required under applicable state securities or blue sky laws or the Financial Industry Regulatory Authority, Inc. ("**FINRA**"). As used herein, a "**Debt Repayment Triggering Event**" means any event or condition which gives, or with the giving of notice or lapse of time would give, the holder of any note, debenture or other evidence of indebtedness (or any person acting on such holder's behalf) the right to require the repurchase, redemption or repayment of all or a portion of such indebtedness by the Company or any of its subsidiaries.

(s) Compliance with Laws. The Company and its subsidiaries have been and are in compliance with all applicable laws, rules and regulations, and all administrative or court decrees, if any, applicable to them, except where failure to be so in compliance could not be expected, individually or in the aggregate, to have a Material Adverse Effect.

(t) No Material Actions or Proceedings. Except as otherwise disclosed in the Registration Statement and the Prospectus, there is no action, suit, proceeding, inquiry or investigation brought by or before any governmental entity now pending or, to the knowledge of the Company, threatened, against or affecting the Company or any of its subsidiaries, which could be expected, individually or in the aggregate, to have a Material Adverse Effect or materially and adversely affect the consummation of the transactions contemplated by this Agreement or the performance by the Company of its obligations hereunder; and the aggregate of all pending legal or governmental proceedings to which the Company or any such subsidiary is a party or of which any of their respective properties or assets is the subject, including ordinary routine litigation incidental to the business, if determined adversely to the Company, could not be expected to have a Material Adverse Effect. No material labor dispute with the employees of the Company or any of its subsidiaries, nor, to the Company's knowledge, with the employees of any principal supplier, manufacturer, customer or contractor of the Company, exists or, to the knowledge of the Company, is threatened or imminent.

(u) Intellectual Property Rights. The Company and its subsidiaries own, or have obtained valid and enforceable licenses for, the inventions, patent applications, patents, trademarks, trade names, service names, copyrights, trade secrets and other intellectual property described in the Registration Statement and the Prospectus as being owned or licensed by them or which are necessary for the conduct of their respective businesses as currently conducted or as currently proposed to be conducted (collectively, "Intellectual Property"). To the Company's knowledge: (i) there are no third parties who have rights to any Intellectual Property, except for customary reversionary rights of third-party licensors with respect to Intellectual Property that is disclosed in the Registration Statement and the Prospectus as licensed to the Company or one or more of its subsidiaries; and (ii) there is no infringement by third parties of any Intellectual Property. There is no pending or, to the Company's knowledge, threatened action, suit, proceeding or claim by others: (A) challenging the Company's rights in or to any Intellectual Property, and the Company is unaware of any facts which would form a reasonable basis for any such action, suit, proceeding or claim; (B) challenging the validity, enforceability or scope of any Intellectual Property, and the Company is unaware of any facts which would form a reasonable basis for any such action, suit, proceeding or claim; or (C) asserting that the Company or any of its subsidiaries infringes or otherwise violates, or would, upon the commercialization of any product or service described in the Registration Statement or the Prospectus as under development, infringe or violate, any patent, trademark, trade name, service name, copyright, trade secret or other proprietary rights of others, and the Company is unaware of any facts which would form a reasonable basis for any such action, suit, proceeding or claim. The Company and its subsidiaries have complied in all material respects with the terms of each agreement pursuant to which Intellectual Property has been licensed to the Company or any subsidiary, and all such agreements are in full force and effect. The product candidates described in the Registration Statement and the Prospectus as under development by the Company or any subsidiary fall within the scope of the claims of one or more patents owned by, or exclusively licensed to, the Company or any subsidiary.

(v) All Necessary Permits, etc. The Company and its subsidiaries possess such valid and current certificates, authorizations or permits required by state, federal or foreign regulatory agencies or bodies to conduct their respective businesses as currently conducted and as described in the Registration Statement or the Prospectus ("**Permits**"), except for such certificates,

authorizations or permits whose failure to obtain could not be expected, individually or in the aggregate, to have a Material Adverse Effect. Neither the Company nor any of its subsidiaries (x) is in violation of, or in default under, any of the Permits (except for such violations or defaults that could not be expected, individually or in the aggregate, to have a Material Adverse Effect) or (y) has received any notice of proceedings relating to the revocation or modification of, or non-compliance with, any such certificate, authorization or permit, which, if the subject of an unfavorable decision, ruling or finding, could be expected, individually or in the aggregate, to have a Material Adverse Effect.

(w) Title to Properties. The Company and its subsidiaries have good and marketable title to all of the real and personal property and other assets reflected as owned in the financial statements referred to in Section 2(k) above (or elsewhere in the Registration Statement or the Prospectus), in each case free and clear of any security interests, mortgages, liens, encumbrances, equities, adverse claims and other defects, except such as do not materially and adversely affect the value of such property and do not materially interfere with the use made or proposed to be made of such property by the Company or any of its subsidiaries. The real property, improvements, equipment and personal property held under lease by the Company or any of its subsidiaries are held under valid and enforceable leases, with such exceptions as are not material and do not materially interfere with the use made or proposed to be made of such real property, improvements, equipment or personal property by the Company or such subsidiary.

(x) Tax Law Compliance. The Company and its subsidiaries have filed all necessary federal, state and foreign income and franchise tax returns or have properly requested extensions thereof and have paid all taxes required to be paid by any of them and, if due and payable, any related or similar assessment, fine or penalty levied against any of them except as may be being contested in good faith and by appropriate proceedings, and except for such exceptions as could not be expected, individually or in the aggregate, to have a Material Adverse Effect. The Company has made adequate charges, accruals and reserves in the applicable financial statements referred to in Section 2(k) above in respect of all federal, state and foreign income and franchise taxes for all periods as to which the tax liability of the Company or any of its subsidiaries has not been finally determined.

(y) Insurance. Except as otherwise disclosed in the Prospectus, each of the Company and its subsidiaries is insured by recognized, financially sound and reputable institutions with policies in such amounts and with such deductibles and covering such risks as, in the reasonable judgment of the Company, are generally deemed adequate and customary for their businesses including, but not limited to, policies covering real and personal property owned or leased by the Company and its subsidiaries against theft, damage, destruction and acts of vandalism and policies covering the Company and its subsidiaries for product liability claims and clinical trial liability claims. The Company has no reason to believe that it or any of its subsidiaries will not be able (i) to renew its existing insurance coverage as and when such policies expire or (ii) to obtain comparable coverage from similar institutions as may be necessary or appropriate to conduct its business as now conducted and at a cost that could not be expected to have a Material Adverse Effect. Neither the Company nor any of its subsidiaries has been denied any insurance coverage which it has sought or for which it has applied.

(z) Compliance with Environmental Laws. Except as described in the Prospectus and except as could not be expected, individually or in the aggregate, to have a Material Adverse Effect: (i) neither the Company nor any of its subsidiaries is in violation of any federal, state, local or foreign statute, law, rule, regulation, ordinance, code, policy or rule of common law or any judicial or administrative interpretation thereof, including any judicial or administrative order, consent, decree or judgment, relating to pollution or protection of human health, the environment (including, without limitation, ambient air, surface water, groundwater, land surface or subsurface strata) or wildlife, including, without limitation, laws and regulations relating to the release or threatened release of chemicals, pollutants, contaminants, wastes, toxic substances, hazardous substances, petroleum or petroleum products (collectively, "**Hazardous Materials**") or to the manufacture, processing, distribution, use, treatment, storage, disposal, transport or handling of Hazardous Materials (collectively, "**Environmental Laws**"); (ii) the Company and its subsidiaries have all permits, authorizations and approvals required under any applicable Environmental Laws and are each in compliance with their requirements; (iii) there are no pending or threatened administrative, regulatory or judicial actions, suits, demands, demand letters, claims, liens, notices of noncompliance or violation, investigation or proceedings relating to any Environmental Law against the Company or any of its subsidiaries; and (iv) there are no events or circumstances that might reasonably be expected to form the basis of an order for clean-up or remediation, or an action, suit or proceeding by any private party or governmental body or agency, against or affecting the Company or any of its subsidiaries relating to Hazardous Materials or any Environmental Laws.

(aa) Periodic Review of Costs of Environmental Compliance. In the ordinary course of its business, the Company conducts a periodic review of the effect of Environmental Laws on the business, operations and properties of the Company and its subsidiaries, in the course of which it identifies and evaluates associated costs and liabilities (including, without limitation, any capital or operating expenditures required for clean-up, closure of properties or compliance with Environmental Laws or any permit, license or approval, any related constraints on operating activities and any potential liabilities to third parties). No facts or circumstances have come to the Company's attention that could result in costs or liabilities that could be expected, individually or in the aggregate, to have a Material Adverse Effect.

(bb) ERISA Compliance. Except as otherwise disclosed in the Prospectus, the Company and its subsidiaries and any "employee benefit plan" (as defined under the Employee Retirement Income Security Act of 1974, as amended, and the regulations and published interpretations thereunder (collectively, "**ERISA**")) established or maintained by the Company, its subsidiaries or their "ERISA Affiliates" (as defined below) are in compliance in all material respects with ERISA. "**ERISA Affiliate**" means, with respect to the Company or any of its subsidiaries, any member of any group of organizations described in Sections 414(b), (c), (m) or (o) of the Internal Revenue Code of 1986, as amended, and the regulations and published interpretations thereunder (the "**Code**") of which the Company or such subsidiary is a member. No "reportable event" (as defined under ERISA) has occurred or is reasonably expected to occur with respect to any "employee benefit plan" established or maintained by the Company, its subsidiaries or any of their ERISA Affiliates. No "employee benefit plan" established or maintained by the Company, its subsidiaries or any of their ERISA Affiliates, if such "employee benefit plan" were terminated, would have any "amount of unfunded benefit liabilities" (as defined under ERISA). Neither the Company, its subsidiaries nor any of their ERISA Affiliates has incurred or reasonably expects to

incur any liability under (i) Title IV of ERISA with respect to termination of, or withdrawal from, any "employee benefit plan" or (ii) Sections 412, 4971, 4975 or 4980B of the Code. Each employee benefit plan established or maintained by the Company, its subsidiaries or any of their ERISA Affiliates that is intended to be qualified under Section 401(a) of the Code is so qualified and nothing has occurred, whether by action or failure to act, which would cause the loss of such qualification.

(cc) Company Not an "Investment Company." The Company is not, and will not be, either after receipt of payment for the Shares or after the application of the proceeds therefrom as described under "Use of Proceeds" in the Registration Statement or the Prospectus, required to register as an "investment company" under the Investment Company Act of 1940, as amended (the "**Investment Company Act**")**)**.

(dd) No Price Stabilization or Manipulation; Compliance with Regulation M. Neither the Company nor any of its subsidiaries has taken, directly or indirectly, any action designed to or that might reasonably be expected to cause or result in stabilization or manipulation of the price of the Common Shares or of any "reference security" (as defined in Rule 100 of Regulation M under the Exchange Act ("**Regulation M**")) with respect to the Common Shares, whether to facilitate the sale or resale of the Shares or otherwise, and has taken no action which would directly or indirectly violate Regulation M.

(ee) Related-Party Transactions. There are no business relationships or related-party transactions involving the Company or any of its subsidiaries or any other person required to be described in the Registration Statement or the Prospectus that have not been described as required.

(ff) FINRA Matters. All of the information provided to the Agent or to counsel for the Agent by the Company, its counsel, its officers and directors and the holders of any securities (debt or equity) or options to acquire any securities of the Company in connection with the offering of the Shares is true, complete, correct and compliant with FINRA's rules and any letters, filings or other supplemental information provided to FINRA pursuant to FINRA Rules or NASD Conduct Rules is true, complete and correct.

(gg) Statistical and Market-Related Data. All statistical, demographic and market-related data included in the Registration Statement or the Prospectus are based on or derived from sources that the Company believes, after reasonable inquiry, to be reliable and accurate. To the extent required, the Company has obtained the written consent to the use of such data from such sources.

(hh) Sarbanes-Oxley Act. There is, and has been, no failure on the part of the Company or any of the Company's directors or officers, in their capacities as such, to comply with any applicable provision of the Sarbanes-Oxley Act of 2002, as amended and the rules and regulations promulgated in connection therewith, including Section 402 related to loans and Sections 302 and 906 related to certifications.

(ii) No Unlawful Contributions or Other Payments. Except as otherwise disclosed in the Prospectus, neither the Company nor any of its subsidiaries nor, to the best of the Company's knowledge, any employee or agent of the Company or any subsidiary, has made any contribution

or other payment to any official of, or candidate for, any federal, state or foreign office in violation of any law or of the character required to be disclosed in the Registration Statement or the Prospectus.

(jj) Anti-Corruption and Anti-Bribery Laws. Neither the Company nor any of its subsidiaries nor to the knowledge of the Company, any director, officer, employee, agent, affiliate or other person acting on behalf of the Company or any of its subsidiaries has, in the course of its actions for, or on behalf of, the Company or any of its subsidiaries (i) used any corporate funds for any unlawful contribution, gift, entertainment or other unlawful expenses relating to political activity; (ii) made or taken any act in furtherance of an offer, promise, or authorization of any direct or indirect unlawful payment or benefit to any foreign or domestic government official or employee, including of any government-owned or controlled entity or public international organization, or any political party, party official, or candidate for political office; (iii) violated or is in violation of any provision of the U.S. Foreign Corrupt Practices Act of 1977, as amended (the "**FCPA**"), the UK Bribery Act 2010, or any other applicable anti-bribery or anti-corruption law; or (iv) made, offered, authorized, requested, or taken an act in furtherance of any unlawful bribe, rebate, payoff, influence payment, kickback or other unlawful payment or benefit. The Company and its subsidiaries and, to the knowledge of the Company, the Company's affiliates have conducted their respective businesses in compliance with the FCPA and have instituted and maintain policies and procedures designed to ensure, and which are reasonably expected to continue to ensure, continued compliance therewith.

(kk) Money Laundering Laws. The operations of the Company and its subsidiaries are and have been conducted at all times in compliance with applicable financial recordkeeping and reporting requirements, including those of the Currency and Foreign Transactions Reporting Act of 1970, as amended, the money laundering statutes of all applicable jurisdictions, the rules and regulations thereunder and any related or similar applicable rules, regulations or guidelines, issued, administered or enforced by any governmental agency (collectively, the "**Anti-Money Laundering Laws**"), and no action, suit or proceeding by or before any court or governmental agency, authority or body or any arbitrator involving the Company or any of its subsidiaries with respect to the Anti-Money Laundering Laws is pending or, to the knowledge of the Company, threatened.

(ll) Compliance with Sanctions Laws. Neither the Company nor any of its subsidiaries, nor, to the knowledge of the Company, any director, officer, employee, agent, affiliate or other person acting on behalf of the Company or any of its subsidiaries is currently the subject or the target of any U.S. sanctions administered by the Office of Foreign Assets Control of the U.S. Department of the Treasury or the U.S. Department of State, the United Nations Security Council, the European Union, Her Majesty's Treasury of the United Kingdom, or other relevant sanctions authority (collectively, "**Sanctions**"); nor is the Company or any of its subsidiaries located, organized or resident in a country or territory that is the subject or the target of Sanctions, including, without limitation, Crimea, Cuba, Iran, North Korea, and Syria (collectively, "**Sanctioned Countries**"); and the Company will not directly or indirectly use the proceeds of this offering, or lend, contribute or otherwise make available such proceeds to any subsidiary, or any joint venture partner or other person or entity, for the purpose of financing the activities of or business with any person, or in any country or territory, that at the time of such financing, is the subject or the target of Sanctions or in any other manner that will result in a violation by any person

(including any person participating in the transaction whether as underwriter, advisor, investor or otherwise) of applicable Sanctions. For the past five years, the Company and its subsidiaries have not knowingly engaged in and are not now knowingly engaged in any dealings or transactions with any person that at the time of the dealing or transaction is or was the subject or the target of Sanctions or with any Sanctioned Country.

(mm) Brokers. Except pursuant to this Agreement, there is no broker, finder or other party that is entitled to receive from the Company any brokerage or finder's fee or other fee or commission as a result of any transactions contemplated by this Agreement.

(nn) Forward-Looking Statements. Each financial or operational projection or other "forward-looking statement" (as defined by Section 27A of the Securities Act or Section 21E of the Exchange Act) contained in the Registration Statement or the Prospectus (i) was so included by the Company in good faith and with reasonable basis after due consideration by the Company of the underlying assumptions, estimates and other applicable facts and circumstances and (ii) is accompanied by meaningful cautionary statements identifying those factors that could cause actual results to differ materially from those in such forward-looking statement. No such statement was made with the knowledge of an executive officer or director of the Company that is was false or misleading.

(oo) Cybersecurity. The Company and its subsidiaries' information technology assets and equipment, computers, systems, networks, hardware, software, websites, applications, and databases (collectively, "**IT Systems**") are adequate for, and operate and perform in all material respects as required in connection with the operation of the business of the Company and its subsidiaries as currently conducted, and to the Company's knowledge, free and clear of all material bugs, errors, defects, Trojan horses, time bombs, malware and other corruptants. The Company and its subsidiaries have implemented and maintained commercially reasonable physical, technical and administrative controls, policies, procedures, and safeguards to maintain and protect their material confidential information and the integrity, continuous operation, redundancy and security of all IT Systems and data, including "Personal Data," used in connection with their businesses. "**Personal Data**" means (i) a natural person's name, street address, telephone number, e-mail address, photograph, social security number or tax identification number, driver's license number, passport number, credit card number, bank information, or customer or account number; (ii) any information which would qualify as "personally identifying information" under the Federal Trade Commission Act, as amended; (iii) "personal data" as defined by the European Union General Data Protection Regulation ("**GDPR**") (EU 2016/679); (iv) any information which would qualify as "protected health information" under the Health Insurance Portability and Accountability Act of 1996, as amended by the Health Information Technology for Economic and Clinical Health Act (collectively, "**HIPAA**"); and (v) any other piece of information that allows the identification of such natural person, or his or her family, or permits the collection or analysis of any data related to an identified person's health or sexual orientation. To the Company's knowledge, there have been no breaches, violations, outages or unauthorized uses of or accesses to same, except for those that have been remedied without material cost or liability or the duty to notify any other person, nor any incidents under internal review or investigations relating to the same. The Company and its subsidiaries are presently in material compliance with all applicable laws or statutes and all judgments, orders, rules and regulations of any court or arbitrator or governmental or regulatory authority, internal policies and contractual obligations relating to the privacy and security of IT

Systems and Personal Data and to the protection of such IT Systems and Personal Data from unauthorized use, access, misappropriation or modification.

(pp) Compliance with Data Privacy Laws. The Company and its subsidiaries are, and at all prior times were, in material compliance with all applicable state and federal data privacy and security laws and regulations, including without limitation HIPAA, and the Company and its subsidiaries have taken commercially reasonable actions to prepare to comply with, and since May 25, 2018, have been and currently are in material compliance with, GDPR (collectively, the "**Privacy Laws**"). The Company and its subsidiaries have in place, comply with, and take appropriate steps reasonably designed to ensure compliance in all material respects with their policies and procedures relating to data privacy and security and the collection, storage, use, disclosure, handling, and analysis of Personal Data (the "**Policies**"). The Company and its subsidiaries have at all times made all disclosures to users or customers required by applicable laws and regulatory rules or requirements, and none of such disclosures made or contained in any Policy have, to the knowledge of the Company, been inaccurate or in violation of any applicable laws and regulatory rules or requirements in any material respect. Neither the Company nor any subsidiary: (i) has received notice of any actual or potential liability under or relating to, or actual or potential violation of, any of the Privacy Laws, and has no knowledge of any event or condition that would reasonably be expected to result in any such notice; (ii) is currently conducting or paying for, in whole or in part, any investigation, remediation, or other corrective action pursuant to any Privacy Law; or (iii) is a party to any order, decree, or agreement that imposes any obligation or liability under any Privacy Law.

(qq) Clinical Data and Regulatory Compliance. The preclinical tests and clinical trials, and other studies (collectively, "**studies**") that are described in, or the results of which are referred to in, the Registration Statement or the Prospectus were and, if still pending, are being conducted in all material respects in accordance with the protocols, procedures and controls designed and approved for such studies and with standard medical and scientific research procedures; each description of the results of such studies is accurate and complete in all material respects and fairly presents the data derived from such studies, and the Company and its subsidiaries have no knowledge of any other studies the results of which are inconsistent with, or otherwise call into question, the results described or referred to in the Registration Statement or the Prospectus; the Company and its subsidiaries have made all such filings and obtained all such approvals as may be required by the Food and Drug Administration of the U.S. Department of Health and Human Services or any committee thereof or from any other U.S. or foreign government or drug or medical device regulatory agency, or health care facility Institutional Review Board (collectively, the "**Regulatory Agencies**"); neither the Company nor any of its subsidiaries has received any notice of, or correspondence from, any Regulatory Agency requiring the termination, suspension or modification of any clinical trials that are described or referred to in the Registration Statement or the Prospectus; and the Company and its subsidiaries have each operated and currently are in compliance in all material respects with all applicable rules, regulations and policies of the Regulatory Agencies.

(rr) Compliance with Health Care Laws. The Company and its subsidiaries are, and at all times have been, in material compliance with all Health Care Laws. For purposes of this Agreement, "**Health Care Laws**" means: (i) the Federal Food, Drug, and Cosmetic Act (21 U.S.C. Section 301 et seq.), the Public Health Service Act (42 U.S.C. Section 201 et seq.), and the regulations

promulgated thereunder; (ii) all applicable federal, state, local and foreign health care fraud and abuse laws, including, without limitation, the Anti-Kickback Statute (42 U.S.C. Section 1320a-7b(b)), the Civil False Claims Act (31 U.S.C. Section 3729 et seq.), the criminal false statements law (42 U.S.C. Section 1320a-7b(a)), 18 U.S.C. Sections 286 and 287, the health care fraud criminal provisions under the HIPAA, the Stark Law (42 U.S.C. Section 1395nn), the civil monetary penalties law (42 U.S.C. Section 1320a-7a), the exclusion law (42 U.S.C. Section 1320a-7), the Physician Payments Sunshine Act (42 U.S.C. Section 1320-7h), and applicable laws governing government funded or sponsored healthcare programs; (iii) HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act (42 U.S.C. Section 17921 et seq.); (iv) the Patient Protection and Affordable Care Act of 2010, as amended by the Health Care and Education Reconciliation Act of 2010; (v) licensure, quality, safety and accreditation requirements under applicable federal, state, local or foreign laws or regulatory bodies; and (vi) all other local, state, federal, national, supranational and foreign laws, relating to the regulation of the Company or its subsidiaries, and (vii) the directives and regulations promulgated pursuant to such statutes and any state or non-U.S. counterpart thereof to which the Company is subject. Neither the Company nor any of its subsidiaries has received written notice of any claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action from any court or arbitrator or governmental or regulatory authority or third party alleging that any product operation or activity is in material violation of any Health Care Laws nor, to the Company's knowledge, is any such claim, action, suit, proceeding, hearing, enforcement, investigation, arbitration or other action threatened. The Company and its subsidiaries have filed, maintained or submitted all material reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments as required by any Health Care Laws, and all such reports, documents, forms, notices, applications, records, claims, submissions and supplements or amendments were complete and accurate on the date filed in all material respects (or were corrected or supplemented by a subsequent submission). Neither the Company nor any of its subsidiaries is a party to any corporate integrity agreements, monitoring agreements, consent decrees, settlement orders, or similar agreements with or imposed by any governmental or regulatory authority. Additionally, neither the Company, any of its subsidiaries, nor any of their respective employees, officers, directors, or to the knowledge of the Company, agents has been excluded, suspended or debarred from participation in any U.S. federal health care program or human clinical research or, to the knowledge of the Company, is subject to a governmental inquiry, investigation, proceeding, or other similar action that could reasonably be expected to result in debarment, suspension, or exclusion.

(ss) No Contract Terminations. Except as otherwise disclosed in the Registration Statement or the Prospectus, neither the Company nor any of its subsidiaries has sent or received any communication regarding termination of, or intent not to renew, any of the contracts or agreements referred to or described in the Prospectus or any free writing prospectus, or referred to or described in, or filed as an exhibit to, the Registration Statement, or any document incorporated by reference therein, and no such termination or non-renewal has been threatened by the Company or any of its subsidiaries or, to the Company's knowledge, any other party to any such contract or agreement, which threat of termination or non-renewal has not been rescinded as of the date hereof.

(tt) Dividend Restrictions. Except as disclosed in the Prospectus, no subsidiary of the Company is prohibited or restricted (pursuant to contract or its charter instruments) from paying dividends to the Company, or from making any other distribution with respect to such subsidiary's equity securities or from repaying to the Company or any other subsidiary of the Company any amounts that may from time to time become due under any loans or advances to such subsidiary

from the Company or from transferring any property or assets to the Company or to any other subsidiary.

(uu) Duties, Transfer Taxes, Etc. No stamp or other issuance or transfer taxes or duties and no capital gains, income, withholding or other taxes are payable by the Agent in the United States or any political subdivision or taxing authority thereof or therein in connection with the execution, delivery or performance of this Agreement by the Company or the sale and delivery by the Company of the Shares.

(vv) Other Underwriting Agreements. The Company is not a party to any agreement with an agent or underwriter for any other "at the market" or continuous equity transaction. Any certificate signed by any officer or representative of the Company or any of its subsidiaries and delivered to the Agent or counsel for the Agent in connection with an issuance of Shares shall be deemed a representation and warranty by the Company to the Agent as to the matters covered thereby on the date of such certificate.

The Company acknowledges that the Agent and, for purposes of the opinions to be delivered pursuant to Section 4(o) hereof, counsel to the Company and counsel to the Agent, will rely upon the accuracy and truthfulness of the foregoing representations and hereby consents to such reliance.

Section 3. ISSUANCE AND SALE OF COMMON SHARES

(a) Sale of Securities. On the basis of the representations, warranties and agreements herein contained, but subject to the terms and conditions herein set forth, the Company and the Agent agree that the Company may from time to time seek to sell Shares through the Agent, acting as sales agent, or directly to the Agent, acting as principal, as follows, with an aggregate Sales Price of up to the Maximum Program Amount, based on and in accordance with Issuance Notices as the Company may deliver, during the Agency Period.

(b) Mechanics of Issuances.

(i) Issuance Notice. Upon the terms and subject to the conditions set forth herein, on any Trading Day during the Agency Period on which the conditions set forth in Section 5(a) and Section 5(b) shall have been satisfied, the Company may exercise its right to request an issuance of Shares by delivering to the Agent an Issuance Notice; *provided*, *however*, that (A) in no event may the Company deliver an Issuance Notice to the extent that (I) the sum of (x) the aggregate Sales Price of the requested Issuance Amount, plus (y) the aggregate Sales Price of all Shares issued under all previous Issuance Notices effected pursuant to this Agreement, would exceed the Maximum Program Amount; and (B) prior to delivery of any Issuance Notice, the period set forth for any previous Issuance Notice shall have expired or been terminated. An Issuance Notice shall be considered delivered on the Trading Day that it is received by e-mail to the persons set forth in Schedule A hereto and confirmed by the Company by telephone (including a voicemail message to the persons so identified), with the understanding that, with adequate prior written notice, the Agent may modify the list of such persons from time to time.

(ii) Agent Efforts. Upon the terms and subject to the conditions set forth in this Agreement, upon the receipt of an Issuance Notice, the Agent will use its commercially reasonable

efforts consistent with its normal sales and trading practices to place the Shares with respect to which the Agent has agreed to act as sales agent, subject to, and in accordance with the information specified in, the Issuance Notice, unless the sale of the Shares described therein has been suspended, cancelled or otherwise terminated in accordance with the terms of this Agreement. For the avoidance of doubt, the parties to this Agreement may modify an Issuance Notice at any time provided they both agree in writing to any such modification.

(iii) Method of Offer and Sale. The Shares may be offered and sold (A) in privately negotiated transactions with the consent of the Company; (B) as block transactions; or (C) by any other method permitted by law deemed to be an "at the market offering" as defined in Rule 415(a)(4) under the Securities Act, including sales made directly on the Principal Market or sales made into any other existing trading market of the Common Shares. Nothing in this Agreement shall be deemed to require either party to agree to the method of offer and sale specified in the preceding sentence, and (except as specified in clauses (A) and (B) above) the method of placement of any Shares by the Agent shall be at the Agent's discretion.

(iv) Confirmation to the Company. If acting as sales agent hereunder, the Agent will provide written confirmation to the Company no later than the opening of the Trading Day next following the Trading Day on which it has placed Shares hereunder setting forth the number of shares sold on such Trading Day, the corresponding Sales Price and the Issuance Price payable to the Company in respect thereof.

(v) Settlement. Each issuance of Shares will be settled on the applicable Settlement Date for such issuance of Shares and, subject to the provisions of Section 5, on or before each Settlement Date, the Company will, or will cause its transfer agent to, electronically transfer the Shares being sold by crediting the Agent or its designee's account at The Depository Trust Company through its Deposit/Withdrawal At Custodian (DWAC) System, or by such other means of delivery as may be mutually agreed upon by the parties hereto and, upon receipt of such Shares, which in all cases shall be freely tradable, transferable, registered shares in good deliverable form, the Agent will deliver, by wire transfer of immediately available funds, the related Issuance Price in same day funds delivered to an account designated by the Company prior to the Settlement Date. The Company may sell Shares to the Agent as principal at a price agreed upon at each relevant time Shares are sold pursuant to this Agreement (each, a "**Time of Sale**").

(vi) Suspension or Termination of Sales. Consistent with standard market settlement practices, the Company or the Agent may, upon notice to the other party hereto in writing or by telephone (confirmed immediately by verifiable email), suspend any sale of Shares, and the period set forth in an Issuance Notice shall immediately terminate; *provided*, *however*, that (A) such suspension and termination shall not affect or impair either party's obligations with respect to any Shares placed or sold hereunder prior to the receipt of such notice; (B) if the Company suspends or terminates any sale of Shares after the Agent confirms such sale to the Company, the Company shall still be obligated to comply with Section 3(b)(v) with respect to such Shares; and (C) if the Company defaults in its obligation to deliver Shares on a Settlement Date, the Company agrees that it will hold the Agent harmless against any loss, claim, damage or expense (including, without limitation, penalties, interest and reasonable legal fees and expenses), as incurred, arising out of or in connection with such default by the Company. The parties hereto acknowledge and agree that, in performing its obligations under this Agreement, the Agent may borrow Common Shares from

stock lenders in the event that the Company has not delivered Shares to settle sales as required by subsection (v) above, and may use the Shares to settle or close out such borrowings. The Company agrees that no such notice shall be effective against the Agent unless it is made to the persons identified in writing by the Agent pursuant to Section 3(b)(i).

(vii) No Guarantee of Placement, Etc. The Company acknowledges and agrees that (A) there can be no assurance that the Agent will be successful in placing Shares; (B) the Agent will incur no liability or obligation to the Company or any other Person if it does not sell Shares; and (C) the Agent shall be under no obligation to purchase Shares on a principal basis pursuant to this Agreement, except as otherwise specifically agreed by the Agent and the Company.

(viii) Material Non-Public Information. Notwithstanding any other provision of this Agreement, the Company and the Agent agree that the Company shall not deliver any Issuance Notice to the Agent, and the Agent shall not be obligated to place any Shares, during any period in which the Company is in possession of material non-public information.

(c) Fees. As compensation for services rendered, the Company shall pay to the Agent, on the applicable Settlement Date, the Selling Commission for the applicable Issuance Amount (including with respect to any suspended or terminated sale pursuant to Section 3(b)(vi)) by the Agent deducting the Selling Commission from the applicable Issuance Amount.

(d) Expenses. The Company agrees to pay all costs, fees and expenses incurred in connection with the performance of its obligations hereunder and in connection with the transactions contemplated hereby, including without limitation (i) all expenses incident to the issuance and delivery of the Shares (including all printing and engraving costs); (ii) all fees and expenses of the registrar and transfer agent of the Shares; (iii) all necessary issue, transfer and other stamp taxes in connection with the issuance and sale of the Shares; (iv) all fees and expenses of the Company's counsel, independent public or certified public accountants and other advisors; (v) all costs and expenses incurred in connection with the preparation, printing, filing, shipping and distribution of the Registration Statement (including financial statements, exhibits, schedules, consents and certificates of experts), the Prospectus, any Free Writing Prospectus prepared by or on behalf of, used by, or referred to by the Company, and all amendments and supplements thereto, and this Agreement; (vi) all filing fees, attorneys' fees and expenses incurred by the Company or the Agent in connection with qualifying or registering (or obtaining exemptions from the qualification or registration of) all or any part of the Shares for offer and sale under the state securities or blue sky laws or the provincial securities laws of Canada, and, if requested by the Agent, preparing and printing a "**Blue Sky Survey**" or memorandum and a "Canadian wrapper," and any supplements thereto, advising the Agent of such qualifications, registrations, determinations and exemptions; (vii) the reasonable fees and disbursements of the Agent's counsel, including the reasonable fees and expenses of counsel for the Agent in connection with, FINRA review, if any, and approval of the Agent's participation in the offering and distribution of the Shares; (viii) the filing fees incident to FINRA review, if any; (ix) the costs and expenses of the Company relating to investor presentations on any "road show" undertaken in connection with the marketing of the offering of the Shares, including, without limitation, expenses associated with the preparation or dissemination of any electronic road show, expenses associated with the production of road show slides and graphics, fees and expenses of any consultants engaged in connection with the road show presentations with the prior approval of the Company, travel and lodging expenses of the representatives, employees and officers of the Company and of the Agent and any such consultants, and if the Company and the Agent mutually agree that an aircraft shall be chartered in connection with the road show, the Company shall be responsible for 50% of the costs of such chartered aircraft and the Agent shall be responsible for the remaining 50% of such costs; and (x) the fees and expenses associated with listing the

Shares on the Principal Market. The fees and disbursements of Agent's counsel pursuant to subsections (vi) and (vii) above shall not exceed $50,000 in the aggregate.

Section 4. ADDITIONAL COVENANTS

The Company covenants and agrees with the Agent as follows, in addition to any other covenants and agreements made elsewhere in this Agreement:

(a) Exchange Act Compliance. During the Agency Period, the Company shall (i) file, on a timely basis, with the Commission all reports and documents required to be filed under Section 13, 14 or 15 of the Exchange Act in the manner and within the time periods required by the Exchange Act (taking into account any extension available under the Exchange Act); and (ii) if required by the Securities Act or the Exchange Act, either (A) include in its quarterly reports on Form 10-Q and its annual reports on Form 10-K, a summary detailing, for the relevant reporting period, (1) the number of Shares sold through the Agent pursuant to this Agreement and (2) the net proceeds received by the Company from such sales or (B) prepare a prospectus supplement containing, or include in such other filing permitted by the Securities Act or Exchange Act (each an "**Interim Prospectus Supplement**"), such summary information and, at least once a quarter and subject to this Section 4, file such Interim Prospectus Supplement pursuant to Rule 424(b) under the Securities Act (and within the time periods required by Rule 424(b) and Rule 430B under the Securities Act).

(b) Securities Act Compliance. After the date of this Agreement, the Company shall promptly advise the Agent in writing (i) of the receipt of any comments of, or requests for additional or supplemental information from, the Commission; (ii) of the time and date of any filing of any post-effective amendment to the Registration Statement, any Rule 462(b) Registration Statement or any amendment or supplement to the Prospectus, or any Free Writing Prospectus; (iii) of the time and date that any post-effective amendment to the Registration Statement or any Rule 462(b) Registration Statement becomes effective; and (iv) of the issuance by the Commission of any stop order suspending the effectiveness of the Registration Statement or any post-effective amendment thereto, any Rule 462(b) Registration Statement or any amendment or supplement to the Prospectus or of any order preventing or suspending the use of any Free Writing Prospectus or the Prospectus, or of any proceedings to remove, suspend or terminate from listing or quotation the Common Shares from any securities exchange upon which they are listed for trading or included or designated for quotation, or of the threatening or initiation of any proceedings for any of such purposes. If the Commission shall enter any such stop order at any time, the Company will use its best efforts to obtain the lifting of such order as soon as reasonably practicable. Additionally, the Company agrees that it shall comply with the provisions of Rule 424(b) and Rule 433, as applicable, under the Securities Act and will use its reasonable efforts to confirm that any filings made by the Company under such Rule 424(b) or Rule 433 were received in a timely manner by the Commission.

(c) Amendments and Supplements to the Prospectus and Other Securities Act Matters. If any event shall occur or condition exist as a result of which it is necessary to amend or supplement the Prospectus so that the Prospectus does not include an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances when the Prospectus is delivered to a purchaser, not misleading, or if in the

opinion of the Agent or counsel for the Agent it is otherwise necessary to amend or supplement the Prospectus to comply with applicable law, including the Securities Act, the Company agrees (subject to Section 4(d) and 4(f)) to promptly prepare, file with the Commission and furnish at its own expense to the Agent, amendments or supplements to the Prospectus so that the statements in the Prospectus as so amended or supplemented will not include an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances when the Prospectus is delivered to a purchaser, not be misleading or so that the Prospectus, as amended or supplemented, will comply with applicable law including the Securities Act. Neither the Agent's consent to, or delivery of, any such amendment or supplement shall constitute a waiver of any of the Company's obligations under Sections 4(d) and 4(f).

(d) Agent's Review of Proposed Amendments and Supplements. Prior to amending or supplementing the Registration Statement (including any registration statement filed under Rule 462(b) under the Securities Act) or the Prospectus (excluding any amendment or supplement through incorporation of any report filed under the Exchange Act), the Company shall furnish to the Agent for review, a reasonable amount of time prior to the proposed time of filing or use thereof, a copy of each such proposed amendment or supplement, and the Company shall not file or use any such proposed amendment or supplement without the Agent's prior consent, which shall not be unreasonably withheld, conditioned or delayed, and to file with the Commission within the applicable period specified in Rule 424(b) under the Securities Act any prospectus required to be filed pursuant to such Rule.

(e) Use of Free Writing Prospectus. Neither the Company nor the Agent has prepared, used, referred to or distributed, or will prepare, use, refer to or distribute, without the other party's prior written consent, any "written communication" that constitutes a "free writing prospectus" as such terms are defined in Rule 405 under the Securities Act with respect to the offering contemplated by this Agreement (any such free writing prospectus being referred to herein as a "**Free Writing Prospectus**").

(f) Free Writing Prospectuses. The Company shall furnish to the Agent for review, a reasonable amount of time prior to the proposed time of filing or use thereof, a copy of each proposed free writing prospectus or any amendment or supplement thereto to be prepared by or on behalf of, used by, or referred to by the Company and the Company shall not file, use or refer to any proposed free writing prospectus or any amendment or supplement thereto without the Agent's consent, which shall not be unreasonably withheld, conditioned or delayed. The Company shall furnish to the Agent, without charge, as many copies of any free writing prospectus prepared by or on behalf of, or used by the Company, as the Agent may reasonably request. If at any time when a prospectus is required by the Securities Act (including, without limitation, pursuant to Rule 173(d)) to be delivered in connection with sales of the Shares (but in any event if at any time through and including the date of this Agreement) there occurred or occurs an event or development as a result of which any free writing prospectus prepared by or on behalf of, used by, or referred to by the Company conflicted or would conflict with the information contained in the Registration Statement or included or would include an untrue statement of a material fact or omitted or would omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances prevailing at that subsequent time, not misleading, the Company shall promptly amend or supplement such free writing prospectus to eliminate or correct such conflict or so that the statements in such free writing prospectus as so amended or supplemented

will not include an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements therein, in the light of the circumstances prevailing at such subsequent time, not misleading, as the case may be; *provided, however*, that prior to amending or supplementing any such free writing prospectus, the Company shall furnish to the Agent for review, a reasonable amount of time prior to the proposed time of filing or use thereof, a copy of such proposed amended or supplemented free writing prospectus and the Company shall not file, use or refer to any such amended or supplemented free writing prospectus without the Agent's consent, which shall not be unreasonably withheld, conditioned or delayed.

(g) Filing of Agent Free Writing Prospectuses. The Company shall not take any action that would result in the Agent or the Company being required to file with the Commission pursuant to Rule 433(d) under the Securities Act a free writing prospectus prepared by or on behalf of the Agent that the Agent otherwise would not have been required to file thereunder.

(h) Copies of Registration Statement and Prospectus. After the date of this Agreement through the last time that a prospectus is required by the Securities Act (including, without limitation, pursuant to Rule 173(d)) to be delivered in connection with sales of the Shares, the Company agrees to furnish the Agent with copies (which may be electronic copies) of the Registration Statement and each amendment thereto, and with copies of the Prospectus and each amendment or supplement thereto in the form in which it is filed with the Commission pursuant to the Securities Act or Rule 424(b) under the Securities Act, both in such quantities as the Agent may reasonably request from time to time; and, if the delivery of a prospectus is required under the Securities Act or under the blue sky or securities laws of any jurisdiction at any time on or prior to the applicable Settlement Date for any period set forth in an Issuance Notice in connection with the offering or sale of the Shares and if at such time any event has occurred as a result of which the Prospectus as then amended or supplemented would include an untrue statement of a material fact or omit to state any material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made when such Prospectus is delivered, not misleading, or, if for any other reason it is necessary during such same period to amend or supplement the Prospectus or to file under the Exchange Act any document incorporated by reference in the Prospectus in order to comply with the Securities Act or the Exchange Act, to notify the Agent and to request that the Agent suspend offers to sell Shares (and, if so notified, the Agent shall cease such offers as soon as practicable); and if the Company decides to amend or supplement the Registration Statement or the Prospectus as then amended or supplemented, to advise the Agent promptly by telephone (with confirmation in writing) and to prepare and cause to be filed promptly with the Commission an amendment or supplement to the Registration Statement or the Prospectus as then amended or supplemented that will correct such statement or omission or effect such compliance; provided, however, that if during such same period the Agent is required to deliver a prospectus in respect of transactions in the Shares, the Company shall promptly prepare and file with the Commission such an amendment or supplement.

(i) Blue Sky Compliance. The Company shall cooperate with the Agent and counsel for the Agent to qualify or register the Shares for sale under (or obtain exemptions from the application of) the state securities or blue sky laws or Canadian provincial securities laws of those jurisdictions designated by the Agent, shall comply with such laws and shall continue such qualifications, registrations and exemptions in effect so long as required for the distribution of the Shares. The Company shall not be required to qualify as a foreign corporation or to take any action

that would subject it to general service of process in any such jurisdiction where it is not presently qualified or where it would be subject to taxation as a foreign corporation. The Company will advise the Agent promptly of the suspension of the qualification or registration of (or any such exemption relating to) the Shares for offering, sale or trading in any jurisdiction or any initiation or threat of any proceeding for any such purpose, and in the event of the issuance of any order suspending such qualification, registration or exemption, the Company shall use its best efforts to obtain the withdrawal thereof as soon as reasonably practicable.

(j) Earnings Statement. As soon as practicable, the Company will make generally available to its security holders and to the Agent an earnings statement (which need not be audited) covering a period of at least twelve months beginning with the first fiscal quarter of the Company occurring after the date of this Agreement which shall satisfy the provisions of Section 11(a) of the Securities Act and Rule 158 under the Securities Act.

(k) Listing; Reservation of Shares. (a) The Company will maintain the listing of the Shares on the Principal Market; and (b) the Company will reserve and keep available at all times, free of preemptive rights, Shares for the purpose of enabling the Company to satisfy its obligations under this Agreement.

(l) Transfer Agent. The Company shall engage and maintain, at its expense, a registrar and transfer agent for the Shares.

(m) Due Diligence. During the term of this Agreement, the Company will reasonably cooperate with any reasonable due diligence review conducted by the Agent in connection with the transactions contemplated hereby, including, without limitation, providing information and making available documents and senior corporate officers, during normal business hours and at the Company's principal offices, as the Agent may reasonably request from time to time.

(n) Representations and Warranties. The Company acknowledges that each delivery of an Issuance Notice and each delivery of Shares on a Settlement Date shall be deemed to be (i) an affirmation to the Agent that the representations and warranties of the Company contained in or made pursuant to this Agreement are true and correct as of the date of such Issuance Notice or of such Settlement Date, as the case may be, as though made at and as of each such date, except as may be disclosed in the Prospectus (including any documents incorporated by reference therein and any supplements thereto); and (ii) an undertaking that the Company will advise the Agent if any of such representations and warranties will not be true and correct as of the Settlement Date for the Shares relating to such Issuance Notice, as though made at and as of each such date (except that such representations and warranties shall be deemed to relate to the Registration Statement and the Prospectus as amended and supplemented relating to such Shares).

(o) Deliverables at Triggering Event Dates; Certificates. The Company agrees that on or prior to the date of the first Issuance Notice and, during the term of this Agreement after the date of the first Issuance Notice, upon:

(A) the filing of the Prospectus or the amendment or supplement of any Registration Statement or Prospectus (other than a prospectus supplement relating solely to an offering of securities other than the Shares or a prospectus filed pursuant to Section 4(a)(ii)(B)),

by means of a post-effective amendment, sticker or supplement, but not by means of incorporation of documents by reference into the Registration Statement or Prospectus;

(B) the filing with the Commission of an annual report on Form 10-K or a quarterly report on Form 10-Q (including any Form 10-K/A or Form 10-Q/A containing amended financial information or a material amendment to the previously filed annual report on Form 10-K or quarterly report on Form 10-Q), in each case, of the Company; or

(C) the filing with the Commission of a current report on Form 8-K of the Company containing amended financial information (other than information "furnished" pursuant to Item 2.02 or 7.01 of Form 8-K or to provide disclosure pursuant to Item 8.01 of Form 8-K relating to reclassification of certain properties as discontinued operations in accordance with Statement of Financial Accounting Standards No. 144) that is material to the offering of securities of the Company in the Agent's reasonable discretion;

(any such event, a "**Triggering Event Date**"), the Company shall furnish the Agent (but in the case of clause (C) above only if the Agent reasonably determines that the information contained in such current report on Form 8-K of the Company is material) with a certificate as of the Triggering Event Date, in the form and substance satisfactory to the Agent and its counsel, substantially similar to the form previously provided to the Agent and its counsel, modified, as necessary, to relate to the Registration Statement and the Prospectus as amended or supplemented, (A) confirming that the representations and warranties of the Company contained in this Agreement are true and correct on the date of such certificate as if made on such date, (B) confirming that the Company has performed all of its obligations hereunder to be performed on or prior to the date of such certificate and as to the matters set forth in Section 5(a)(iii) hereof, and (C) containing any other certification that the Agent shall reasonably request. The requirement to provide a certificate under this Section 4(o) shall be waived for any Triggering Event Date occurring at a time when no Issuance Notice is pending or a suspension is in effect, which waiver shall continue until the earlier to occur of the date the Company delivers instructions for the sale of Shares hereunder (which for such calendar quarter shall be considered a Triggering Event Date) and the next occurring Triggering Event Date. Notwithstanding the foregoing, if the Company subsequently decides to sell Shares following a Triggering Event Date when a suspension was in effect and did not provide the Agent with a certificate under this Section 4(o), then before the Company delivers the instructions for the sale of Shares or the Agent sells any Shares pursuant to such instructions, the Company shall provide the Agent with a certificate in conformity with this Section 4(o) dated as of the date that the instructions for the sale of Shares are issued.

(p) Legal Opinions. On or prior to the date of the first Issuance Notice and on or prior to each Triggering Event Date with respect to which the Company is obligated to deliver a certificate pursuant to Section 4(o) for which no waiver is applicable and excluding the date of this Agreement, a negative assurances letter and a written legal opinion of each of Gibson, Dunn & Crutcher LLP, counsel to the Company and Latham & Watkins LLP, counsel to the Agent, and a written legal opinion of Honigman LLC, intellectual property counsel to the Company, with respect to certain intellectual property matters, each dated the date of delivery, shall be delivered to the Agent, each in form and substance reasonably satisfactory to the Agent and its counsel, substantially similar to the form previously provided to the Agent and its counsel, modified, as necessary, to relate to the Registration Statement and the Prospectus as then amended or

supplemented. In lieu of such opinions for subsequent periodic filings, in the discretion of the Agent, the Company may furnish a reliance letter from such counsel to the Agent, permitting the Agent to rely on a previously delivered opinion letter, modified as appropriate for any passage of time or Triggering Event Date (except that statements in such prior opinion shall be deemed to relate to the Registration Statement and the Prospectus as amended or supplemented as of such Triggering Event Date).

(q) Comfort Letter. On or prior to the date of the first Issuance Notice and on or prior to each Triggering Event Date with respect to which the Company is obligated to deliver a certificate pursuant to Section 4(o) for which no waiver is applicable and excluding the date of this Agreement, the Company shall cause Rose, Snyder & Jacobs, LLP, the independent registered public accounting firm who has audited the financial statements included or incorporated by reference in the Registration Statement, to furnish the Agent a comfort letter, dated the date of delivery, in form and substance reasonably satisfactory to the Agent and its counsel, substantially similar to the form previously provided to the Agent and its counsel; provided, however, that any such comfort letter will only be required on the Triggering Event Date specified to the extent that it contains financial statements filed with the Commission under the Exchange Act and incorporated or deemed to be incorporated by reference into a Prospectus. If requested by the Agent, the Company shall also cause a comfort letter to be furnished to the Agent within ten (10) Trading Days of the date of occurrence of any material transaction or event requiring the filing of a current report on Form 8-K containing material amended financial information of the Company, including the restatement of the Company's financial statements. The Company shall be required to furnish no more than one comfort letter hereunder per calendar quarter.

(r) Secretary's Certificate. On or prior to the date of the first Issuance Notice and on or prior to each Triggering Event Date with respect to which the Company is obligated to deliver a certificate pursuant to Section 4(o) for which no waiver is applicable, the Company shall furnish the Agent a certificate executed by the Secretary of the Company, signing in such capacity, dated the date of delivery (i) certifying that attached thereto are true and complete copies of the resolutions duly adopted by the Board of Directors of the Company authorizing the execution and delivery of this Agreement and the consummation of the transactions contemplated hereby (including, without limitation, the issuance of the Shares pursuant to this Agreement), which authorization shall be in full force and effect on and as of the date of such certificate, (ii) certifying and attesting to the office, incumbency, due authority and specimen signatures of each Person who executed this Agreement for or on behalf of the Company, and (iii) containing any other certification that the Agent shall reasonably request.

(s) Agent's Own Account; Clients' Account. The Company consents to the Agent trading, in compliance with applicable law, in the Common Shares for the Agent's own account and for the account of its clients at the same time as sales of the Shares occur pursuant to this Agreement.

(t) Investment Limitation. The Company shall not invest, or otherwise use the proceeds received by the Company from its sale of the Shares in such a manner as would require the Company or any of its subsidiaries to register as an investment company under the Investment Company Act.

(u) Market Activities. The Company will not take, directly or indirectly, any action designed to or that might be reasonably expected to cause or result in stabilization or manipulation of the price of the Shares or any other reference security, whether to facilitate the sale or resale of the Shares or otherwise, and the Company will, and shall cause each of its affiliates to, comply with all applicable provisions of Regulation M. If the limitations of Rule 102 of Regulation M ("**Rule 102**") do not apply with respect to the Shares or any other reference security pursuant to any exception set forth in Section (d) of Rule 102, then promptly upon notice from the Agent (or, if later, at the time stated in the notice), the Company will, and shall cause each of its affiliates to, comply with Rule 102 as though such exception were not available but the other provisions of Rule 102 (as interpreted by the Commission) did apply. The Company shall promptly notify the Agent if it no longer meets the requirements set forth in Section (d) of Rule 102.

(v) Notice of Other Sale. Without the written consent of the Agent, the Company will not, directly or indirectly, (i) offer to sell, sell, contract to sell, grant any option to sell or otherwise dispose of any Common Shares or securities convertible into or exchangeable for Common Shares (other than Shares hereunder), warrants or any rights to purchase or acquire Common Shares, during the period beginning on the third Trading Day immediately prior to the date on which any Issuance Notice is delivered to the Agent hereunder and ending on the earlier of (A) the third Trading Day immediately following the Settlement Date with respect to Shares sold pursuant to such Issuance Notice and (B) the date an Issuance Notice is cancelled if no Shares have been sold pursuant to such Issuance Notice; (ii) effect a reverse stock split, recapitalization, share consolidation, reclassification or similar transaction affecting the outstanding Common Shares; or (iii) enter into any other "at the market" or continuous equity transaction offer to sell, sell, contract to sell, grant any option to sell or otherwise dispose of any Common Shares (other than the Shares offered pursuant to this Agreement) or securities convertible into or exchangeable for Common Shares, warrants or any rights to purchase or acquire, Common Shares prior to the termination of this Agreement; provided, however, that such restrictions will not be required in connection with the Company's (w) issuance or sale of Common Shares, options to purchase Common Shares or Common Shares issuable upon the exercise of options or other equity awards pursuant to any employee or director share option, incentive or benefit plan, share purchase or ownership plan, long-term incentive plan, dividend reinvestment plan, inducement award under Principal Market rules or other compensation plan of the Company or its subsidiaries, as in effect on the date of this Agreement, (x) issuance or sale of Common Shares issuable upon exchange, conversion or redemption of securities or the exercise or vesting of warrants, options or other equity awards outstanding at the date of this Agreement or subsequently disclosed in filings by the Company available on EDGAR or otherwise in writing to the Agent, (y) issuance or sale of Common Shares or securities convertible into or exchangeable for Common Shares as consideration for mergers, acquisitions, other business combinations, joint ventures or strategic alliances occurring after the date of this Agreement which are not used for capital raising purposes, provided that the aggregate number of Common Shares issued or underlying such securities convertible into or exchangeable for Common Shares issued in connection with all such acquisitions and other transactions does not exceed 5% of the aggregate number of Common Shares outstanding as of the date of such issuance, and (z) modification of any outstanding options, warrants of any rights to purchase or acquire Common Shares.

Section 5. CONDITIONS TO DELIVERY OF ISSUANCE NOTICES AND TO SETTLEMENT

(a) Conditions Precedent to the Right of the Company to Deliver an Issuance Notice and the Obligation of the Agent to Sell Shares. The right of the Company to deliver an Issuance Notice hereunder is subject to the satisfaction, on the date of delivery of such Issuance Notice, and the obligation of the Agent to use its commercially reasonable efforts to place Shares during the applicable period set forth in the Issuance Notice is subject to the satisfaction, on each Trading Day during the applicable period set forth in the Issuance Notice, of each of the following conditions:

(i) Accuracy of the Company's Representations and Warranties; Performance by the Company. The Company shall have delivered the certificate required to be delivered pursuant to Section 4(o) on or before the date on which delivery of such certificate is required pursuant to Section 4(o). The Company shall have performed, satisfied and complied with all covenants, agreements and conditions required by this Agreement to be performed, satisfied or complied with by the Company at or prior to such date, including, but not limited to, the covenants contained in Section 4(p), Section 4(q) and Section 4(r).

(ii) No Injunction. No statute, rule, regulation, executive order, decree, ruling or injunction shall have been enacted, entered, promulgated or endorsed by any court or governmental authority of competent jurisdiction or any self-regulatory organization having authority over the matters contemplated hereby that prohibits or directly and materially adversely affects any of the transactions contemplated by this Agreement, and no proceeding shall have been commenced that may have the effect of prohibiting or materially adversely affecting any of the transactions contemplated by this Agreement.

(iii) Material Adverse Changes. Except as disclosed in the Prospectus and the Time of Sale Information, (a) in the judgment of the Agent there shall not have occurred any Material Adverse Change; and (b) there shall not have occurred any downgrading, nor shall any notice have been received by the Company of any intended or potential downgrading or of any review for a possible change that does not indicate the direction of the possible change, in the rating accorded any securities of the Company or any of its subsidiaries by any "nationally recognized statistical rating organization" as such term is defined for purposes of Section 3(a)(62) of the Exchange Act.

(iv) No Suspension of Trading in or Delisting of Common Shares; Other Events. The trading of the Common Shares (including without limitation the Shares) shall not have been suspended by the Commission, the Principal Market or FINRA and the Common Shares (including without limitation the Shares) shall have been approved for listing or quotation on and shall not have been delisted from the Nasdaq Stock Market, the New York Stock Exchange or any of their constituent markets. There shall not have occurred (and be continuing in the case of occurrences under clauses (i) and (ii) below) any of the following: (i) trading or quotation in any of

the Company's securities shall have been suspended or limited by the Commission or by the Principal Market or trading in securities generally on the Principal Market shall have been suspended or limited, or minimum or maximum prices shall have been generally established on any of such stock exchanges by the Commission or the FINRA; (ii) a general banking moratorium shall have been declared by any of federal or New York, authorities; or (iii) there shall have occurred any outbreak or escalation of national or international hostilities or any crisis or calamity, or any change in the United States or international financial markets, or any substantial change or development involving a prospective substantial change in United States' or international political, financial or economic conditions, as in the judgment of the Agent is material and adverse and makes it impracticable to market the Shares in the manner and on the terms described in the Prospectus or to enforce contracts for the sale of securities.

(b) Documents Required to be Delivered on each Issuance Notice Date. The Agent's obligation to use its commercially reasonable efforts to place Shares hereunder shall additionally be conditioned upon the delivery to the Agent on or before the Issuance Notice Date of a certificate in form and substance reasonably satisfactory to the Agent, executed by the Chief Executive Officer, President or Chief Financial Officer of the Company, to the effect that all conditions to the delivery of such Issuance Notice shall have been satisfied as at the date of such certificate (which certificate shall not be required if the foregoing representations shall be set forth in the Issuance Notice).

(c) No Misstatement or Material Omission. The Agent shall not have advised the Company that the Registration Statement, the Prospectus or the Time of Sale Information, or any amendment or supplement thereto, contains an untrue statement of fact that in the Agent's reasonable opinion is material, or omits to state a fact that in the Agent's reasonable opinion is material and is required to be stated therein or is necessary to make the statements therein not misleading.

Section 6. INDEMNIFICATION AND CONTRIBUTION

(a) Indemnification of the Agent. The Company agrees to indemnify and hold harmless the Agent, its officers and employees, and each person, if any, who controls the Agent within the meaning of the Securities Act or the Exchange Act against any loss, claim, damage, liability or expense, as incurred, to which the Agent or such officer, employee or controlling person may become subject, under the Securities Act, the Exchange Act, other federal or state statutory law or regulation, or the laws or regulations of foreign jurisdictions where Shares have been offered or sold or at common law or otherwise (including in settlement of any litigation), insofar as such loss, claim, damage, liability or expense (or actions in respect thereof as contemplated below) arises out of or is based upon: (i) any untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, or any amendment thereto, including any information deemed to be a part thereof pursuant to Rule 430B under the Securities Act, or the omission or alleged omission therefrom of a material fact required to be stated therein or necessary to make the statements therein not misleading; or (ii) any untrue statement or alleged untrue statement of a material fact contained in any Free Writing Prospectus that the Company has used, referred to or filed, or is required to file, pursuant to Rule 433(d) of the Securities Act or the Prospectus (or any

amendment or supplement thereto), or the omission or alleged omission therefrom of a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading, and to reimburse the Agent and each such officer, employee and controlling person for any and all documented expenses (including the reasonable fees and disbursements of counsel chosen by the Agent) as such expenses are reasonably incurred by the Agent or such officer, employee or controlling person in connection with investigating, defending, settling, compromising or paying any such loss, claim, damage, liability, expense or action; provided, however, that the foregoing indemnity agreement shall not apply to any loss, claim, damage, liability or expense to the extent, but only to the extent, arising out of or based upon any untrue statement or alleged untrue statement or omission or alleged omission made in reliance upon and in conformity with written information furnished to the Company by the Agent expressly for use in the Registration Statement, any such Free Writing Prospectus or the Prospectus (or any amendment or supplement thereto), it being understood and agreed that the only such information furnished by the Agent to the Company consists of the information set forth in the first sentence of the ninth paragraph under the caption "Plan of Distribution" in the Prospectus (the "**Agent Information**"). The indemnity agreement set forth in this Section 6(a) shall be in addition to any liabilities that the Company may otherwise have.

(b) Indemnification of the Company and Company Officers and Directors. The Agent agrees to indemnify and hold harmless the Company, each of its directors, each of its officers who signed the Registration Statement and each person, if any, who controls the Company within the meaning of the Securities Act or the Exchange Act against any loss, claim, damage, liability or expense, as incurred, to which the Company or any such director, officer or controlling person may become subject, under the Securities Act, the Exchange Act, other federal or state statutory law or regulation, or the laws or regulations of foreign jurisdictions where Shares have been offered or sold or at common law or otherwise (including in settlement of any litigation), insofar as such loss, claim, damage, liability or expense (or actions in respect thereof as contemplated below) arises out of or is based upon (i) any untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, or any amendment thereto, including any information deemed to be a part thereof pursuant to Rule 430B under the Securities Act, or the omission or alleged omission therefrom of a material fact required to be stated therein or necessary to make the statements therein not misleading; or (ii) any untrue statement or alleged untrue statement of a material fact contained in any Free Writing Prospectus that the Company has used, referred to or filed, or is required to file, pursuant to Rule 433(d) of the Securities Act or the Prospectus (or any amendment or supplement thereto), or the omission or alleged omission therefrom of a material fact necessary in order to make the statements therein, in the light of the circumstances under which they were made, not misleading; but, for each of (i) and (ii) above, only to the extent arising out of or based upon any untrue statement or alleged untrue statement or omission or alleged omission made in reliance upon and in conformity with written information furnished to the Company by the Agent expressly for use in the Registration Statement, any such Free Writing Prospectus or the Prospectus (or any amendment or supplement thereto), it being understood and agreed that the only such information furnished by the Agent to the Company consists of the Agent Information, and to reimburse the Company and each such director, officer and controlling person for any and all documented expenses (including the reasonable and documented fees and disbursements of counsel chosen by the Company) as such expenses are reasonably incurred by the Company or such officer, director or controlling person in connection with investigating, defending, settling, compromising or paying any such loss, claim, damage, liability, expense or

action. The indemnity agreement set forth in this Section 6(b) shall be in addition to any liabilities that the Agent or the Company may otherwise have.

(c) Notifications and Other Indemnification Procedures. Promptly after receipt by an indemnified party under this Section 6 of notice of the commencement of any action, such indemnified party will, if a claim in respect thereof is to be made against an indemnifying party under this Section 6, notify the indemnifying party in writing of the commencement thereof, but the omission so to notify the indemnifying party will not relieve it from any liability which it may have to any indemnified party for contribution or otherwise than under the indemnity agreement contained in this Section 6 or to the extent it is not prejudiced as a proximate result of such failure. In case any such action is brought against any indemnified party and such indemnified party seeks or intends to seek indemnity from an indemnifying party, the indemnifying party will be entitled to participate in, and, to the extent that it shall elect, jointly with all other indemnifying parties similarly notified, by written notice delivered to the indemnified party promptly after receiving the aforesaid notice from such indemnified party, to assume the defense thereof with counsel reasonably satisfactory to such indemnified party; provided, however, if the defendants in any such action include both the indemnified party and the indemnifying party and the indemnified party shall have reasonably concluded that a conflict may arise between the positions of the indemnifying party and the indemnified party in conducting the defense of any such action or that there may be legal defenses available to it and/or other indemnified parties which are different from or additional to those available to the indemnifying party, the indemnified party or parties shall have the right to select separate counsel to assume such legal defenses and to otherwise participate in the defense of such action on behalf of such indemnified party or parties. Upon receipt of notice from the indemnifying party to such indemnified party of such indemnifying party's election to so assume the defense of such action and approval by the indemnified party of counsel, the indemnifying party will not be liable to such indemnified party under this Section 6 for any legal or other expenses subsequently incurred by such indemnified party in connection with the defense thereof unless (i) the indemnified party shall have employed separate counsel in accordance with the proviso to the preceding sentence (it being understood, however, that the indemnifying party shall not be liable for the fees and expenses of more than one separate counsel (together with local counsel), representing the indemnified parties who are parties to such action), which counsel (together with any local counsel) for the indemnified parties shall be selected by the indemnified party (in the case of counsel for the indemnified parties referred to in Section 6(a) or Section 6(b) above), (ii) the indemnifying party shall not have employed counsel reasonably satisfactory to the indemnified party to represent the indemnified party within a reasonable time after notice of commencement of the action or (iii) the indemnifying party has authorized in writing the employment of counsel for the indemnified party at the expense of the indemnifying party, in each of which cases the fees and expenses of counsel shall be at the expense of the indemnifying party and shall be paid as they are incurred.

(d) Settlements. The indemnifying party under this Section 6 shall not be liable for any settlement of any proceeding effected without its written consent, but if settled with such consent or if there be a final judgment for the plaintiff, the indemnifying party agrees to indemnify the indemnified party against any loss, claim, damage, liability or expense by reason of such settlement or judgment. Notwithstanding the foregoing sentence, if at any time an indemnified party shall have requested an indemnifying party to reimburse the indemnified party for fees and expenses of counsel as contemplated by Section 6(b) hereof, the indemnifying party agrees that it shall be liable

for any settlement of any proceeding effected without its written consent if (i) such settlement is entered into more than 60 days after receipt by such indemnifying party of the aforesaid request; and (ii) such indemnifying party shall not have reimbursed the indemnified party in accordance with such request prior to the date of such settlement. No indemnifying party shall, without the prior written consent of the indemnified party, effect any settlement, compromise or consent to the entry of judgment in any pending or threatened action, suit or proceeding in respect of which any indemnified party is or could have been a party and indemnity was or could have been sought hereunder by such indemnified party, unless such settlement, compromise or consent includes an unconditional release of such indemnified party from all liability on claims that are the subject matter of such action, suit or proceeding.

(e) Contribution. If the indemnification provided for in this Section 6 is for any reason held to be unavailable to or otherwise insufficient to hold harmless an indemnified party in respect of any losses, claims, damages, liabilities or expenses referred to therein, then each indemnifying party shall contribute to the aggregate amount paid or payable by such indemnified party, as incurred, as a result of any losses, claims, damages, liabilities or expenses referred to therein (i) in such proportion as is appropriate to reflect the relative benefits received by the Company, on the one hand, and the Agent, on the other hand, from the offering of the Shares pursuant to this Agreement; or (ii) if the allocation provided by clause (i) above is not permitted by applicable law, in such proportion as is appropriate to reflect not only the relative benefits referred to in clause (i) above but also the relative fault of the Company, on the one hand, and the Agent, on the other hand, in connection with the statements or omissions which resulted in such losses, claims, damages, liabilities or expenses, as well as any other relevant equitable considerations. The relative benefits received by the Company, on the one hand, and the Agent, on the other hand, in connection with the offering of the Shares pursuant to this Agreement shall be deemed to be in the same respective proportions as the total gross proceeds from the offering of the Shares (before deducting expenses) received by the Company bear to the total commissions received by the Agent. The relative fault of the Company, on the one hand, and the Agent, on the other hand, shall be determined by reference to, among other things, whether any such untrue or alleged untrue statement of a material fact or omission or alleged omission to state a material fact relates to information supplied by the Company, on the one hand, or the Agent, on the other hand, and the parties' relative intent, knowledge, access to information and opportunity to correct or prevent such statement or omission.

The amount paid or payable by a party as a result of the losses, claims, damages, liabilities and expenses referred to above shall be deemed to include, subject to the limitations set forth in Section 6(c), any reasonable and documented legal or other fees or expenses reasonably incurred by such party in connection with investigating or defending any action or claim. The provisions set forth in Section 6(c) with respect to notice of commencement of any action shall apply if a claim for contribution is to be made under this Section 6(e); *provided, however,* that no additional notice shall be required with respect to any action for which notice has been given under Section 6(c) for purposes of indemnification.

The Company and the Agent agree that it would not be just and equitable if contribution pursuant to this Section 6(e) were determined by pro rata allocation or by any other method of allocation which does not take account of the equitable considerations referred to in this Section 6(e).

Notwithstanding the provisions of this Section 6(e), the Agent shall not be required to contribute any amount in excess of the agent fees received by the Agent in connection with the offering contemplated hereby. No person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) shall be entitled to contribution from any person who was not guilty of such fraudulent misrepresentation. For purposes of this Section 6(e), each officer and employee of the Agent and each person, if any, who controls the Agent within the meaning of the Securities Act or the Exchange Act shall have the same rights to contribution as the Agent, and each director of the Company, each officer of the Company who signed the Registration Statement, and each person, if any, who controls the Company with the meaning of the Securities Act and the Exchange Act shall have the same rights to contribution as the Company.

Section 7. TERMINATION & SURVIVAL

(a) Term. Subject to the provisions of this Section 7, the term of this Agreement shall continue from the date of this Agreement until the end of the Agency Period, unless earlier terminated by the parties to this Agreement pursuant to this Section 7.

(b) Termination; Survival Following Termination.

(i) Either party may terminate this Agreement prior to the end of the Agency Period, by giving written notice as required by this Agreement, upon ten (10) Trading Days' notice to the other party; provided that, (A) if the Company terminates this Agreement after the Agent confirms to the Company any sale of Shares, the Company shall remain obligated to comply with Section 3(b)(v) with respect to such Shares and (B) Section 2, Section 6, Section 7 and Section 8 shall survive termination of this Agreement. If termination shall occur prior to the Settlement Date for any sale of Shares, such sale shall nevertheless settle in accordance with the terms of this Agreement.

(ii) In addition to the survival provision of Section 7(b)(i), the respective indemnities, agreements, representations, warranties and other statements of the Company, of its officers and of the Agent set forth in or made pursuant to this Agreement will remain in full force and effect, regardless of any investigation made by or on behalf of the Agent or the Company or any of its or their partners, officers or directors or any controlling person, as the case may be, and, anything herein to the contrary notwithstanding, will survive delivery of and payment for the Shares sold hereunder and any termination of this Agreement.

Section 8. MISCELLANEOUS

(a) Press Releases and Disclosure. The Company may issue a press release describing the material terms of the transactions contemplated hereby as soon as practicable following the date of this Agreement, and may file with the Commission a Current Report on Form 8-K, with this Agreement attached as an exhibit thereto, describing the material terms of the transactions contemplated hereby, and the Company shall consult with the Agent prior to making such disclosures, and the parties hereto shall use all commercially reasonable efforts, acting in good faith, to agree upon a text for such disclosures that is reasonably satisfactory to all parties hereto.

No party hereto shall issue thereafter any press release or like public statement (including, without limitation, any disclosure required in reports filed with the Commission pursuant to the Exchange Act) related to this Agreement or any of the transactions contemplated hereby without the prior written approval of the other party hereto, except as may be necessary or appropriate in the reasonable opinion of the party seeking to make disclosure to comply with the requirements of applicable law or stock exchange rules. If any such press release or like public statement is so required, the party making such disclosure shall consult with the other party prior to making such disclosure, and the parties shall use all commercially reasonable efforts, acting in good faith, to agree upon a text for such disclosure that is reasonably satisfactory to all parties hereto.

(b) No Advisory or Fiduciary Relationship. The Company acknowledges and agrees that (i) the transactions contemplated by this Agreement, including the determination of any fees, are arm's-length commercial transactions between the Company and the Agent, (ii) when acting as a principal under this Agreement, the Agent is and has been acting solely as a principal and is not the agent or fiduciary of the Company, or its stockholders, creditors, employees or any other party, (iii) the Agent has not assumed nor will assume an advisory or fiduciary responsibility in favor of the Company with respect to the transactions contemplated hereby or the process leading thereto (irrespective of whether the Agent has advised or is currently advising the Company on other matters) and the Agent does not have any obligation to the Company with respect to the transactions contemplated hereby except the obligations expressly set forth in this Agreement, (iv) the Agent and its respective affiliates may be engaged in a broad range of transactions that involve interests that differ from those of the Company, and (v) the Agent has not provided any legal, accounting, regulatory or tax advice with respect to the transactions contemplated hereby and the Company has consulted its own legal, accounting, regulatory and tax advisors to the extent it deemed appropriate.

(c) Research Analyst Independence. The Company acknowledges that the Agent's research analysts and research departments are required to and should be independent from their respective investment banking divisions and are subject to certain regulations and internal policies, and as such the Agent's research analysts may hold views and make statements or investment recommendations and/or publish research reports with respect to the Company or the offering that differ from the views of their respective investment banking divisions. The Company understands that the Agent is a full service securities firm and as such from time to time, subject to applicable securities laws, may effect transactions for its own account or the account of its customers and hold long or short positions in debt or equity securities of the companies that may be the subject of the transactions contemplated by this Agreement.

(d) Notices. All communications hereunder shall be in writing and shall be mailed, hand delivered or telecopied and confirmed to the parties hereto as follows:

If to the Agent:

Jefferies LLC
520 Madison Avenue
New York, NY 10022
Facsimile: (646) 786-5719
Attention: General Counsel

with a copy (which shall not constitute notice) to:

Latham & Watkins LLP
12670 High Bluff Drive
San Diego, CA 92130
Facsimile: (858) 523-5450
Attention: Cheston J. Larson

If to the Company:

Arrowhead Pharmaceuticals, Inc.
177 E. Colorado Blvd., Suite 700
Pasadena, CA 91105
Facsimile: (626) 304-3401
Attention: General Counsel

with a copy (which shall not constitute notice) to:

Gibson, Dunn & Crutcher LLP
555 Mission Street
San Francisco, CA 94105
Facsimile: (415) 374-8430
Attention: Ryan A. Murr; Branden C. Berns

Any party hereto may change the address for receipt of communications by giving written notice to the others in accordance with this Section 8(d).

(e) Successors. This Agreement will inure to the benefit of and be binding upon the parties hereto, and to the benefit of the employees, officers and directors and controlling persons referred to in Section 6, and in each case their respective successors, and no other person will have any right or obligation hereunder. The term "successors" shall not include any purchaser of the Shares as such from the Agent merely by reason of such purchase.

(f) Partial Unenforceability. The invalidity or unenforceability of any Article, Section, paragraph or provision of this Agreement shall not affect the validity or enforceability of any other Article, Section, paragraph or provision hereof. If any Article, Section, paragraph or provision of this Agreement is for any reason determined to be invalid or unenforceable, there shall be deemed to be made such minor changes (and only such minor changes) as are necessary to make it valid and enforceable.

(g) Governing Law Provisions. This Agreement shall be governed by and construed in accordance with the internal laws of the State of New York applicable to agreements made and to be performed in such state. Any legal suit, action or proceeding arising out of or based upon this Agreement or the transactions contemplated hereby may be instituted in the federal courts of the United States of America located in the Borough of Manhattan in the City of New York or the

courts of the State of New York in each case located in the Borough of Manhattan in the City of New York (collectively, the "**Specified Courts**"), and each party irrevocably submits to the exclusive jurisdiction (except for proceedings instituted in regard to the enforcement of a judgment of any such court, as to which such jurisdiction is non-exclusive) of such courts in any such suit, action or proceeding. Service of any process, summons, notice or document by mail to such party's address set forth above shall be effective service of process for any suit, action or other proceeding brought in any such court. The parties irrevocably and unconditionally waive any objection to the laying of venue of any suit, action or other proceeding in the Specified Courts and irrevocably and unconditionally waive and agree not to plead or claim in any such court that any such suit, action or other proceeding brought in any such court has been brought in an inconvenient forum.

(h) General Provisions. This Agreement constitutes the entire agreement of the parties to this Agreement and supersedes all prior written or oral and all contemporaneous oral agreements, understandings and negotiations with respect to the subject matter hereof. This Agreement may be executed in two or more counterparts, each one of which shall be an original, with the same effect as if the signatures thereto and hereto were upon the same instrument, and may be delivered by facsimile transmission or by electronic delivery of a portable document format (PDF) file. This Agreement may not be amended or modified unless in writing by all of the parties hereto, and no condition herein (express or implied) may be waived unless waived in writing by each party whom the condition is meant to benefit. The Article and Section headings herein are for the convenience of the parties only and shall not affect the construction or interpretation of this Agreement.

[Signature Page Immediately Follows]

If the foregoing is in accordance with your understanding of our agreement, kindly sign and return to the Company the enclosed copies hereof, whereupon this instrument, along with all counterparts hereof, shall become a binding agreement in accordance with its terms

Very truly yours,

ARROWHEAD PHARMACEUTICALS, INC.

By: /s/ Christopher Anzalone
Name: Christopher Anzalone
Title: President and Chief Executive Officer

The foregoing Agreement is hereby confirmed and accepted by the Agent in New York, New York as of the date first above written.

JEFFERIES LLC

By: /s/ Michael Magarro
Name: Michael Magarro
Title: Managing Director

EXHIBIT A

ISSUANCE NOTICE

[Date]

Jefferies LLC
520 Madison Avenue
New York, New York 10022

Attn: [_____]

Reference is made to the Open Market Sale Agreement between Arrowhead Pharmaceuticals, Inc. (the "**Company**") and Jefferies LLC (the "**Agent**") dated as of August 5, 2020. The Company confirms that all conditions to the delivery of this Issuance Notice are satisfied as of the date hereof.

Date of Delivery of Issuance Notice (determined pursuant to Section 3(b)(i)): _____

Issuance Amount (equal to the total Sales Price for such Shares):

$

Number of days in selling period:

First date of selling period:

Last date of selling period:

Settlement Date(s) if other than standard T+2 settlement:

Floor Price Limitation (in no event less than $1.00 without the prior written consent of the Agent, which consent may be withheld in the Agent's sole discretion): $ ____ per share

Comments:

_____

By:

Name:
Title:

Schedule A

Notice Parties

The Company

Chris Anzalone (canzalone@arrowheadpharma.com)

Vince Anzalone (vanzalone@arrowheadpharma.com)

Ken Myszkowski (kmyszkowski@arrowheadpharma.com)

Patrick O’Brien (pobrien@arrowheadpharma.com)

The Agent

Michael Brinkman (mbrinkman@jefferies.com)

Michael Magarro (mmagarro@jefferies.com)

Donald Lynaugh (dlynaugh@jefferies.com)

Jack Fabbri (jfabbri@jefferies.com)

Gibson, Dunn & Crutcher LLP
555 Mission Street
San Francisco, CA 94105-0921
Tel 415.393.8200
www.gibsondunn.com

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Client: 04695-00002

August 5, 2020

Arrowhead Pharmaceuticals, Inc.
177 E. Colorado Blvd, Suite 700
Pasadena, CA 91105

Re: *Arrowhead Pharmaceuticals, Inc.*
Registration Statement on Form S-3 (File No. 333-235324)

Ladies and Gentlemen:

We have examined the Registration Statement on Form S-3, File No. 333-235324 (the "Registration Statement"), of Arrowhead Pharmaceuticals, Inc., a Delaware corporation (the "Company"), filed with the Securities and Exchange Commission (the "Commission") pursuant to the Securities Act of 1933, as amended (the "Securities Act"), and the prospectus supplement thereto dated August 5, 2020 (the "Prospectus Supplement"), in connection with the offering by the Company of up to $250,000,000 of the Company's common stock, par value $0.001 per share (the "Shares").

In arriving at the opinion expressed below, we have examined originals, or copies certified or otherwise identified to our satisfaction as being true and complete copies of the originals, of specimen Common Stock certificate and such other documents, corporate records, certificates of officers of the Company and of public officials and other instruments as we have deemed necessary or advisable to enable us to render the opinions set forth below. In our examination, we have assumed without independent investigation the genuineness of all signatures, the legal capacity and competency of all natural persons, the authenticity of all documents submitted to us as originals and the conformity to original documents of all documents submitted to us as copies. We have further assumed that all offers and sales of the Shares will comply with the minimum offering price and pricing formula set forth in the authorization of the offering and sale of the Shares by the Company's Board of Directors.

Based upon the foregoing, and subject to the assumptions, exceptions, qualifications and limitations set forth herein, we are of the opinion that the Shares, when issued against payment therefor as set forth in the Registration Statement and the Prospectus Supplement thereto, will be validly issued, fully paid and non-assessable.

We consent to the filing of this opinion as an exhibit to the Registration Statement, and we further consent to the use of our name under the caption "Legal Matters" in the Registration Statement and the Prospectus Supplement. In giving these consents, we do not thereby admit that we are within the category of persons whose consent is required under Section 7 of the Securities Act or the Rules and Regulations of the Commission.

Very truly yours,

/s/ Gibson, Dunn & Crutcher LLP

Exhibit 31.1

CERTIFICATION PURSUANT SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Christopher Anzalone, Chief Executive Officer of Arrowhead Pharmaceuticals, Inc., certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Arrowhead Pharmaceuticals, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: August 5, 2020

/s/ Christopher Anzalone

Christopher Anzalone
Chief Executive Officer

Exhibit 31.2

CERTIFICATION PURSUANT SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Kenneth A. Myszkowski, Chief Financial Officer of Arrowhead Pharmaceuticals, Inc., certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Arrowhead Pharmaceuticals, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: August 5, 2020

/s/ Kenneth A. Myszkowski

Kenneth A. Myszkowski,
Chief Financial Officer

Exhibit 32.1

CERTIFICATION PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

I, Christopher Anzalone, Chief Executive Officer of Arrowhead Pharmaceuticals, Inc. (the "Company"), certify, pursuant to Rule 13(a)-14(b) or Rule 15(d)-14(b) of the Securities Exchange Act of 1934 and 18 U.S.C. Section 1350, that (i) the Quarterly Report on Form 10-Q of the Company for the quarterly period ended June 30, 2020, fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, and (ii) the information contained in such Quarterly Report on Form 10-Q fairly presents in all material respects the financial condition and results of operations of the Company.

Date: August 5, 2020

/s/ CHRISTOPHER ANZALONE

Christopher Anzalone
Chief Executive Officer

A signed original of these written statements required by 18 U.S.C. Section 1350 has been provided to Arrowhead Pharmaceuticals, Inc. and will be retained by Arrowhead Pharmaceuticals, Inc. and furnished to the Securities and Exchange Commission or its staff upon request.

Exhibit 32.2

CERTIFICATION PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

I, Kenneth A. Myszkowski, Chief Financial Officer of Arrowhead Pharmaceuticals, Inc. (the "Company"), certify, pursuant to Rule 13(a)-14(b) or Rule 15(d)-14(b) of the Securities Exchange Act of 1934 and 18 U.S.C. Section 1350, that (i) the Quarterly Report on Form 10-Q of the Company for the quarterly period ended June 30, 2020, fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, and (ii) the information contained in such Quarterly Report on Form 10-Q fairly presents in all material respects the financial condition and results of operations of the Company.

Date: August 5, 2020

/s/ Kenneth A. Myszkowski

Kenneth A. Myszkowski
Chief Financial Officer

A signed original of these written statements required by 18 U.S.C. Section 1350 has been provided to Arrowhead Pharmaceuticals, Inc. and will be retained by Arrowhead Pharmaceuticals, Inc. and furnished to the Securities and Exchange Commission or its staff upon request.