
**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**

Washington, DC 20549

Form 10-Q

QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the quarterly period ended June 30, 2018
OR

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the transition period from _____ to _____
Commission File Number: 001-36281

DICERNA PHARMACEUTICALS, INC.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation or organization)

20-5993609
(IRS Employer
Identification No.)

87 Cambridgepark Drive
Cambridge, MA 02140
(Address of principal executive offices and zip code)
(617) 621-8097
(Registrant's telephone number, including area code)

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 and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, 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. (Check one):

Large accelerated filer	<input type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/> (Do not check if a smaller reporting company)	Smaller reporting company	<input checked="" type="checkbox"/>
		Emerging growth company	<input checked="" type="checkbox"/>

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.

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

As of August 6, 2018, there were 52,949,660 shares of the registrant's common stock, par value \$0.0001 per share, outstanding.

DICERNA PHARMACEUTICALS, INC.
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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Quarterly Report on Form 10-Q includes “forward-looking statements” within the meaning of Section 27A of the Securities Act of 1933, as amended (the “Securities Act”), and Section 21E of the Securities Exchange Act of 1934, as amended (the “Exchange Act”). All statements other than statements of historical fact are “forward-looking statements” for purposes of this Quarterly Report on Form 10-Q. In some cases, you can identify forward-looking statements by terminology such as “may,” “could,” “will,” “would,” “should,” “expect,” “plan,” “anticipate,” “believe,” “estimate,” “intend,” “predict,” “seek,” “contemplate,” “project,” “continue,” “potential,” “ongoing,” “goal,” or the negative of these terms or other comparable terminology. These forward-looking statements include, but are not limited to, statements about:

- how long we expect to maintain liquidity to fund our planned level of operations and our ability to obtain additional funds for our operations;
- the initiation, timing, progress and results of our research and development programs, preclinical studies, any clinical trials and Investigational New Drug application, Clinical Trial Application, New Drug Application, and other regulatory submissions;
- our ability to identify and develop product candidates for treatment of additional disease indications;
- our or a collaborator’s ability to obtain and maintain regulatory approval of any of our product candidates;
- the rate and degree of market acceptance of any approved product candidates;
- the commercialization of any approved product candidates;
- our ability to establish and maintain additional collaborations and retain commercial rights for our product candidates in the collaborations;
- the implementation of our business model and strategic plans for our business, technologies, and product candidates;
- our estimates of our expenses, ongoing losses, future revenue, and capital requirements;
- our ability to obtain and maintain intellectual property protection for our technologies and product candidates and our ability to operate our business without infringing the intellectual property rights of others;
- our reliance on third parties to conduct our preclinical studies or any clinical trials;
- our reliance on third-party suppliers and manufacturers to supply the materials and components for, and manufacture, our research and development, preclinical and clinical trial drug supplies;
- our ability to attract and retain qualified key management and technical personnel;
- our dependence on our existing collaborator, Boehringer Ingelheim International GmbH (“BI”) for developing, obtaining regulatory approval for, and commercializing product candidates in the collaboration;
- our receipt and timing of any milestone payments or royalties under our research collaboration and license agreement with BI or any future arrangements with any other collaborators;
- our expectations regarding the time during which we will be an emerging growth company under the Jumpstart Our Business Startups Act of 2012;
- our financial performance; and
- developments relating to our competitors or our industry.

These statements relate to future events or to our future financial performance and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by these forward-looking statements. Factors that may cause actual results to differ materially from current expectations include, among other things, those set forth in Part II, Item 1A — “Risk Factors” below and for the reasons described elsewhere in this Quarterly Report on Form 10-Q. Any forward-looking statement in this Quarterly Report on Form 10-Q reflects our current view with respect to future events and is subject to these and other risks, uncertainties and assumptions relating to our operations, results of operations, industry and future growth. Given these uncertainties, you should not place undue reliance on these forward-looking statements. Except as required by law, we assume no obligation to update or revise these forward-looking statements for any reason, even if new information becomes available in the future.

This Quarterly Report on Form 10-Q also contains estimates, projections, and other information concerning our industry, our business, and the markets for certain drugs, including data regarding the estimated size of those markets, their projected growth rates, and the incidence of certain medical conditions. Information that is based on estimates, forecasts, projections, or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances reflected in this information. Unless otherwise expressly stated, we obtained these industry, business, market, and other data from reports, research surveys, studies, and similar data prepared by third parties, industry, medical and general publications, government data, and similar sources. In some cases, we do not expressly refer to the sources from which these data are derived.

Except where the context otherwise requires, in this Quarterly Report on Form 10-Q, “we,” “us,” “our,” “Dicema,” and the “Company” refer to Dicema Pharmaceuticals, Inc. and, where appropriate, its consolidated subsidiaries.

Trademarks

This Quarterly Report on Form 10-Q includes trademarks, service marks, and trade names owned by us or by other companies. All trademarks, service marks, and trade names included in this Quarterly Report on Form 10-Q are the property of their respective owners.

PART I. FINANCIAL INFORMATION

Item 1. Financial Statements

DICERNA PHARMACEUTICALS, INC.
Condensed Consolidated Balance Sheets
(Unaudited)
(In thousands, except share data and par value)

	June 30, 2018	December 31, 2017
ASSETS		
CURRENT ASSETS:		
Cash and cash equivalents	\$ 42,426	\$ 68,789
Held-to-maturity investments	39,875	44,889
Withholding tax receivable	1,583	1,583
Prepaid expenses and other current assets	3,728	3,415
Total current assets	<u>87,612</u>	<u>118,676</u>
NONCURRENT ASSETS:		
Property and equipment—net	1,293	1,512
Restricted cash equivalents	744	744
Other noncurrent assets	66	70
Total noncurrent assets	<u>2,103</u>	<u>2,326</u>
TOTAL ASSETS	<u><u>\$ 89,715</u></u>	<u><u>\$ 121,002</u></u>
LIABILITIES AND STOCKHOLDERS' EQUITY		
CURRENT LIABILITIES:		
Accounts payable	\$ 3,757	\$ 4,920
Accrued expenses and other current liabilities	6,299	5,726
Current portion of deferred revenue	6,180	6,180
Total current liabilities	<u>16,236</u>	<u>16,826</u>
NONCURRENT LIABILITIES:		
Long-term payable and accrued interest	8,904	—
Deferred revenue, net of current portion	—	3,090
Total noncurrent liabilities	<u>8,904</u>	<u>3,090</u>
TOTAL LIABILITIES	<u>25,140</u>	<u>19,916</u>
COMMITMENTS AND CONTINGENCIES		
STOCKHOLDERS' EQUITY:		
Preferred stock, \$0.0001 par value—5,000,000 shares authorized; no shares issued or outstanding at June 30, 2018 or December 31, 2017	—	—
Common stock, \$0.0001 par value—150,000,000 shares authorized; 52,867,771 and 51,644,841 shares issued and outstanding at June 30, 2018 and December 31, 2017, respectively	5	5
Additional paid-in capital	431,749	417,037
Accumulated deficit	(367,179)	(315,956)
Total stockholders' equity	<u>64,575</u>	<u>101,086</u>
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	<u><u>\$ 89,715</u></u>	<u><u>\$ 121,002</u></u>

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

Dicerna Pharmaceuticals, Inc.
Condensed Consolidated Statements of Operations
(Unaudited)
(In thousands, except share and per share data)

	Three Months Ended June 30,		Six Months Ended June 30,	
	2018	2017	2018	2017
Revenue from collaborative arrangements	\$ 1,545	\$ —	\$ 3,090	\$ —
Operating expenses:				
Research and development	10,339	9,068	20,232	17,811
General and administrative	4,760	4,066	9,095	8,188
Litigation expense	22,244	2,234	25,428	3,608
Total operating expenses	37,343	15,368	54,755	29,607
Loss from operations	(35,798)	(15,368)	(51,665)	(29,607)
Other income (expense):				
Interest income	330	143	619	181
Interest expense	(176)	—	(176)	—
Total other income, net	154	143	443	181
Net loss	(35,644)	(15,225)	(51,222)	(29,426)
Dividends on redeemable convertible preferred stock	—	(2,622)	—	(2,622)
Deemed dividend related to beneficial conversion feature of redeemable convertible preferred stock	—	(6,144)	—	(6,144)
Net loss attributable to common stockholders	\$ (35,644)	\$ (23,991)	\$ (51,222)	\$ (38,192)
Net loss per share attributable to common stockholders— basic and diluted	\$ (0.68)	\$ (1.15)	\$ (0.98)	\$ (1.84)
Weighted average common shares outstanding—basic and diluted	52,555,751	20,794,193	52,141,849	20,792,925

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

Dicerna Pharmaceuticals, Inc.
Condensed Consolidated Statements of Cash Flows
(Unaudited)
(In thousands)

	Six Months Ended June 30, 2018	Six Months Ended June 30, 2017
CASH FLOWS FROM OPERATING ACTIVITIES:		
Net loss	\$ (51,222)	\$ (29,426)
Adjustments to reconcile net loss to net cash used in operating activities:		
Non-cash litigation expense	10,315	—
Stock-based compensation	3,525	4,033
Depreciation	393	363
Loss on disposal of property and equipment	—	51
Amortization of (discount)/premium on investments	(195)	(35)
Changes in operating assets and liabilities:		
Long-term payable	8,904	—
Deferred revenue	(3,090)	—
Prepaid expenses and other assets	(313)	(1,013)
Accounts payable	(1,163)	(599)
Accrued expenses and other liabilities	573	(272)
Net cash used in operating activities	<u>(32,273)</u>	<u>(26,898)</u>
CASH FLOWS FROM INVESTING ACTIVITIES:		
Purchases of property and equipment	(173)	(58)
Maturities of held-to-maturity investments	35,000	25,000
Purchases of held-to-maturity investments	(29,790)	(49,908)
Net cash provided by (used in) investing activities	<u>5,037</u>	<u>(24,966)</u>
CASH FLOWS FROM FINANCING ACTIVITIES:		
Proceeds from issuance of redeemable convertible preferred stock, net of issuance costs	—	69,700
Proceeds from stock option exercises and issuances under Employee Stock Purchase Plan	908	87
Settlement of restricted stock for tax withholding	(35)	(11)
Net cash provided by financing activities	<u>873</u>	<u>69,776</u>
NET (DECREASE) INCREASE IN CASH, CASH EQUIVALENTS AND RESTRICTED CASH EQUIVALENTS	(26,363)	17,912
CASH, CASH EQUIVALENTS AND RESTRICTED CASH EQUIVALENTS — Beginning of period	69,533	21,981
CASH, CASH EQUIVALENTS AND RESTRICTED CASH EQUIVALENTS — End of period	<u>\$ 43,170</u>	<u>\$ 39,893</u>
SUPPLEMENTAL CASH FLOW INFORMATION:		
NONCASH FINANCING ACTIVITIES:		
Dividends on redeemable convertible preferred stock	\$ —	\$ 2,622
Deemed dividend related to beneficial conversion feature of redeemable preferred stock	\$ —	\$ 6,144
Redeemable convertible preferred stock issuance costs included in accounts payable	\$ —	\$ 450
NONCASH INVESTING ACTIVITIES:		
Property and equipment purchases included in accounts payable	\$ 6	\$ —

Reconciliation of cash, cash equivalents and restricted cash equivalents within the Company's consolidated balance sheets:

	As of June 30, 2018	As of June 30, 2017
Cash and cash equivalents	42,426	38,777
Restricted cash equivalents	744	1,116
Cash, cash equivalents and restricted cash equivalents presented above	<u>\$ 43,170</u>	<u>\$ 39,893</u>

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

DICERNA PHARMACEUTICALS, INC.
Notes to Condensed Consolidated Financial Statements
(Unaudited)
(tabular amounts in thousands, except share and per share data and where otherwise noted)

1. Description of Business and Basis of Presentation

Business

Dicerna Pharmaceuticals, Inc. (“Dicerna” or the “Company”), a Delaware corporation founded in 2006 and located in Cambridge, Massachusetts, is a biopharmaceutical company focused on the discovery and development of innovative subcutaneously delivered ribonucleic acid interference (“RNAi”)-based pharmaceuticals using its GalXC™ RNAi platform for the treatment of diseases involving the liver, including rare diseases, viral infectious diseases, chronic liver diseases, and cardiovascular diseases.

Basis of presentation

These condensed consolidated financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America (“GAAP”) and in accordance with the rules and regulations of the Securities and Exchange Commission (“SEC”) for interim financial information. Accordingly, these condensed consolidated financial statements do not include all of the information and notes required by GAAP to constitute a complete set of financial statements. These condensed consolidated financial statements have been prepared on the same basis as the Company’s annual consolidated financial statements and, in the opinion of management, reflect all adjustments, which include only normal recurring adjustments, necessary to present fairly the Company’s financial position at June 30, 2018 and results of operations and cash flows for the interim periods ended June 30, 2018 and 2017. These unaudited condensed consolidated interim financial statements should be read in conjunction with the Company’s audited consolidated financial statements and notes thereto included in the Company’s Annual Report on Form 10-K for the year ended December 31, 2017. The results of the three and six months ended June 30, 2018 are not necessarily indicative of the results to be expected for the year ending December 31, 2018 or for any other interim period or for any other future year.

Significant judgments and estimates

The preparation of consolidated financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, and the disclosure of contingent assets and liabilities at the date of the Company’s consolidated financial statements, as well as the revenues and expenses incurred during the reporting periods. On an ongoing basis, the Company evaluates judgments and estimates, including those related to revenue recognition and accrued expenses. The Company bases its estimates on historical experience and on various other factors that the Company believes are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not apparent from other sources. Changes in estimates are reflected in reported results for the period in which they become known. Actual results could differ materially from those estimates.

Liquidity

Based on the Company’s current operating plan and liquidity, management believes that available cash, cash equivalents, and held-to-maturity investments will be sufficient to fund the Company’s planned level of operations for at least the 12-month period following, August 8, 2018, which is the date that these condensed consolidated financial statements have been issued. Notwithstanding the availability of current liquidity, the Company’s ability to fund its preclinical and clinical operations, including completion of its clinical trials, will depend on the Company’s ability to raise additional capital through a combination of public or private equity offerings, debt financings, and research collaborations and license agreements. If the Company is unable to generate funding from one or more of these sources within a reasonable timeframe, it may have to delay, reduce, or terminate its research and development programs, preclinical or clinical trials, limit strategic opportunities, or undergo reductions in its workforce or other corporate restructuring 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 adopting the Financial Accounting Standards Board’s (“FASB”) Accounting Standards Update (“ASU”) No. 2014-09, *Revenue from Contracts with Customers (Topic 606)* (“Topic 606”), as discussed below.

Revenue recognition

The Company generates revenue from research collaboration and license agreements with third-party customers. Goods and services in the agreements typically include (i) the grant of licenses for the use of the Company's technology and (ii) the provision of services associated with the research and development of customer product candidates. Such agreements may provide for consideration to the Company in the form of upfront payments, research and development services, option payments, milestone payments, and royalty payments on licensed products.

The Company accounts for a contract when the Company has approval and commitment from both parties, when the rights of the parties are identified, when payment terms are identified, when the contract has commercial substance, and when collectability of consideration is probable.

In determining the appropriate amount of revenue to be recognized as the Company fulfills its obligations under each of its agreements, management completes the following steps: (i) identification of the promised goods or services in the contract; (ii) determination of whether the promised goods or services are performance obligations; (iii) measurement of the transaction price, including whether there are any constraints on variable consideration; (iv) allocation of the transaction price to the performance obligations; and (v) recognition of revenue when (or as) the Company satisfies each performance obligation. As part of the accounting for the relevant arrangements, the Company develops assumptions that require judgment to determine the stand-alone selling price for each performance obligation identified in the underlying contract. The Company uses key assumptions to determine the stand-alone selling price which may include, as applicable, relevant market data, forecasted revenues, development timelines, reimbursement rates for personnel costs, discount rates, or probabilities of technical and regulatory success.

Licenses of intellectual property: If a license granted to a customer to use the Company's intellectual property is determined to be distinct from the other performance obligations identified in the arrangement, the Company recognizes revenue from consideration allocated to the license when the license is transferred to the licensee and the licensee is able to use and benefit from the license. For licenses that are bundled with other promises, the Company applies judgment to assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, to conclude upon the appropriate method of measuring progress for purposes of recognizing revenue related to consideration allocated to the performance obligation. The Company evaluates the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition.

Milestone payments: At the inception of each contract with a customer that includes development or regulatory milestone payments, the Company evaluates whether the milestones are considered probable of being reached and estimates the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within the control of the Company or of the licensee, such as regulatory approvals, are assessed as to the probability of achieving the related milestones. At the end of each subsequent reporting period, the Company re-evaluates the probability of achievement of all milestones and any related constraint, and, if necessary, adjusts the estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis and are recorded as revenue and through earnings in the period of adjustment.

Options: Customer options, such as options granted to allow a licensee to choose to research and develop product candidates against target genes to be identified in the future, generally do not provide a material right to the customer and therefore do not give rise to a separate performance obligation. As such, the additional consideration that would result from a customer exercising an option in the future is not included in the transaction price for the current contract. Instead, additional option fee payments are recognized or begin being recognized as revenue when the licensee exercises the options, and the exercise of the option would be treated as a separate contract for accounting purposes.

Research and development services: Arrangements that include a promise to provide research or development services at the licensee's discretion are assessed to determine whether the services provide a material right to the licensee and are capable of being distinct, are not highly interdependent or do not significantly modify one another, and if so, the services are accounted for as separate performance obligations as the services are provided to the customer. Otherwise, where research or development services are determined not to be capable of being distinct or distinct within the context of the contract, those services are added to the performance obligation that includes the underlying license.

Royalties: For arrangements that include sales-based royalties, including commercial milestone payments based on the level of sales, and when the license is deemed to be the predominant item to which the royalties relate, the Company recognizes revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied). To date, the Company has not recognized any royalty revenue resulting from any out-licensing arrangement.

The Company receives payments from its licensees as established in each contract. Upfront payments and fees are recorded as deferred revenue upon receipt or when due, and may require deferral of revenue recognition to a future period until the Company performs its obligations under these arrangements. Where applicable, amounts are recorded as contracts receivable when the Company's right to consideration is unconditional. The Company does not assess whether a contract has a significant financing component if the expectation at contract inception is such that the period between payment by the licensees and the transfer of the promised goods or services to the licensees will be one year or less.

Recent Accounting Pronouncements

Adopted in 2018

Revenue recognition

In May 2014, the FASB issued Topic 606, which amends the guidance for accounting for revenue from contracts with customers, superseding the revenue recognition requirements in Accounting Standards Codification Topic 605, *Revenue Recognition*. Topic 606 is effective for annual reporting periods beginning after December 15, 2017. Under Topic 606, two adoption methods were allowed: retrospectively to all prior reporting periods presented, with certain practical expedients permitted, or retrospectively with the cumulative effect of initially adopting Topic 606 recognized at the date of initial application. The Company elected to apply Topic 606 retrospectively to all prior periods presented. Adoption of Topic 606 did not have a significant quantitative impact on the Company's consolidated financial statements. Adoption of Topic 606 has resulted in additional revenue-related disclosures in the notes to the Company's condensed consolidated financial statements, as discussed above and in note 6.

Income taxes

In October 2016, the FASB issued ASU No. 2016-16, *Accounting for Income Taxes: Intra-Entity Asset Transfers of Assets Other than Inventory* ("ASU 2016-16"), which is part of the FASB's simplification initiative aimed at reducing complexity in accounting standards. ASU 2016-16 eliminates the current exception that the tax effects of intra-entity asset transfers (intercompany sales) be deferred until the transferred asset is sold to a third party or otherwise recovered through use. Instead, the new guidance will require a reporting entity to recognize any tax expense from the sale of the asset in the seller's tax jurisdiction when the transfer occurs, even though the pre-tax effects of that transaction are eliminated in consolidation. Any deferred tax asset that arises in the buyer's jurisdiction would also be recognized at the time of the transfer. ASU 2016-16 is effective for public business entities in fiscal years beginning on January 1, 2018. Adoption of ASU 2016-16 did not have any impact on the Company's condensed consolidated financial statements.

Statement of cash flows

In August 2016, the FASB issued ASU No. 2016-15, *Statement of Cash Flows (Topic 230)* ("ASU 2016-15"), a consensus of the FASB's Emerging Issues Task Force ("EITF"). ASU 2016-15 is intended to reduce diversity in practice in how certain transactions are classified in the statement of cash flows and requires companies, among other matters, to use reasonable judgment to separate cash flows. Specifically, in the absence of specific guidance, ASU 2016-15 prescribes that an entity should classify each separately identifiable cash source and use on the basis of the nature of the underlying cash flows. The Company adopted ASU 2016-15 on January 1, 2018, with no significant impact on the Company's condensed consolidated financial statements.

In November 2016, the FASB issued ASU No. 2016-18, *Statement of Cash Flows (Topic 230): Restricted Cash* ("ASU 2016-18"), a consensus of the FASB's EITF. ASU 2016-18 requires that the statement of cash flows explain the change during the period in the total of cash and cash equivalents, including amounts generally described as restricted cash or restricted cash equivalents. Entities are required to reconcile such total to amounts on the balance sheet and disclose the nature of the restrictions. By requiring that the statement of cash flows explain the change during the period in the total of cash, cash equivalents and restricted cash, the new guidance eliminates current diversity in practice. The Company adopted ASU 2016-18 on January 1, 2018 and has applied this new guidance retrospectively to all periods presented. Consequently, transfers between restricted and unrestricted cash equivalents accounts are no longer reported as a cash flow in the Company's condensed consolidated statement of cash flows.

Stock-based compensation

In May 2017, the FASB issued ASU No. 2017-09, *Compensation—Stock Compensation (Topic 718): Scope of Modification Accounting* (“ASU 2017-09”), which clarifies when to account for a change to the terms or conditions of a share-based payment award as a modification. Under ASU 2017-09, modification accounting is required only if the fair value, the vesting conditions, or the classification of the award (as equity or liability) changes as a result of the change in terms or conditions, whereas under previous guidance, judgments about whether certain changes to an award are substantive may impact whether or not modification accounting is applied in certain situations. The Company adopted ASU 2017-19 on January 1, 2018, with no impact on the Company’s condensed consolidated financial statements.

Not yet adopted

Leases

In February 2016, the FASB issued ASU No. 2016-02, *Leases (Topic 842)* (“ASU 2016-02”), which amends the existing accounting standards for lease accounting, including requiring lessees to recognize most leases on their balance sheets and making targeted changes to lessor accounting. ASU 2016-02 will be effective for the Company beginning in the first quarter of 2019. ASU 2016-02 requires a modified retrospective transition approach for all leases existing at, or entered into after, the date of initial application, with an option to use certain transition relief. Management expects that the adoption of ASU 2016-02 will result in the recognition of a right of use asset and related liability associated with the Company’s non-cancelable operating lease arrangement for office and laboratory space that was executed in 2014 (see note 7).

Nonemployee stock-based compensation

In June 2018, the FASB issued ASU No. 2018-07, *Compensation—Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting* (“ASU 2018-07”). The ASU is intended to simplify the accounting for nonemployee share-based payments to be consistent with Accounting Standards Codification 718, *Compensation—Stock Compensation (Topic 718)* (“ASC 718”). Per ASU 2018-07, entities will be required to apply the measurement and classification requirements of ASC 718 to nonemployee awards instead of *Equity—Equity Based Payments to Nonemployees (Topic 505)*. ASU 2018-07 will be effective for the Company beginning in the first quarter of 2019 with early adoption permitted. Management is currently evaluating the impact of ASU 2018-07 and expects that the adoption will not have a significant impact on the Company’s consolidated financial statements.

2. Net Loss Per Share

The outstanding securities presented below were excluded from the calculation of net loss per share, because such securities would have been anti-dilutive due to the Company’s net loss per share during the periods ending on the dates presented.

	June 30,	
	2018	2017
Options to purchase common stock	7,556,554	6,212,437
Warrants to purchase common stock	2,198	87,901
Unvested restricted common stock	—	10,000
Redeemable convertible preferred stock	—	718,404
Total	<u>7,558,752</u>	<u>7,028,742</u>

3. Held-to-maturity investments

The following tables provide information relating to the Company’s held-to-maturity investments (amounts in thousands).

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
As of June 30, 2018:				
Held-to-maturity investments				
U.S. treasury securities maturing in one year or less	<u>\$ 39,875</u>	<u>\$ —</u>	<u>\$ (17)</u>	<u>\$ 39,858</u>

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
As of December 31, 2017:				
Held-to-maturity investments				
U.S. treasury securities maturing in one year or less	\$ 44,889	\$ —	\$ (30)	\$ 44,859

4. Stock Option Plan and Stock-Based Compensation

During the three and six months ended June 30, 2018, the Company granted stock options to purchase 442,000 and 1,761,350 shares, respectively, of common stock to employees with aggregate grant date fair values of \$3.8 million and \$13.2 million, respectively, compared to stock options to purchase 352,500 and 1,330,997 shares of common stock granted to employees with aggregate grant date fair values of \$0.7 million and \$2.7 million, for the three and six months ended June 30, 2017, respectively.

The assumptions used to estimate the grant date fair value using the Black-Scholes option pricing model were as follows:

	Three Months Ended June 30, 2018	Six Months Ended June 30, 2018
Common stock price	\$9.14 – \$14.41	\$9.14 – \$14.41
Expected option term (in years)	5.50-6.25	5.50-6.25
Expected volatility	76.8% – 78.33%	75.89% – 90.9%
Risk-free interest rate	2.65% – 2.84%	2.32% – 2.84%
Expected dividend yield	0.00%	0.00%

	Three Months Ended June 30, 2017	Six Months Ended June 30, 2017
Common stock price	\$2.91 – \$3.47	\$2.49 – \$3.47
Expected option term (in years)	5.50-6.25	5.50-6.25
Expected volatility	79.7% – 80.8%	79.4% – 80.8%
Risk-free interest rate	1.86% – 1.89%	1.86% – 2.07%
Expected dividend yield	0.00%	0.00%

The Company has classified stock-based compensation in its condensed consolidated statements of operations as follows (amounts in thousands):

	Three Months Ended June 30, 2018	Six Months Ended June 30, 2018	Three Months Ended June 30, 2017	Six Months Ended June 30, 2017
Research and development expense	\$ 751	\$ 1,557	\$ 972	\$ 1,917
General and administrative expenses	1,028	1,968	1,053	2,116
Total	\$ 1,779	\$ 3,525	\$ 2,025	\$ 4,033

5. Fair Value Measurements

A summary of the Company's financial assets that are measured or disclosed at fair value on a recurring basis as of June 30, 2018 and December 31, 2017 are presented below (amounts in thousands).

Description	At June 30, 2018	Level 1	Level 2	Level 3
Cash equivalents				
Money market fund	\$ 38,258	\$ 38,258	\$ —	\$ —
Held-to-maturity investments				
U.S. treasury securities	39,858	—	\$ 39,858	—
Restricted cash equivalents				
Money market fund	744	—	744	—
Total	\$ 78,860	\$ 38,258	\$ 40,602	\$ —

Description	At December 31, 2017	Level 1	Level 2	Level 3
Cash equivalents				
Money market fund	\$ 51,441	\$ 51,441	\$ —	\$ —
Held-to-maturity investments				
U.S. treasury securities	44,859	—	44,859	—
Restricted cash equivalents				
Money market fund	744	—	744	—
Total	\$ 97,044	\$ 51,441	\$ 45,603	\$ —

The Company's cash equivalents, which are in money market funds, are classified within Level 1 of the fair value hierarchy because they are valued using quoted prices as of June 30, 2018 and December 31, 2017.

The Company's restricted cash equivalents bore interest at the prevailing market rates for instruments with similar characteristics and, accordingly, the carrying value of these instruments also approximated their fair value. These financial instruments were classified within Level 2 of the fair value hierarchy because the inputs to the fair value measurement are valued using observable inputs as of June 30, 2018 and December 31, 2017.

The Company's held-to-maturity investments bore interest at the prevailing market rates for instruments with similar characteristics. The financial instruments were classified within Level 2 of the fair value hierarchy because the inputs to the fair value measurement are valued using observable inputs as of June 30, 2018 and December 31, 2017.

As of June 30, 2018, and December 31, 2017, the carrying amounts of the withholding tax receivable, accounts payable, and accrued expenses approximated their estimated fair values because of the short-term nature of these financial instruments.

As of June 30, 2018, we had an \$8.7 million long-term payable to Alnylam Pharmaceuticals, Inc. ("Alnylam"). The long-term payable carries an interest rate set at current market rates, which is the primary driver in our conclusion that the carrying value approximates fair value. There was no long-term payable for the period ended June 30, 2017.

For the three and six months ended June 30, 2018 and 2017, there were no transfers between Level 1 and Level 2.

6. Collaborative Research and License Agreement

On October 27, 2017, the Company entered into a collaborative research and license agreement with Boehringer Ingelheim International GmbH (“BI”) (the “BI Agreement”), pursuant to which the Company and BI jointly research and develop product candidates for the treatment of chronic liver disease using the GalXC platform, Dicerna’s proprietary RNAi-based technology. The BI Agreement is for the development of product candidates against one target gene with an option for BI to add the development of product candidates that target a second gene. Also, pursuant to the BI Agreement, Dicerna granted BI a worldwide license in connection with the research and development of the product candidates and will transfer to BI intellectual property rights of the product candidates selected by BI for clinical development and commercialization. Dicerna also may provide assistance to BI in order to help BI further develop selected product candidates. Under the terms of the BI Agreement, BI agreed to pay Dicerna a non-refundable upfront payment of \$10.0 million for the first target, less a refundable withholding tax in Germany of \$1.6 million. The German withholding tax was withheld by BI and remitted to the German tax authorities in accordance with local tax law; the Company received reimbursement of this tax in July 2018.

During the term of the research program, BI will reimburse Dicerna the cost of certain materials and third-party expenses that have been included in the preclinical studies. The Company is eligible to receive up to \$191.0 million in potential development and commercial milestones related to the initial target. Dicerna is also eligible to receive royalty payments on potential global net sales, subject to certain adjustments, tiered from high single digits up to low double digits. BI’s option to add a second target would provide for an option fee payment and success-based development and commercialization milestones and royalty payments to Dicerna.

Milestone payments that are contingent upon the Company’s performance under the BI Agreement include potential developmental milestones totaling \$99.0 million, including milestones for the first commercial sale. The Company has excluded the amounts from allocable consideration at the outset of the arrangement, as described below. All potential net sales milestones, totaling \$95.0 million, will be accounted for in the same manner as royalties and recorded as revenue at the later of the achievement of the milestone or the satisfaction of the performance obligation.

The Company assessed the BI Agreement in accordance with Topic 606 and concluded that BI is a customer. The Company identified the following performance obligations under the contract: the license of intellectual property and conducting agreed-upon research program services. The Company has concluded that the license and research and development services do not have standalone value and are not capable of being distinct, therefore, the Company considers these as one performance obligation. The Company concluded the option underlying the transfer of future licenses and potential associated research for any not-yet-known target gene is not a performance obligation of the contract at inception because the option is not considered to be a material right, as the option fee reflects the standalone selling price of the option. The Company considered the level of BI’s therapeutic expertise specifically related to RNAi, as well as BI’s know-how vis-à-vis the Company’s GalXC conjugates, and concluded that BI cannot currently benefit from the granted license on its own or together with other resources that are readily available to BI, including relationships with oligonucleotide vendors who synthesize GalXC conjugates under contract with the Company. As a result, the combination of the license of intellectual property together with the provision of research and development support services together represent the highest level of goods and services that can be deemed distinct.

Based on management’s evaluation, the non-refundable upfront fee and the agreed-upon reimbursable third-party expenses constituted the amount of the consideration to be included in the transaction price and has been allocated to the performance obligations identified based on the Company’s best estimate of the relative standalone selling price via application of a market assessment approach. None of the development milestones have been included in the transaction price, since none of such milestone amounts are within the control of the Company and are not considered probable to occur until confirmed by BI, at BI’s sole discretion. Any consideration related to commercial sales-based milestones (including royalties) will be recognized when the related sales occur, since these amounts have been determined to relate predominantly to the license granted to BI and therefore are recognized at the later of when the performance obligation is satisfied or the related sales occur. The Company will re-evaluate the transaction price in each reporting period and as uncertain events are resolved or other changes in circumstances occur.

The \$10.3 million transaction price is being recognized over the current research term, which is estimated to extend through June 30, 2019, which represents the Company’s best estimate of the period of the obligation to provide research support services to BI, and is the expected period over which we estimate the deferred revenue balance will be recognized in revenue. Related revenue is being recognized on a straight-line basis, which is in management’s judgment an appropriate measure of progress toward satisfying the performance obligation, largely in absence of evidence that obligations are fulfilled in a specific pattern.

The following table presents changes in the Company's deferred revenue accounts during the six months ended June 30, 2018 (amounts in thousands).

Six months ended June 30, 2018	Balance at beginning of period	Additions	Deductions	Balance at end of period
Current portion of deferred revenue	\$ 6,180	—		\$ 6,180
Deferred revenue, net of current portion	\$ 3,090	—	\$ (3,090)	\$ —

The Company recognized revenues of \$1.5 million and \$3.1 million for the three and six months ended June 30, 2018, as a result of changes in the deferred revenue balances. There was no activity related to the Company's deferred revenue accounts during the three and six months ended June 30, 2017.

7. Commitments and Contingencies

Facility lease

Future minimum lease payments on the Company's non-cancelable operating lease for office and laboratory space are as follows (amounts in thousands):

Years Ending December 31,	Operating Lease
Remaining 2018	\$ 817
2019	\$ 1,678
2020*	1,580
Total	<u>\$ 4,075</u>

* The end of the lease term is November 30, 2020.

Litigation

On June 10, 2015, Alnylam filed a complaint against the Company in the Superior Court of Middlesex County, Massachusetts (the "Court"). The complaint alleged misappropriation of confidential, proprietary, and trade secret information, as well as other related claims, in connection with the Company's hiring of a number of former employees of Merck & Co., Inc. ("Merck") and its discussions with Merck regarding the acquisition of its subsidiary, Sima Therapeutics, Inc., which was subsequently acquired by Alnylam.

On April 18, 2018, the Company and Alnylam entered into a Confidential Settlement Agreement and General Release (the "Settlement Agreement"), resolving all ongoing litigation between the Company and Alnylam. The terms of the Settlement Agreement include mutual releases and dismissals with prejudice of all claims and counterclaims in the following litigation between the parties: (i) *Alnylam Pharmaceuticals, Inc. v. Dicerna Pharmaceuticals, Inc.*, No. 15-4126 pending in the Massachusetts Superior Court for Middlesex County and (ii) *Dicerna Pharmaceuticals, Inc., v. Alnylam Pharmaceuticals, Inc.* No. 1:17-cv-11466 pending in the United States District Court for the District of Massachusetts. Pursuant to the terms of the Settlement Agreement, the Company has agreed to make the following payments to Alnylam: (i) a \$2.0 million upfront payment in cash; (ii) an additional \$13.0 million in cash to be paid as 10% of any upfront or first year cash consideration that the Company receives pursuant to future collaborations related to GalNAc-conjugated RNAi research and development (excluding any amounts received or to be received by the Company from its existing collaboration with BI), provided that the \$13.0 million must be paid by no later than April 28, 2022; and (iii) issuance of shares of the Company's common stock (the "Shares") pursuant to a share issuance agreement between the parties (the "Share Issuance Agreement").

Under the Settlement Agreement, for periods ranging from 18 months up to four years, the Company will be restricted in its development and other activities relating to oligonucleotide-based therapeutics directed toward a defined set of eight Alnylam targets (the "Oligo Restrictions"). The Oligo Restrictions pertain to targets where Dicerna does not have, or does not currently intend to have, a therapeutic program, or are expected to be consistent with Dicerna's execution on programs in the normal course of business. The Settlement Agreement does not include any admission of liability or wrongdoing by either party or any licenses to any intellectual property from either party.

On April 20, 2018, the Company and Alnylam entered into the Share Issuance Agreement, pursuant to which the Company agreed to issue to Alnylam 983,208 Shares in satisfaction of the Company's obligation under the Settlement Agreement to deliver Shares to Alnylam. The Share Issuance Agreement contains customary representations and warranties of each party. Pursuant to the terms of the

Share Issuance Agreement, Alnylam may not, without the prior approval of the Company, dispose of any of the Shares for a six-month period commencing on the closing date of the Share issuance. Thereafter, through the fifth anniversary of the closing date of the Share issuance, Alnylam will only dispose of the maximum number of Shares that it would be permitted to dispose if the Shares were subject to the volume restrictions set forth in Rule 144(e) of the Securities Act of 1933, as amended.

The Company paid the upfront payment of \$2.0 million dollars in May 2018 and recorded the future payment of \$13.0 million as a long-term payable discounted to present value of \$8.7 million at an effective interest rate of 10%. The 983,208 shares issued pursuant to the Share Issuance Agreement was recorded at fair market value of \$10.3 million based on the Company's closing share price on April 18, 2018, the date the Settlement Agreement was executed. The Settlement Agreement resulted in the Company recording an additional \$21.0 million of litigation expenses for the three and six months ended June 30, 2018. The Company did not assign any value to the Oligo Restrictions as the Company did not incur additional losses or give up any value as a result of the restrictions.

Total litigation expense was \$22.2 million and \$25.4 million for the three and six months ended June 30, 2018, respectively, all of which related to the litigation with Alnylam, of which \$21.0 million related to the Settlement Agreement. The Company recorded litigation expenses, also related to the Alnylam litigation, of \$2.2 million and \$3.6 million for three and six months ended June 30, 2017, respectively, which was previously recorded as a component of general and administrative expenses and recast to litigation expense for comparative purposes.

From time to time, the Company may be subject to various claims and legal proceedings. 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, 2018 and December 31, 2017.

8. Subsequent Events

Under the BI Agreement, BI paid to Dicerna a non-refundable upfront payment of \$10.0 million for the first target, less a refundable withholding tax in Germany of \$1.6 million. The German withholding tax was withheld by BI and remitted to the German tax authorities in accordance with local tax law, and the Company received reimbursement of this tax in July of 2018.

Item 2. Management’s Discussion and Analysis of Financial Condition and Results of Operations

The following discussion contains forward-looking statements that involve risks and uncertainties. Our actual results could differ materially from those discussed here. Factors that could cause or contribute to such differences include, but are not limited to, those discussed in this section as well as factors described in Part II, Item 1A — “Risk Factors.”

Overview

Dicerna Pharmaceuticals, Inc. (“we”, “the Company” or “Dicerna”) is a biopharmaceutical company focused on the discovery and development of innovative subcutaneously delivered ribonucleic acid (“RNA”) interference (“RNAi”)–based pharmaceuticals using our GalXC™ RNAi platform for the treatment of diseases involving the liver, including rare diseases, viral infectious diseases, chronic liver diseases and cardiovascular diseases. Within these therapeutic areas, we believe our GalXC RNAi platform will allow us to build a broad pipeline of therapeutics with commercially attractive pharmaceutical properties, including a subcutaneous route of administration, infrequent dosing (e.g., dosing that is monthly or quarterly, and potentially even less frequent), high therapeutic index, and specificity to a single target gene.

All of our GalXC drug discovery and development efforts are based on the therapeutic modality of RNAi, a highly potent and specific mechanism for silencing the activity of a targeted gene. In this naturally occurring biological process, double-stranded RNA molecules induce the enzymatic destruction of the messenger ribonucleic acid (“mRNA”) of a target gene that contains sequences that are complementary to one strand of the therapeutic double-stranded RNA molecule. The Company’s approach is to design proprietary double-stranded RNA molecules that have the potential to engage the enzyme Dicer and initiate an RNAi process to silence a specific target gene. Our GalXC RNAi platform utilizes a particular structure of double-stranded RNA molecules configured for subcutaneous delivery to the liver. Due to the enzymatic nature of RNAi, a single GalXC molecule incorporated into the RNAi machinery can destroy hundreds or thousands of mRNAs from the targeted gene.

The GalXC RNAi platform supports Dicerna’s long-term strategy to retain, subject to the evaluation of potential licensing opportunities as they may arise, a full or substantial ownership stake and to invest internally in diseases with focused patient populations, such as certain rare diseases. We see such diseases as representing opportunities that carry a relatively higher probability of success, with genetically and molecularly defined disease markers, high unmet need, a limited number of Centers of Excellence to facilitate reaching these patients, and the potential for more rapid clinical development programs. For more complex diseases with multiple gene dysfunctions and larger patient populations, we plan to pursue collaborations that can provide the enhanced scale, resources, and commercial infrastructure required to maximize these prospects, such as the BI Agreement, as defined and discussed below.

Development Programs

In choosing which development programs to advance, we apply scientific, clinical, and commercial criteria that we believe allow us to best leverage our GalXC RNAi platform and maximize value. The Company is focusing its efforts on three priority therapeutic programs that currently have a Clinical Trial Application (“CTA”) filed, Investigational New Drug (“IND”) application filed, or are in enabling studies in preparation to file additional regulatory clearances to initiate clinical trials. The Company is also focusing its efforts on a series of programs in the clinical candidate selection stage that may be elevated into IND/CTA enabling studies in the future, either on our own or in collaboration with larger pharmaceutical companies. Our three priority programs are: DCR-PHXC for the treatment of primary hyperoxaluria (“PH”); a program for an undisclosed rare disease; and DCR-HBVS for the treatment of chronic hepatitis B virus (“HBV”) infection. Our programs in clinical candidate selection include a program for the treatment of hypercholesterolemia, for which DCR-PCSK9 has been selected as a provisional clinical candidate, and multiple programs targeting undisclosed targets in chronic liver diseases, cardiovascular diseases and additional rare diseases. In October 2017, we filed a CTA for our lead GalXC product candidate, DCR-PHXC, with the Medicines and Healthcare products Regulatory Agency (“MHRA”) in the United Kingdom (“UK”), and in December 2017, we dosed the first human in the Group A portion of the Phase 1 clinical trial of DCR-PHXC. On March 30, 2018, we received a notice from the United States (“U.S.”) Food and Drug Administration (“FDA”) indicating that our proposed clinical investigation for DCR-PHXC referenced in our IND may proceed. In May 2018, the Company dosed the first PH patient with DCR-PHXC in the Group B portion of the Phase 1 clinical trial and received notice from the FDA granting Orphan Drug Designation to DCR-PHXC for treatment of PH. In July 2018, the European Medicines Agency (“EMA”)’s Committee for Orphan Medicinal Products (“COMP”) recommended designating DCR-PHXC as an orphan medicinal product for the treatment of PH in the EU and the recommendation was adopted by the European Commission in August 2018. We have received regulatory and ethical approvals for the clinical trial in the UK, France, and Germany. A CTA has been submitted and is pending approval in the Netherlands. We expect to file for additional regulatory clearances to commence clinical trials for our programs in 2018 and 2019.

The table below sets forth the state of development of our various GalXC RNAi platform product candidates as of August 8, 2018.

		STAGES OF DEVELOPMENT			PARTNERING STATUS	
PRODUCT CANDIDATE	INDICATION	RESEARCH	PRECLINICAL	CLINICAL POC STUDIES		
RARE DISEASES	DCR-PHXC	Primary Hyperoxalurias				Proprietary program
	DCR-undisclosed	Rare Disease				
	DCR-undisclosed	Rare Disease				
	DCR-undisclosed	Rare Disease				
LARGE POPULATION DISEASE	DCR-HBV5	Hepatitis B Virus				
	DCR-PCSK9	Hypercholesterolemia				
	DCR-LIV1	NASH				Partnered with Boehringer Ingelheim
	DCR-undisclosed	Cardiometabolic				
	DCR-undisclosed	Cardiometabolic				
	DCR-undisclosed	Cardiometabolic				
	DCR-undisclosed	Cardiometabolic				

Our current GalXC RNAi platform development programs are as follows:

- Primary Hyperoxaluria.** We are developing DCR-PHXC for the treatment of all types of PH. PH is a family of rare inborn errors of metabolism in which the liver produces excessive levels of oxalate, which in turn causes damage to the kidneys and to other tissues in the body. DCR-PHXC is currently being investigated in a Phase 1 clinical trial called PHYOX. In preclinical models of PH, DCR-PHXC reduces oxalate production to near-normal levels, ameliorating the disease condition.

PHYOX is a Phase 1 single ascending-dose study of DCR-PHXC in normal healthy volunteers (“NHVs”) and patients with PH. The study is divided into two groups: Group A is a placebo-controlled, single-blind, single center study, which has enrolled 25 NHVs; Group B is an open-label, multi-center study enrolling up to 16 patients with PH type 1 (“PH1”) and PH type 2 (“PH2”). The primary objective of the study is to evaluate the safety and tolerability of single doses of DCR-PHXC in both groups. The secondary objectives are to evaluate the pharmacodynamic effect of single doses of DCR-PHXC on biochemical markers, and to characterize the pharmacokinetics of single doses of DCR-PHXC in NHVs and patients with PH. We have submitted CTAs for the PHYOX study in the UK, France, and Germany and have received the appropriate regulatory and ethical approvals. A CTA has been submitted and is pending approval in the Netherlands. The FDA has accepted the Company’s IND for the PHYOX study. We have completed the Group A portion of the study in NHV. While the study is still blinded toward treatment assignment, there have been no serious adverse events. There have been two mild-to-moderate transient injection site reactions lasting up to a total of 36 hours at the highest doses of 6 and 12 mg/kg. With the completion of the Group A portion of the study in NHVs, we have started on the Group B portion of the study and dosed the first PH patient with DCR-PHXC. Group B consists of three cohorts of patients dosed with PH1 at 1.5, 3, and 6 mg/kg. An additional fourth cohort that consists of patients with PH2 dosed at a flexible dosing level. We have enrolled 10 patients out of 16 (four PH1 patients in Cohort 1, four PH1 patients in Cohort 2, one PH1 patient in Cohort 3, and one PH2 patient in Cohort 4). We expect to report interim results from the PHYOX trial later in the third quarter and publicly present trial results in the fourth quarter of 2018. Additionally, we intend to initiate a multi-dose Phase 2/3 study in the first quarter of 2019, pending positive proof-of-concept (“POC”) data and regulatory feedback.

- An undisclosed rare disease involving the liver.** We are developing a GalXC-based therapeutic, targeting a liver-expressed gene involved in a serious rare disease. For competitive reasons, we have not yet publicly disclosed the target gene or disease. We have selected this target gene and disease based on criteria that include having a strong therapeutic hypothesis, a readily-identifiable patient population, the availability of a potentially predictive biomarker, high unmet medical need, favorable competitive positioning and what we believe is a rapid projected path to approval. The disease is a genetic disorder where mutations in the disease gene lead to the

production of an abnormal protein. The protein causes progressive liver damage and fibrosis, in some cases leading to cirrhosis and liver failure, and we believe that silencing of the disease gene will prevent production of the abnormal protein and thereby slow or stop progression of the liver fibrosis. Greater than 100,000 people in the U.S. are believed to be homozygous (i.e. having identical pairs of genes for any given pair of hereditary characteristics) for the mutation that causes the liver disease, and at least 10% of those people, and potentially a significantly higher fraction, are believed to have liver-associated disease as a consequence. We are seeking a risk-sharing collaborator for this program before we file regulatory clearances to initiate a clinical trial, which we expect to be prepared to file towards the end of 2018.

- **Chronic Hepatitis B Virus infection.** We have declared a GalXC RNAi platform-based product candidate for the treatment of HBV, DCR-HBVS, and are conducting formal non-clinical development studies. We expect to file regulatory clearances in New Zealand and Australia during the fourth quarter of 2018. Current therapies for HBV rarely lead to a long-term immunological cure as measured by the clearance of HBV surface antigen (“HBsAg”) and sustained HBV deoxyribonucleic acid (“DNA”) suppression in patient plasma or blood. DCR-HBVS targets HBV messenger RNA and leads to greater than 99% reduction in circulated HBsAg in mouse models of HBV infection. Based on these preclinical studies, and only if we receive appropriate regulatory approval to begin human clinical trials, we hope to determine the potential of DCR-HBVS to reduce HBsAg and HBV DNA levels in the blood of HBV patients in a commercially attractive subcutaneous dosing paradigm.
- **Hypercholesterolemia (PCSK9 targeted therapy).** We are using our GalXC RNAi platform to develop a therapeutic that targets the PCSK9 gene for the treatment of hypercholesterolemia. The Company has selected a provisional clinical candidate for the program but is continuing to explore ways to further optimize the program. PCSK9 is a validated target for hypercholesterolemia, and there are FDA-approved therapies targeting PCSK9 that are based on monoclonal antibody technology. Based on preclinical studies, we believe that our GalXC RNAi platform has the potential to produce a PCSK9-targeted therapy with attractive commercial properties, such as small subcutaneous injection volumes and less frequent dosing.
- **Additional pipeline programs.** We have developed a robust portfolio of additional targets and diseases that we plan to pursue either on our own or in collaboration with partners. We have applied our GalXC technology to multiple gene targets across our disease focus areas of rare diseases, chronic liver diseases and cardiovascular diseases. Pursuant to our strategy, we are seeking collaborations with larger and/or more experienced pharmaceutical companies to advance our programs in the areas of chronic liver diseases and cardiovascular diseases. Both these disease areas represent large and diverse patient populations, requiring complex clinical development and commercialization paths that we believe can be more effectively pursued in collaboration with larger pharmaceutical companies. For our additional rare diseases, we are continuing to assess their potential for clinical success and market opportunity while optimizing our GalXC molecules. For our additional pipeline programs (including PCSK9), we may utilize more advanced versions of our GalXC technology that further improve pharmaceutical properties of the GalXC molecules, including enhancing the duration of action and potency. We have further optimized our GalXC technology platform, enabling the development of next generation GalXC molecules. Improvements to our GalXC compound include modification of the tetraloop end of the molecule, which can be applied to any target gene, resulting in a substantially longer duration of action and higher potency of target gene silencing in animal models across multiple targets. Modification of the tetraloop only impacts the passenger strand and does not impact the guide strand. These modifications are unique to our GalXC molecules and, we believe, provide a competitive advantage for the Company.

In addition to the GalXC development programs outlined above, we are party to a collaborative research and license agreement with Boehringer Ingelheim International GmbH (“BI”) (the “BI Agreement”), pursuant to which the Company and BI jointly research and develop product candidates for the treatment of chronic liver diseases, with an initial focus on nonalcoholic steatohepatitis (“NASH”) using our GalXC platform. NASH is caused by the buildup of fat in the liver, potentially leading to liver fibrosis and cirrhosis. NASH has an especially high prevalence among obese and diabetic patients and is an area of high unmet medical need. The BI Agreement is for the development of product candidates against one target gene with an option for BI to add the development of product candidates that target a second gene. We are working exclusively with BI to develop the product candidates against the undisclosed target gene. We are responsible for the discovery and initial profiling of the product candidates, including primary pre-clinical studies, synthesis, and delivery. BI is responsible for evaluating and selecting the product candidates for further development. If BI selects one or more product candidates, it will be responsible for further pre-clinical development, clinical development, manufacturing, and commercialization of those products. Also pursuant to the BI Agreement, we granted BI a worldwide license in connection with the research and development of the product candidates and will transfer to BI intellectual property rights of the product candidates selected by BI for clinical development and commercialization. We also may provide assistance to BI in order to help BI further develop selected product candidates. Pursuant to the BI Agreement, BI agreed to pay us a non-refundable upfront payment of \$10.0 million for the first target. During the term of the research program, BI will reimburse us the cost of materials and third-party expenses that have been included in the preclinical studies up to an agreed-upon limit. We are eligible to receive up to \$191.0 million in potential development and commercial milestones related to the initial target. We are also eligible to receive royalty payments on potential global net sales, subject to certain adjustments, tiered from high single digits up to low double digits. BI’s option to add a second target would provide for an option fee payment and success-based development and commercialization milestones and royalty payments to us.

We also have developed a wholly-owned clinical candidate, DCR-BCAT, targeting the β -catenin oncogene. DCR-BCAT is based on an extended version of our earlier generation non-GalXC Dicer Substrate RNAi technology and is delivered by our lipid nanoparticle tumor delivery system, EnCore™. We plan to out-license, spin out or seek external funding to advance the DCR-BCAT opportunity, given our focus on our GalXC platform-based programs.

Corporate Developments

On April 18, 2018, we entered into a Confidential Settlement Agreement and General Release (the “Settlement Agreement”) with Alnylam Pharmaceuticals, Inc. (“Alnylam”), resolving all ongoing litigation between the Company and Alnylam. The terms of the Settlement Agreement include mutual releases and dismissals with prejudice of all claims and counterclaims in the following litigation between the parties: (i) *Alnylam Pharmaceuticals, Inc. v. Dicerna Pharmaceuticals, Inc.*, No. 15-4126 pending in the Massachusetts Superior Court for Middlesex County and (ii) *Dicerna Pharmaceuticals, Inc., v. Alnylam Pharmaceuticals, Inc.* No.1:17-cv-11466 pending in the United States District Court for the District of Massachusetts. Pursuant to the terms of the Settlement Agreement, we have agreed to make the following payments to Alnylam: (i) a \$2 million upfront payment in cash; (ii) an additional \$13 million in cash, to be paid as 10% of any upfront or first year cash consideration that we receive pursuant to future collaborations related to GalNAc-conjugated RNAi research and development (excluding any amounts received or to be received by the Company from its existing collaboration with BI), provided that the \$13 million must be paid by no later than April 28, 2022; and (iii) issuance of shares of our common stock (the “Shares”) pursuant to a share issuance agreement between the parties (the “Share Issuance Agreement”).

Under the Settlement Agreement, for periods ranging from 18 months up to four years, we will be restricted in our development and other activities relating to oligonucleotide-based therapeutics directed toward a defined set of eight Alnylam targets (the “Oligo Restrictions”). The Oligo Restrictions pertain to targets where Dicerna does not have, or does not currently intend to have, a therapeutic program, or are expected to be consistent with our execution on programs in the normal course of business. The Settlement Agreement does not include any admission of liability or wrongdoing by either party or any licenses to any other intellectual property from either party.

On April 20, 2018, we entered into the Share Issuance Agreement, pursuant to which we agreed to issue to Alnylam 983,208 Shares in satisfaction of our obligation under the Settlement Agreement to deliver Shares to Alnylam. The Share Issuance Agreement contains customary representations and warranties of each party. Pursuant to the terms of the Share Issuance Agreement, Alnylam may not, without our prior approval, dispose of any of the Shares for a six-month period commencing on the closing date of the Share issuance. Thereafter, through the fifth anniversary of the closing date of the Share issuance, Alnylam will only dispose of the maximum number of Shares that it would be permitted to dispose if the Shares were subject to the volume restrictions set forth in Rule 144(e) of the Securities Act of 1933, as amended.

Critical Accounting Policies and Significant Judgments and Estimates

Our management’s discussion and analysis of financial condition and results of operations is based on our condensed consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the U.S. The preparation of our condensed consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the condensed consolidated financial statements, as well as the revenue and expenses incurred during the reported periods. On an ongoing basis, we evaluate our estimates and judgments, including those related to revenue recognition and accrued expenses. We base our estimates on historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not apparent from other sources. Changes in estimates are reflected in reported results for the period in which they become known. Actual results may differ from these estimates under different assumptions or conditions.

The critical accounting policies that we believe impact significant judgments and estimates used in the preparation of our financial statements presented in this report are described in our Management’s Discussion and Analysis of Financial Condition and Results of Operations in our Annual Report on Form 10-K filed with the SEC on March 8, 2018. There have been no changes to our critical accounting policies during the three or six months ended June 30, 2018 from those discussed in “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies and Significant Judgments and Estimates” in our Annual Report on Form 10-K filed with the SEC on March 8, 2018, except as discussed below.

Recent Accounting Pronouncements

A summary of recent accounting pronouncements that have been adopted or are expected to be adopted by the Company is included in note 1 to our condensed consolidated financial statements (see Part I, Item 1 –“Financial Statements” of this Quarterly Report on Form 10-Q). Additional information regarding relevant accounting pronouncements is provided below.

Adopted in 2018

Revenue recognition

In May 2014, the accounting guidance related to revenue recognition was amended to replace current guidance with a single, comprehensive standard for accounting for revenue from contracts with customers. The new guidance became effective for us on January 1, 2018. The new revenue standard applies to all contracts with customers, and only contracts with customers are in the scope of the new revenue standard. Once a contractual arrangement is scoped into the new guidance, revenue is recognized based on a model that includes identifying performance obligations and determining and allocating the transaction price to the performance obligations identified in the contract. Revenue is recognized as those performance obligations are satisfied. We elected to apply this new guidance retrospectively to all prior periods presented, and adoption of this new guidance did not have a significant quantitative impact on our condensed consolidated financial statements. Adoption of this guidance has resulted in additional revenue-related disclosures in the notes to our condensed consolidated financial statements.

Income taxes

New guidance issued in October 2017 related to income taxes is aimed at reducing complexity in accounting standards by eliminating the current exception that the tax effects of intra-entity asset transfers (such as intercompany sales or transfers of intellectual property) be deferred until the transferred asset is sold to a third party or otherwise recovered through use. Instead, the new guidance will require that a reporting entity recognize any tax expense from the sale of the asset in the seller's tax jurisdiction when the transfer occurs, even though the pre-tax effects of that transaction are eliminated in consolidation. Any deferred tax asset that arises in the buyer's jurisdiction would also be recognized at the time of the transfer. We adopted this new guidance on January 1, 2018, and such adoption did not have an impact on our condensed consolidated financial statements, largely given that we have not recorded any deferred tax assets or liabilities on our condensed consolidated balance sheet.

Statement of cash flows

In August 2017, the accounting guidance related to the statement of cash flows was amended with the intent of reducing diversity in practice as to the classification of certain transactions in the statement of cash flows. This guidance became effective for us on January 1, 2018, with no significant impact on our condensed consolidated financial statements. Additionally, in November 2017, new accounting guidance was issued related to the statement of cash flows implications related to restricted cash and cash equivalents. The guidance requires that the statement of cash flows explain the change during the period in the total of cash and cash equivalents, including amounts generally described as restricted cash or restricted cash equivalents. Entities are also required to reconcile such total to amounts on the balance sheet and disclose the nature of the restrictions. We applied this new guidance on January 1, 2018 and have made current and retrospective presentation adjustments such that transfers between restricted and unrestricted cash accounts no longer are reported as a cash flow in our condensed consolidated statement of cash flows.

Stock-based compensation

In May 2017, the accounting guidance related to stock-based compensation was amended to clarify when to account for a change to the terms or conditions of a share-based payment award as a modification. Per the new guidance, modification accounting is required only if the fair value, the vesting conditions, or the classification of the award (as equity or liability) changes as a result of the change in terms or conditions, whereas under previous guidance, judgments about whether certain changes to an award are substantive may impact whether or not modification accounting is applied in certain situations. This new guidance is effective prospectively for annual periods beginning on or after December 15, 2017. We adopted this guidance on January 1, 2018, with no impact to our condensed consolidated financial statements.

Not yet adopted

Leases

In February 2016, accounting guidance related to leases was issued that will require an entity to recognize leased assets and the rights and obligations created by those leased assets on the balance sheet and to disclose key information about an entity's leasing arrangements. This guidance will become effective for us on January 1, 2019, with early adoption permitted. We expect that the adoption of this guidance will impact our condensed consolidated financial statements and notes thereto, resulting, among other factors, from the recognition of a right of use asset and related liability related to our 2014 non-cancelable operating lease arrangement for our office and laboratory space in Cambridge, Massachusetts. As of June 30, 2018, and as presented below, our total future minimum lease obligation associated with this lease was \$4.1 million, and a substantial portion of this commitment will remain outstanding at the time we adopt the new guidance. Our evaluation of this guidance and its full impact on our condensed consolidated financial statements will continue throughout 2018.

Nonemployee stock-based compensation

In June 2018, accounting guidance related to nonemployee share-based compensation was issued that will require an entity to apply the measurement and classification criteria consistent with the accounting for employee share-based compensation. This guidance will become effective for us on January 1, 2019, with early adoption permitted. We expect that the adoption of this guidance will not have a significant impact on our condensed consolidated financial statements.

Financial Operations Overview

Comparison of the Three and Six Months Ended June 30, 2018 and 2017

The following table summarizes the results of our operations for the periods indicated (amounts in thousands, except percentages).

	Three Months Ended June 30, 2018	Three Months Ended June 30, 2017	Increase/ (Decrease)	Six Months Ended June 30, 2018	Six Months Ended June 30, 2017	Increase/ (Decrease)
Revenue from collaborative arrangements	\$ 1,545	\$ —	\$ 1,545	\$ 3,090	\$ —	\$ 3,090
Expenses:						
Research and development	10,339	9,068	1,271	20,232	17,811	2,421
General and administrative	4,760	4,066	694	9,095	8,188	907
Litigation expense	22,244	2,234	20,010	25,428	3,608	21,820
Total operating expenses	37,343	15,368	21,975	54,755	29,607	25,148
Loss from operations	(35,798)	(15,368)	(20,430)	(51,665)	(29,607)	(22,058)
Other income (expense):						
Interest income	330	143	187	619	181	438
Interest expense	(176)	—	(176)	(176)	—	(176)
Total other income, net	154	143	11	443	181	262
Net loss	(35,644)	(15,225)	(20,419)	(51,222)	(29,426)	(21,796)
Dividends on redeemable convertible preferred stock	—	(2,622)	2,622	—	(2,622)	2,622
Deemed dividend related to beneficial conversion feature of redeemable convertible preferred stock	—	(6,144)	6,144	—	(6,144)	6,144
Net loss attributable to common stockholders	<u>\$ (35,644)</u>	<u>\$ (23,991)</u>	<u>\$ (11,653)</u>	<u>\$ (51,222)</u>	<u>\$ (38,192)</u>	<u>\$ (13,030)</u>

Revenue from collaborative arrangements

Revenue recognized during the three and six months ended June 30, 2018 relates primarily to the BI Agreement, pursuant to which BI agreed to pay us a non-refundable upfront payment of \$10.0 million for the first target and agreed to reimburse us for the cost of certain materials and third-party expenses that have been included in the preclinical studies. Revenue recognized to date is primarily comprised of the periodic amortization of the aforementioned upfront payment.

We recognized \$1.5 million and \$3.1 million of the \$10.3 million transaction price during the three and six months ended June 30, 2018, respectively, which explains the increase as compared to the three and six months ended June 30, 2017, respectively, during which no collaboration revenues were recorded.

We do not expect to generate any product revenue for the foreseeable future.

Research and development expenses

The following table summarizes our research and development expenses incurred during the periods indicated (amounts in thousands).

	Three Months Ended June 30,		
	2018	2017	Increase (Decrease)
Direct research and development expenses	\$ 5,066	\$ 4,016	\$ 1,050
Platform-related expenses	1,425	1,707	(282)
Employee-related expenses	3,053	2,553	500
Facilities, depreciation and other expenses	795	792	3
Total	<u>\$ 10,339</u>	<u>\$ 9,068</u>	<u>\$ 1,271</u>

	Six Months Ended June 30,		
	2018	2017	Increase (Decrease)
Direct research and development expenses	\$ 9,831	\$ 7,314	\$ 2,517
Platform-related expenses	2,538	3,541	(1,003)
Employee-related expenses	6,255	5,347	908
Facilities, depreciation and other expenses	1,608	1,609	(1)
Total	<u>\$ 20,232</u>	<u>\$ 17,811</u>	<u>\$ 2,421</u>

Research and development expenses were \$10.3 and \$20.2 million for the three and six months ended June 30, 2018, respectively, as compared to \$9.1 million and \$17.8 million for the three and six months ended June 30, 2017, respectively, due to higher direct research and development and employee-related expenses, partially offset by a reduction in platform-related expenses. The increase in the three months ended June 30, 2018 was primarily due to an increase of \$0.7 million in clinical study costs and a \$0.5 million increase in research and development salaries due to an increase in research and development headcount compared to the three months ended June 30, 2017. The increase in the six months ended June 30, 2018 was primarily due to a \$1.4 million increase in toxicology studies and an \$0.8 million increase in clinical studies.

The decrease in platform-related expenses for the three and six months ended June 30, 2018 was primarily due to \$0.2 million and \$0.7 million of lab material and supply costs, and \$0.1 million and \$0.2 million of contract research costs associated with applying our GalXC platform against gene targets, respectively.

We expect our overall research and development expenses to increase during the third and fourth quarters of 2018 as compared to the three and six months ended June 30, 2018, primarily as we complete clinical manufacturing activities, advance pre-clinical toxicology studies, and continue clinical activities associated with our lead product candidates.

General and administrative expenses

General and administrative expenses were \$4.8 million and \$9.1 million for the three and six months ended June 30, 2018, respectively, as compared to \$4.1 million and \$8.2 million for the three and six months ended June 30, 2017, respectively. The increase in the three and six months ended June 30, 2018 is predominantly related to higher consulting of \$0.4 million and \$0.3 million, and \$0.1 million and \$0.2 million of corporate legal expenses, respectively.

Litigation expenses

Litigation expenses, all related to the litigation with Alnylam, were \$22.2 million and \$25.4 million for the three and six months ended June 30, 2018, respectively, as compared to \$2.2 million and \$3.6 million for the three and six months ended June 30, 2017, respectively. The increase is predominantly due to \$21.0 million of settlement expenses related to the litigation settlement recorded in the three months ended June 30, 2018.

Interest income

Interest income primarily represents interest earned from our money market accounts and held-to-maturity investments. Interest income was \$0.3 million and \$0.4 million for the three and six months ended June 30, 2018, respectively, as compared to \$0.1 million and \$0.2 million for the three and six months ended June 30, 2017, respectively. The increases were primarily due to higher cash and cash equivalent balances during the three and six months ended June 30, 2018 resulting from financing activities completed in April and December of 2017.

Interest expense

Interest expense of \$0.2 million during the three and six months ended June 30, 2018 represents interest expense incurred on our long-term payable with Alnylam.

Dividends

There were no dividends recorded related to redeemable convertible preferred stock for the three and six months ended June 30, 2018, as all shares of the redeemable convertible preferred stock were converted into shares of our common stock on December 18, 2017.

Net loss attributable to common stockholders

Net loss attributable to common stockholders was \$35.6 million and \$51.2 million for the three and six months ended June 30, 2018, as compared to \$24.0 million and \$38.2 million for the three and six months ended June 30, 2017, respectively. This increase is attributable to higher operating expenses, including the \$21.0 million in litigation settlement expenses, partially offset by higher revenues, interest income, and elimination of the redeemable convertible preferred stock, as discussed above.

Liquidity and Capital Resources

As of June 30, 2018, we had cash and cash equivalents and held-to-maturity investments of \$82.3 million and \$0.7 million in cash equivalents held in restriction.

On October 31, 2016, a universal shelf registration statement on Form S-3 permitting the sale of up to \$150.0 million of our common stock and other securities was declared effective by the U.S. Securities and Exchange Commission ("SEC"). In December 2017, we sold an aggregate of 24,206,663 shares of our common stock, for gross proceeds of \$46.0 million, pursuant to this registration statement.

On May 31, 2018, a universal shelf registration statement on Form S-3 permitting the sale of up to \$250.0 million of our common stock and other securities was declared effective by the SEC.

Cash flows

The following table shows a summary of our cash flows for the periods indicated (amounts in thousands).

	Six Months Ended	
	June 30,	
	2018	2017
Net cash used in operating activities	\$ (32,273)	\$ (26,898)
Net cash provided by (used in) investing activities	5,037	(24,966)
Net cash provided by financing activities	873	69,776
(Decrease) increase in cash, cash equivalents, and restricted cash equivalents	<u>\$ (26,363)</u>	<u>\$ 17,912</u>

Operating activities

Net cash used in operating activities was \$32.3 million for the six months ended June 30, 2018, as compared to \$26.9 million for the six months ended June 30, 2017. The increase of \$5.4 million was primarily due to litigation and research and development expenses of \$2.6 million and \$2.4 million, respectively.

Investing activities

Net cash provided by investing activities was \$5.0 million for the six months ended June 30, 2018, as compared to cash used in investing activities of \$25.0 million for the six months ended June 30, 2017. The increase of \$30.0 million was due to a \$20.1 million decline in purchases of, and a \$10.0 million increase in maturities of, held-to-maturity investments, respectively.

Financing activities

Net cash provided by financing activities was \$0.9 million for the six months ended June 30, 2018, as compared to \$69.8 million for the six months ended June 30, 2017. The decrease of \$69.0 million was primarily due to receipt of \$70.0 million in gross proceeds in April 2017 from the Private Placement of redeemable convertible preferred stock.

Funding requirements

We expect that our primary uses of capital will continue to be third-party clinical research and development services and manufacturing costs, compensation and related expenses, laboratory and related supplies, legal and other regulatory expenses, and general overhead costs. Because of the numerous risks and uncertainties associated with the development and commercialization of our product candidates and the extent to which we may enter into additional collaborations with third parties to participate in their development and commercialization, we are unable to estimate the amounts of capital outlays and operating expenditures associated with our anticipated development activities. However, based on our current operating plan, we believe that available cash, cash equivalents, and held-to-maturity investments will be sufficient to fund our planned level of operations for at least the 12-month period following August 8, 2018. We have based this estimate on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we currently expect.

Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement that involves risks and uncertainties, and actual results could vary materially as a result of a number of factors. Our future capital requirements are difficult to forecast and will depend on many factors, including:

- the receipt of any milestone payments under the BI Agreement;
- the terms and timing of any other collaboration, licensing, and other arrangements that we may establish;
- the initiation, progress, timing, and completion of preclinical studies and clinical trials for our potential product candidates;
- the number and characteristics of product candidates that we pursue;
- the outcome, timing, and cost of regulatory approvals;
- delays that may be caused by changing regulatory requirements;
- the cost and timing of hiring new employees to support our continued growth;
- the costs involved in filing and prosecuting patent applications and enforcing and defending patent claims;
- the costs of filing and prosecuting intellectual property rights and enforcing and defending any intellectual property-related claims;
- the costs of responding to and defending ourselves against complaints and potential litigation (see Part II, Item 1—“Legal Proceedings” in this Quarterly Report on Form 10-Q);
- the costs and timing of procuring clinical and commercial supplies for our product candidates;
- the extent to which we acquire or in-license other product candidates and technologies; and
- the extent to which we acquire or invest in other businesses, product candidates, or technologies.

Until such time, if ever, that we generate product revenue, we expect to finance our cash needs through a combination of public or private equity offerings, debt financings, and research collaboration and license agreements. We may be unable to raise capital or enter into such other arrangements when needed or on favorable terms, or at all. Our failure to raise capital or enter into such other arrangements in a reasonable timeframe would have a negative impact on our financial condition, and we may have to delay, reduce, or terminate our research and development programs, preclinical or clinical trials, limit strategic opportunities, or undergo reductions in our workforce or other corporate restructuring activities.

Please see the risk factors set forth in Part II, Item 1A –“Risk Factors” in this Quarterly Report on Form 10-Q for additional risks associated with our substantial capital requirements.

Contractual Obligations and Commitments

The following is a summary of our significant contractual obligations as of June 30, 2018 (amounts in thousands):

	Payments Due By Period				
	Total	Less Than 1 Year	More Than 1 Year and Less Than 3 Years	More Than 3 Years and Less Than 5 Years	More Than 5 Years
Operating lease obligation*	\$ 4,075	\$ 1,654	\$ 2,421	\$ —	\$ —

* Represents future minimum lease payments under our existing non-cancelable operating lease for our office and laboratory space in Cambridge, Massachusetts. The end of the lease term is November 30, 2020.

We also have obligations to make future payments to licensors that become due and payable on the achievement of certain development, regulatory, and commercial milestones. We have not included any such potential obligations on our condensed consolidated balance sheet or in the table above, since the achievement and timing of these milestones were not probable or estimable as of June 30, 2018.

See also Part II, Item 1 –“Legal Proceedings” in this Quarterly Report on Form 10-Q for additional information related to litigation. We recorded \$8.9 million of litigation liabilities related to Alnylam on our condensed consolidated balance sheet as of June 30, 2018.

Off-balance Sheet Arrangements

During the periods presented, we did not have, and we currently do not have, any off-balance sheet arrangements, as defined in the rules and regulations of the SEC.

Item 3. QUANTITATIVE AND QUALITATIVE DISCLOSURE ABOUT MARKET RISK

The primary objectives of our investment activities are to ensure liquidity and to preserve principal while at the same time maximizing the income we receive from our marketable securities without significantly increasing risk. Some of the securities that we invest in may have market risk related to changes in interest rates. As of June 30, 2018, we had cash and cash equivalents and held-to-maturity investments of \$82.3 million. Our primary exposure to market risk is interest rate sensitivity, which is affected by changes in the general level of U.S. interest rates. Due to the short-term maturities of our cash and cash equivalents and held-to-maturity investments and the low risk profile of our investments, an immediate 100 basis point change in interest rates would not have a material effect on the fair market value of our cash and cash equivalents or held-to-maturity investments. To minimize the risk in the future, we intend to maintain our portfolio of cash and cash equivalents and held-to-maturity investments in a variety of securities, including commercial paper, money market funds, and government securities.

Item 4. CONTROLS AND PROCEDURES**Disclosure Controls and Procedures**

We maintain disclosure controls and procedures that are designed to ensure that information required to be disclosed in our periodic and current reports that we file under the Securities Exchange Act of 1934, as amended, with the SEC is recorded, processed, summarized, and reported within the time periods specified in the SEC's rules and forms, and that such information is accumulated and communicated to our management, including our chief executive officer and principal financial officer, as appropriate, to allow timely decisions regarding required disclosure.

As of the end of the period covered by this Quarterly Report on Form 10-Q, we carried out an evaluation, under the supervision and with the participation of our management, including the chief executive officer and the chief financial officer, of the effectiveness of the design and operation of our disclosure controls and procedures pursuant to Exchange Act Rule 13a-15. Based upon, and as of the date of, this evaluation, the chief executive officer and the chief financial officer concluded that our disclosure controls and procedures were effective. Accordingly, management believes that the financial statements included in this report fairly present in all material respects our financial condition, results of operations, and cash flows for the periods presented.

Changes in Internal Control Over Financial Reporting

There was no change in our internal control over financial reporting during the quarter ended June 30, 2018, which was identified in connection with management's evaluation required by Exchange Act Rules 13a-15 and 15d-15 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Inherent Limitations on the Effectiveness of Controls

Our management, including the chief executive officer and chief financial officer, does not expect that our disclosure controls and procedures or our internal control over financial reporting will prevent all error and all fraud. A control system, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within the company have been detected. These inherent limitations include the realities that judgments in decision making can be faulty and that breakdowns can occur because of simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people, or by management override of the control. The design of any system of controls is also based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions. Over time, controls may become inadequate because of changes in conditions, or the degree of compliance with the policies or procedures may deteriorate. Because of the inherent limitations in a cost-effective control system, misstatements due to error or fraud may occur and not be detected.

PART II: OTHER INFORMATION

Item 1. LEGAL PROCEEDINGS

We are not currently a party to or aware of any proceedings that we believe will have, individually or in the aggregate, a material adverse effect on our business, financial condition, or results of operations.

On June 10, 2015, Alnylam Pharmaceuticals, Inc. (“Alnylam”) filed a complaint against the Company in the Superior Court of Middlesex County, Massachusetts (the “Court”). The complaint alleged misappropriation of confidential, proprietary, and trade secret information, as well as other related claims, in connection with the Company’s hiring of a number of former employees of Merck & Co., Inc. (“Merck”) and its discussions with Merck regarding the acquisition of its subsidiary, Sima Therapeutics, Inc. (“Sima”), which was subsequently acquired by Alnylam.

On April 18, 2018, the Company and Alnylam entered into a Confidential Settlement Agreement and General Release (the “Settlement Agreement”) resolving all ongoing litigation between the Company and Alnylam. The terms of the Settlement Agreement include mutual releases and dismissals with prejudice of all claims and counterclaims in the following litigation between the parties: (i) *Alnylam Pharmaceuticals, Inc. v. Dicerna Pharmaceuticals, Inc.*, No. 15-4126 pending in the Massachusetts Superior Court for Middlesex County and (ii) *Dicerna Pharmaceuticals, Inc. v. Alnylam Pharmaceuticals, Inc.* No.1:17-cv-11466 pending in the United States District Court for the District of Massachusetts. Pursuant to the terms of the Settlement Agreement, the Company has agreed to make the following payments to Alnylam: (i) a \$2.0 million upfront payment in cash; (ii) an additional \$13.0 million in cash, to be paid as 10% of any upfront or first year cash consideration that the Company receives pursuant to future collaborations related to GalNAc-conjugated RNAi research and development (excluding any amounts received or to be received by the Company from its existing collaboration with BI), provided that the \$13.0 million must be paid by no later than April 28, 2022; and (iii) issuance of shares of the Company’s common stock (the “Shares”) pursuant to a share issuance agreement between the parties (the “Share Issuance Agreement”).

Under the Settlement Agreement, the Company is restricted in its development and other activities relating to oligonucleotide-based therapeutics directed toward a defined set of eight Alnylam targets, for periods ranging from 18 months up to four years (the “Oligo Restrictions”). The Oligo Restrictions pertain to targets where Dicerna does not have, or does not currently intend to have, a therapeutic program, or are expected to be consistent with Dicerna’s execution on programs in the normal course of business. The Settlement Agreement does not include any admission of liability or wrongdoing by either party or any licenses to any other intellectual property from either party.

On April 20, 2018, the Company and Alnylam entered into the Share Issuance Agreement, pursuant to which the Company agreed to issue to Alnylam 983,208 Shares in satisfaction of the Company’s obligation under the Settlement Agreement to deliver Shares to Alnylam. The Share Issuance Agreement contains customary representations and warranties of each party. Pursuant to the terms of the Share Issuance Agreement, Alnylam may not, without the prior approval of the Company, dispose of any of the Shares for a six-month period commencing on the closing date of the Share issuance. Thereafter, through the fifth anniversary of the closing date of the Share issuance, Alnylam will only dispose of the maximum number of Shares that it would be permitted to dispose if the Shares were subject to the volume restrictions set forth in Rule 144(e) of the Securities Act of 1933, as amended.

Item 1A. Risk Factors

We are providing the following cautionary discussion of risk factors, uncertainties, and assumptions that we believe are relevant to our business. These are factors that, individually or in the aggregate, we think could cause our actual results to differ materially from expected and historical results and our forward-looking statements. We note these factors for investors as permitted by Section 21E of the Securities Exchange Act of 1934, as amended, and Section 27A of the Securities Act of 1933, as amended. You should understand that it is not possible to predict or identify all such factors. Consequently, you should not consider this section to be a complete discussion of all potential risks or uncertainties that may substantially impact our business. Moreover, we operate in a competitive and rapidly changing environment. New factors emerge from time to time and it is not possible to predict the impact of all of these factors on our business, financial condition, or results of operations.

Risks Related to Our Business

We will need to raise substantial additional funds to advance development of our product candidates, and we cannot guarantee that we will have sufficient funds available in the future to develop and commercialize our current or future product candidates.

We will need to raise substantial additional funds to expand our development, regulatory, manufacturing, marketing, and sales capabilities, whether internally or through other organizations. We have used substantial funds to develop our product candidates and delivery technologies and will require significant funds to conduct further research and development and preclinical testing and clinical trials of our product candidates, to seek regulatory approvals for our product candidates, and to manufacture and market products, if any are approved for commercial sale. As of June 30, 2018, we had \$82.3 million in cash and cash equivalents and held-to-maturity investments. Based on our current operating plan and liquidity, we believe that our available cash, cash equivalents, and held-to-maturity investments will be sufficient to fund our planned level of operations for at least the 12-month period following August 8, 2018. Our future capital requirements and the period for which we expect our existing resources to support our operations may vary significantly from what we expect. Our monthly spending levels vary based on new and ongoing development and corporate activities. Because the length of time and activities associated with successful development of our product candidates is highly uncertain, we are unable to estimate the actual funds we will require for development and any approved marketing and commercialization activities. To execute our business plan, we will need, among other things:

- to obtain the human and financial resources necessary to develop, test, obtain regulatory approval for, manufacture, and market our product candidates;
- to build and maintain a strong intellectual property portfolio and avoid infringing intellectual property of third parties;
- to establish and maintain successful licenses, collaborations, and alliances;
- to satisfy the requirements of clinical trial protocols, including patient enrollment;
- to establish and demonstrate the clinical efficacy and safety of our product candidates;
- to manage our spending as costs and expenses increase due to preclinical studies and clinical trials, regulatory approvals, manufacturing scale-up, and commercialization;
- to obtain additional capital to support and expand our operations; and
- to market our products to achieve acceptance and use by the medical community.

If we are unable to obtain funding on a timely basis or on acceptable terms, we may have to delay, reduce, or terminate our research and development programs and preclinical studies or clinical trials, if any, limit strategic opportunities, or undergo reductions in our workforce or other corporate restructuring activities. We also could be required to seek funds through arrangements with collaborators or others that may require us to relinquish rights to some of our technologies or product candidates that we would otherwise pursue on our own. We do not expect to realize revenue from product sales, milestone payments, or royalties in the foreseeable future, if at all. Our revenue sources are, and will remain, extremely limited unless and until our product candidates are clinically tested, approved for commercialization, and successfully marketed. To date, we have financed our operations primarily through the sale of securities, debt financings, and credit and loan facilities. We will be required to seek additional funding in the future and intend to do so through a combination of public or private equity offerings, debt financings, and research collaborations and license agreements. Our ability to raise additional funds will depend on financial, economic, and other factors, many of which are beyond our control. For example, a number of factors, including the timing and outcomes of our clinical activities, our status as a smaller reporting company under SEC regulations, as well as conditions in the global financial markets, may present significant challenges to accessing the capital markets at a time when we would like or require, and at an increased cost of capital. Additional funds may not be available to us on acceptable terms or at all. If we raise additional funds by issuing equity securities, our stockholders will suffer dilution, and the terms of any financing may adversely affect the rights of our stockholders. In addition, as a condition to providing additional funds to us, future investors may demand, and may be granted, rights superior to those of existing stockholders. Debt financing, if available, may involve restrictive covenants limiting our flexibility in conducting future business activities, and, in the event of insolvency, debt holders would be repaid before holders of equity securities receive any distribution of corporate assets.

We are a biopharmaceutical company with a history of losses, expect to continue to incur significant losses for the foreseeable future and may never achieve or maintain profitability, which could result in a decline in the market value of our common stock.

We are a biopharmaceutical company with a limited operating history focused on the discovery and development of treatments based on the emerging therapeutic modality RNAi, a biological process in which RNA molecules inhibit gene expression. Since our inception in October 2006, we have devoted our resources to the development of DsiRNA molecules and delivery technologies. We have had significant operating losses since our inception. As of June 30, 2018, we had an accumulated deficit of \$367.2 million. For the six months ended June 30, 2018 and for the years ended December 31, 2017, 2016, and 2015, our net loss was \$51.2 million, \$80.1 million, \$59.5 million, and \$62.8 million, respectively. Substantially all of our operating losses have resulted from expenses incurred in connection with our research and development programs and from general and administrative costs associated with our operations. Our technologies and product candidates are in early stages of development, and we are subject to the risks of failure inherent in the development of product candidates based on novel technologies.

We have not generated, and do not expect to generate, any revenue from product sales for the foreseeable future, and we expect to continue to incur significant operating losses for the foreseeable future due to the cost of research and development, preclinical studies and clinical trials, and the regulatory approval process for product candidates. The amount of future losses is uncertain. Our ability to achieve profitability, if ever, will depend on, among other things, us or our existing collaborators, or any future collaborators, successfully developing product candidates, obtaining regulatory approvals to market and commercialize product candidates, manufacturing any approved products on commercially reasonable terms, establishing a sales and marketing organization or suitable third-party alternatives for any approved product, and raising sufficient funds to finance business activities. If we or our existing collaborators, or any future collaborators, are unable to develop and commercialize one or more of our product candidates or if sales revenue from any product candidate that receives approval is insufficient, we will not achieve profitability, which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Our quarterly operating results may fluctuate significantly or may fall below the expectations of investors or securities analysts, each of which may cause our stock price to fluctuate or decline.

We expect our operating results to be subject to quarterly fluctuations. Our net loss and other operating results will be affected by numerous factors, including:

- variations in the level of expense related to our product candidates or future development programs;
- results of clinical trials, or the addition or termination of clinical trials or funding support by us, our existing collaborators, or any future collaborator or licensor;
- the timing of the release of results from any clinical trials conducted by us or our collaborator BI;
- our execution of any collaboration, licensing, or similar arrangement, and the timing of payments we may make or receive under such existing or future arrangements or the termination or modification of any such existing or future arrangements;
- any intellectual property infringement or misappropriation lawsuit or opposition, interference, re-examination, post-grant review, inter partes review, nullification, derivation action, or cancellation proceeding in which we may become involved;
- additions and departures of key personnel;
- strategic decisions by us and our competitors, such as acquisitions, divestitures, spin-offs, joint ventures, strategic investments, or changes in business strategy;
- if any of our product candidates receive regulatory approval, market acceptance and demand for such product candidates;
- if any of our third-party manufacturers fail to execute on our manufacturing requirements;
- regulatory developments affecting our product candidates or those of our competitors;
- disputes concerning patents, proprietary rights, or license and collaboration agreements that negatively impact our receipt of milestone payments or royalties or require us to make significant payments arising from licenses, settlements, adverse judgments, or ongoing royalties; and
- changes in general market and economic conditions.

If our quarterly operating results fluctuate or fall below the expectations of investors or securities analysts, the price of our common stock could fluctuate or decline substantially. We believe that quarterly comparisons of our financial results are not necessarily meaningful and should not be relied upon as an indication of our future performance.

Our approach to the discovery and development of innovative therapeutic treatments based on novel technologies is unproven and may not result in marketable products.

We plan to develop subcutaneously delivered RNAi-based pharmaceuticals using our GalXC RNAi platform for the treatment of rare diseases involving the liver and for other therapeutic areas involving the liver such as chronic liver diseases, as well as cardiovascular diseases and viral infectious diseases. We believe that product candidates identified with our drug discovery and delivery platform may offer an improved therapeutic approach to small molecules and monoclonal antibodies, as well as several advantages over earlier generation RNAi molecules. However, the scientific research that forms the basis of our efforts to develop product candidates is relatively new. The scientific evidence to support the feasibility of developing therapeutic treatments based on RNAi and GalXC is both preliminary and limited.

Relatively few product candidates based on RNAi have been tested in animals or humans, and a number of clinical trials conducted by other companies using RNAi technologies have not been successful. We may discover that GalXC does not possess certain properties required for a drug to be safe and effective, such as the ability to remain stable in the human body for the period of time required for the drug to reach the target tissue or the ability to cross the cell wall and enter into cells within the target tissue for effective delivery. We currently have only limited data, and no conclusive evidence, to suggest that we can introduce these necessary drug-like properties into GalXC. We may spend substantial funds attempting to introduce these properties and may never succeed in doing so. In addition, product candidates based on GalXC may demonstrate different chemical and pharmacological properties in patients than they do in laboratory studies. Even if product candidates, such as DCR-PHXC, have successful results in animal studies, they may not demonstrate the same chemical and pharmacological properties in humans and may interact with human biological systems in unforeseen, ineffective, or harmful ways. As a result, we may never succeed in developing a marketable product, we may not become profitable, and the value of our common stock will decline.

Further, the FDA has relatively limited experience with RNAi or GalXC based therapeutics. No regulatory authority has granted approval to any person or entity, including us, to market and commercialize therapeutics using RNAi or GalXC, which may increase the complexity, uncertainty, and length of the regulatory approval process for our product candidates. We and our current collaborators, or any future collaborators, may never receive approval to market and commercialize any product candidate. Even if we or a collaborator obtain regulatory approval, the approval may be for disease indications or patient populations that are not as broad as we intended or desired or may require labeling that includes significant use or distribution restrictions or safety warnings. We or a collaborator may be required to perform additional or unanticipated clinical trials to obtain approval or be subject to post-marketing testing requirements to maintain regulatory approval. If our technologies based on GalXC prove to be ineffective, unsafe, or commercially unviable, our entire platform and pipeline would have little, if any, value, which would have a material adverse effect on our business, financial condition, results of operations, and prospects.

The market may not be receptive to our product candidates based on a novel therapeutic modality, and we may not generate any future revenue from the sale or licensing of product candidates.

Even if approval is obtained for a product candidate, we may not generate or sustain revenue from sales of the product due to numerous factors, including whether the product can be sold at a competitive price and otherwise is accepted in the market. The product candidates that we are developing are based on new technologies and therapeutic approaches. Market participants with significant influence over acceptance of new treatments, such as physicians and third-party payors, may not adopt a treatment based on GalXC technology, and we may not be able to convince the medical community and third-party payors, including health insurers, to accept and use, or to provide favorable coverage or reimbursement for, any product candidates developed by us or our existing collaborator or any future collaborators. Market acceptance of our product candidates will depend on, among other factors:

- the timing of our receipt of any marketing and commercialization approvals;
- the terms of any approvals and the countries in which approvals are obtained;
- the safety and efficacy of our product candidates;
- the prevalence and severity of any adverse side effects associated with our product candidates;
- limitations or warnings contained in any labeling approved by the FDA or other regulatory authority;
- relative convenience and ease of administration of our product candidates;
- the willingness of physicians and patients to accept any new methods of administration;

- the success of our physician education programs;
- the availability of adequate government and third-party payor coverage and reimbursement;
- the pricing of our products, particularly as compared to alternative treatments;
- our ability to compliantly market and sell our products; and
- availability of alternative effective treatments for the disease indications our product candidates are intended to treat and the relative risks, benefits and costs of those treatments.

With our focus on the emerging therapeutic modality RNAi, these risks may increase to the extent the market becomes more competitive or less favorable to this approach. Additional risks apply to any disease indications we pursue which are for rare diseases. Because of the small patient population for a rare disease, if pricing is not approved or accepted in the market at an appropriate level for an approved rare disease product, such drug may not generate enough revenue to offset costs of development, manufacturing, marketing, and commercialization, despite any benefits received from our efforts to obtain orphan drug designation by regulatory agencies in major commercial markets, such as the U.S., the European Union (“EU”), and Japan. These benefits may include market exclusivity, assistance in clinical trial design, or a reduction in user fees or tax credits related to development expense. Market size is also a variable in disease indications that are not classified as rare. Our estimates regarding potential market size for any indication may be materially different from what we discover to exist if we ever get to the point of product commercialization, which could result in significant changes in our business plan and have a material adverse effect on our business, financial condition, results of operations, and prospects.

If a product candidate that has orphan drug designation subsequently receives the first FDA approval for the indication for that designation, the product candidate is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications to market the same product candidate for the same indication, except in very limited circumstances, for seven years. Orphan drug exclusivity, however, could also block the approval of one of our product candidates for seven years if a competitor obtains approval of the same product candidate as defined by the FDA.

Even if we, or any future collaborators, obtain orphan drug exclusivity for a product, that exclusivity may not effectively protect the product from competition because different drugs can be approved for the same condition. Even after an orphan drug is approved, the FDA can subsequently approve the same drug for the same condition if the FDA concludes that the later drug is clinically superior in that it is shown to be safer, more effective, or makes a major contribution to patient care.

On August 3, 2017, the Congress passed the FDA Reauthorization Act of 2017, or FDARA. FDARA, among other things, codified the FDA’s preexisting regulatory interpretation, to require that a drug sponsor demonstrate the clinical superiority of an orphan drug that is otherwise the same as a previously approved drug for the same rare disease in order to receive orphan drug exclusivity. The new legislation reverses prior precedent holding that the Orphan Drug Act unambiguously requires that the FDA recognize the orphan exclusivity period regardless of a showing of clinical superiority. The FDA may further reevaluate the Orphan Drug Act and its regulations and policies. We do not know if, when, or how the FDA may change the orphan drug regulations and policies in the future, and it is uncertain how any changes might affect our business. Depending on what changes the FDA may make to its orphan drug regulations and policies, our business could be adversely impacted.

As in the U.S., we may apply for designation of a product candidate as an orphan drug for the treatment of a specific indication in the EU before the application for marketing authorization is made. Sponsors of orphan drugs in the EU can enjoy economic and marketing benefits, including up to 10 years of market exclusivity for the approved indication. During such period, marketing authorization applications for a “similar medicinal product” will not be accepted, unless another applicant can show that its product is safer, more effective, or otherwise clinically superior to the orphan-designated product. In the EU, a “similar medicinal product” is a medicinal product containing a similar active substance or substances as contained in a currently authorized orphan medicinal product, and which is intended for the same therapeutic indication. The respective orphan designation and exclusivity frameworks in the U.S. and in the EU are subject to change, and any such changes may affect our ability to obtain EU or U.S. orphan designations in the future.

Our product candidates are in early stages of development and may fail or suffer delays that materially and adversely affect their commercial viability.

We have no products on the market and all of our product candidates are in early stages of development. Our ability to achieve and sustain profitability depends on obtaining regulatory approvals, including ethics committee approval to conduct clinical trials at particular sites, and successfully commercializing our product candidates, either alone or with third parties, such as our collaborator BI. Before obtaining regulatory approval for the commercial distribution of our product candidates, we or a collaborator must conduct extensive preclinical tests and clinical trials to demonstrate the safety and efficacy of our product candidates in humans. Preclinical testing and clinical trials are expensive, difficult to design and implement, can take many years to complete, and are uncertain as to outcome. The start or end of a clinical study is often delayed or halted due to changing regulatory requirements, manufacturing challenges, required clinical trial administrative actions, slower than anticipated patient enrollment, changing standards of care, availability or prevalence of use of a comparative drug or required prior therapy, clinical outcomes, and financial constraints. For

instance, delays or difficulties in patient enrollment or difficulties in retaining trial participants can result in increased costs, longer development times, or termination of a clinical trial. Clinical trials of a new product candidate require the enrollment of a sufficient number of patients, including patients who are suffering from the disease the product candidate is intended to treat and who meet other eligibility criteria. Rates of patient enrollment are affected by many factors, including the size of the patient population, the eligibility criteria for the clinical trial, the age and condition of the patients, the stage and severity of disease, the nature of the protocol, the proximity of patients to clinical sites, and the availability of effective treatments for the relevant disease.

A product candidate can unexpectedly fail at any stage of preclinical and clinical development. The historical failure rate for product candidates is high due to many factors, including scientific feasibility, safety, efficacy, and changing standards of medical care. The results from preclinical testing or early clinical trials of a product candidate may not predict the results that will be obtained in later phase clinical trials of the product candidate. We, the FDA, the applicable Institutional Review Board (“IRB”), an independent ethics committee, or other applicable regulatory authorities may suspend clinical trials of a product candidate at any time for various reasons, including a belief that individuals participating in such trials are being exposed to unacceptable health risks or adverse side effects. Similarly, an IRB or ethics committee may suspend a clinical trial at a particular trial site. We may not have the financial resources to continue development of, or to enter into collaborations for, a product candidate if we experience any problems or other unforeseen events that delay or prevent regulatory approval of, or our ability to commercialize, product candidates, including:

- negative or inconclusive results from our clinical trials or the clinical trials of others for product candidates similar to ours, leading to a decision or requirement to conduct additional preclinical testing or clinical trials or abandon a program;
- serious and unexpected drug-related side effects experienced by participants in our clinical trials or by individuals using drugs similar to our product candidates;
- delays in submitting INDs or comparable foreign applications or delays or failure in obtaining the necessary approvals from regulators or IRBs to commence a clinical trial, or a suspension or termination of a clinical trial once commenced;
- conditions imposed by the FDA or comparable foreign authorities, such as the European Medicines Agency (“EMA”), regarding the scope or design of our clinical trials;
- delays in enrolling individuals in clinical trials;
- high drop-out rates of study participants;
- inadequate supply or quality of drug product or product candidate components or materials or other supplies necessary for the conduct of our clinical trials;
- greater than anticipated clinical trial costs;
- poor effectiveness of our product candidates during clinical trials;
- unfavorable FDA or other regulatory agency inspection and review of a clinical trial site;
- failure of our third-party contractors or investigators to comply with regulatory requirements or otherwise meet their contractual obligations in a timely manner, or at all;
- delays and changes in regulatory requirements, policy and guidelines, including the imposition of additional regulatory oversight around clinical testing generally or with respect to our technology in particular; and
- varying interpretations of data by the FDA and foreign regulatory agencies.

We are dependent on BI for the successful development of product candidates in the collaboration.

On October 27, 2017, we entered into the BI Agreement to jointly research and develop candidate products using the GalXC platform to target specific disease-linked genes in the hepatocytes for the treatment of NASH. Under the terms of the BI Agreement, BI agreed to pay us a non-refundable upfront payment of \$10.0 million, and we will be eligible to receive up to \$191.0 million in development and commercial milestones related to the initial target and royalty payments on global net sales. Once a product candidate is selected, the success of our collaboration with BI and the realization of the milestone and royalty payments under the BI Agreement depends entirely upon the efforts of BI, which may not be successful in obtaining approvals for the product candidates developed under the collaboration or in marketing, or arranging for necessary supply, manufacturing or distribution relationships for, any approved products. BI may change its strategic focus or pursue alternative technologies in a manner that results in reduced, delayed, or no revenue to us. BI has a variety of marketed products and product candidates under collaboration with other companies, possibly including some of our competitors, and BI’s own corporate objectives may not be consistent with our interests. If BI fails to develop, obtain regulatory approval for, or ultimately commercialize any product candidate under our collaboration, or if BI terminates our collaboration, our business, financial condition, results of operations, and prospects could be materially and adversely affected. In

addition, if we have a dispute or enter into litigation with BI in the future, it could delay development programs, create uncertainty as to ownership of intellectual property rights, distract management from other business activities, and generate substantial expense.

If third parties on which we depend to conduct our preclinical studies, or any future clinical trials, do not perform as contractually required, fail to satisfy regulatory or legal requirements, or miss expected deadlines, our development program could be delayed with materially adverse effects on our business, financial condition, results of operations, and prospects.

We rely on third-party clinical investigators, contract research organizations (“CROs”), clinical data management organizations, and consultants to design, conduct, supervise, and monitor preclinical studies of our product candidates and will do the same for any clinical trials. Because we rely on third parties and do not have the ability to conduct preclinical studies or clinical trials independently, we have less control over the timing, quality, compliance, and other aspects of preclinical studies and clinical trials than we would if we conducted them on our own. These investigators, CROs, and consultants are not our employees and we have limited control over the amount of time and resources that they dedicate to our programs. These third parties may have contractual relationships with other entities, some of which may be our competitors, which may draw time and resources from our programs. The third parties with which we contract might not be diligent, careful, compliant, or timely in conducting our preclinical studies or clinical trials, resulting in the preclinical studies or clinical trials being delayed or unsuccessful.

If we cannot contract with acceptable third parties on commercially reasonable terms, or at all, or if these third parties do not carry out their contractual duties, satisfy legal and regulatory requirements for the conduct of preclinical studies or clinical trials, or meet expected deadlines, our clinical development programs could be delayed and otherwise adversely affected. In all events, we are responsible for ensuring that each of our preclinical studies and clinical trials is conducted in accordance with the general investigational plan and protocols for the trial as well as applicable laws and regulations. The FDA and certain foreign regulatory authorities, such as the EMA, require preclinical studies to be conducted in accordance with applicable good laboratory practices and clinical trials to be conducted in accordance with applicable FDA regulations and applicable good clinical practices, including requirements for conducting, recording, and reporting the results of preclinical studies and clinical trials to assure that data and reported results are credible and accurate and that the rights, integrity, and confidentiality of clinical trial participants are protected. Our reliance on third parties that we do not control does not relieve us of these responsibilities and requirements. Any such event could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Because we rely on third-party manufacturing and supply partners, our supply of research and development, preclinical studies, and clinical trial materials may become limited or interrupted or may not be of satisfactory quantity or quality.

We rely on third-party supply and manufacturing companies and organizations to supply the materials, components, and manufacturing services for our research and development, preclinical study, and clinical trial drug supplies.

We do not own or lease manufacturing facilities or supply sources for such components and materials. Our manufacturing requirements include oligonucleotides and custom amides, some of which we procure from a single source supplier on a purchase order basis. In addition, for each product candidate we typically contract with only one manufacturer for the formulation and filling of drug product. There can be no assurance that our supply of research and development, preclinical study, and clinical trial drugs and other materials will not be limited, interrupted, restricted in certain geographic regions, or of satisfactory quality, or continue to be available at acceptable prices. In particular, any replacement of our drug substance manufacturer could require significant effort and expertise because there may be a limited number of qualified replacements.

If we are at any time unable to provide an uninterrupted supply of our product candidates or, following regulatory approval, any products to patients, we may lose patients, physicians may elect to utilize competing therapeutics instead of our products, and our clinical trials may be adversely affected, which could materially and adversely affect our clinical trial outcome.

The manufacturing process for a product candidate is subject to FDA and foreign regulatory authority review. Suppliers and manufacturers must meet applicable manufacturing requirements and undergo rigorous facility and process validation tests required by regulatory authorities in order to comply with regulatory standards, such as current good manufacturing practices (“cGMP”). In the event that any of our suppliers or manufacturers fails to comply with such requirements or to perform its obligations regarding quality, timing or otherwise, or if our supply of components or other materials becomes limited or interrupted for other reasons, we may experience shortages resulting in delayed shipments, supply constraints and/or stock-outs of our products, be forced to manufacture the materials ourselves, for which we currently do not have the capabilities or resources, or enter into an agreement with another third party, which we may not be able to do on reasonable terms, if at all. In some cases, the technical skills or technology required to manufacture our product candidates may be unique or proprietary to the original manufacturer and we may have difficulty, or there may be contractual restrictions prohibiting us from, transferring such skills or technology to another third party and a feasible alternative may not exist. These factors would increase our reliance on such manufacturer or require us to obtain a license from such manufacturer in order to have another third party manufacture our product candidates. If we are required to change manufacturers for

any reason, we will be required to verify that the new manufacturer maintains facilities and procedures that comply with quality standards and with all applicable regulations. The delays associated with the verification of a new manufacturer could negatively affect our ability to develop product candidates in a timely manner or within budget.

We expect to continue to rely on third-party manufacturers if we receive regulatory approval for any product candidate. To the extent that we have existing, or enter into future, manufacturing arrangements with third parties, we will depend on these third parties to perform their obligations in a timely manner consistent with contractual and regulatory requirements, including those related to quality control and assurance. If we are unable to obtain or maintain third-party manufacturing for product candidates, or to do so on commercially reasonable terms, we may not be able to develop and commercialize our product candidates successfully. Our or a third party's failure to execute on our manufacturing requirements could adversely affect our business in a number of ways, including:

- an inability to initiate or continue preclinical studies or clinical trials of product candidates under development;
- delay in submitting regulatory applications, or receiving regulatory approvals, for product candidates;
- loss of the cooperation of a collaborator;
- subjecting manufacturing facilities of our product candidates to additional inspections by regulatory authorities;
- requirements to cease distribution or to recall batches of our product candidates; and
- in the event of approval to market and commercialize a product candidate, an inability to meet commercial demands for our products.

We may not successfully engage in strategic transactions, including any additional collaborations we seek, which could adversely affect our ability to develop and commercialize product candidates, impact our cash position, increase our expense, and present significant distractions to our management.

From time to time, we may consider strategic transactions, such as collaborations, acquisitions of companies, asset purchases, and out- or in-licensing of product candidates or technologies. In particular, in addition to our current collaboration with BI, we will evaluate and, if strategically attractive, seek to enter into additional collaborations, including with major biotechnology or pharmaceutical companies. The competition for collaborators is intense, and the negotiation process is time-consuming and complex. Any new collaboration may be on terms that are not optimal for us, and we may be unable to maintain any new or existing collaboration if, for example, development or approval of a product candidate is delayed, sales of an approved product do not meet expectations, or the collaborator terminates the collaboration. Any such collaboration, or other strategic transaction, may require us to incur non-recurring or other charges, increase our near- and long-term expenditures, and pose significant integration or implementation challenges or disrupt our management or business. These transactions entail numerous operational and financial risks, including exposure to unknown liabilities, disruption of our business, and diversion of our management's time and attention in order to manage a collaboration or develop acquired products, product candidates or technologies, incurrence of substantial debt or dilutive issuances of equity securities to pay transaction consideration or costs, higher than expected collaboration, acquisition, or integration costs, write-downs of assets or goodwill or impairment charges, increased amortization expenses, difficulty and cost in facilitating the collaboration or combining the operations and personnel of any acquired business, impairment of relationships with key suppliers, manufacturers, or customers of any acquired business due to changes in management and ownership and the inability to retain key employees of any acquired business. Accordingly, although there can be no assurance that we will undertake or successfully complete any transactions of the nature described above, any transactions that we do complete may be subject to the foregoing or other risks and have a material adverse effect on our business, results of operations, financial condition, and prospects. Conversely, any failure to enter any collaboration or other strategic transaction that would be beneficial to us could delay the development and potential commercialization of our product candidates and have a negative impact on the competitiveness of any product candidate that reaches market.

We face competition from entities that have developed or may develop product candidates for our target disease indications, including companies developing novel treatments and technology platforms based on modalities and technology similar to ours. If these companies develop technologies or product candidates more rapidly than we do or their technologies, including delivery technologies, are more effective, our ability to develop and successfully commercialize product candidates may be adversely affected.

The development and commercialization of drugs is highly competitive. We compete with a variety of multinational pharmaceutical companies and specialized biotechnology companies, as well as technology being developed at universities and other research institutions. Our competitors have developed, are developing, or may develop product candidates and processes competitive with our product candidates, some of which may become commercially available before any of our product candidates. Competitive therapeutic treatments include those that have already been approved and accepted by the medical community and any new treatments that enter

the market. We are aware of many companies that are working in the field of RNAi therapeutics, including major pharmaceutical companies and a number of biopharmaceutical companies including Alnylam, Arrowhead Pharmaceuticals, Inc. (“Arrowhead”), and Arbutus Biopharma Corporation. We believe that a significant number of products are currently under development, and may become commercially available in the future, for the treatment of conditions for which we may try to develop product candidates.

We also compete with companies working to develop antisense and other RNA-based drugs. Like RNAi therapeutics, antisense drugs target mRNA with the objective of suppressing the activity of specific genes. The development of antisense drugs is more advanced than that of RNAi therapeutics, and antisense technology may become the preferred technology for products that target mRNAs. Significant competition also exists from companies such as Alnylam and Arrowhead to discover and develop safe and effective means to deliver therapeutic RNAi molecules, such as DsiRNAs, to the relevant cell and tissue types.

Many of our competitors have significantly greater financial, technical, manufacturing, marketing, sales and supply resources, or experience than we have. If we successfully obtain approval for any product candidate, we will face competition based on many different factors, including safety and effectiveness, ease with which our products can be administered and the extent to which patients and physicians accept relatively new routes of administration, timing and scope of regulatory approvals, availability and cost of manufacturing, marketing and sales capabilities, price, reimbursement coverage, and patent position of our products. Competing products could present superior treatment alternatives, including by being more effective, safer, less expensive or marketed and sold more effectively than any products we may develop. Competitive products may make any products we develop obsolete or noncompetitive before we recover the expense of developing and commercializing our product candidates. Competitors could also recruit our employees, which could negatively impact our level of expertise and our ability to execute our business plan.

Any inability to attract and retain qualified key management and technical personnel would impair our ability to implement our business plan.

Our success largely depends on the continued service of key management and other specialized personnel, including: Douglas M. Fambrough, III, Ph.D., our chief executive officer; Bob D. Brown, Ph.D., our chief scientific officer; Ralf Roskamp, M.D., our chief medical officer; John B. Green, our chief financial officer; and James B. Weissman, our chief business officer. The loss of one or more members of our management team or other key employees or advisors could delay our research and development programs and materially harm our business, financial condition, results of operations, and prospects. The relationships that our key managers have cultivated within our industry make us particularly dependent upon their continued employment with us. We are dependent on the continued service of our technical personnel because of the highly complex nature of our product candidates and technologies and the specialized nature of the regulatory approval process. Because our management team and key employees are not obligated to provide us with continued service, they could terminate their employment with us at any time without penalty. We do not maintain key person life insurance policies on any of our management team members or key employees. Our future success will depend in large part on our continued ability to attract and retain other highly qualified scientific, technical, and management personnel, as well as personnel with expertise in clinical testing, manufacturing, governmental regulation and commercialization. We face competition for personnel from other companies, universities, public and private research institutions, government entities, and other organizations.

If our product candidates advance into clinical trials, we may experience difficulties in managing our growth and expanding our operations.

We have limited experience in drug development and very limited experience with clinical trials of product candidates. As our product candidates enter and advance through preclinical studies and any clinical trials, we will need to expand our development, regulatory, and manufacturing capabilities or contract with other organizations to provide these capabilities for us. In the future, we expect to have to manage additional relationships with collaborators, suppliers, and other organizations. Our ability to manage our operations and future growth will require us to continue to improve our operational, financial, and management controls; reporting systems, and procedures. We may not be able to implement improvements to our management information and control systems in an efficient or timely manner and may discover deficiencies in existing systems and controls.

If any of our product candidates are approved for marketing and commercialization and we are unable to develop sales, marketing, and distribution capabilities on our own or enter into agreements with third parties to perform these functions on acceptable terms, we will be unable to successfully commercialize any such future products.

We currently have no sales, marketing, or distribution capabilities or experience. If any of our product candidates are approved, we will need to develop internal sales, marketing, and distribution capabilities to commercialize such products, which would be expensive and time-consuming, or enter into collaborations with third parties to perform these services. If we decide to market our products directly, we will need to commit significant financial, legal, and managerial resources to develop a marketing and sales force with technical expertise and supporting distribution, administration, and compliance capabilities. If we rely on third parties with such capabilities to market our approved products or decide to co-promote products with collaborators, we will need to establish and maintain marketing and distribution arrangements with third parties, and there can be no assurance that we will be able to enter into such arrangements on acceptable, compliant terms, or at all. In entering into third-party marketing or distribution arrangements, any revenue we receive will depend upon the efforts of the third parties and there can be no assurance that such third parties will establish adequate sales and distribution capabilities or be successful in gaining market acceptance of any approved product. If we are not successful in commercializing any product approved in the future, either on our own or through third parties, our business, financial condition, results of operations, and prospects could be materially and adversely affected.

If we fail to comply with U.S. and foreign regulatory requirements, regulatory authorities could limit or withdraw any marketing or commercialization approvals we may receive and subject us to other penalties that could materially harm our business.

The Company, our product candidates, our suppliers, and our contract manufacturers, distributors, and contract testing laboratories are subject to extensive regulation by governmental authorities in the EU, the U.S., and other countries, with the regulations differing from country to country.

Even if we receive marketing and commercialization approval of a product candidate, we and our third-party services providers will be subject to continuing regulatory requirements, including a broad array of regulations related to establishment registration and product listing, manufacturing processes, risk management measures, quality and pharmacovigilance systems, post-approval clinical studies, labeling, advertising and promotional activities, record keeping, distribution, adverse event reporting, import and export of pharmaceutical products, pricing, sales and marketing, and fraud and abuse requirements. We are required to submit safety and other post market information and reports and are subject to continuing regulatory review, including in relation to adverse patient experiences with the product and clinical results that are reported after a product is made commercially available, both in the U.S. and any foreign jurisdiction in which we seek regulatory approval. The FDA and certain foreign regulatory authorities, such as the EMA, have significant post-market authority, including the authority to require labeling changes based on new safety information and to require post-market studies or clinical trials to evaluate safety risks related to the use of a product or to require withdrawal of the product from the market. The FDA also has the authority to require a risk evaluation and mitigation strategy (“REMS”) plan after approval, which may impose further requirements or restrictions on the distribution or use of an approved drug. The EMA now routinely requires risk management plans (“RMPs”) as part of the marketing authorization application process, and such plans must be continually modified and updated throughout the lifetime of the product as new information becomes available. In addition, for nationally authorized medicinal products, the relevant governmental authority of any EU member state can request an RMP whenever there is a concern about a risk affecting the benefit risk balance of the product. The manufacturer and manufacturing facilities we use to make a future product, if any, will also be subject to periodic review and inspection by the FDA and other regulatory agencies, including for continued compliance with cGMP requirements. The discovery of any new or previously unknown problems with our third-party manufacturers, manufacturing processes, or facilities may result in restrictions on the product, manufacturer, or facility, including withdrawal of the product from the market. If we rely on third-party manufacturers, we will not have control over compliance with applicable rules and regulations by such manufacturers. Any product promotion and advertising will also be subject to regulatory requirements and continuing regulatory review. If we or our collaborators, manufacturers, or service providers fail to comply with applicable continuing regulatory requirements in the U.S. or foreign jurisdictions in which we seek to market our products, we or they may be subject to, among other things, fines, warning and untitled letters, clinical holds, delay or refusal by the FDA or foreign regulatory authorities to approve pending applications or supplements to approved applications, suspension, refusal to renew or withdrawal of regulatory approval, product recalls, seizures or administrative detention of products, refusal to permit the import or export of products, operating restrictions, inability to participate in government programs including Medicare and Medicaid, and total or partial suspension of production or distribution, injunction, restitution, disgorgement, debarment, civil penalties, and criminal prosecution.

We have a subsidiary located in the United Kingdom (“UK”), which we established in order to allow us to conduct clinical trials in EU member states. On June 23, 2016, the UK held a referendum in which voters approved an exit from the EU, commonly referred to as “Brexit.” The withdrawal of the UK from the EU will take effect either on the effective date of the withdrawal agreement or, in the absence of agreement, two years after the UK provides a notice of withdrawal pursuant to the EU Treaty. On March 29, 2017, the Prime Minister of the UK delivered a formal notice of withdrawal to the EU. On May 22, 2017, the Council of the EU (the “Council”), adopted a decision authorizing the opening of Brexit negotiations with the UK and formally nominated the European Commission as EU negotiator. The Council also adopted negotiating directives for the talks, which began on April 18, 2018. It appears likely that the UK’s withdrawal from the EU will involve a process of lengthy negotiations between the UK and EU member states to determine the future terms of the UK’s relationship with the EU. This could lead to a period of uncertainty and increase the likelihood that we establish a new subsidiary elsewhere in the EU for ongoing regulatory initiatives therein.

Price controls imposed in foreign markets and downward pricing pressure in the U.S. may adversely affect our future profitability.

In some countries, particularly member states of the EU, the pricing of prescription drugs may be subject to governmental control, at national as well as at regional levels. In these countries, pricing negotiations with governmental authorities can take considerable time after receipt of marketing approval for a product. In addition, in the U.S. and elsewhere, there can be considerable pressure by governments and other stakeholders on prices and reimbursement levels, including as part of cost containment measures. Political, economic and regulatory developments may further complicate pricing and reimbursement negotiations, and pricing negotiations may continue after coverage or reimbursement has been obtained. Reference pricing used by various EU member states and parallel distribution, or arbitrage between low-priced and high-priced member states, can further reduce prices. In some countries, we or our collaborators may be required to conduct a clinical trial or other studies that compare the cost-effectiveness of our RNAi therapeutic candidates to other available therapies in order to obtain or maintain reimbursement or pricing approval. Publication of discounts by third-party payors or authorities may lead to further pressure on the prices or reimbursement levels within the country of publication and other countries. If reimbursement of any product candidate approved for marketing is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our business, financial condition, results of operations, or prospects could be adversely affected.

Our business entails a significant risk of product liability and our ability to obtain sufficient insurance coverage could harm our business, financial condition, results of operations, or prospects.

Our business exposes us to significant product liability risks inherent in the development, testing, manufacturing, and marketing of therapeutic treatments. Product liability claims could delay or prevent completion of our development programs. If we succeed in marketing products, such claims could result in an investigation by certain regulatory authorities, such as the FDA or foreign regulatory authorities, of the safety and effectiveness of our products, our manufacturing processes and facilities, or our marketing programs and potentially a recall of our products or more serious enforcement action, limitations on the approved indications for which they may be used, or suspension or withdrawal of approvals. Regardless of the merits or eventual outcome, liability claims may also result in decreased demand for our products, injury to our reputation, costs to defend related litigation, a diversion of management's time and our resources, substantial monetary awards to clinical trial participants or patients, and a decline in our stock price. We currently have product liability insurance that we believe is appropriate for our stage of development and may need to obtain higher levels prior to marketing any of our product candidates. Any insurance we have or may obtain may not provide sufficient coverage against potential liabilities. Furthermore, clinical trial and product liability insurance is becoming increasingly expensive. As a result, we may be unable to obtain sufficient insurance at a reasonable cost to protect us against losses caused by product liability claims that could have a material adverse effect on our business.

Our employees may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements, which could have a material adverse effect on our business.

We are exposed to the risk of employee fraud or other misconduct. Misconduct by employees could include, but is not limited to, intentional failures to comply with FDA or U.S. healthcare laws and regulations or applicable laws, regulations, guidance, or codes of conduct set by foreign governmental authorities or self-regulatory industry organizations, provide accurate information to any governmental authorities such as the FDA, comply with manufacturing standards we may establish, comply with federal and state healthcare fraud and abuse laws and regulations, report financial information or data accurately, or disclose unauthorized activities to us. In particular, sales, marketing, and business arrangements in the healthcare industry are subject to extensive laws, regulations, guidance, and codes of conduct intended to prevent fraud, kickbacks, self-dealing, and other abusive practices. These laws, regulations, guidance, and codes of conduct may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive program, healthcare professional, and other business arrangements. Employee misconduct could also involve the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions, including debarment or disqualification of those employees from participation in FDA-regulated activities, and serious harm to our reputation. It is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws, regulations, guidance, or codes of conduct. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, including the imposition of significant fines, exclusion from government programs, or other sanctions.

Our internal computer systems, or those of third parties with which we do business, including our CROs or other contractors or consultants, may fail or suffer security breaches, which could result in a material disruption of our product development programs or the theft of Company or patient confidential information.

Despite the implementation of security measures, our internal computer systems and those of third parties with which we do business, including our CROs and other contractors and consultants are vulnerable to damage from computer viruses, unauthorized access, natural disasters, terrorism, war, and telecommunication and electrical failures. Such events could cause interruptions of our operations. For instance, the loss of preclinical data or data from any future clinical trial involving our product candidates could result in delays in our development and regulatory filing efforts and significantly increase our costs. Certain data breaches must also be reported to affected individuals and the government, and in some cases to the media, under provisions of the U.S. federal Health Insurance Portability and Accountability Act (“HIPAA”), as amended by the Health Information Technology for Economic and Clinical Health Act (“HITECH”), other U.S. federal and state law, and requirements of non-U.S. jurisdictions, including the European Union Data Protection Directive, and financial penalties may also apply. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data, or inappropriate disclosure of confidential or proprietary information of the Company or patients, we could incur liability and the development of our product candidates could be delayed.

If we do not comply with laws regulating the protection of the environment and health and human safety, our business could be adversely affected.

Our research, development, and manufacturing involve the use of hazardous materials and various chemicals. We maintain quantities of various flammable and toxic chemicals in our facilities in Cambridge, Massachusetts, that are required for our research, development, and manufacturing activities. We are subject to federal, state, and local laws and regulations governing the use, manufacture, storage, handling, and disposal of these hazardous materials. We believe our procedures for storing, handling, and disposing these materials in our Cambridge facilities comply with the relevant guidelines of Cambridge, the Commonwealth of Massachusetts, and the Occupational Safety and Health Administration of the U.S. Department of Labor. Although we believe that our safety procedures for handling and disposing of these materials comply with the standards mandated by applicable regulations, the risk of accidental contamination or injury from these materials cannot be eliminated. If an accident occurs, we could be held liable for resulting damages, which could be substantial. We are also subject to numerous environmental, health, and workplace safety laws and regulations, including those governing laboratory procedures, exposure to blood-borne pathogens, and the handling of animals and biohazardous materials. Although we maintain workers’ compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees resulting from the use of these materials, this insurance may not provide adequate coverage against potential liabilities. We do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us in connection with our storage or disposal of biological or hazardous materials. Additional federal, state, and local laws and regulations affecting our operations may be adopted in the future. We may incur substantial costs to comply with, and substantial fines or penalties if we violate any of these laws or regulations.

Our information technology systems could face serious disruptions that could adversely affect our business.

Despite the use of off-site (cloud-based) information storage systems for all key corporate information, our internal information technology and other infrastructure systems, including corporate firewalls, servers, leased lines and connection to the Internet, face the risk of systemic failure that could disrupt our operations. A significant disruption in the availability of our information technology and other internal infrastructure systems could cause interruptions in our collaborations and delays in our research and development work.

Our current operations are largely concentrated in one location and any events affecting this location may have material adverse consequences.

Our current operations are carried out primarily in our facilities located in Cambridge, Massachusetts. Any unplanned event, such as flood, fire, explosion, earthquake, extreme weather condition, medical epidemics, power shortage, telecommunication failure, or other natural or manmade accidents, or incidents that prevent us from fully utilizing the facilities, may have a material adverse effect on our ability to operate our business, particularly on a daily basis, and have significant negative consequences on our financial and operating conditions. Loss of access to these facilities may result in increased costs, delays in the development of our product candidates, or interruption of our business operations. As part of our risk management policy, we maintain insurance coverage at levels that we believe are appropriate for our business. However, in the event of an accident or incident at these facilities, we cannot assure you that the amounts of insurance will be sufficient to satisfy any damages and losses. If our facilities are unable to operate because of an accident or incident or for any other reason, even for a short period of time, any or all of our research and development programs may be harmed. Any business interruption may have a material adverse effect on our business, financial position, results of operations, and prospects.

Our ability to utilize our net operating loss carryforwards and certain other tax attributes may be limited.

We have incurred substantial losses during our history, do not expect to become profitable for the foreseeable future, and may never achieve profitability. To the extent that we continue to generate taxable losses, unused losses will carry forward to offset future taxable income, if any, until such unused losses expire. We may be unable to use these losses to offset income before such unused losses expire. Under Section 382 of the Internal Revenue Code of 1986, as amended, if a corporation undergoes an “ownership change,” which is generally defined as a greater than 50 percentage point change by value in its equity ownership over a three-year period, the corporation’s ability to use its pre-change net operating loss carryforwards and other pre-change tax attributes to offset its post-change income may be further limited. We have not performed an analysis on whether we have experienced any ownership changes in the past. It is possible that we have experienced an ownership change, including pursuant to the initial public offering of our common stock, which closed on February 4, 2014, our follow-on offering of common stock in 2015, our underwritten follow-on public offering in December 2017 and the issuance of common stock in connection with the conversion in December 2017, of our redeemable convertible preferred stock, which we had issued in April 2017 (“Redeemable Convertible Preferred”), and that our net operating losses are subject to such limitation. As of December 31, 2017, we had significant U.S. federal and Massachusetts net operating loss carryforwards. Any limit on these loss carryforwards if we have or do experience an ownership change could have an adverse effect on our business, financial position, results of operations, and prospects.

The investment of our cash and cash equivalents and held-to-maturity investments is subject to risks which may cause losses and affect the liquidity of these investments.

As of June 30, 2018, we had \$82.3 million in cash and cash equivalents and held-to-maturity investments. We historically have invested substantially all of our available cash and cash equivalents in corporate bonds, commercial paper, securities issued by the U.S. government, certificates of deposit, and money market funds meeting the criteria of our investment policy, which is focused on the preservation of our capital. These investments are subject to general credit, liquidity, market, and interest rate risks. For example, the impact of U.S. sub-prime mortgage defaults in recent years affected various sectors of the financial markets and caused credit and liquidity issues. We may realize losses in the fair value of these investments or a complete loss of these investments, which would have a negative effect on our consolidated financial statements.

In addition, should our investments cease paying or reduce the amount of interest paid to us, our interest income would suffer. The market risks associated with our investment portfolio may have an adverse effect on our results of operations, liquidity, and financial condition.

Changes in accounting rules and regulations, or interpretations thereof, could result in unfavorable accounting charges or require us to change our compensation policies.

Accounting methods and policies for biopharmaceutical companies, including policies governing revenue recognition, research and development and related expenses, and accounting for stock-based compensation, are subject to review, interpretation, and guidance from our auditors and relevant accounting authorities, including the SEC. Changes to accounting methods or policies, or interpretations thereof, may require us to reclassify, restate, or otherwise change or revise our consolidated financial statements, including those contained in our Annual Reports on Form 10-K.

Risks Related to Intellectual Property

If we are not able to obtain and enforce patent protection for our technologies or product candidates, development and commercialization of our product candidates may be adversely affected.

Our success depends in part on our ability to obtain and maintain patents and other forms of intellectual property rights, including in-licenses of intellectual property rights of others, for our product candidates, methods used to manufacture our product candidates and methods for treating patients using our product candidates, as well as our ability to preserve our trade secrets, to prevent third parties from infringing upon our proprietary rights, and to operate without infringing upon the proprietary rights of others. There can be no assurance that an issued patent will remain valid and enforceable in a court of law through the entire patent term. Should the validity of a patent be challenged, the legal process associated with defending the patent may be costly and time consuming. Issued patents can be subject to oppositions, interferences, post-grant proceedings, and other third-party challenges that can result in the revocation of the patent or limit patent claims such that patent coverage lacks sufficient breadth to protect subject matter that is commercially relevant. Competitors may be able to circumvent our patents. Development and commercialization of pharmaceutical products can be subject to substantial delays and it is possible that at the time of commercialization any patent covering the product will have expired or will be in force for only a short period of time thereafter.

As of August 8, 2018, our worldwide patent estate, not including the patents and patent applications that we have licensed from third parties, included over 50 issued patents or allowed patent applications and over 100 pending patent applications supporting commercial development of our RNAi molecules and delivery technologies. We may not be able to apply for patents on certain aspects of our product candidates or delivery technologies in a timely fashion or at all. Our existing issued and granted patents and any future patents we obtain may not be sufficiently broad to prevent others from using our technology or from developing competing products and technology. There is no guarantee that any of our pending patent applications will result in issued or granted patents, that any of our issued or granted patents will not later be found to be invalid or unenforceable, or that any issued or granted patents will include claims that are sufficiently broad to cover our product candidates or delivery technologies or to provide meaningful protection from our competitors. Moreover, the patent position of biotechnology and pharmaceutical companies can be highly uncertain because it involves complex legal and factual questions. We will be able to protect our proprietary rights from unauthorized use by third parties only to the extent that our current and future proprietary technology and product candidates are covered by valid and enforceable patents or are effectively maintained as trade secrets. If third parties disclose or misappropriate our proprietary rights, it may materially and adversely impact our position in the market.

The U.S. Patent and Trademark Office (“USPTO”) and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment, and other provisions during the patent process. There are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case. The standards applied by the USPTO and foreign patent offices in granting patents are not always applied uniformly or predictably. For example, there is no uniform worldwide policy regarding patentable subject matter or the scope of claims allowable in biotechnology and pharmaceutical patents. As such, we do not know the degree of future protection that we will have on our proprietary products and technology. While we will endeavor to protect our product candidates with intellectual property rights such as patents, as appropriate, the process of obtaining patents is time-consuming, expensive, and sometimes unpredictable.

In addition, there are numerous recent changes to the patent laws and proposed changes to the rules of the USPTO which may have a significant impact on our ability to protect our technology and enforce our intellectual property rights. For example, the Leahy-Smith America Invents Act enacted in 2011 involves significant changes in patent legislation. The U.S. Supreme Court has ruled on several patent cases in recent years, some of which cases either narrow the scope of patent protection available in certain circumstances or weaken the rights of patent owners in certain situations. The 2013 decision by the U.S. Supreme Court in *Association for Molecular Pathology v. Myriad Genetics, Inc.* precludes a claim to a nucleic acid having a stated nucleotide sequence which is identical to a sequence found in nature and unmodified. We currently are not aware of an immediate impact of this decision on our patents or patent applications because we are developing nucleic acid products that are not found in nature. However, this decision has yet to be clearly interpreted by courts and by the USPTO. We cannot assure you that the interpretations of this decision or subsequent rulings will not adversely impact our patents or patent applications. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents, once obtained. Depending on decisions by the U.S. Congress, the federal courts, and the USPTO, the laws and regulations governing U.S. patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future.

Once granted, patents may remain open to opposition, interference, re-examination, post-grant review, inter partes review, nullification or derivation action in court or before patent offices or similar proceedings for a given period before or after allowance or grant, during which time third parties can raise objections against such initial grant. In the course of such proceedings, which may continue for a protracted period of time, the patent owner may be compelled to limit the scope of the allowed or granted claims thus attacked, or may lose the allowed or granted claims altogether. Our patent risks include that:

- others may, or may be able to, make, use, or sell compounds that are the same as or similar to our product candidates but that are not covered by the claims of the patents that we own or license;
- we or our licensors, collaborators, or any future collaborators may not be the first to file patent applications covering certain aspects of our inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights;
- a third party may challenge our patents, and, if challenged, a court may not hold that our patents are valid, enforceable, and infringed;
- a third party may challenge our patents in various patent offices, and, if challenged, we may be compelled to limit the scope of our allowed or granted claims or lose the allowed or granted claims altogether;

- any issued patents that we own or have licensed from others may not provide us with any competitive advantages, or may be challenged by third parties;
- we may not develop additional proprietary technologies that are patentable;
- the patents of others could harm our business; and
- our competitors could conduct research and development activities in countries where we will not have enforceable patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets.

Intellectual property rights of third parties could adversely affect our ability to commercialize our product candidates, and we might be required to litigate or obtain licenses from third parties in order to develop or market our product candidates. Such litigation could be costly and licenses may be unavailable on commercially reasonable terms.

Research and development of RNAi-based therapeutics and other oligonucleotide-based therapeutics has resulted in many patents and patent applications from organizations and individuals seeking to obtain patent protection in the field. Our efforts are based on RNAi technology that we have licensed and that we have developed internally and own or co-own. We have chosen this approach to increase our likelihood of technical success and our freedom to operate. We have obtained grants and issuances of RNAi-based patents and have licensed other patents from third parties on exclusive and non-exclusive bases. The issued patents and pending patent applications in the U.S. and in key markets around the world that we own, co-own, or license claim many different methods, compositions, and processes relating to the discovery, development, manufacture, and commercialization of RNAi therapeutics. Specifically, we own, co-own, or have licensed a portfolio of patents, patent applications, and other intellectual property covering: (1) certain aspects of the structure and uses of RNAi molecules, including their manufacture and use as therapeutics, and RNAi-related mechanisms, (2) chemical modifications to RNAi molecules that improve their properties and suitability for therapeutic uses, (3) RNAi molecules directed to specific gene sequences and drug targets as treatments for particular diseases, and (4) delivery technologies, such as in the field of lipid nanoparticles and lipid nanoparticle formulation, and chemical modifications such as conjugation to targeting moieties.

The RNAi-related intellectual property landscape, including patent applications in prosecution where no definitive claims have yet issued, is still evolving, and it is difficult to conclusively assess our freedom to operate. Other companies are pursuing patent applications and possess issued patents broadly directed to RNAi compositions, methods of making and using RNAi, and to RNAi-related delivery and modification technologies. Our competitive position may suffer if patents issued to third parties cover our products, or our manufacture or uses relevant to our commercialization plans. In such cases, we may not be in a position to commercialize products unless we enter into a license agreement with the intellectual property right holder, if available, on commercially reasonable terms or successfully pursue litigation, opposition, interference, re-examination, post-grant review, inter partes review, nullification, derivation action, or cancellation proceeding to limit, nullify, or invalidate the third-party intellectual property right concerned. Even if we are successful in limiting, nullifying, or invalidating third-party intellectual property rights through such proceedings, we may incur substantial costs and could require significant time and attention of our personnel.

While we believe our intellectual property allows us to pursue our current development programs, the biological process of RNAi is a natural process and cannot be patented. Several companies in the space are pursuing alternate methods to exploit this phenomenon and have built their intellectual property around these methods. For example, Alnylam controls three patent families containing both pending patent applications and issued patents (e.g., U.S. Patent Numbers 8,853,384 and 9,074,213, and European Patent EP 1 352 061 B1) that pertain to RNAi. These are referred to in their corporate literature as the “Tuschl family” (e.g. patents and applications claiming priority to WO2002/044321, filed November 29, 2001, and their priority filings) and the “Kreutzer-Limmer family” (e.g. patents and applications claiming priority to WO 2002/044895, filed January 29, 2000, WO 2002/055693, filed January 9, 2002, and their priority filings). Both families contain patent applications still in prosecution, with the applicants actively seeking to extend the reach of this intellectual property in ways that might strategically impact our business. Additional areas of intellectual property pursued by Alnylam and others include oligonucleotide delivery-related technologies (such as conjugation to targeting moieties) and oligonucleotides directed to specific gene targets. In addition, Silence Therapeutics owns patents directed to certain chemical modifications of RNAi molecules, including U.S. Patent Number 9,222,092, with a priority date of August 5, 2002.

Patent applications in the U.S. and elsewhere are generally published approximately 18 months after the earliest filing for which priority is claimed, with such earliest filing date being commonly referred to as the priority date. Therefore, patent applications covering our product candidates or platform technology could have been filed by others without our knowledge. Additionally, pending claims in patent applications which have been published can, subject to certain limitations, be later amended in a manner that could cover our platform technologies, our product candidates, or the use of our product candidates. Third-party intellectual property right holders may also bring patent infringement claims against us. No such patent infringement actions have been brought against us. We cannot guarantee that we will be able to successfully settle or otherwise resolve any future infringement claims. If we are unable to successfully settle future claims on terms acceptable to us, we may be required to engage in or continue costly, unpredictable, and time-consuming litigation, and may be prevented from or experience substantial delays in marketing our products. If we fail in any such dispute, in addition to being forced to pay damages, we may be temporarily or permanently prohibited from commercializing any of our product candidates that are held to be infringing. We might also be forced to redesign product candidates so that we no longer infringe the third-party intellectual property rights. Any of these events, even if we were ultimately to prevail, could require us to divert substantial financial and management resources that we would otherwise be able to devote to our business.

As the field of RNAi therapeutics matures, patent applications are being processed by national patent offices around the world. There is uncertainty about which patents will issue, and, if they do, as to when, to whom, and with what claims. It is likely that there will be significant litigation in the courts and other proceedings, such as interference, re-examination, opposition, post-grant review, inter partes review, nullification, derivation action, or cancellation proceedings, in various patent offices relating to patent rights in the RNAi therapeutics field. In many cases, the possibility of appeal or opposition exists for either us or our opponents, and it may be years before final, unappealable rulings are made with respect to these patents in certain jurisdictions. The timing and outcome of these and other proceedings is uncertain and may adversely affect our business if we are not successful in defending the patentability and scope of our pending and issued patent claims or if third parties are successful in obtaining claims that cover our RNAi technology or any of our product candidates. In addition, third parties may attempt to invalidate our intellectual property rights. Even if our rights are not directly challenged, disputes could lead to the weakening of our intellectual property rights. Our defense against any attempt by third parties to circumvent or invalidate our intellectual property rights could be costly to us, could require significant time and attention of our management, and could have a material adverse effect on our business and our ability to successfully compete in the field of RNAi therapeutics.

There are many issued and pending patents that claim aspects of oligonucleotide chemistry and modifications that we may need to apply to our therapeutic candidates. There are also many issued patents that claim targeting genes or portions of genes that may be relevant for drugs we wish to develop. Thus, it is possible that one or more organizations will hold patent rights to which we will need a license. If those organizations refuse to grant us a license to such patent rights on reasonable terms, we may be unable to market products or perform research and development or other activities covered by these patents.

We may license patent rights from third-party owners or licensees. If such owners or licensees do not properly or successfully obtain, maintain, or enforce the patents underlying such licenses, or if they retain or license to others any competing rights, our competitive position and business prospects may be adversely affected.

We may, in the future, rely on intellectual property rights licensed from third parties to protect our technology, including licenses that give us rights to third-party intellectual property that is necessary or useful for our business. We also may license additional third-party intellectual property in the future. Our success may depend in part on the ability of our licensors to obtain, maintain, and enforce patent protection for our licensed intellectual property, in particular, those patents to which we have secured exclusive rights. Our licensors may not successfully prosecute the patent applications licensed to us. Even if patents issue or are granted, our licensors may fail to maintain these patents, may determine not to pursue litigation against other companies that are infringing these patents, or may pursue litigation less aggressively than we would. Further, we may not obtain exclusive rights, which would allow for third parties to develop competing products. Without protection for, or exclusive right to, the intellectual property we license, other companies might be able to offer substantially identical products for sale, which could adversely affect our competitive business position and harm our business prospects. In addition, we sublicense certain of our rights under our third-party licenses to BI and may sublicense such rights to current or future collaborators. Any impairment of these sublicensed rights could result in reduced revenue under our collaboration agreement with BI or result in termination of an agreement by one or more of our existing or any other future collaborators.

We may be unable to protect our intellectual property rights throughout the world.

Obtaining a valid and enforceable issued or granted patent covering our technology in the U.S. and worldwide can be extremely costly. In jurisdictions where we have not obtained patent protection, competitors may use our technology to develop their own products, and further, may export otherwise infringing products to territories where we have patent protection, but where it is more difficult to enforce a patent as compared to the U.S. We also may face competition in jurisdictions where we do not have issued or granted patents or where our issued or granted patent claims or other intellectual property rights are not sufficient to prevent competitor activities in these jurisdictions. The legal systems of certain countries, particularly certain developing countries, make it

difficult to enforce patents and such countries may not recognize other types of intellectual property protection, particularly that relating to biopharmaceuticals. This could make it difficult for us to prevent the infringement of our patents or marketing of competing products in violation of our proprietary rights generally in certain jurisdictions. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial cost and divert our efforts and attention from other aspects of our business.

We generally file a provisional patent application first (a priority filing) at the USPTO. A U.S. utility application and/or international application under the Patent Cooperation Treaty (“PCT”) are usually filed within 12 months after the priority filing. Based on the PCT filing, national and regional patent applications may be filed in the EU, Japan, Australia, and Canada and, depending on the individual case, also in any or all of, inter alia, China, India, South Korea, Singapore, Taiwan, and South Africa. We have so far not filed for patent protection in all national and regional jurisdictions where such protection may be available. In addition, we may decide to abandon national and regional patent applications before grant. Finally, the grant proceeding of each national or regional patent is an independent proceeding which may lead to situations in which applications might be refused in some jurisdictions, while granted by others. Depending on the country, various scopes of patent protection may be granted on the same product candidate or technology.

The laws of some jurisdictions do not protect intellectual property rights to the same extent as the laws in the U.S., and many companies have encountered significant difficulties in protecting and defending such rights in such jurisdictions. If we or our licensors encounter difficulties in protecting, or are otherwise precluded from effectively protecting, the intellectual property rights important for our business in such jurisdictions, the value of these rights may be diminished and we may face additional competition from others in those jurisdictions. Many countries have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In addition, many countries limit the enforceability of patents against government agencies or government contractors. In these countries, the patent owner may have limited remedies, which could materially diminish the value of such patent. If we or any of our licensors are forced to grant a license to third parties with respect to any patents relevant to our business, our competitive position in the relevant jurisdiction may be impaired and our business and results of operations may be adversely affected.

We, our licensors, or existing or future collaborators may become subject to third-party claims or litigation alleging infringement of patents or other proprietary rights or seeking to invalidate patents or other proprietary rights, and we may need to resort to litigation to protect or enforce our patents or other proprietary rights, all of which could be costly, time consuming, delay, or prevent the development and commercialization of our product candidates, or put our patents and other proprietary rights at risk.

We, our licensors, or existing or future collaborators may be subject to third-party claims for infringement or misappropriation of patent or other proprietary rights. We are generally obligated under our license or collaboration agreements to indemnify and hold harmless our licensors or collaborators for damages arising from intellectual property infringement by us. If we, our licensors or existing or future collaborators are found to infringe a third-party patent or other intellectual property rights, we could be required to pay damages, potentially including treble damages, if we are found to have willfully infringed. In addition, we, our licensors, or existing or future collaborators may choose to seek, or be required to seek, a license from a third party, which may not be available on acceptable terms, if at all. Even if a license can be obtained on acceptable terms, the rights may be non-exclusive, which could give our competitors access to the same technology or intellectual property rights licensed to us. If we fail to obtain a required license, we, our licensors, or existing or future collaborators may be unable to effectively market product candidates based on our technology, which could limit our ability to generate revenue or achieve profitability and possibly prevent us from generating revenue sufficient to sustain our operations. In addition, we may find it necessary to pursue claims or initiate lawsuits to protect or enforce our patent or other intellectual property rights. The cost to us in defending or initiating any litigation or other proceeding relating to patent or other proprietary rights, even if resolved in our favor, could be substantial, and litigation would divert our management’s attention. Some of our competitors may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could delay our research and development efforts and limit our ability to continue our operations.

If we were to initiate legal proceedings against a third party to enforce a patent covering one of our products or our technology, the defendant could counterclaim that our patent is invalid or unenforceable. In patent litigation in the U.S., defendant counterclaims alleging invalidity or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, for example, lack of novelty, obviousness, or non-enablement. Grounds for an unenforceability assertion could be an allegation that someone connected with prosecution of the patent withheld relevant information from the USPTO, or made a misleading statement, during patent prosecution. The outcome following legal assertions of invalidity and unenforceability during patent litigation is unpredictable. With respect to the validity question, for example, we cannot be certain that there is no invalidating prior art, of which we and the patent examiner were unaware during patent prosecution. If a defendant were to prevail on a legal assertion of invalidity or unenforceability, we would lose at least part, and perhaps all, of the patent protection on one or more of our products or certain aspects of our platform technology. Such a loss of patent protection could have a material adverse impact on our business. Patents and other intellectual property rights also will not protect our technology if competitors design around our protected technology without legally infringing our patents or other intellectual property rights.

If we fail to comply with our obligations under any license, collaboration, or other agreements, we may be required to pay damages and could lose intellectual property rights that are necessary for developing and protecting our product candidates and delivery technologies, or we could lose certain rights to grant sublicenses.

Any future licenses we enter into are likely to impose various development, commercialization, funding, milestone, royalty, diligence, sublicensing, insurance, patent prosecution and enforcement, and other obligations on us. If we breach any of these obligations, or use the intellectual property licensed to us in an unauthorized manner, we may be required to pay damages, and the licensor may have the right to terminate the license, which could result in us being unable to develop, manufacture, and sell products that are covered by the licensed technology, or enable a competitor to gain access to the licensed technology. Moreover, our licensors may own or control intellectual property that has not been licensed to us and, as a result, we may be subject to claims, regardless of their merit, that we are infringing or otherwise violating the licensor's rights. In addition, while we cannot currently determine the amount of the royalty obligations we would be required to pay on sales of future products, if any, the amounts may be significant. The amount of our future royalty obligations will depend on the technology and intellectual property we use in products that we successfully develop and commercialize, if any. Therefore, even if we successfully develop and commercialize products, we may be unable to achieve or maintain profitability.

If we are unable to protect the confidentiality of our trade secrets, our business and competitive position would be harmed.

In addition to seeking patent protection for certain aspects of our product candidates and delivery technologies, we also consider trade secrets, including confidential and unpatented know-how, important to the maintenance of our competitive position. We protect trade secrets and confidential and unpatented know-how, in part, by entering into non-disclosure and confidentiality agreements with parties who have access to such knowledge, such as our employees, corporate collaborators, outside scientific collaborators, CROs, contract manufacturers, consultants, advisors, and other third parties. We also enter into confidentiality and invention or patent assignment agreements with our employees and consultants that obligate them to maintain confidentiality and assign their inventions to us. Despite these efforts, any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret is difficult, expensive, and time-consuming, and the outcome is unpredictable. In addition, some courts in the U.S. and certain foreign jurisdictions are less willing or unwilling to protect trade secrets. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor, we would have no right to prevent them from using that technology or information to compete with us. If any of our trade secrets were to be disclosed to or independently developed by a competitor, our competitive position would be harmed.

We are also subject both in the U.S. and outside the U.S. to various regulatory schemes regarding requests for the information we provide to regulatory authorities, which may include, in whole or in part, trade secrets or confidential commercial information. While we are likely to be notified in advance of any disclosure of such information and would likely object to such disclosure, there can be no assurance that our challenge to the request would be successful.

We may be, in the future, subject to claims that we or our employees or consultants have wrongfully used or disclosed alleged trade secrets of our employees' or consultants' former employers or their clients. These claims may be costly to defend and if we do not successfully do so, we may be required to pay monetary damages, may be prohibited from using some of our research and development work, and may lose valuable intellectual property rights or personnel.

Many of our employees were previously employed at universities or biotechnology or pharmaceutical companies, including our competitors or potential competitors. From time to time, we have received correspondence from other companies alleging the improper use or disclosure, or inquiring regarding the use or disclosure, by certain of our employees who have previously been employed elsewhere in our industry, including with our competitors, of their former employer's trade secrets or other proprietary information. Responding to these allegations can be costly and disruptive to our business, even when the allegations are without merit, and can be a distraction to management.

We may be subject to additional claims in the future that these or other employees of the Company have, or we have, inadvertently or otherwise used or disclosed trade secrets or other proprietary information of their former employers. Litigation may be necessary to defend against these claims. If we fail in defending current or future claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, personnel, or the ability to use some of our research and development work. A loss of intellectual property, key research personnel, or their work product could hamper our ability to commercialize, or prevent us from commercializing, our product candidates, which could severely harm our business.

If our trademarks and trade names are not adequately protected, we may not be able to build name recognition in our markets of interest and our business may be adversely affected.

Our trademarks or trade names may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. Any trademark litigation could be expensive. We may not be able to protect our rights to these trademarks and trade names or may be forced to stop using these names, which we need for name recognition by potential collaborators or customers in our markets of interest. If we are unable to establish name recognition based on our trademarks and trade names, we may not be able to compete effectively and our business may be adversely affected.

Risks Related to Government Regulation

We may be unable to obtain U.S. or foreign regulatory approval and, as a result, may be unable to commercialize our product candidates.

Our product candidates are subject to extensive governmental regulations relating to, among other things, research, development, testing, manufacture, quality control, approval, labeling, packaging, promotion, storage, record-keeping, advertising, distribution, sampling, pricing, sales and marketing, safety, post-approval monitoring and reporting, and export and import of drugs. Rigorous preclinical testing and clinical trials and an extensive regulatory approval process are required to be successfully completed in the U.S. and in many foreign jurisdictions before a new drug can be marketed. Satisfaction of these and other regulatory requirements is costly, time consuming, uncertain, and subject to unanticipated delays. It is possible that none of the product candidates we may develop will obtain the regulatory approvals necessary for us or our collaborators to begin selling them.

We have very limited experience in conducting and managing the clinical trials necessary to obtain regulatory approvals, including approval by the FDA as well as foreign regulatory authorities, such as the EMA. The time required to obtain FDA and foreign regulatory approvals is unpredictable but typically takes many years following the commencement of clinical trials, depending upon the type, complexity, and novelty of the product candidate. The standards that the FDA and its foreign counterparts use when regulating us are not always applied predictably or uniformly and can change. Any analysis we perform of data from preclinical and clinical activities is subject to confirmation and interpretation by regulatory authorities, which could delay, limit, or prevent regulatory approval. We may also encounter unexpected delays or increased costs due to new government regulations, for example, from future legislation or administrative action, or from changes in the policy of the FDA or foreign regulatory authorities during the period of product development, clinical trials, and regulatory review by the FDA or foreign regulatory authorities. It is impossible to predict whether legislative changes will be enacted, or whether FDA or foreign laws, regulations, guidance, or interpretations will be changed, or what the impact of such changes, if any, may be.

Because the drugs we are developing may represent a new class of drug, the FDA and its foreign counterparts have not yet established any definitive policies, practices, or guidelines in relation to these drugs. While we believe the product candidates that we are currently developing are regulated as new drugs under the Federal Food, Drug, and Cosmetic Act, the FDA could decide to reclassify them, namely to regulate them or other products we may develop as biologics under the Public Health Service Act. The lack of policies, practices, or guidelines may hinder or slow review by the FDA or foreign regulatory authorities of any regulatory filings that we may submit. Moreover, the FDA or foreign regulatory authorities may respond to these submissions by defining requirements we may not have anticipated. Such responses could lead to significant delays in the clinical development of our product candidates. In addition, because there may be approved treatments for some of the diseases for which we may seek approval, in order to receive regulatory approval, we may need to demonstrate through clinical trials that the product candidates we develop to treat these diseases, if any, are not only safe and effective, but safer or more effective than existing products.

Any delay or failure in obtaining required approvals could have a material adverse effect on our ability to generate revenues from the particular product candidate for which we are seeking approval. Furthermore, any regulatory approval to market a product may be subject to limitations on the approved uses for which we may market the product or the labeling or other restrictions. Regulatory authorities also may impose requirements for costly post-marketing studies or clinical trials and surveillance to monitor the safety or efficacy of the product. In addition, the FDA has the authority to require a REMS plan as part of an NDA or biologics license application or after approval, which may impose further requirements or restrictions on the distribution or use of an approved drug or biologic, such as limiting prescribing to certain physicians or medical centers that have undergone specialized training, limiting treatment to patients who meet certain safe-use criteria, and requiring treated patients to enroll in a registry. These limitations and restrictions may limit the size of the market for the product and affect coverage and reimbursement by third-party payors.

We are also subject to numerous foreign regulatory requirements governing, among other things, the conduct of clinical trials, manufacturing and marketing authorization, pricing, and third-party reimbursement. The foreign regulatory approval process varies among countries and may include all of the risks associated with FDA approval described above as well as risks attributable to the satisfaction of local regulations in foreign jurisdictions. Moreover, the time required to obtain approval may differ from that required to obtain FDA approval. Approval by the FDA does not ensure approval by regulatory authorities outside the U.S. and vice versa.

If we or current or future collaborators, manufacturers, or service providers fail to comply with healthcare laws and regulations, we or they could be subject to enforcement actions and substantial penalties, which could affect our ability to develop, market, and sell our products, and may harm our reputation.

Although we do not currently have any products on the market, once our therapeutic candidates or clinical trials are covered by federal health care programs, we will be subject to additional healthcare statutory and regulatory requirements and enforcement by the federal, state and foreign governments of the jurisdictions in which we conduct our business. Healthcare providers, physicians, and third-party payors play a primary role in the recommendation and prescription of any therapeutic candidates for which we obtain marketing approval. Our future arrangements with third-party payors and customers may expose us to broadly applicable fraud and abuse, transparency, and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell, and distribute our therapeutic candidates for which we obtain marketing approval. Restrictions under applicable federal and state healthcare laws and regulations include, but are not limited to, the following:

- the U.S. federal Anti-Kickback Statute, which prohibits, among other things, persons from soliciting, receiving, offering, or providing remuneration, directly or indirectly, to induce either the referral of an individual for a healthcare item or service, or the purchasing or ordering of an item or service, for which payment may be made, in whole or in part, under a federal healthcare program such as Medicare or Medicaid;
- federal civil and criminal false claims laws and civil monetary penalty laws, such as the U.S. federal False Claims Act (“FCA”), which imposes criminal and civil penalties, including through civil whistleblower or *qui tam* actions, against individuals or entities for knowingly presenting or causing to be presented, to the federal government, claims for payment that are false or fraudulent or making a false statement to avoid, decrease, or conceal an obligation to pay money to the federal government. In addition, the government may assert that a claim including items and services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the FCA;
- HIPAA includes a fraud and abuse provision referred to as the HIPAA All-Payor Fraud Law, which imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program, or knowingly and willfully falsifying, concealing, or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items, or services. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- HIPAA, as amended by HITECH, and its implementing regulations, which impose obligations on certain covered entity healthcare providers, health plans, and healthcare clearinghouses, as well as their business associates that perform certain services involving the use or disclosure of individually identifiable health information, including mandatory contractual terms, with respect to safeguarding the privacy, security, and transmission of individually identifiable health information, and require notification to affected individuals and regulatory authorities of certain breaches of security of individually identifiable health information;
- federal and state consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers;
- the federal Physician Payment Sunshine Act and the implementing regulations, also referred to as “Open Payments,” issued under the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Affordability Reconciliation Act of 2010, collectively referred to as the “ACA,” which require that manufacturers of pharmaceutical and biological drugs reimbursable under Medicare, Medicaid, and Children’s Health Insurance Programs report to the Department of Health and Human Services all consulting fees, travel reimbursements, research grants, and other payments, transfers of value, or gifts made to physicians and teaching hospitals with limited exceptions; and
- Analogous state laws and regulations, such as state anti-kickback and false claims laws potentially applicable to sales or marketing arrangements and claims involving healthcare items or services reimbursed by nongovernmental third-party payors, including private insurers; and some state laws require pharmaceutical companies to comply with the pharmaceutical industry’s voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government in addition to requiring drug manufacturers to report information related to payments to physicians and other healthcare providers or marketing expenditures, and state laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.
- The EU General Data Protection Regulation, which was officially adopted in April 2016 and enforced in May 2018, introduces new data protection requirements in the European Union, as well as substantial fines for breaches of the data protection rules. The EU General Data Protection Regulation will increase our responsibility and liability in relation to personal data that we process, and we may be required to put in place additional mechanisms to ensure compliance with the new EU data protection rules.

The scope and enforcement of each of these laws is uncertain and subject to rapid change in the current environment of healthcare reform, especially in light of the lack of applicable precedent and regulations. Federal and state enforcement bodies have recently increased their scrutiny of interactions between healthcare companies and healthcare providers, which has led to a number of investigations, prosecutions, convictions, and settlements in the healthcare industry. Responding to investigations can be time- and resource-consuming and can divert management's attention from the business. Any such investigation or settlement could increase our costs or otherwise have an adverse effect on our business.

Ensuring that our business arrangements with third parties comply with applicable healthcare laws and regulations could involve substantial costs. If our operations are found to be in violation of any such requirements, we may be subject to penalties, including civil or criminal penalties, monetary damages, the curtailment or restructuring of our operations, or exclusion from participation in government contracting, healthcare reimbursement, or other government programs, including Medicare and Medicaid, any of which could adversely affect our financial results. Although effective compliance programs can mitigate the risk of investigation and prosecution for violations of these laws, these risks cannot be entirely eliminated. Any action against us for an alleged or suspected violation could cause us to incur significant legal expenses and could divert our management's attention from the operation of our business, even if our defense is successful. In addition, achieving and sustaining compliance with applicable laws and regulations may be costly to us in terms of money, time, and resources.

If we or current or future collaborators, manufacturers, or service providers fail to comply with applicable federal, state, or foreign laws or regulations, we could be subject to enforcement actions, which could affect our ability to develop, market, and sell our products successfully and could harm our reputation and lead to reduced acceptance of our products by the market. These enforcement actions include, among others:

- adverse regulatory inspection findings;
- warning or untitled letters;
- voluntary or mandatory product recalls or public notification or medical product safety alerts to healthcare professionals;
- restrictions on, or prohibitions against, marketing our products;
- restrictions on, or prohibitions against, importation or exportation of our products;
- suspension of review or refusal to approve pending applications or supplements to approved applications;
- exclusion from participation in government-funded healthcare programs;
- exclusion from eligibility for the award of government contracts for our products;
- a corporate integrity agreement;
- FDA debarment of individuals at our Company;
- suspension or withdrawal of product approvals;
- seizure or administrative detention of products;
- injunctions; and
- civil and criminal penalties and fines.

Any drugs we develop may become subject to unfavorable pricing regulations, third-party coverage, and reimbursement practices or healthcare reform initiatives, thereby harming our business.

The regulations that govern marketing approvals, pricing, coverage, and reimbursement for new drugs vary widely from country to country. Some countries require approval of the sale price of a drug before it can be marketed. In many countries, the pricing review period begins after marketing or product licensing approval is granted. In some foreign markets, prescription pharmaceutical pricing remains subject to continuing governmental control even after initial approval is granted. Although we intend to monitor these regulations, our programs are currently in the early stages of development and we will not be able to assess the impact of price regulations for a number of years. As a result, we might obtain regulatory approval for a product in a particular country but then be subject to price regulations that delay our commercial launch of the product and negatively impact the revenues we are able to generate from the sale of the product in that country.

Our ability to commercialize any products successfully will also depend in part on the extent to which coverage and reimbursement for these products and related treatments will be available from government health administration authorities, private health insurers, and other organizations. However, there may be significant delays in obtaining coverage for newly-approved drugs. Moreover, eligibility for coverage does not necessarily signify that a drug will be reimbursed in all cases or at a rate that covers our costs, including research, development, manufacture, sale, and distribution costs. Also, interim payments for new drugs, if applicable, may be insufficient to cover our costs and may not be made permanent. Thus, even if we succeed in bringing one or more products to the market, these products may not be considered medically necessary or cost-effective, and the amount reimbursed for any products may be insufficient to allow us to sell our products on a competitive basis. Because our programs are in the early stages of development, we are unable at this time to determine their cost effectiveness, or the likely level or method of reimbursement. In addition, obtaining coverage and reimbursement approval of a product from a government or other third-party payor is a time-consuming and costly process that could require us to provide to each payor supporting scientific, clinical, and cost-effectiveness data for the use of our product on a payor-by-payor basis, with no assurance that coverage and adequate reimbursement will be obtained. A payor's decision to provide coverage for a product does not imply that an adequate reimbursement rate will be approved. Further, one payor's determination to provide coverage for a product does not assure that other payors will also provide coverage for the product. Adequate third-party reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in product development. If reimbursement is not available or is available only at limited levels, we may not be able to successfully commercialize any product candidate that we successfully develop.

Increasingly, the third-party payors who reimburse patients or healthcare providers, such as government and private insurance plans, are seeking greater upfront discounts, additional rebates, and other concessions to reduce the prices for pharmaceutical products. If the price we are able to charge for any products we develop, or the reimbursement provided for such products, is inadequate in light of our development and other costs, our return on investment could be adversely affected.

We currently expect that certain drugs we develop may need to be administered under the supervision of a physician on an outpatient basis. Under currently applicable U.S. law, certain drugs that are not usually self-administered (including injectable drugs) may be eligible for coverage under Medicare through Medicare Part B. Specifically, Medicare Part B coverage may be available for eligible beneficiaries when the following, among other requirements have been satisfied:

- the product is reasonable and necessary for the diagnosis or treatment of the illness or injury for which the product is administered according to accepted standards of medical practice;
- the product is typically furnished incident to a physician's services;
- the indication for which the product will be used is included or approved for inclusion in certain Medicare-designated pharmaceutical compendia (when used for an off-label use); and
- the product has been approved by the FDA.

Average prices for drugs may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that presently restrict imports of drugs from countries where they may be sold at lower prices than in the U.S. Reimbursement rates under Medicare Part B would depend in part on whether the newly approved product would be eligible for a unique billing code. Self-administered, outpatient drugs are typically reimbursed under Medicare Part D, and drugs that are administered in an inpatient hospital setting are typically reimbursed under Medicare Part A under a bundled payment. It is difficult for us to predict how Medicare coverage and reimbursement policies will be applied to our products in the future and coverage and reimbursement under different federal healthcare programs are not always consistent. Medicare reimbursement rates may also reflect budgetary constraints placed on the Medicare program.

Third-party payors often rely upon Medicare coverage policies and payment limitations in setting their own reimbursement rates. These coverage policies and limitations may rely, in part, on compendia listings for approved therapeutics. Our inability to promptly obtain relevant compendia listings, coverage, and adequate reimbursement from both government-funded and private payors for new drugs that we develop and for which we obtain regulatory approval could have a material adverse effect on our operating results, our ability to raise capital needed to commercialize products, and our financial condition.

We expect that these and other healthcare reform measures that may be adopted in the future, may result in more rigorous coverage criteria and lower reimbursement, and in additional downward pressure on the price that we receive for any approved product. Any reduction in reimbursement from Medicare or other government-funded programs may result in a similar reduction in payments from private payors. The implementation of cost containment measures or other healthcare reforms may prevent us from being able to generate revenue, attain profitability, or commercialize our drugs once marketing approval is obtained.

We believe that the efforts of governments and third-party payors to contain or reduce the cost of healthcare and legislative and regulatory proposals to broaden the availability of healthcare will continue to affect the business and financial condition of pharmaceutical and biopharmaceutical companies. A number of legislative and regulatory changes in the healthcare system in the U.S. and other major healthcare markets have been proposed, and such efforts have expanded substantially in recent years. These developments could, directly or indirectly, affect our ability to sell our products, if approved, at a favorable price.

For example, in the U.S., in 2010, the U.S. Congress passed the ACA, a sweeping law intended to broaden access to health insurance, reduce or constrain the growth of health spending, enhance remedies against fraud and abuse, add new transparency requirements for the healthcare and health insurance industries, impose new taxes and fees on the health industry, and impose additional policy reforms.

Among the provisions of the ACA addressing coverage and reimbursement of pharmaceutical products, of importance to our potential therapeutic candidates are the following

- increases to pharmaceutical manufacturer rebate liability under the Medicaid Drug Rebate Program due to an increase in the minimum basic Medicaid rebate on most branded prescription drugs and the application of Medicaid rebate liability to drugs used in risk-based Medicaid managed care plans;
- the expansion of the 340B Drug Pricing Program to require discounts for “covered outpatient drugs” sold to certain children’s hospitals, critical access hospitals, freestanding cancer hospitals, rural referral centers, and sole community hospitals;
- requirements imposed on pharmaceutical companies are required to offer discounts on brand-name drugs to patients who fall within the Medicare Part D coverage gap, commonly referred to as the “Donut Hole”;
- requirements imposed on pharmaceutical companies to pay an annual non-tax-deductible fee to the federal government based on each company’s market share of prior year total sales of branded drugs to certain federal healthcare programs, such as Medicare, Medicaid, Department of Veterans Affairs, and Department of Defense. Since we currently expect our branded pharmaceutical sales to constitute a small portion of the total federal healthcare program pharmaceutical market, we do not currently expect this annual assessment to have a material impact on our financial condition; and
- For products classified as biologics, marketing approval for a follow-on biologic product may not become effective until 12 years after the date on which the reference innovator biologic product was first licensed by the FDA, with a possible six-month extension for pediatric products. After this exclusivity ends, it may be possible for biosimilar manufacturers to enter the market, which is likely to reduce the pricing for the innovator product and could affect our profitability if our products are classified as biologics.

Separately, pursuant to the health reform legislation and related initiatives, the Centers for Medicare and Medicaid Services (“CMS”) is working with various healthcare providers to develop, refine, and implement Accountable Care Organizations (“ACOs”), and other innovative models of care for Medicare and Medicaid beneficiaries, including the Bundled Payments for Care Improvement Initiative, the Comprehensive Primary Care Initiative, the Duals Demonstration, and other models. The continued development and expansion of ACOs and other innovative models of care will have an uncertain impact on any future reimbursement we may receive for approved therapeutics administered by such organizations.

From time to time, legislation is drafted, introduced, and passed in the U.S. Congress that could significantly change the statutory provisions governing coverage, reimbursement, and marketing of products regulated by CMS or other government agencies. In addition to new legislation, CMS coverage and reimbursement policies are often revised or interpreted in ways that may significantly affect our business and our products.

The healthcare industry is heavily regulated in the U.S. at the federal, state, and local levels, and our failure to comply with applicable requirements may subject us to penalties and negatively affect our financial condition.

As a healthcare company, our operations, clinical trial activities, and interactions with healthcare providers may be subject to extensive regulation in the U.S., particularly if we receive FDA approval for any of our products in the future. For example, if we receive FDA approval for a product for which reimbursement is available under a federal healthcare program (e.g., Medicare, Medicaid), it would be subject to a variety of federal laws and regulations, including those that prohibit the filing of false or improper claims for payment by federal healthcare programs (e.g. the federal FCA), prohibit unlawful inducements for the referral of business reimbursable by federal healthcare programs (e.g. the federal Anti-Kickback Statute), and require disclosure of certain payments or other transfers of value made to U.S.-licensed physicians and teaching hospitals or Open Payments. We are not able to predict how third parties will interpret these laws and apply applicable governmental guidance and may challenge our practices and activities under one or more of these laws. If our past or present operations are found to be in violation of any of these laws, we could be subject to civil and criminal penalties which could hurt our business, our operations, and financial condition.

The federal Anti-Kickback Statute prohibits, among other things, any person or entity from knowingly and willfully offering, paying, soliciting, or receiving any remuneration, directly or indirectly, overtly or covertly, in cash or in kind, to induce or in return for, purchasing, leasing, ordering, or arranging for the purchase, lease, or order of any item or service reimbursable under Medicare, Medicaid, or other federal healthcare programs. The term remuneration has been interpreted broadly to include anything of value. The Anti-Kickback Statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on one hand and prescribers, purchasers, and formulary managers on the other. There are a number of statutory exceptions and regulatory safe harbors protecting some common activities from prosecution. The exceptions and safe harbors are drawn narrowly, and practices that involve remuneration that may be alleged to be intended to induce prescribing, purchasing, or recommending may be subject to scrutiny if they do not qualify for an exception or safe harbor. Failure to meet all of the requirements of a particular applicable statutory exception or regulatory safe harbor does not make the conduct per se illegal under the Anti-Kickback Statute. Instead, the legality of the arrangement will be evaluated on a case-by-case basis based on a cumulative review of all of its facts and circumstances. Our practices may not in all cases meet all of the criteria for protection under a statutory exception or regulatory safe harbor.

Additionally, the intent standard under the Anti-Kickback Statute was amended by the ACA to a stricter standard such that a person or entity no longer needs to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation. In addition, the ACA codified case law that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal FCA (discussed below).

The civil monetary penalties statute imposes penalties against any person or entity that, among other things, is determined to have presented or caused to be presented a claim to a federal healthcare program that the person knows or should know is for an item or service that was not provided as claimed or is false or fraudulent.

Federal false claims and false statement laws, including the federal FCA, prohibit, among other things, any person or entity from knowingly presenting, or causing to be presented, a false or fraudulent claim for payment to, or approval by, the federal healthcare programs, including Medicare and Medicaid, or knowingly making, using, or causing to be made or used, a false record or statement material to a false or fraudulent claim to the federal government. A claim includes “any request or demand” for money or property presented to the U.S. government. For instance, historically, pharmaceutical and other healthcare companies have been prosecuted under these laws for allegedly providing free product to customers with the expectation that the customers would bill federal programs for the product. Other companies have been prosecuted for causing false claims to be submitted because of the companies’ marketing of the product for unapproved, off-label, and thus generally non-reimbursable, uses.

HIPAA prohibits, among other offenses, knowingly and willfully executing a scheme to defraud any healthcare benefit program, including private payors, or falsifying, concealing, or covering up a material fact, or making any materially false, fictitious, or fraudulent statement in connection with the delivery of or payment for items or services under a healthcare benefit program. To the extent that we act as a business associate to a healthcare provider engaging in electronic transactions, we may also be subject to the privacy and security provisions of HIPAA, as amended by HITECH, which restricts the use and disclosure of patient-identifiable health information, mandates the adoption of standards relating to the privacy and security of patient-identifiable health information, and requires the reporting of certain security breaches to healthcare provider customers with respect to such information. Additionally, many states have enacted similar laws that may impose more stringent requirements on entities like ours. Failure to comply with applicable laws and regulations could result in substantial penalties and adversely affect our financial condition and results of operations.

Also, many states have similar fraud and abuse statutes or regulations that apply to items and services reimbursed under Medicaid and other state programs, or, in several states, apply regardless of the payor. Additionally, to the extent that our product is sold in a foreign country, we may be subject to similar foreign laws.

Certain Dicerna products, once approved, may be eligible for coverage under Medicare and Medicaid, among other government healthcare programs. Accordingly, Dicerna may be subject to a number of obligations based on its participation in these programs, such as a requirement to calculate and report certain price reporting metrics to the government, such as average sales price and best price. Penalties may apply in some cases when such metrics are not submitted accurately and timely. Further, these prices for drugs may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that presently restrict imports of drugs from countries where they may be sold at lower prices than in the U.S. It is difficult to predict how Medicare coverage and reimbursement policies will be applied to Dicerna’s products in the future, and coverage and reimbursement under different federal healthcare programs are not always consistent. Medicare reimbursement rates may also reflect budgetary constraints placed on the Medicare program.

In order to distribute products commercially, we must comply with state laws that require the registration of manufacturers and wholesale distributors of drug and biological products in a state, including, in certain states, manufacturers and distributors who ship products into the state even if such manufacturers or distributors have no place of business within the state. Some states also impose requirements on manufacturers and distributors to establish the pedigree of product in the chain of distribution, including some states that require manufacturers and others to adopt new technology capable of tracking and tracing product as it moves through the distribution chain. Several states have enacted legislation requiring pharmaceutical and biotechnology companies to establish marketing compliance programs, file periodic reports with the state, make periodic public disclosures on sales, marketing, pricing, clinical trials and other activities, and/or register their sales representatives, as well as to prohibit pharmacies and other healthcare entities from providing certain physician prescribing data to pharmaceutical and biotechnology companies for use in sales and marketing, and to prohibit certain other sales and marketing practices. All of our activities are potentially subject to federal and state consumer protection and unfair competition laws.

If our operations are found to be in violation of any of the federal and state healthcare laws described above or any other governmental regulations that apply to us, we may be subject to penalties, including, without limitation, civil, criminal, and/or administrative penalties, damages, fines, disgorgement, exclusion from participation in government programs, such as Medicare and Medicaid, injunctions, private “qui tam” actions brought by individual whistleblowers in the name of the government, or refusal to allow us to enter into government contracts, contractual damages, reputational harm, administrative burdens, diminished profits and future earnings, and the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our results of operations.

Our ability to obtain reimbursement or funding from the federal government may be impacted by possible reductions in federal spending.

U.S. federal government agencies currently face potentially significant spending reductions. The Budget Control Act of 2011 (the “BCA”) established a Joint Select Committee on Deficit Reduction, which was tasked with achieving a reduction in the federal debt level of at least \$1.2 trillion. That committee did not draft a proposal by the BCA’s deadline. As a result, automatic cuts, referred to as sequestration, in various federal programs were scheduled to take place, beginning in January 2013, although the American Taxpayer Relief Act of 2012 delayed the BCA’s automatic cuts until March 1, 2013. While the Medicare program’s eligibility and scope of benefits are generally exempt from these cuts, Medicare payments to providers and Part D health plans are not exempt. The BCA did, however, provide that the Medicare cuts to providers and Part D health plans would not exceed two percent. President Obama issued the sequestration order on March 1, 2013, and cuts went into effect on April 1, 2013. Additionally, the Bipartisan Budget Act of 2015 extended sequestration for Medicare through fiscal year 2027.

The U.S. federal budget remains in flux, which could, among other things, cut Medicare payments to providers. The Medicare program is frequently mentioned as a target for spending cuts. The full impact on our business of any future cuts in Medicare or other programs is uncertain. In addition, we cannot predict any impact President Trump’s administration and the U.S. Congress may have on the federal budget. If federal spending is reduced, anticipated budgetary shortfalls may also impact the ability of relevant agencies, such as the FDA or the National Institutes of Health, to continue to function at current levels. Amounts allocated to federal grants and contracts may be reduced or eliminated. These reductions may also impact the ability of relevant agencies to timely review and approve drug research and development, manufacturing, and marketing activities, which may delay our ability to develop, market, and sell any products we may develop.

If any of our product candidates receive marketing approval and we or others later identify undesirable side effects caused by the product candidate, our ability to market and derive revenue from the product candidates could be compromised.

In the event that any of our product candidates receive regulatory approval and we or others identify undesirable side effects, adverse events, or other problems caused by one of our products, any of the following adverse events could occur, which could result in the loss of significant revenue to us and materially and adversely affect our results of operations and business:

- regulatory authorities may withdraw their approval of the product or seize the product;
- we may need to recall the product or change the way the product is administered to patients;
- additional restrictions may be imposed on the marketing of the particular product or the manufacturing processes for the product or any component thereof;
- we may not be able to secure or maintain adequate coverage and reimbursement for our proprietary product candidates from government (including U.S. federal health care programs) and private payors;
- we may be subject to fines, restitution or disgorgement of profits or revenues, injunctions, or the imposition of civil penalties, or criminal prosecution;

- regulatory authorities may require the addition of labeling statements, such as a “black box” warning or a contraindication;
- regulatory authorities may require us to implement a REMS, or to conduct post-marketing studies or clinical trials and surveillance to monitor the safety or efficacy of the product; we may be required to create a Medication Guide outlining the risks of such side effects for distribution to patients;
- we could be sued and held liable for harm caused to patients;
- the product may become less competitive; and
- our reputation may suffer.

Risks Related to Our Common Stock

We are an “emerging growth company” and a “smaller reporting company,” and we cannot be certain if the reduced reporting requirements applicable to emerging growth companies and smaller reporting companies will make our common stock less attractive to investors.

We are an “emerging growth company” as defined in the JOBS Act. For as long as we continue to be an emerging growth company, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including (1) not being required to comply with the auditor attestation requirements of Section 404(b) of the Sarbanes-Oxley Act of 2002 (“Sarbanes-Oxley Act”), (2) reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements, and (3) exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved. We could be an emerging growth company for up to five years, although circumstances could cause us to lose that status earlier, including if the market value of our common stock held by non-affiliates exceeds \$700.0 million as of the prior June 30 or if we have total annual gross revenue of \$1.0 billion or more during any fiscal year before that time, in which cases we would no longer be an emerging growth company as of the following December 31, or if we issue more than \$1.0 billion in non-convertible debt during any three-year period before that time, in which case we would no longer be an emerging growth company immediately. Even after we no longer qualify as an emerging growth company, we may, under certain circumstances, still qualify as a “smaller reporting company,” which would allow us to take advantage of many of the same exemptions from disclosure requirements, including not being required to comply with the auditor attestation requirements of Section 404(b) of the Sarbanes-Oxley Act and reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements. We cannot predict if investors will find our common stock less attractive because we may rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our share price may be more volatile.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards and, therefore, will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

Our stock price is volatile and purchasers of our common stock could incur substantial losses.

Our stock price is volatile. From January 30, 2014, the first day of trading of our common stock, through August 6, 2018, the closing sale price of our common stock has ranged between a high of \$46.00 per share and a low of \$2.45 per share. The market price for our common stock may be influenced by many factors, including the other risks described in this “Risk Factors” section, and the following:

- the success or failure of competitive products or technologies;
- results of preclinical studies and clinical trials of our product candidates, or those of our competitors, our existing collaborator, or any future collaborators;
- regulatory or legal developments in the U.S. and other countries, especially changes in laws or regulations applicable to our product candidates;
- introductions and announcements of new products by us, our commercialization collaborators, or our competitors, and the timing of these introductions or announcements;
- actions taken by regulatory agencies with respect to our or our competitors’ product candidates, products, clinical studies, manufacturing process, or sales and marketing terms;

- actual or anticipated variations in our financial results or those of companies that are perceived to be similar to us;
- the success of our or our competitors' efforts to acquire or in-license additional technologies, products, or product candidates;
- developments concerning our or our competitors' collaborations, including but not limited to, those with sources of manufacturing supply and commercialization partners;
- announcements by us or our competitors of significant acquisitions, strategic collaborations, joint ventures, or capital commitments;
- our ability or inability to raise additional capital and the terms on which we raise it;
- the recruitment or departure of key personnel;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors;
- actual or anticipated changes in earnings estimates or changes in stock market analyst recommendations regarding our common stock, other comparable companies, or our industry generally;
- our failure or the failure of our competitors to meet analysts' projections or guidance that we or our competitors may give to the market;
- fluctuations in the valuation of companies perceived by investors to be comparable to us;
- announcement and expectation of additional financing efforts;
- speculation in the press or investment community;
- trading volume of our common stock;
- sales of our common stock by us or our stockholders;
- the absence of lock-up agreements with the holders of substantially all of our outstanding shares in connection with the follow-on public offering of our common stock;
- the concentrated ownership of our common stock;
- changes in accounting principles;
- terrorist acts, acts of war, or periods of widespread civil unrest;
- natural disasters and other calamities;
- general economic, industry, and market conditions; and
- developments concerning complaints or litigation against us.

In addition, the stock markets in general, and the markets for pharmaceutical, biopharmaceutical, and biotechnology stocks in particular have experienced extreme volatility that has often been unrelated to the operating performance of the issuer. These broad market and industry factors may seriously harm the market price of our common stock, regardless of our operating performance.

The future issuance of equity or of debt securities that are convertible into equity will dilute our share capital.

We may choose to raise additional capital in the future depending on market conditions, strategic considerations, and operational requirements. To the extent that additional capital is raised through the issuance of shares or other securities convertible into shares, our stockholders will be diluted. Future issuances of our common stock or other equity securities, or the perception that such sales may occur, could adversely affect the trading price of our common stock and impair our ability to raise capital through future offerings of shares or equity securities. We cannot predict the effect, if any, that future sales of common stock or the availability of common stock for future sales will have on the trading price of our common stock.

The employment agreements with our executive officers may require us to pay severance benefits to officers who are terminated in connection with a change of control of the Company, which could harm our financial condition.

Our executive officers are parties to employment agreements providing, in the event of a termination of employment in connection with a change of control of the Company, for significant cash payments for severance and other benefits and acceleration of vesting of up to all outstanding stock options. The accelerated vesting of options could result in dilution to our existing stockholders and reduce the market price of our common stock. The payment of these severance benefits could harm our financial condition. In addition, these potential severance payments may discourage or prevent third parties from seeking a business combination with us.

If securities or industry analysts do not publish research or reports about our business, or if they issue an adverse or misleading opinion regarding our stock, our stock price and trading volume could decline.

The trading market for our common stock will be influenced by the research and reports that industry or securities analysts publish about us or our business. If any of the analysts who cover us issue an adverse or misleading opinion regarding us, our business model, our intellectual property, or our stock performance, or if our target studies and operating results fail to meet the expectations of analysts, our stock price would likely decline. If one or more of these analysts cease coverage of us or fail to publish reports on us regularly, we could lose visibility in the financial markets, which in turn could cause our stock price or trading volume to decline.

Our principal stockholders and management own a significant percentage of our stock and will be able to exert significant control over matters subject to stockholder approval.

As of June 30, 2018, our executive officers and directors, together with holders of five percent or more of our outstanding common stock and their respective affiliates, beneficially owned, in the aggregate, approximately 71% of our outstanding common stock, including shares subject to outstanding options and warrants that are exercisable within 60 days after such date, based on the Forms 3 and 4 and Schedules 13D and 13G filed by them with the SEC. As a result, these stockholders, if acting together, will continue to have significant influence over the outcome of corporate actions requiring stockholder approval, including the election of directors, any merger, consolidation, or sale of all or substantially all of our assets, and any other significant corporate transaction. The interests of these stockholders may not be the same as, or may even conflict with, the interests of our other stockholders. For example, these stockholders could delay or prevent a change of control of our Company, even if such a change of control would benefit our other stockholders, which could deprive our stockholders of an opportunity to receive a premium for their common stock as part of a sale of our Company or our assets and might affect the prevailing market price of our common stock. The significant concentration of stock ownership may adversely affect the trading price of our common stock due to investors' perception that conflicts of interest may exist or arise.

Anti-takeover provisions in our charter documents and under Delaware law could make an acquisition of us, which may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management.

Provisions in our amended and restated certificate of incorporation and our amended and restated bylaws may delay or prevent an acquisition of us or a change in our management. In addition, these provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors. Because our board of directors is responsible for appointing the members of our management team, these provisions could in turn affect any attempt by our stockholders to replace current members of our management team. These provisions include:

- a prohibition on actions by our stockholders by written consent;
- a requirement that special meetings of stockholders, which the Company is not obligated to call more than once per calendar year, be called only by the chairman of our board of directors, our chief executive officer, our board of directors pursuant to a resolution adopted by a majority of the total number of authorized directors, or, subject to certain conditions, by our secretary at the request of the stockholders holding of record, in the aggregate, shares entitled to cast not less than ten percent of the votes at a meeting of the stockholders (assuming all shares entitled to vote at such meeting were present and voted);
- advance notice requirements for election to our board of directors and for proposing matters that can be acted upon at stockholder meetings; and
- the authority of the board of directors to issue preferred stock, such as the Redeemable Convertible Preferred, with such terms as the board of directors may determine.

Moreover, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, as amended, which prohibits a person who owns in excess of 15 percent of our outstanding voting stock from merging or combining with us for a period of three years after the date of the transaction in which the person acquired in excess of 15 percent of our outstanding voting stock, unless the merger or combination is approved in a prescribed manner. These provisions would apply even if the proposed merger or acquisition could be considered beneficial by some stockholders.

We incur increased costs as a result of operating as a public company, and our management is required to devote substantial time to new compliance initiatives and corporate governance practices.

As a public company, we incur, and particularly after we are no longer an emerging growth company, and if we ever cease to be a smaller reporting company, we will incur significant legal, accounting, and other expenses that we did not incur as a private company.

The Sarbanes-Oxley Act, the Dodd-Frank Wall Street Reform and Consumer Protection Act, the listing requirements of the NASDAQ, and other applicable securities rules and regulations impose various requirements on public companies, including establishment and maintenance of effective disclosure and financial controls and corporate governance practices. Our management and other personnel need to devote a substantial amount of time to these compliance initiatives. Moreover, these rules and regulations increase our legal and financial compliance costs and make some activities more time-consuming and costly. For example, we expect that these rules and regulations make it more difficult and more expensive for us to obtain director and officer liability insurance, which in turn could make it more difficult for us to attract and retain qualified members of our board of directors. However, these rules and regulations are often subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices.

We are not currently required to comply with the rules of the SEC that implement Section 404(b) of the Sarbanes-Oxley Act. Pursuant to Section 404 of the Sarbanes-Oxley Act ("Section 404"), we are required to furnish a report by our management on our internal control over financial reporting. However, while we remain an emerging growth company and a smaller reporting company, we will not be required to include an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. To achieve compliance with Section 404 within the prescribed period, we will be engaged in a process to document and evaluate our internal control over financial reporting, which is both costly and challenging. In this regard, we will need to continue to dedicate internal resources, potentially engage outside consultants, and adopt a detailed work plan to assess and document the adequacy of internal control over financial reporting, continue steps to improve control processes as appropriate, validate through testing that controls are functioning as documented, and implement a continuous reporting and improvement process for internal control over financial reporting. Despite our efforts, there is a risk that we will not be able to conclude, within the prescribed timeframe or at all, that our internal control over financial reporting is effective as required by Section 404. If we identify one or more material weaknesses, it could result in an adverse reaction in the financial markets due to a loss of confidence in the reliability of our financial statements. In addition, if we are not able to continue to meet these requirements, we may not be able to remain listed on The NASDAQ Global Select Market.

Because we do not anticipate paying any cash dividends on our capital stock in the foreseeable future, capital appreciation, if any, will be your sole source of gain.

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all of our future earnings, if any, to finance the growth and development of our business. As a result, capital appreciation, if any, of our common stock will be sole source of gain of our common stockholders for the foreseeable future.

We may incur significant costs from class action litigation due to our historical or expected stock volatility.

Our stock price has fluctuated and may fluctuate for many reasons, including as a result of public announcements regarding the progress of our development efforts or the development efforts of our collaborators or competitors, the addition or departure of our key personnel, variations in our quarterly operating results, and changes in market valuations of pharmaceutical and biotechnology companies. This risk is especially relevant to us because pharmaceutical and biotechnology companies have experienced significant stock price volatility in recent years. When the market price of a stock has been volatile as our stock price has been and may be, holders of that stock have occasionally brought securities class action litigation against the company that issued the stock. If any of our stockholders were to bring a lawsuit of this type against us, even if the lawsuit is without merit, we could incur substantial costs defending the lawsuit. The lawsuit could also divert the time and attention of our management.

Our amended and restated bylaws designate the Court of Chancery of the State of Delaware as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers, or employees.

Our amended and restated bylaws provide that, subject to limited exceptions, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for any derivative action or proceeding brought on our behalf, any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers, or other employees to us or our stockholders, any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law, as amended, our amended and restated certificate of incorporation or our amended and restated bylaws, any action to interpret, apply, enforce, or determine the validity of our amended and restated certificate of incorporation or our amended and restated bylaws, any action to interpret, apply, enforce or determine the validity of our amended and restated certificate of incorporation or our amended and restated bylaws, or any other action asserting a claim against us that is governed by the internal affairs doctrine. Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and to have consented to the provisions of our amended and restated certificate of incorporation described above. This choice of forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers, or other employees, which may discourage such lawsuits against us and our directors, officers, and employees. Alternatively, if a court were to find these provisions of our amended and restated certificate of incorporation inapplicable to, or unenforceable in respect of, one or more of the specified types of actions or proceedings, we may incur additional costs associated with resolving such matters in other jurisdictions, which could adversely affect our business and financial condition.

Our stockholders may experience significant dilution as a result of future equity offerings and exercise of outstanding options.

In order to raise additional capital, we may in the future offer additional shares of our common stock or other securities convertible into or exchangeable for our common stock, as we did with the Redeemable Convertible Preferred, which was converted into common stock in December 2017. We cannot assure you that we will be able to sell shares or other securities in any offering at a price per share that is equal to or greater than the price paid by our existing shareholders, and investors purchasing shares or other securities in the future could have rights superior to existing stockholders. The price per share at which we sell additional shares of our common stock or other securities convertible into or exchangeable for our common stock in future transactions may be higher or lower than the price per share paid by our existing stockholders.

In addition, we have a significant number of securities allowing the purchase of our common stock. As of August 6, 2018, we also had 1,473,246 shares of common stock reserved for future issuance under our stock incentive plans. As of that date, there were also stock options and awards to purchase 7,541,679 shares of our common stock outstanding and warrants to purchase 2,198 shares of our common stock outstanding. The exercise of outstanding options and warrants having an exercise price per share that is less than the offering price per share paid by our existing stockholders will increase dilution to such stockholders.

Future sales of our common stock in the public market could cause our stock price to fall.

Sales of a substantial number of shares of our common stock in the public market, or the perception that these sales might occur, could depress the market price of our common stock and could impair our ability to raise capital through the sale of additional equity securities. As of August 6, 2018, we had 52,949,660 shares of common stock outstanding, all of which shares, other than shares held by our directors and certain officers, were eligible for sale in the public market, subject in some cases to compliance with the requirements of Rule 144, including the volume limitations and manner of sale requirements. In addition, shares of common stock issuable upon exercise of outstanding options and shares reserved for future issuances under our stock incentive plans will become eligible for sale in the public market to the extent permitted by applicable vesting requirements and subject in some cases to compliance with the requirements of Rule 144.

Sales of shares issued in private placements may cause the market price of our shares to decline.

In April 2017, we issued 700,000 shares of the Redeemable Convertible Preferred, which were convertible into shares of our common stock at an agreed conversion rate. In December 2017, all shares of Redeemable Convertible Preferred were converted into 24,206,663 shares of our common stock. We have agreed to grant the holders of Redeemable Convertible Preferred certain demand, shelf, and "piggyback" registration rights with respect to the shares of common stock issued upon conversion of the Redeemable Convertible Preferred. Such registration rights continue subsequent to the conversion and repurchase of the Redeemable Convertible Preferred with respect to the shares of common stock issued in such conversion. Upon the effectiveness of such registration statements, all shares of common stock issued upon conversion of the Redeemable Convertible Preferred may be freely sold in the open market. The sale of a significant amount of these shares in the open market or the perception that these sales may occur could cause the market price of our common stock to decline or become highly volatile.

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

(a) Unregistered Sales of Equity Securities

Not applicable.

(b) Use of Proceeds

Not applicable.

(c) Issuer Purchases of Equity Securities

We did not repurchase any of our equity securities during the period covered by this report.

Item 3. DEFAULTS UPON SENIOR SECURITIES

Not applicable.

Item 4. MINE SAFETY DISCLOSURES

Not applicable.

Item 5. OTHER INFORMATION

None

Item 6. EXHIBITS

Exhibit Number	Description of Documents
10.1(1)	<u>Confidential Settlement Agreement and General Release, dated as of April 18, 2018, between the Company and Anylam Pharmaceuticals, Inc +.</u>
10.2(1)	<u>Share Issuance Agreement, dated as of April 20, 2018, between the Company and Anylam Pharmaceuticals, Inc.</u>
31.1(1)	<u>Certification of the Company's principal executive officer required by Rule 13a-14(a) or Rule 15d-14(a).</u>
31.2(1)	<u>Certification of the Company's principal financial officer required by Rule 13a-14(a) or Rule 15d-14(a).</u>
32.1*	<u>Section 1350 Certifications.</u>
101.INS(1)	XBRL Report Instance Document
101.SCH(1)	XBRL Taxonomy Extension Schema Document
101.CAL(1)	XBRL Taxonomy Calculation Linkbase Document
101.LAB(1)	XBRL Taxonomy Label Linkbase Document
101.PRE(1)	XBRL Taxonomy Presentation Linkbase Document
101.DEF(1)	XBRL Taxonomy Extension Definition Linkbase Document

+ Confidential treatment with respect to specific portions of this Exhibit has been requested, and such portions are omitted and have been filed separately with the Securities and Exchange Commission.

* Exhibit 32.1 is being furnished and shall not be deemed to be "filed" for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section, nor shall such exhibit be deemed to be incorporated by reference in any registration statement or other document filed under the Securities Act, or the Exchange Act, except as otherwise stated in such filing.

(1) Filed herewith.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

DICERNA PHARMACEUTICALS, INC.

Date: August 8, 2018

By: /s/ John B. Green

John B. Green
Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer)

***Text Omitted and Filed Separately with the Securities and Exchange Commission. Confidential Treatment Requested Under 17 C.F.R. Sections 200.80(b)(4) and 240.24b-2

CONFIDENTIAL SETTLEMENT AGREEMENT AND GENERAL RELEASE

This Settlement Agreement and General Release (the "Agreement") is entered into this 18th day of April 2018 (the "Effective Date") by and among Alnylam Pharmaceuticals, Inc., a Delaware corporation with a principal place of business at 300 Third Street, Cambridge, MA 02142 ("Alnylam"), and Dicerna Pharmaceuticals, Inc., a Delaware corporation with a principal place of business at 87 Cambridgepark Drive, Cambridge, MA 02140 ("Dicerna"). Each of Alnylam and Dicerna shall be considered a "Party," and collectively they shall be considered the "Parties."

WHEREAS, on or about June 10, 2015, Alnylam filed a lawsuit in the Massachusetts Superior Court for Middlesex County, *Alnylam Pharmaceuticals, Inc. v. Dicerna Pharmaceuticals, Inc.*, No. 15-4126 (the "State Court Action"), asserting claims against Dicerna for misappropriation of confidential information and trade secrets in violation of common law and Mass. Gen. Laws Ch. 93, § 42 and 42A, breach of contract, conversion of Alnylam property, aiding and abetting misappropriation of trade secrets, unjust enrichment, and violation of Mass. Gen. Laws Ch. 93A;

WHEREAS, on or about July 10, 2015, Dicerna answered Alnylam's complaint in the State Court Action, denying any and all wrongdoing or liability;

WHEREAS, on or about June 7, 2017, Dicerna moved for leave to amend its answer to Alnylam's complaint in the State Court Action to add counterclaims against Alnylam;

WHEREAS, on or about August 4, 2017, the Massachusetts Superior Court for Middlesex County granted Dicerna's motion to amend its answer, and on or about August 7, 2017, Dicerna filed an amended answer which asserted counterclaims against Alnylam for tortious interference with advantageous relations, abuse of process, and violation of Mass. Gen. Laws Ch. 93A;

WHEREAS, on or about September 27, 2017, Alnylam moved to dismiss Dicerna's counterclaims;

WHEREAS, on or about October 23, 2017, the Massachusetts Superior Court for Middlesex County denied Alnylam's motion to dismiss Dicerna's counterclaims;

WHEREAS, on or about November 9, 2017, Alnylam answered Dicerna's counterclaims in the State Court Action, denying any and all wrongdoing or liability;

WHEREAS, trial in the State Court Action on Alnylam's claims and Dicerna's counterclaims is scheduled to begin on April 23, 2018;

WHEREAS, on or about August 8, 2017, Dicerna filed a lawsuit in the United States District Court for the District of Massachusetts, *Dicerna Pharmaceuticals, Inc. v. Alnylam*

Pharmaceuticals, Inc., No. 1:17-cv-11466 (the “Federal Court Action”), asserting that Alnylam has prevented Dicerna from developing a treatment for Primary Hyperoxaluria (“PH”);

WHEREAS, on or about October 23, 2017, Alnylam filed a motion to dismiss Dicerna’s complaint in the Federal Court Action;

WHEREAS, on or about November 20, 2017, Dicerna filed an amended complaint in the Federal Court Action;

WHEREAS, on or about December 4, 2017, Alnylam filed a motion to dismiss Dicerna’s amended complaint in the Federal Court Action;

WHEREAS, as of the Effective Date of this Agreement, Alnylam’s motion to dismiss Dicerna’s complaint in the Federal Court Action is pending decision;

WHEREAS, having consulted with competent counsel of their own choosing, the Parties have agreed to a full and final resolution of all claims and counterclaims and defenses thereto that were asserted in the State Court Action or the Federal Court Action, subject to the terms and conditions specified in this Agreement;

NOW AND THEREFORE, in consideration of the promises and conditions set forth herein, the sufficiency of which is hereby acknowledged, the Parties agree as follows:

1. Definitions:

a. [***].

b. “Agreement” shall have the meaning set forth in the Preamble, and shall include, for the avoidance of doubt, all Exhibits attached hereto.

c. [***].

d. [***].

e. [***].

f. “Alnylam” shall mean Alnylam Pharmaceuticals, Inc. and any parent, subsidiary or affiliate thereof.

g. “Alnylam Related Parties” shall mean any partner, collaborator or licensee of Alnylam, including without limitation Sanofi Genzyme, Vir Biotechnology and The Medicines Company.

h. “Alnylam Released Parties” shall have the meaning set forth in section 3.b.

i. [***].

- j. [***].
- k. “Business Day” shall mean a day on which banking institutions in Boston, Massachusetts are open for business.
- l. [***].
- m. “Common Stock” shall have the meaning set forth in section 4.
- n. “Dicerna” shall mean Dicerna Pharmaceuticals, Inc. and any parent, subsidiary or affiliate thereof.
- o. “Dicerna Related Parties” shall mean any partner, collaborator or licensee of Dicerna, including without limitation Boehringer-Ingelheim.
- p. “Dicerna Released Parties” shall have the meaning set forth in section 3.a.
- q. “Dosing” shall mean administering a dose to a human volunteer or patient in a clinical trial.
- r. “Effective Date” shall have the meaning set forth in the Preamble.
- s. “FDA” shall mean the United States Food and Drug Administration.
- t. “Federal Court Action” shall have the meaning set forth in the Preamble.
- u. [***].
- v. “IND” shall mean an application or comparable document that is submitted to a Regulatory Authority in order to seek authorization to initiate human clinical trials, including, without limitation (a) an Investigational New Drug application or any successor application or procedure filed with the FDA, or any foreign equivalent thereof, and (b) all supplements and amendments that may be filed with respect thereto.
- w. [***].
- x. “Merck” shall mean Merck & Co., Inc. and Merck Sharp & Dohme Corp.
- y. “Merck Patent Rights” shall mean all Patent Rights acquired by Alnylam in the Merck Stock Purchase Agreement.
- z. “Merck Stock Purchase Agreement” shall mean the agreement and all schedules and exhibits thereto, by and between Alnylam, Sirna, and Merck, dated January 10, 2014, by which Alnylam acquired certain know-how, trade secrets and Patent Rights from Merck.
- aa. “NCBI” shall mean the National Center for Biotechnology Information.

- Agreement.
- bb. “New Transaction” shall mean a transaction with an effective date after the Effective Date of this
 - cc. “Parties” shall have the meaning set forth in the Preamble.
 - dd. “Party” shall have the meaning set forth in the Preamble.
 - ee. “Patent Rights” shall mean all United States patents (including all reissues, extensions, substitutions, confirmations, re-registrations, re-examinations, invalidations, supplementary protection certificates and patents of addition) and United States patent applications (including all provisional applications, continuations, continuations-in-part and divisional applications), and foreign equivalents of any of the foregoing.
 - ff. [***].
 - gg. [***].
 - hh. “R&D” shall mean research and development.
 - ii. “Regulatory Authority” shall mean the federal, national, multinational, state, provincial or local regulatory agency, department, bureau or other governmental entity with authority over the testing, manufacture, use, storage, import, promotion, marketing or sale of an investigational therapeutic anywhere in the world.
 - jj. “Securities Act” shall have the meaning set forth in section 4.b.
 - kk. “Share Issuance Agreement” shall have the meaning set forth in section 4.
 - ll. “Sirna” shall mean Sirna Therapeutics, Inc.
 - mm. “State Court Action” shall have the meaning set forth in the Preamble.
 - nn. “Target” shall mean (a) a polypeptide or entity comprising a combination of at least one polypeptide and other macromolecules that is a site or potential site of therapeutic intervention by a therapeutic agent; or a nucleic acid which is required for expression of such polypeptide; (b) variants of a polypeptide (including any splice variant thereof), cellular entity or nucleic acid described in clause (a); or (c) a defined non-peptide entity, including a microorganism, virus, bacterium or single cell parasite; *provided that* the entire genome of a virus shall be regarded as a single Target.
 - oo. “Third Party Beneficiaries” shall have the meaning set forth in section 13.d.
 - pp. [***].

2. Dismissal of All Disputes with Prejudice: Simultaneously with the complete execution of this Agreement, the Parties shall direct their respective counsel to execute Stipulations of Dismissal with Prejudice dismissing all claims and counterclaims that were asserted in the State Court Action as well as all claims and counterclaims that were asserted in the Federal Court Action. The form of the Stipulations of Dismissal with Prejudice shall be as attached hereto as Exhibit A. The plaintiff in each matter shall file the relevant stipulation in the appropriate matter no later than four Business Days after the Effective Date. Each Party shall bear its own attorneys' fees and costs, and each Party waives all rights of appeal with respect to the State Court Action and/or the Federal Court Action.

3. Mutual General Releases: The Parties hereby exchange the following general releases:

a. Alnylam's Release of Dicerna: Alnylam, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, releases and discharges Dicerna and each of its past and present parents, subsidiaries, departments and divisions, and predecessors and successors in interest, and each of the current and former employees, officers, directors, attorneys, and insurers or any of the foregoing (collectively, the "Dicerna Released Parties"), and each of them, jointly and severally, from any and all claims or counterclaims, causes, causes of action, counts, remedies, promises, damages, liabilities, obligations, judgments, suits, demands, actions, costs, expenses, fees, covenants, controversies, and agreements, of whatever kind or nature, anywhere in the world, whether at law, equity, statutory, administrative, arbitration or otherwise, whether known or unknown, foreseen or unforeseen, accrued or unaccrued, suspected or unsuspected, which Alnylam may now have, has ever had, or in the future may have against any and each of the Dicerna Released Parties that are based on any material fact, known or unknown, in existence at any time prior to the Effective Date, including, without limitation, all claims and counterclaims that were or could have been brought in the State Court Action or Federal Court Action, but expressly excluding, notwithstanding the foregoing, any and all claims asserting infringement of, or challenging the validity or enforceability of, any Patent Rights, including but not limited to Merck Patent Rights, whether before a court or any administrative body or patent office anywhere in the world.

Alnylam further agrees that the above release shall extend to any such claims as described above in this section 3 that may be asserted against Dicerna Related Parties, but only to the extent of claims against any of the Dicerna Related Parties arising from such party's partnership, collaboration, or license with Dicerna.

b. Dicerna's Release of Alnylam: Dicerna, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, releases and discharges Alnylam and each of its past and present parents, subsidiaries, departments and divisions, and predecessors and successors in interest, and each of the current and former employees, officers, directors, attorneys, and insurers or any of the foregoing (collectively, the "Alnylam Released Parties"), and each of them, jointly and severally, from any and all claims or counterclaims, causes, causes of action, counts, remedies, promises, damages, liabilities, obligations, judgments, suits, demands, actions, costs, expenses, fees, covenants, controversies,

and agreements, of whatever kind or nature, anywhere in the world, whether at law, equity, statutory, administrative, arbitration or otherwise, whether known or unknown, foreseen or unforeseen, accrued or unaccrued, suspected or unsuspected, which Dicerna may now have, has ever had, or in the future may have against any and each of the Alynlam Released Parties that are based on any material fact, known or unknown, in existence at any time prior to the Effective Date, including, without limitation, all claims and counterclaims that were or could have been brought in the State Court Action or Federal Court Action, but expressly excluding, notwithstanding the foregoing, any and all claims asserting infringement of, or challenging the validity or enforceability of, any Patent Rights, including but not limited to Merck Patent Rights, whether before a court or any administrative body or patent office anywhere in the world.

Dicerna further agrees that the above release shall extend to any such claims as described above in this section 3 that may be asserted against Alynlam Related Parties, but only to the extent of claims against any of the Alynlam Related Parties arising from such party's partnership, collaboration, or license with Alynlam.

c. Notwithstanding anything herein to the contrary, even if based on any material, known or unknown fact in existence at any time prior to the Effective Date, the general releases and covenants not to sue set forth in this Agreement are not intended to and do not release the Parties from any of their obligations under this Agreement and are not intended to and do not prohibit claims for breach of this Agreement.

d. For clarity and the avoidance of doubt, the aforementioned releases do not include a release of either Party or their respective Related Parties from any and all claims asserting infringement of, or challenging the validity or enforceability of, any Patent Rights, including but not limited to Merck Patent Rights, whether before a court or any administrative body or patent office anywhere in the world.

4. Payment: In consideration for the releases described in section 3, Dicerna shall pay Alynlam Twenty-Five Million Dollars (\$25,000,000.00) in a combination of United States funds and shares of Common Stock of Dicerna (as defined in the Share Issuance Agreement executed herewith ("Share Issuance Agreement")), as follows:

a. Two Million Dollars in United States funds (\$2,000,000.00) paid in cash within fifteen (15) days of the Effective Date.

b. Shares of Dicerna Common Stock with a market value of ten million dollars (\$10,000,000.00) based on the volume-weighted average closing price for the Common Stock in the ten (10) trading days prior to the Effective Date, to be issued to Alynlam within fifteen (15) days of the Effective Date, which shares of Dicerna Common Stock shall be issued pursuant to a private placement exempt from registration under Rule 144 of the Securities Act by Alynlam, after expiration of the six month holding period under Rule 144(d), subject to the following restrictions in accordance with the terms of the Share Issuance Agreement:

i. Alynlam agrees to a six month lockup period with respect to the shares issued; and

ii. Alnylam agrees that, after the six month lockup period, it will dispose of the shares issued in a manner that Alnylam believes in good faith will not unduly harm Dicerna by, specifically, disposing of the shares in orderly transactions in a manner consistent with the volume limitations set forth in Rule 144 under the Securities Act (whether or not such limitations would by their terms apply to such sales).

c. Thirteen Million Dollars in United States funds (\$13,000,000.00) paid within four years of the Effective Date, as follows:

i. Dicerna agrees to pay Alnylam ten percent (10%) of any cash consideration Dicerna receives in up-front or first year consideration, including, without limitation, up-front cash, R&D funding, earned or prepaid milestones, earned or prepaid royalties, and premium over fair market value paid on equity purchased from Dicerna, as part of any New Transaction with any partner or collaborator related to GalNAc-conjugated RNAi research and development between the Effective Date and four years from the Effective Date, up to \$13,000,000.00. For clarity and avoidance of doubt, the term New Transaction does not encompass Dicerna's existing collaboration with Boehringer-Ingelheim, and any cash consideration received by Dicerna from Boehringer-Ingelheim arising from that existing collaboration will not be subject to this section 4.

ii. In the event that Dicerna does not pay Alnylam the full \$13,000,000.00 within four years of the Effective Date pursuant to section 4.c.i, Dicerna will pay any remaining amount owed to Alnylam in cash within ten (10) days following the fourth anniversary of the Effective Date.

5. Dicerna's Development of Oligonucleotide-Based Therapeutics: In consideration for the releases described in section 3, Dicerna further agrees to the following:

- a. Dicerna agrees [***].
- b. Dicerna agrees [***].
- c. Dicerna agrees [***].

6. Alnylam's Development of an Oligonucleotide-Based Therapeutic for Treating [***]: [***], Alnylam agrees to the following:

[***].

7. Covenants Not to Sue:

a. Each Party hereby covenants not to file or assert in any lawsuit, arbitration, or other proceeding of any nature, anywhere in the world, against the other any claims or counterclaims, causes, causes of action, counts, remedies, promises, damages, liabilities, obligations, judgments, suits, demands, actions, costs, expenses, fees, covenants, controversies, and agreements that are within the scope of the releases set forth in section 3

above, including without limitation, on any matter relating to information (including confidential information and trade secrets) Dicerna received from Merck, directly or indirectly, or from any former Merck employees hired by Dicerna or relating to the claims and counterclaims asserted by Dicerna against Alnylam with respect to its alleged anticompetitive intentions.

b. Alnylam covenants not to file or assert in any lawsuit, arbitration, or other proceeding of any nature, anywhere in the world, against any Dicerna Related Party, any claims or counterclaims, causes, causes of action, counts, remedies, promises, damages, liabilities, obligations, judgments, suits, demands, actions, costs, expenses, fees, covenants, controversies, and agreements that are within the scope of the releases set forth in section 3 above, including without limitation, on any matter relating to information (including confidential information and trade secrets) Dicerna received from Merck, directly or indirectly, or from any former Merck employees hired by Dicerna, but, only to the extent of claims against the Dicerna Related Party arising from its partnership or collaboration with Dicerna.

c. Dicerna covenants not to file or assert in any lawsuit, arbitration, or other proceeding of any nature, anywhere in the world, against any Alnylam Related Party, any claims or counterclaims, causes, causes of action, counts, remedies, promises, damages, liabilities, obligations, judgments, suits, demands, actions, costs, expenses, fees, covenants, controversies, and agreements that are within the scope of the releases set forth in section 3 above, including without limitation, on any matter relating to the claims and counterclaims asserted by Dicerna against Alnylam with respect to its alleged anticompetitive intentions, but, only to the extent of claims against the Alnylam Related Party arising from its partnership or collaboration with Alnylam.

d. For clarity and avoidance of doubt, the covenants in this section 8 shall not prohibit the filing or assertion of any claims for breach of this Agreement or for infringement of, or challenging the validity or enforceability of, any Patent Rights, including without limitation the Merck Patent Rights, whether before a court or any administrative body or patent office or in any arbitration anywhere in the world.

8. Certification: Within thirty (30) days of the Effective Date, Dicerna shall certify to Alnylam that it has destroyed all copies of any documents that Dicerna obtained in any form from the Merck electronic data room during the Sirna diligence process as well as all copies of any Merck documents taken or received from Merck by the former Merck employees now employed by Dicerna and now in the possession of or under the control of such employees or Dicerna's counsel, whether in hard copy or electronic form, regardless of where such documents are located, provided, however, that outside counsel may retain a single archival copy of these documents for outside counsel eyes only, and provided further that this certification as it relates to the former Merck employees is limited to Dicerna's knowledge after due inquiry and use of its best efforts. Each Party confirms that it will return or destroy materials produced to the other during the State Court Action in accordance with the terms of the Stipulated Protective Order entered in that action.

9. Public Statements: Following the complete execution of this Agreement and at a date and time that is agreed to by the Parties in writing, or otherwise is required by law, the Parties may issue mutually agreed upon press releases. They will thereafter make no further public statement about the State Court Action (including the settlement thereof), the Federal Court Action (including the settlement thereof), or the subject matter of those disputes that goes substantially beyond or is substantially inconsistent with the press releases, unless such public statement is reasonably necessary to comply with the request of a governmental authority or a regulatory requirement, including the rules and regulations of the United States Securities and Exchange Commission or similar regulatory agency in a country other than the United States.

10. Confidentiality:

a. All negotiations, communications, documents, drafts, and other materials and information relating to and in connection with this Agreement, including all of its terms, shall be treated as strictly private and confidential by the Parties and shall not be disclosed to any third party, disseminated to the public, or released to the press; except that: (i) the Parties may disclose a redacted copy of this Agreement to be agreed upon between the Parties promptly following the Effective Date, but only to the extent reasonably necessary to comply with a regulatory requirement, including the rules and regulations of the United States Securities and Exchange Commission or similar regulatory agency in a country other than the United States; (ii) the Parties may disclose any information if required by a governmental authority or required as a matter of law by judicial or administrative process, subject to the terms of section 11.b; and (iii) either party may disclose a mutually approved redacted copy of this Agreement to third parties with whom the disclosing party is seeking to enter into a partnership, collaboration, licensing, merger or acquisition, joint venture, or financing transaction, with the form of such redacted copy to be agreed upon among the Parties promptly following the Effective Date, so long as such third party agrees in writing to maintain the confidentiality of the redacted Agreement insofar as it includes nonpublic information.

b. If a Party is required by judicial or administrative process or requested by a governmental authority to disclose any information subject to the preceding paragraph, such Party shall promptly inform the other Party of the disclosure that is being sought in order to provide the other Party an opportunity to challenge or limit the disclosure obligations. If any Party intends to challenge or limit disclosure, it shall notify the other Party and promptly take commercially reasonable steps to ask an appropriate judicial or administrative body to preclude or limit disclosure. No Party may disclose any information about the Agreement until any such motion or challenge is resolved. Any such information that is disclosed in a judicial or administrative process shall remain otherwise subject to the confidentiality provisions in the preceding paragraph, and the Party disclosing such information shall take all steps reasonably practical, including without limitation seeking an order of confidentiality, to ensure the continued confidential treatment of such information.

11. Non-Disparagement:

a. No Disparagement of Alnylam: During the period beginning on the Effective Date and ending on the fourth anniversary of the Effective Date neither Dicerna's

executive officers nor members of its Board of Directors shall disparage or denigrate Alnylam or Alnylam's officers, directors, employees, or representatives, and, except as provided in section 10, they shall make no statements concerning the State Court Action or the Federal Court Action or the merits of any claims or issues raised in the State Court Action and Federal Court Action, except as required as a matter of law or by judicial or administrative process or by a regulatory requirement, including the rules and regulations of the United States Securities and Exchange Commission or similar regulatory agency in a country other than the United States.

b. No Disparagement of Dicerna: During the period beginning on the Effective Date and ending on the fourth anniversary of the Effective Date neither Alnylam's executive officers nor members of its Board of Directors shall disparage or denigrate Dicerna or Dicerna's officers, directors, employees, or representatives and, except as provided in section 10, they shall make no statements concerning the State Court Action or the Federal Court Action or the merits of any claims or issues raised in the State Court Action and Federal Court Action, except as required as a matter of law or by judicial or administrative process or by a regulatory requirement, including the rules and regulations of the United States Securities and Exchange Commission or similar regulatory agency in a country other than the United States.

c. Notwithstanding the foregoing, if required in any legal proceeding to testify under oath as to subject matter covered by these non-disparagement provisions, then no truthful testimony given under oath in such proceeding shall violate this section 12 and nothing in this section 12 shall compel a person to provide untruthful testimony in any legal proceeding.

12. General Provisions:

a. Knowing and Voluntary Entry into this Agreement: Each Party agrees that no other Party has made any representation to it of any kind whatsoever, whether oral or in writing, upon which that Party has relied in entering into this Agreement. Each Party further agrees that in entering into this Agreement, it has received independent legal advice from competent counsel of its choosing. Each Party enters into this Agreement of its own volition, without compulsion of any kind, and after a full and fair opportunity to consider this matter with its own legal advisor.

b. No Admissions or Concessions by Virtue of this Agreement: Each Party to this Agreement acknowledges and agrees that this Agreement is a compromise of claims which the Parties have entered into solely for the purpose of avoiding the burdens, inconvenience, and expense of continuing disputes and litigation. Nothing in this Agreement, or the negotiations that preceded this Agreement, shall be construed to be or deemed an admission or concession by any Party of any liability or wrongdoing, or as an infirmity of any claim or defense. Nor shall it be construed as an admission or concession as to the amount or outcome that any Party could or would have recovered at trial. Neither this Agreement nor anything related to the negotiations that preceded it may be offered against the Alnylam Released Parties or the Dicerna Released Parties in any proceeding, with the sole exception of a proceeding to enforce the terms of this Agreement.

c. No Prior Assignment of Claims: Each Party represents and warrants that it has not voluntarily or involuntarily assigned, pledged, liened or otherwise sold or transferred in any manner whatsoever to any other person or entity, either by instrument, in writing or otherwise, any right, action, claim or counterclaim, cause, cause of action, action, count, remedy, promise, damage, liability, debt, due, sums of money, account, reckoning, obligation, judgment, writ of execution, lien, levy, attachment, suit, demand, cost, expense, fee, bond, bill, specialty, covenant, controversy, agreement, set-off, third party action or proceeding of whatever kind or nature, or any portion thereof, to be released under section 3 above.

d. Third Party Beneficiaries: The Parties acknowledge and agree that this Agreement is made solely for the benefit of the Parties hereto, as well as the non-parties identified in the releases set forth in section 3 and the covenant not to sue set forth in section 8, each of whom are intended third-party beneficiaries to this Agreement (the "Third Party Beneficiaries"). The Parties further acknowledge and agree that the Third Party Beneficiaries have the right to enforce the provisions in this Agreement to the extent necessary to protect any rights granted to them in this Agreement. Except as provided in the preceding two sentences, this Agreement does not create any other rights, claims or benefits inuring to any person or entity that is not a party to this Agreement, nor does it create any other third party beneficiary hereto.

e. No Assignment: Except in connection with a sale of all or substantially all of its assets or stock, neither Party may assign this Agreement in whole or in part to any party other than a parent or subsidiary of the Party without the prior written consent of the other Party, which consent shall not be unreasonably denied or delayed, and any such attempted assignment without prior written consent shall be deemed null and void.

f. Applicable Law; Venue: This Agreement shall be governed, interpreted, and enforced according to the laws of the Commonwealth of Massachusetts, without regard to any conflict of law provisions. The Parties agree that any action brought by either Party under or in relation to this Agreement, including without limitation to interpret or enforce any provision of this Agreement, shall be brought in, and each Party agrees to, and does hereby, submit to the jurisdiction and venue of, the state courts located in Massachusetts and to the jurisdiction of the United States District Court for the District of Massachusetts.

g. Invalidity: With the exception of the releases set forth in section 3 and the covenant not to sue set forth in section 8, if any provision, or portion thereof, of this Agreement is held invalid, void, or unenforceable under any applicable statute or rule of law, only that provision, or portion thereof, shall be deemed omitted from this Agreement, and only to the extent to which it is held invalid, and the remainder of the Agreement shall remain in full force and effect. If any portion of the releases set forth in section 3 or the covenant not to sue set forth in section 8 is deemed invalid, it shall be rewritten to conform to the provisions written in this Agreement to the maximum extent permitted by law. If any other provision is deemed invalid, the parties shall attempt to rewrite such provision to render it valid.

h. Obligation of Good Faith: Each Party acknowledges that it has an obligation of good faith and fair dealing under this Agreement, and neither Party shall challenge the validity of any of the provisions herein.

i. Entire Agreement: This Agreement constitutes the entire agreement and understanding between the Parties relating to the subject matter of this Agreement, and supersedes all previous written or oral representations, agreements, drafts and understandings between the Parties. Each Party warrants and represents that no representation or statement of any kind whatsoever, other than in the terms and provisions in this Agreement, was made to it that in any way whatsoever induced it to enter this Agreement.

j. Written Modification: This Agreement may only be varied or modified by a written agreement signed by duly authorized representatives of each of the Parties hereto.

k. Execution in Counterparts: This Agreement may be executed in counterparts and transmitted by email or facsimile, each of which shall be deemed an original and any set of which, when taken together, shall constitute one and the same instrument and be sufficient proof of the instrument so constituted.

l. Binding Agreement between the Parties: This Agreement shall be binding on and inure to the benefit of the Parties, their legal representatives, and their successors.

m. Paragraph Headings: The paragraph headings form no part of this Agreement and may not be used to construe the provisions of this Agreement.

n. Construction of Agreement: Each Party and its counsel have participated in the drafting of this Agreement. The Agreement shall not be construed for or against any Party as the draftsman hereof. In addition, as used in this Agreement, (a) words of any gender include all genders; (b) words using the singular or plural number also include the plural or singular number, respectively; and (c) the word "including" shall mean "including, but not limited to."

o. Authority: The Parties represent that each person signing this Agreement on behalf of a Party has the full power and authority to enter into the Agreement.

p. Additional Documents: Each Party agrees to execute any additional documents and to take further action which reasonably may be required to consummate this Agreement and/or otherwise fulfill the intent of the Parties.

[Remainder of page intentionally left blank. Signature page follows.]

IN WITNESS WHEREOF, duly authorized representatives of the Parties have executed this Agreement under seal as of the Effective Date.

ALNYLAM PHARMACEUTICALS, INC.

By: /s/ Laurie B. Keating
Name: Laurie B. Keating
Title: SVP, General Counsel
Date: 04-18-18

DICERNA PHARMACEUTICALS, INC.

By: /s/ Douglas Fambrough
Name: Douglas Fambrough
Title: CEO
Date: 4-18-2018

Exhibit A

COMMONWEALTH OF MASSACHUSETTS

MIDDLESEX, ss.

SUPERIOR COURT DEPARTMENT

ALNYLAM PHARMACEUTICALS, INC.,)
 Plaintiff,)
 v.)
 DICERNA PHARMACEUTICALS, INC.,)
 Defendant.)

_____)

CIVIL ACTION NO. 15-4126-H

) Specially Assigned to: Honorable Edward P. Leibensperger

JOINT STIPULATION OF DISMISSAL WITH PREJUDICE

Pursuant to Massachusetts Rule of Civil Procedure 41(a)(1)(ii), Plaintiff Alnylam Pharmaceuticals, Inc. and Defendant Dicerna Pharmaceuticals, Inc. hereby stipulate that all claims and counterclaims in the above-captioned action be dismissed, with prejudice. Each party shall bear its own costs, expenses, and attorneys' fees.

Respectfully submitted,

ALNYLAM PHARMACEUTICALS, INC.

By its attorneys,

Eric J. Marandett (BBO# 561730)
emarandett@choate.com
Paul D. Popeo (BBO# 567727)
ppopeo@choate.com
Matthew S. Barrett (BBO# 673882)
mbarrett@choate.com
Greta A. Fails (BBO# 695483)
gfails@choate.com
Phoebe Fischer-Groban (BBO# 687068)
pfischergroban@choate.com
CHOATE HALL & STEWART LLP
Two International Place
Boston, MA 02110
Tel: 617-248-5000
Fax: 617-248-4000

DICERNA PHARMACEUTICALS, INC.

By its attorneys,

Marjorie S. Cooke (BBO# 097800)
mcooke@ccg-law.com
Barbara Gruenthal (BBO# 544209)
bgruenthal@ccg-law.com
Paula M. Bagger (BBO#547703)
pbagger@ccg-law.com
COOKE CLANCY & GRUENTHAL LLP
One Liberty Square
Boston, MA 02109
Tel: 617-428-6800
Fax: 617-428-6868

Michael R. Gottfried (BBO # 542156)
MRGottfried@duanemorris.com
Vincent L. Capuano (BBO # 568517)
VCapuano@duanemorris.com
Gregory S. Bombard (BBO # 679720)
gbombard@duanemorris.com
DUANE MORRIS LLP
100 High Street, Suite 2400
Boston, MA 02110
Telephone: 857.488.4200

Dated: April __18, 2018

UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

DICERNA PHARMACEUTICALS, INC.,)
Plaintiff,) CIVIL ACTION NO. 1:17-cv-11466-NMG
v.)
ALNYLAM PHARMACEUTICALS, INC.,)
Defendant.)

JOINT STIPULATION OF DISMISSAL WITH PREJUDICE

Pursuant to Federal Rule of Civil Procedure 41(a)(1)(A)(ii), Plaintiff Dicerna Pharmaceuticals, Inc. and Defendant Alnylam Pharmaceuticals, Inc. hereby stipulate that all claims and counterclaims in the above-captioned action be dismissed, with prejudice. Each party shall bear its own costs, expenses, and attorneys' fees.

Respectfully submitted,

ALNYLAM PHARMACEUTICALS, INC.

By its attorneys,

DICERNA PHARMACEUTICALS, INC.

By its attorneys,

Eric J. Marandett (BBO# 561730)
emarandett@choate.com
Paul D. Popeo (BBO# 567727)
ppopeo@choate.com
Matthew S. Barrett (BBO# 673882)
mbarrett@choate.com
CHOATE HALL & STEWART LLP
Two International Place
Boston, MA 02110
Tel: 617-248-5000
Fax: 617-248-4000

Michael R. Gottfried (BBO # 542156)
MRGottfried@duanemorris.com
Vincent L. Capuano (BBO # 568517)
VCapuano@duanemorris.com
Gregory S. Bombard (BBO # 679720)
gbombard@duanemorris.com
DUANE MORRIS LLP
100 High Street, Suite 2400
Boston, MA 02110
Telephone: 857.488.4200

Dated: April 18, 2018

SHARE ISSUANCE AGREEMENT

THIS SHARE ISSUANCE AGREEMENT (this "**Agreement**"), is made as of April 20, 2018, by and between Alnylam Pharmaceuticals, Inc., a Delaware corporation (the "**Share Acquiror**"), and Dicerna Pharmaceuticals, Inc., a Delaware corporation (the "**Company**").

WHEREAS, concurrently with the entering into of this Agreement, the Company and the Share Acquiror are entering into that certain Confidential Settlement Agreement and General Release attached hereto as Exhibit A (the "**Settlement Agreement**");

WHEREAS, pursuant to the Settlement Agreement, the Company is obligated to deliver shares of the Company's common stock, par value \$0.0001 per share ("**Common Stock**") with a market value of ten million dollars (\$10,000,000.00) (as calculated pursuant to the Settlement Agreement) (the "**Settlement Shares**") to the Share Acquiror; and

WHEREAS, pursuant to the terms and subject to the conditions set forth in this Agreement, the Company desires to issue to the Share Acquiror, and the Share Acquiror desires to acquire from the Company, at the Closing (as defined below), 983,208 shares (the "**Shares**") of Common Stock in satisfaction of the Company's obligation under the Settlement Agreement to deliver the Settlement Shares to the Share Acquiror;

NOW, THEREFORE, in consideration of the foregoing recitals, the mutual representations, warranties, promises and obligations in the Settlement Agreement and the following mutual representations, warranties, promises and obligations, and for other good and valuable consideration, the adequacy and sufficiency of which are hereby acknowledged, the Share Acquiror and the Company agree as follows:

1. Definitions.

1.1 Defined Terms. When used in this Agreement, the following terms shall have the respective meanings specified therefor below:

"**Affiliate**" shall have the meaning set forth in Section 405 under the Securities Act.

"**Agreement**" means as set forth in the Preamble, including all exhibits attached hereto.

"**Business Day**" means a day on which commercial banking institutions in Boston, Massachusetts and New York, New York are open for business.

"**Common Stock Equivalents**" means any options, warrants or other securities or rights convertible into or exercisable or exchangeable for, whether directly or following conversion into or exercise or exchange for other options, warrants or other securities or rights, shares of Common Stock.

"**Disposition**" or "**Dispose of**" means (a) pledge, sale, contract to sell, sale of any option or contract to purchase, purchase of any option or contract to sell, grant of any option, right or warrant for the sale of, or other disposition of or transfer of any shares of Common Stock, or any

Common Stock Equivalents, including, without limitation, any “short sale” or similar arrangement, or (b) swap, hedge, derivative instrument or any other agreement or any transaction that transfers, in whole or in part, directly or indirectly, the economic consequence of ownership of shares of Common Stock, whether any such swap or transaction is to be settled by delivery of securities, in cash or otherwise.

“**Exchange Act**” means the Securities Exchange Act of 1934, as amended.

“**Governmental Authority**” means any applicable government authority, court, tribunal, arbitrator, agency, department, legislative body, commission or other instrumentality of (a) any government of any country or territory, (b) any nation, state, province, county, city or other political subdivision thereof or (c) any supranational body.

“**Law**” or “**Laws**” means all laws, statutes, rules, regulations, orders, judgments, injunctions and/or ordinances of any Governmental Authority.

“**Organizational Documents**” means (i) the Certificate of Incorporation of the Company, as amended and restated from time to time and as in effect as of the date of this Agreement, and (ii) the Amended and Restated Bylaws of the Company as in effect as of the date of this Agreement.

“**Permitted Transferee**” means an Affiliate of the Share Acquiror; provided, however, that no such Person shall be deemed a Permitted Transferee for any purpose under this Agreement unless: (a) the Permitted Transferee, prior to or simultaneously with such transfer, shall have agreed in writing to be subject to and bound by all restrictions and obligations set forth in this Agreement as though it were the Share Acquiror hereunder, and (b) the Share Acquiror acknowledges that it continues to be bound by all restrictions and obligations set forth in this Agreement.

“**Person**” means any individual, partnership, limited liability company, firm, corporation, trust, unincorporated organization, government or any department or agency thereof or other entity.

“**Securities Act**” means the Securities Act of 1933, as amended.

“**Settlement Agreement**” has the meaning set forth in the recitals.

“**Settlement Shares**” has the meaning set forth in the recitals.

“**Third Party**” means any Person other than the Share Acquiror, the Company or any Affiliate of the Share Acquiror or the Company.

“**Transaction**” means the issuance of the Shares by the Company, and the acquisition of the Shares by the Share Acquiror, in accordance with the terms hereof.

“**Transaction Agreements**” means this Agreement and the Settlement Agreement.

1.2 Additional Defined Terms. In addition to the terms defined in Section 1.1, the following terms shall have the respective meanings assigned thereto in the sections indicated below:

Defined Term	Section
Share Acquiror	<u>Preamble</u>
Closing	<u>Section 3.1</u>
Closing Date	<u>Section 3.1</u>
Common Stock	<u>Recitals</u>
Company	<u>Preamble</u>
Dribble Amount	<u>Section 6.2</u>
Enforceability Exceptions	<u>Section 4.2(b)</u>
Lockup Shares	<u>Section 6.1</u>
Registration Statement	<u>Section 3.2</u>
SEC	<u>Section 4.4</u>
Shares	<u>Recitals</u>

2. Issuance of Common Stock. Subject to the terms and conditions of this Agreement, at the Closing, the Company shall issue to the Share Acquiror and the Share Acquiror shall acquire from the Company the Shares.

3. Closing Date; Deliveries.

3.1 Closing Date. The closing of the acquisition and issuance of the Shares hereunder (the “**Closing**”) shall be held on the date hereof by electronic exchange of signature pages and Shares or at such other time, date and location as the parties may mutually agree in writing. The date the Closing occurs is hereinafter referred to as the “**Closing Date**.”

3.2 Deliveries. At the Closing, the Company shall deliver or cause to be delivered to the Share Acquiror (a) the Shares in book-entry form and (b) evidence reasonably satisfactory to the Share Acquiror that the Shares have been issued to the Share Acquiror pursuant to a private placement exempt from registration under the Securities Act.

4. Representations and Warranties of the Company. The Company hereby represents and warrants to the Share Acquiror as of the date hereof as follows:

4.1 Organization. The Company is a corporation duly organized, validly existing and in good standing under the laws of the State of Delaware. The Company has all requisite power and authority to enter into the Transaction Agreements, to issue the Shares and to perform its obligations under and to carry out the other transactions contemplated by the Transaction Agreements.

4.2 Authorization.

(a) All requisite corporate action on the part of the Company required by applicable Law for the authorization, execution and delivery by the Company of the Transaction Agreements and the performance of all obligations of the Company hereunder and thereunder, including the authorization, issuance and delivery of the Shares, has been taken.

(b) Each of the Transaction Agreements has been duly executed and delivered by the Company, and upon the due execution and delivery of each of the Transaction Agreements by the Share Acquiror, it will constitute valid and legally binding obligations of the Company, enforceable against the Company in accordance with their respective terms except as limited by: (i) applicable bankruptcy, insolvency, reorganization, moratorium, fraudulent conveyance and other laws of general application relating to or affecting enforcement of creditors' rights generally; and (ii) as limited by laws relating to the availability of specific performance, injunctive relief or other equitable remedies (the exceptions set forth in (i) and (ii), the "**Enforceability Exceptions**").

4.3 No Conflicts. The execution, delivery and performance of the Transaction Agreements, and compliance with the provisions hereof and thereof, by the Company do not and shall not: (a) subject to the Required Approvals, violate any provision of applicable Law or any ruling, writ, injunction, order, permit, judgment or decree of any Governmental Authority to which the Company is subject, (b) result in any encumbrance upon any of the Shares, other than restrictions on resale pursuant to securities laws or as set forth in the Transaction Agreements, or (c) violate or conflict with any of the provisions of the Company's Organizational Documents, except, in the case of subsections (a) and (b) as would not have or be reasonably likely to have a material adverse effect with respect to the Transaction Agreements.

4.4 No Approval. No consent, approval, authorization or other order of, or filing with, or notice to, any Governmental Authority is required to be obtained or made by the Company in connection with the authorization, execution and delivery by the Company of any of the Transaction Agreements or with the authorization, issuance by the Company of the Shares, except (a) such filings as may be required to be made with the Securities and Exchange Commission (the "**SEC**"), which filings shall be made in a timely manner in accordance with all applicable Laws, and (b) those that have been made or obtained prior to the date of this Agreement (the items referred to in clauses (a) and (b), the "**Required Approvals**").

4.5 Valid Issuance of Shares. When issued and delivered at the Closing in accordance with the terms hereof in satisfaction of the Company's obligation to deliver the Settlement Shares pursuant to the Settlement Agreement, the Shares will be duly authorized, validly issued, fully paid and nonassessable, free from any liens, encumbrances or restrictions on transfer, including preemptive rights, rights of first refusal or other similar rights, other than as set forth in the Transaction Agreements, as a result of any action by the Share Acquiror or under federal or state securities Laws. Assuming the accuracy of the representations and warranties of the Share Acquiror in this Agreement and subject to the filings referenced in Section 4.4, the Shares will be issued in compliance with all applicable federal and state securities laws. No stop order or suspension of trading of Common Stock has been imposed by NASDAQ or the SEC and remains in effect.

4.6 NASDAQ Listing. Common Stock is listed on The Nasdaq Global Select Market, and the Company has taken no action designed terminate the registration of the Common Stock under the Exchange Act or delist Common Stock from The Nasdaq Global Select Market.

4.7 SEC Reports. Parent has filed all required forms, reports and documents with the SEC since January 1, 2017 (“**Company SEC Reports**”), each of which complied at the time of filing in all material respects with all applicable requirements of the Securities Act and the Exchange Act, as applicable, in each case as in effect on the dates such forms reports and documents were filed.

4.8 Brokers’ or Finders’ Fees. No broker, finder, investment banker or other Person is entitled to any brokerage, finder’s or other fee or commission from the Company in connection with the transactions contemplated by the Transaction Agreements.

4.9 Not Investment Company. The Company is not, and solely after the consummation of the Transactions, will not be, an “investment company” as defined in the Investment Company Act of 1940, as amended.

4.10 No General Solicitation. Neither the Company nor, to the Company’s knowledge, any Person acting on behalf of the Company has either directly or indirectly, including through a broker or finder, engaged in any general solicitation or published any advertisement in connection with the offer and issuance of the Shares.

5. Representations and Warranties of the Share Acquiror. The Share Acquiror hereby represents and warrants to the Company as of the date hereof as follows:

5.1 Organization. The Share Acquiror is a corporation duly organized, validly existing and in good standing under the laws of Delaware. The Share Acquiror has all requisite power and authority to enter into the Transaction Agreements, to purchase the Shares and to perform its obligations under and to carry out the other transactions contemplated by the Transaction Agreements.

5.2 Authorization. All requisite action on the part of the Share Acquiror and its directors and stockholders, required by applicable Law for the authorization, execution and delivery by the Share Acquiror of the Transaction Agreements and the performance of all of its obligations thereunder, including the acquisition of the Shares, has been taken. This Agreement has been duly executed and delivered by the Share Acquiror and upon the due execution and delivery thereof by the Company, will constitute valid and legally binding obligations of the Share Acquiror, enforceable against the Share Acquiror in accordance with their respective terms except as limited by the Enforceability Exceptions.

5.3 No Conflicts. The execution, delivery and performance of the Transaction Agreements and compliance with the provisions thereof, by the Share Acquiror do not and shall not: (a) violate any provision of applicable Law or any ruling, writ, injunction, order, permit, judgment or decree of any Governmental Authority, or (b) violate or conflict with any of the provisions of the Share Acquiror’s organizational documents (including any articles or memoranda of organization or association, charter, by-laws or similar documents), except as would not impair

or adversely affect the ability of the Share Acquiror to consummate the transactions contemplated by, and perform its obligations under, the Transaction Agreements.

5.4 No Approval. No consent, approval, authorization or other order of any Governmental Authority is required to be obtained by the Share Acquiror in connection with the authorization, execution and delivery of any of the Transaction Agreements or with the subscription for and purchase of the Shares.

5.5 Acquisition Entirely for Own Account. The Shares shall be acquired for investment for the Share Acquiror's own account, not as a nominee or agent, and not with a view to the resale or distribution of any part thereof, and the Share Acquiror has no present intention of selling, granting any participation or otherwise distributing the Shares. The Share Acquiror does not have and will not have as of the Closing any contract, undertaking, agreement or arrangement with any Person to sell, transfer or grant participation to a Person any of the Shares.

5.6 Investment Experience and Accredited Investor Status. The Share Acquiror is an "accredited investor" (as defined in Regulation D under the Securities Act). The Share Acquiror has conducted its own due diligence on the Company to its satisfaction and has such knowledge and experience in financial or business matters that it is capable of evaluating the merits and risks of the investment in the Shares to be purchased hereunder.

5.7 Restricted Securities. The Share Acquiror understands that the Shares, when issued, will be "restricted securities" under the federal securities Laws inasmuch as they are being acquired from the Company in a transaction not involving a public offering and that under such Laws the Shares may be resold without registration under the Securities Act only in certain limited circumstances. The Share Acquiror represents that it is familiar with Rule 144 of the Securities Act, as presently in effect.

5.8 Legends. In addition to any other legend required by Law, the book-entry or certificated form of the Shares shall bear any legend required by the "blue sky" laws of any state and a restrictive legend in substantially the following form:

THESE SECURITIES HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED. THEY MAY NOT BE SOLD, OFFERED FOR SALE, PLEDGED OR HYPOTHECATED IN THE ABSENCE OF A REGISTRATION STATEMENT IN EFFECT WITH RESPECT TO THE SECURITIES UNDER SUCH ACT OR AN OPINION OF COUNSEL SATISFACTORY TO THE ISSUER THAT SUCH REGISTRATION IS NOT REQUIRED OR UNLESS SOLD PURSUANT TO RULE 144 OF SUCH ACT.

5.9 Acquiring Person. As of the date of this Agreement and immediately prior to the Closing, neither the Share Acquiror nor any of its Affiliates beneficially owns, or will beneficially own (as determined pursuant to Rule 13d-3 under the Exchange Act without regard

for the number of days in which a Person has the right to acquire such beneficial ownership, and without regard to Share Acquiror's rights under this Agreement), any securities of the Company.

5.10 United States Person. The Investor is a United States person (as defined by Section 7701(a)(30) of the U.S. Internal Revenue Code of 1986, as amended.

5.11 No General Solicitation. Neither the Share Acquiror nor, to the Share Acquiror's knowledge, any Person acting on behalf of the Share Acquiror has either directly or indirectly, including through a broker or finder (a) engaged in any general solicitation or (b) published any advertisement in connection with the offer and issuance of the Shares.

6. Lock-Up.

6.1 From and after the Closing Date and until the date that is six months after the Closing Date, without the prior approval of the Company, the Share Acquiror shall not Dispose of (x) any of the Shares, together with any shares of Common Stock issued in respect thereof as a result of any stock split, stock dividend, share exchange, merger, consolidation or similar recapitalization, and (y) any Common Stock issued as (or issuable upon the exercise of any warrant, right or other security that is issued as) a dividend or other distribution with respect to, or in exchange or in replacement of, the shares of Common Stock described in clause (x) of this sentence (collectively, "**Lockup Shares**"); provided, however, that the foregoing shall not prohibit the Share Acquiror from transferring any Lockup Shares to (i) a Permitted Transferee; provided that the Permitted Transferee agrees to be bound in writing by the restrictions set forth herein; or (ii) to the Company.

6.2 From and after the date that is six months after the Closing Date through the fifth (5th) anniversary of the Closing Date, without the prior approval of the Company, the Share Acquiror hereby agrees that it shall not, at any specific time, Dispose of more than the Dribble Amount of Lockup Shares as of such time; provided, however, that the foregoing shall not prohibit the Share Acquiror from transferring any Lockup Shares to (i) a Permitted Transferee; provided that the Permitted Transferee agrees to be bound in writing by the restrictions set forth herein; or (ii) to the Company. "**Dribble Amount**" of Lockup Shares shall mean, as of a specific time, the maximum number of Lockup Shares that the Share Acquiror would be permitted to Dispose if the Lockup Shares were subject to the volume limitations set forth in Rule 144(e) under the Securities Act (and, for the avoidance of doubt, not subject to any of the other limitations on sale set forth in Rule 144 under the Securities Act). The parties acknowledge that the restrictions in this paragraph are contractual in nature rather than pursuant to an interpretation of Rule 144.

7. Miscellaneous.

7.1 Governing Law; Submission to Jurisdiction. This Agreement shall be governed by and construed in accordance with the Laws of the State of Delaware, without regard to the conflict of laws principles thereof that would require the application of the Law of any other jurisdiction. Any action brought, arising out of, or relating to this Agreement shall, if it has jurisdiction, be brought in the Court of Chancery of the State of Delaware. Each party hereby irrevocably submits to the jurisdiction of said Court in respect of any claim relating to the validity, interpretation and enforcement of this Agreement, and hereby waives, and agrees not to assert, as a defense in any action, suit or proceeding in which any such claim is made that it is not subject

thereto or that such action, suit or proceeding may not be brought or is not maintainable in such courts, or that the venue thereof may not be appropriate or that this agreement may not be enforced in or by such courts. The parties hereby consent to and grant the Court of Chancery of the State of Delaware jurisdiction over such parties and over the subject matter of any such claim and agree that mailing of process or other papers in connection with any such action, suit or proceeding in the manner provided in Section 7.12 hereof or in such other manner as may be permitted by law, shall be valid and sufficient thereof.

7.2 No Waiver, Modifications. It is agreed that no waiver by a party hereto of any breach or default of any of the covenants or agreements set forth herein shall be deemed a waiver as to any subsequent or similar breach or default. The failure of either party to insist on the performance of any obligation hereunder shall not be deemed a waiver of any such obligation. No amendment, modification, waiver, release or discharge to this Agreement shall be binding upon the parties unless in writing and duly executed by authorized representatives of both parties.

7.3 Notices. Any consent, notice, report or other communication required or permitted to be given or made under this Agreement by one of the parties to the other party will be delivered in writing by one of the following means and be effective: (a) upon receipt, if delivered personally; (b) when sent, if sent via e-mail (provided that such sent e-mail is kept on file (whether electronically or otherwise) by the sending party and the sending party does not immediately receive an automatically generated message from the recipient's e-mail server that such e-mail could not be delivered to such recipient); (c) when sent, if sent by facsimile (provided confirmation of transmission is mechanically or electronically generated and kept on file by the sending party); or (d) when delivered by a reputable, commercial overnight courier; provided in all cases addressed to such other party at its address indicated below, or to such other address as the addressee will have last furnished in writing to the addressor and will be effective upon receipt by the addressee.

If to Share Acquiror:

Alnylam Pharmaceuticals, Inc.
300 Third Street
Cambridge, MA 02142
Attention: Laurie B. Keating, General Counsel
Facsimile No.: 617-812-0353
e-mail: lkeating@alnylam.com

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

Choate, Hall & Stewart LLP
Two International Place
Boston, MA 02110
Attention: Eric Marandett
Facsimile: 617-248-4000
e-mail: emarandett@choate.com

If to the Company:

Dicerna Pharmaceuticals, Inc.
87 Cambridgepark Drive
Cambridge, MA 02140
Attention: Jack Green
Facsimile: 617-612-6298
e-mail: jgreen@dicerna.com

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

Sidley Austin LLP
1001 Page Mill Road, Building 1, Suite 100
Palo Alto, California 94304
Attention: Sam Zucker
Facsimile: (650) 565-7100
e-mail: szucker@sidley.com

Written confirmation of receipt (ii) given by the recipient of such notice, (iii) mechanically or electronically generated by the sender's facsimile machine containing the time, date and recipient facsimile number or (iii) provided by an overnight courier service shall be rebuttable evidence of personal service, receipt by facsimile or receipt from an overnight courier service in accordance with clause (a), (c) or (d) above, respectively. A copy of the e-mail transmission containing the time, date and recipient e-mail address shall be rebuttable evidence of receipt by e-mail in accordance with clause (b) above.

7.4 Entire Agreement. This Agreement and the Settlement Agreement contain the entire agreement among the parties with respect to the subject matter hereof and thereof and supersede all prior and contemporaneous arrangements or understandings, whether written or oral, with respect hereto and thereto.

7.5 Headings; Nouns and Pronouns; Section References. Headings in this Agreement are for convenience of reference only and shall not be considered in construing this Agreement. Whenever the context may require, any pronouns used herein shall include the corresponding masculine, feminine or neuter forms, and the singular form of names and pronouns shall include the plural and vice-versa. References in this Agreement to a section or subsection shall be deemed to refer to a section or subsection of this Agreement unless otherwise expressly stated.

7.6 Severability. If any provision of this Agreement is held to be illegal, invalid or unenforceable under any present or future law, (a) such provision shall be fully severable, (b) this Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part hereof, and (c) the remaining provisions of this Agreement shall remain in full force and effect and shall not be affected by the illegal, invalid or unenforceable provision or by its severance herefrom.

7.7 Assignment. Except for an assignment by the Share Acquiror of this Agreement or any rights hereunder to an Affiliate or Permitted Transferee (which assignment will not relieve the Share Acquiror of any obligation hereunder), neither this Agreement nor any of the

rights or obligations hereunder may be assigned by either the Share Acquiror or the Company without (a) the prior written consent of Company in the case of any assignment by the Share Acquiror or (b) the prior written consent of the Share Acquiror in the case of an assignment by the Company.

7.8 Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors and permitted assigns.

7.9 Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original but which together shall constitute one and the same instrument. In the event that any signature is delivered by facsimile transmission or by an e-mail which contains a portable document format (.pdf) file of an executed signature page, such executed signature page shall create a valid and binding obligation of the party executing it (or on whose behalf such signature page is executed) with the same force and effect as if such executed signature page were an original thereof.

7.10 Third Party Beneficiaries. None of the provisions of this Agreement shall be for the benefit of or enforceable by any Third Party, including any creditor of any party hereto, except that each Affiliate of the Share Acquiror is an express third party beneficiary entitled to enforce this agreement directly against the Company. No Third Party shall obtain any right under any provision of this Agreement or shall by reason of any such provision make any claim in respect of any debt, liability or obligation (or otherwise) against any party hereto.

7.11 No Strict Construction. This Agreement has been prepared jointly and will not be construed against either party. No presumption as to construction of this Agreement shall apply against either party with respect to any ambiguity in the wording of any provision(s) of this Agreement irrespective of which party may be deemed to have authored the ambiguous provision(s).

7.12 Remedies. The rights, powers and remedies of the parties under this Agreement are cumulative and not exclusive of any other right, power or remedy which such parties may have under any other agreement or Law. No single or partial assertion or exercise of any right, power or remedy of a party hereunder shall preclude any other or further assertion or exercise thereof. The parties hereby acknowledge and agree that the rights of the parties hereunder are special, unique and of extraordinary character, and that if any party refuses or otherwise fails to act, or to cause its Affiliates to act, in accordance with the provisions of this Agreement, such refusal or failure would result in irreparable injury to the Company or the Share Acquiror as the case may be, the exact amount of which would be difficult to ascertain or estimate and the remedies at law for which would not be reasonable or adequate compensation. Accordingly, if any party refuses or otherwise fails to act, or to cause its Affiliates to act, in accordance with the provisions of this Agreement, then, in addition to any other remedy which may be available to any damaged party at law or in equity, such damaged party will be entitled to seek specific performance and injunctive relief, without posting bond or other security, and without the necessity of proving actual or threatened damages, which remedy such damaged party will be entitled to seek in any court of competent jurisdiction.

7.13 Expenses. Each party shall pay its own fees and expenses in connection with the preparation, negotiation, execution, delivery and performance of the Transaction Agreements.

[Signature Page Follows]

IN WITNESS WHEREOF, the parties have executed and delivered this Agreement as of the date first above written.

Dicerna Pharmaceuticals, Inc., a Delaware corporation

By: /s/ Douglas Fambrough
Name: Douglas Fambrough
Title: President & Chief Executive Officer

Amylam Pharmaceuticals, Inc., a Delaware corporation

By: /s/ Laurie Keating
Name: Laurie Keating
Title: Senior Vice President and General Counsel

[Signature Page to Share Issuance Agreement]

EXHIBIT A
SETTLEMENT AGREEMENT

A-1

CERTIFICATIONS

I, Douglas M. Fambrough, III, Ph.D., certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Dicerna 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.
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 8, 2018

/s/ Douglas M. Fambrough, III, Ph.D.

Douglas M. Fambrough, III, Ph.D.
President, Chief Executive Officer and Director

CERTIFICATIONS

I, John B. Green, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Dicerna 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 my 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.
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 8, 2018

/s/ John B. Green

John B. Green
Chief Financial Officer

SECTION 1350 CERTIFICATIONS*

Pursuant to the requirement set forth in Rule 13a-14(b) of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and Section 1350 of Chapter 63 of Title 18 of the United States Code (18 U.S.C. § 1350), Douglas M. Fambrough, III, Ph.D., President, Chief Executive Officer and Director of Dicerna Pharmaceuticals, Inc. (the "Company"), and John B. Green, Chief Financial Officer of the Company, each hereby certifies that, to the best of his knowledge:

1. The Company's Quarterly Report on Form 10-Q for the quarter ended June 30, 2018, to which this Certification is attached as Exhibit 32.1 (the "Quarterly Report"), fully complies with the requirements of Section 13(a) or 15(d) of the Exchange Act; and

2. The information contained in the Quarterly Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: August 8, 2018

/s/ Douglas M. Fambrough, III, Ph.D.

Douglas M. Fambrough, III, Ph.D.

President, Chief Executive Officer and Director

/s/ John B. Green

John B. Green

Chief Financial Officer

* This certification accompanies the Quarterly Report on Form 10-Q, to which it relates, is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of the Company under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended (whether made before or after the date of the Form 10-Q), irrespective of any general incorporation language contained in such filing.

