UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 20549

FORM 10-Q

(Mark One)

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

For the quarterly period ended June 30, 2022

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: 001-38942

ARCTURUS THERAPEUTICS HOLDINGS INC.

(Exact Name of Registrant as Specified in its Charter)

Delaware **(State or other jurisdiction of incorporation or organization)**	**32-0595345** **(I.R.S. Employer Identification No.)**
10628 Science Center Drive, Suite 250 **San Diego, California** **(Address of principal executive offices)**	**92121** **(Zip Code)**

Registrant's telephone number, including area code: (858) 900-2660

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

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, par value $0.001 per share	ARCT	The NASDAQ Stock Market LLC

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

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

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

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

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

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 5, 2022, the registrant had 26,576,357 shares of voting common stock outstanding.

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES

TABLE OF CONTENTS

Special Note Regarding Forward-Looking Statements

This Quarterly Report on Form 10-Q, or this quarterly report, including the section entitled "Management's Discussion and Analysis of Financial Condition and Results of Operations," and the documents incorporated by reference herein may contain express or implied "forward-looking statements" within the meaning of the federal securities laws, Section 27A of the Securities Act of 1933, as amended and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Our actual results could differ materially from those anticipated in these forward-looking statements as a result of various factors, including those set forth below under Part II, Item 1A, "Risk Factors" in this quarterly report. Except as required by law, we assume no obligation to update these forward-looking statements, whether as a result of new information, future events or otherwise. These statements, which represent our current expectations or beliefs concerning various future events, may contain words such as "may," "will," "expect," "anticipate," "intend," "plan," "believe," "estimate" or other words indicating future results, though not all forward-looking statements necessarily contain these identifying words. Forward-looking statements in this quarterly report include, but are not limited to, statements about:

- the initiation, cost, progress and results of, and our expected ability to undertake certain activities and accomplish certain goals with respect to, our research and preclinical development activities, including the selection of a STARR candidate for our LUNAR-Flu program;
- the initiation, design, enrollment, cost, timing, progress and results of, and submissions of applications to conduct, any clinical trials, including with respect to the anticipated ARCT-154 booster study and other ongoing ARCT-154 studies, the anticipated CTA filing for ARCT-032;
- the potential safety, immunogenicity, efficacy or regulatory approval of ARCT-154 or any of our COVID-19 vaccine candidates as a booster or primary vaccination series;
- the potential effects and benefits of our technologies and product candidates on their own and in comparison to technologies, drugs or courses of treatment currently available or that may be developed by competitors;
- the likelihood that preclinical or clinical data will be predictive of future clinical results or efficacy or safety of a product candidate, including the clinical data on ARCT-154 as both a primary vaccination series and booster vaccination;
- the likelihood that clinical data will be sufficient for regulatory approval;
- the anticipated timing for receipt of data or results of a study or clinical trial, including the anticipated data for our ARCT-810 trial;
- the likelihood or timing of any regulatory approval, including the anticipated EUA decision for ARCT-154;
- the potential administration regimen or dosage, or ability to administer multiple doses of, any of our product candidates;
- our plans to research, develop and commercialize our product candidates;
- our ability to obtain and maintain regulatory approval of our product candidates, and any related restrictions, limitations, and/or warnings in the label of an approved product candidate;
- our ability to successfully commercialize, and our expectations regarding future therapeutic and commercial potential with respect to, our product candidates;
- the rate and degree of market acceptance of our product candidates;
- the success of competing therapies that are or may become available;
- our ability to obtain and maintain intellectual property protection for our product candidates;
- interactions with regulatory authorities in the United States and foreign countries;
- our ability to attract and retain experienced and seasoned scientific and management professionals to lead the Company;
- the performance of our third-party suppliers and manufacturers, including our ability to scale-up manufacturing levels as necessary, including the timing and anticipated capacity of the manufacturing facility in Hanoi, Vietnam;
- our strategic alliance partners' election to pursue development and commercialization of any programs or product candidates that are subject to our collaboration and license agreements with such partners;
- our ability to attract collaborators with relevant development, regulatory and commercialization expertise;
- future activities to be undertaken by our strategic alliance partners, collaborators and other third parties;
- our ability to develop sales and marketing capabilities, whether alone or with potential future collaborators;
- our ability to avoid, settle or be victorious at costly litigation with shareholders, former executives or others, should these situations arise;

- our ability to obtain and deploy funding for our operations and to efficiently use our financial and other resources;
- our ability to continue as a going concern; and
- the accuracy of our estimates regarding future expenses, future revenues, capital requirements and need for additional financing.

These and other forward-looking statements are only current predictions and are subject to known and unknown risks, uncertainties, and other factors that may cause our or our industry's actual results, levels of activity, performance or achievements to be materially different from those anticipated by the forward-looking statements. In addition, historic results of scientific research, preclinical and clinical trials do not guarantee that future research or trials will suggest the same conclusions, nor that historic results referred to herein will be interpreted in the same manner due to additional research, preclinical and clinical trial results or otherwise. The forward-looking statements contained in this quarterly report are subject to risks and uncertainties, including those discussed in our other filings with the United States Securities and Exchange Commission, or the Commission. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date hereof unless specifically stated otherwise. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee future results, levels of activity, performance, or achievements.

PART I—FINANCIAL INFORMATION

Item 1. Financial Statements.

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED BALANCE SHEETS
(in thousands, except par value information)

	June 30, 2022 (unaudited)	December 31, 2021
Assets		
Current assets:		
Cash and cash equivalents	$ 283,491	$ 370,492
Accounts receivable	2,247	3,367
Prepaid expenses and other current assets	5,767	5,102
Total current assets	291,505	378,961
Property and equipment, net	8,951	5,643
Operating lease right-of-use asset, net	34,480	5,618
Equity-method investment	—	515
Non-current restricted cash	2,078	2,077
Total assets	$ 337,014	$ 392,814
Liabilities and stockholders' equity		
Current liabilities:		
Accounts payable	$ 5,762	$ 10,058
Accrued liabilities	33,614	23,523
Current portion of long-term debt	27,018	22,474
Deferred revenue	26,349	43,482
Total current liabilities	92,743	99,537
Deferred revenue, net of current portion	5,590	19,931
Long-term debt, net of current portion	35,761	40,633
Operating lease liability, net of current portion	32,203	4,502
Total liabilities	$ 166,297	$ 164,603
Stockholders' equity		
Common stock: $0.001 par value; 60,000 shares authorized; 26,434 issued and outstanding at June 30, 2022 and 26,372 issued and outstanding at December 31, 2021	26	26
Additional paid-in capital	590,913	575,675
Accumulated deficit	(420,222)	(347,490)
Total stockholders' equity	170,717	228,211
Total liabilities and stockholders' equity	$ 337,014	$ 392,814

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

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS
(unaudited)
(in thousands except per share data)

	Three Months Ended June 30,		Six Months Ended June 30,	
	2022	2021	2022	2021
Revenue	$ 27,093	$ 2,001	$ 32,337	$ 4,128
Operating expenses:				
Research and development, net	38,189	45,679	83,082	95,729
General and administrative	10,993	10,042	21,723	19,785
Total operating expenses	49,182	55,721	104,805	115,514
Loss from operations	(22,089)	(53,720)	(72,468)	(111,386)
Gain (loss) from equity-method investment	(131)	(328)	(515)	920
Gain (loss) from foreign currency	1,217	(13)	1,375	417
Finance expense, net	(560)	(520)	(1,124)	(878)
Net loss	$ (21,563)	$ (54,581)	$ (72,732)	$ (110,927)
Net loss per share, basic and diluted	$ (0.82)	$ (2.07)	$ (2.75)	$ (4.22)
Weighted-average shares outstanding, basic and diluted	26,425	26,323	26,401	26,284
Comprehensive loss:				
Net loss	$ (21,563)	$ (54,581)	$ (72,732)	$ (110,927)
Comprehensive loss	$ (21,563)	$ (54,581)	$ (72,732)	$ (110,927)

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

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(unaudited)
in thousands

Three Months Ended June 30, 2022

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Deficit	Total Stockholders' Equity
BALANCE – March 31, 2022	**26,407**	**$ 26**	**$ 583,382**	**$ (398,659)**	**$ 184,749**
Net loss	—	—	—	(21,563)	(21,563)
Share-based compensation expense	—	—	7,274	—	7,274
Issuance of common stock upon exercise of stock options	27	—	257	—	257
BALANCE – June 30, 2022	**26,434**	**$ 26**	**$ 590,913**	**$ (420,222)**	**$ 170,717**

Three Months Ended June 30, 2021

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Deficit	Total Stockholders' Equity
BALANCE – March 31, 2021	**26,319**	**$ 26**	**$ 552,743**	**$ (200,162)**	**$ 352,607**
Net loss	—	—	—	(54,581)	(54,581)
Share-based compensation expense	—	—	7,540	—	7,540
Issuance of common stock upon exercise of stock options	8	—	82	—	82
BALANCE – June 30, 2021	**26,327**	**$ 26**	**$ 560,365**	**$ (254,743)**	**$ 305,648**

Six Months Ended June 30, 2022

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Deficit	Total Stockholders' Equity
BALANCE – December 31, 2021	**26,372**	**$ 26**	**$ 575,675**	**$ (347,490)**	**$ 228,211**
Net loss	—	—	—	(72,732)	(72,732)
Share-based compensation expense	—	—	14,645	—	14,645
Issuance of common stock upon exercise of stock options	62	—	593	—	593
BALANCE – June 30, 2022	**26,434**	**$ 26**	**$ 590,913**	**$ (420,222)**	**$ 170,717**

Six Months Ended June 30, 2021

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Deficit	Total Stockholders' Equity
BALANCE – December 31, 2020	**26,192**	**$ 26**	**$ 540,343**	**$ (143,816)**	**$ 396,553**
Net loss	—	—	—	(110,927)	(110,927)
Issuance of common stock related to acquired in-process research and development	75	—	5,000	—	5,000
Issuance of common stock upon exercise of stock options	60	—	495	—	495
Share-based compensation expense	—	—	14,527	—	14,527
BALANCE – June 30, 2021	**26,327**	**$ 26**	**$ 560,365**	**$ (254,743)**	**$ 305,648**

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED STATEMENTS OF CASH FLOWS
(unaudited)
in thousands

	Six Months Ended June 30,	
	2022	2021
OPERATING ACTIVITIES:		
Net loss	$ (72,732)	$ (110,927)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	559	594
Share-based compensation expense	14,645	14,527
Acquired in-process research and development expense	—	5,000
Loss (gain) from equity-method investment	515	(920)
Foreign currency transaction gain	(1,410)	(417)
Other non-cash expenses	2,411	1,583
Changes in operating assets and liabilities		
Accounts receivable	1,120	(38)
Prepaid expense and other assets	(933)	468
Accounts payable	(4,422)	(791)
Accrued liabilities	5,861	17,727
Deferred revenue	(31,474)	(2,699)
Net cash used in operating activities	(85,860)	(75,893)
INVESTING ACTIVITIES:		
Acquisition of property and equipment	(1,733)	(522)
Net cash used in investing activities	(1,733)	(522)
FINANCING ACTIVITIES:		
Proceeds from debt	—	46,599
Proceeds from exercise of stock options	593	495
Net cash provided by financing activities	593	47,094
NET (DECREASE) INCREASE IN CASH, CASH EQUIVALENTS AND RESTRICTED CASH	(87,000)	(29,321)
Cash, cash equivalents and restricted cash at beginning of the period	372,569	463,002
Cash, cash equivalents and restricted cash at end of the period	$ 285,569	$ 433,681

	Six Months Ended June 30,	
	2022	2021
Supplemental disclosure of cash flow information		
Cash paid for interest	$ 355	$ 341
Non-cash investing activities		
Right-of-use asset obtained in exchange for lease liabilities	$ 30,191	$ 1,828
Acquisition of in-process research and development through issuance of common stock	$ —	$ 5,000
Purchase of property and equipment in accounts payable and accrued expenses	$ 2,134	$ 101

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

Note 1. Description of Business, Basis of Presentation and Summary of Significant Accounting Policies

Description of Business

Arcturus Therapeutics Holdings Inc. (the “Company” or "Arcturus") is a late-stage global clinical messenger RNA medicines company focused on the development of infectious disease vaccines and significant opportunities within liver and respiratory rare diseases. The Company became a clinical stage company during 2020 when it announced that its Investigational New Drug (“IND”) application for ornithine transcarbamylase (“OTC”) deficiency and its Clinical Trial Application (“CTA”) for candidate LUNAR-COV19 were approved by applicable health authorities.

Basis of Presentation

The accompanying condensed consolidated financial statements include the accounts of Arcturus Therapeutics Holdings Inc. and its subsidiaries and are unaudited. All intercompany accounts and transactions have been eliminated in consolidation. These condensed consolidated financial statements have been prepared in accordance with U.S. generally accepted accounting principles (“GAAP”) for interim financial information. Accordingly, they do not include all of the information and footnotes required by GAAP for complete financial statements. In management’s opinion, the accompanying condensed consolidated financial statements reflect all adjustments, consisting of normal recurring adjustments, considered necessary for a fair presentation of the results for the interim periods presented.

Interim financial results are not necessarily indicative of results anticipated for the full year. These condensed consolidated financial statements should be read in conjunction with the audited consolidated financial statements and footnotes included in the Company’s Annual Report on Form 10-K for the year ended December 31, 2021.

These condensed consolidated financial statements are prepared in accordance with GAAP, which requires management to make estimates and assumptions regarding the valuation of debt instruments, the equity-method investment, share-based compensation expense, accruals for liabilities, income taxes, revenue and deferred revenue, leases, and other matters that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting periods. Although these estimates are based on management’s knowledge of current events and actions the Company may undertake in the future, actual results may ultimately differ from these estimates and assumptions.

Joint Ventures, Equity Method Investments and Variable Interest Entities

Investments for which the Company exercises significant influence, but does not have control are accounted for under the equity method. Equity method investment activity is related to a 49% joint venture with Axcelead, Inc. (see the following paragraph for further details) and a 8% ownership in Vallon Pharmaceuticals, Inc. (see “*Note 10, Related Party Transactions*” for further details). The Company’s share of the investees’ results is presented as either income or loss from equity method investees in the accompanying condensed consolidated statements of operations and comprehensive loss.

In April 2021, Arcturus and Axcelead, Inc., a company existing under the laws of Japan (“Axcelead”), formed a joint venture entity, named Arcalis, Inc. (“JV Entity”), which operates as a corporation under the laws of Japan. Axcelead is an integrated drug discovery solutions provider to the pharmaceutical industry in Japan. On July 1, 2017, Axcelead became the successor to a portion of the drug discovery research department of Takeda Pharmaceutical Company Limited. The goal of the JV Entity is to be a contract development and manufacturing organization focused on mRNA manufacturing that would provide manufacturing services to the Company and also to third parties. The joint venture includes a shareholders agreement which sets forth initial funding of the JV Entity and rights of the JV Entity shareholders, including certain approval rights of Arcturus. As part of the joint venture, the Company entered into a License and Technology Transfer Agreement with the JV Entity, pursuant to which Arcturus grants to JV Entity a nonexclusive license to certain intellectual property for use at the JV Entity’s facilities, and obligates Arcturus to conduct certain technology transfer activities.

The Company consolidates variable interest entities (“VIEs”) where it has been determined that the Company is the primary beneficiary of those entities’ operations. Management believes that power is shared between Arcturus and Axcelead, as unrelated parties. The consent of each of the parties is substantive and is required to make the decisions about the JV Entity’s significant activities. Management does not believe that Arcturus has the power to direct the activities of the JV Entity that most significantly impact the JV Entity’s economic performance. Therefore, the Company concluded it is not required to consolidate the JV Entity under the VIE model.

The equity method of accounting is applicable for the JV Entity as the Company does not own more than 50% of voting power, but has influence over the operation and financial policies of the investee. The Company accounts for its investment in the JV Entity using the equity method of accounting as specified in Accounting Standard Codification ("ASC") 323, Investments — Equity Method and Joint Ventures. Under ASC 323, equity method investments are recorded initially at cost. The Company's initial investment in the JV Entity totaled $9.2 million. However, the JV Entity paid the Company back the initial investment of $9.2 million as an upfront fee/consideration for the License and Technology Transfer Agreement. In substance, there was no cash consideration paid by the Company for its 49% equity interest in the JV Entity.

Liquidity

The Company has incurred significant operating losses since its inception. As of June 30, 2022 and December 31, 2021, the Company had an accumulated deficit of $420.2 million and $347.5 million, respectively.

The Company's activities since inception have consisted principally of research and development activities, general and administrative activities, and raising capital. The Company's activities are subject to significant risks and uncertainties, including failing to secure additional funding before the Company achieves sustainable revenues and profit from operations. From the Company's inception through June 30, 2022, the Company has funded its operations principally with the proceeds from the sale of capital stock, revenues earned through collaboration agreements and proceeds from long-term debt. During fiscal year 2021, the Company received a term loan of $46.6 million from Economic Development Board of the Republic of Singapore. Additionally, the Company received an upfront payment of $40.0 million from Vinbiocare to fund the technology transfer in Vietnam. At June 30, 2022, the Company's balance of cash and cash equivalents, including restricted cash, was $285.6 million.

Management believes that it has sufficient working capital on hand to fund operations through at least the next twelve months from the date these condensed consolidated financial statements were available to be issued. There can be no assurance that the Company will be successful in securing additional funding, that the Company's projections of its future working capital needs will prove accurate, or that any additional funding would be sufficient to continue operations in future years.

Segment Information

In making decisions regarding resource allocation and assessing performance, the chief operating decision-maker identifies operating segments as components of an enterprise for which separate discrete financial information is available for evaluation. The Company and its chief operating decision-maker view the Company's operations and manage its business in one operating segment, which is the research and development of medical applications for the Company's nucleic acid-focused technology.

Revenue Recognition

The Company determines revenue recognition for arrangements within the scope of Topic 606 by performing the following five steps: (i) identify the contract; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when, or as, the Company satisfies a performance obligation.

The terms of the Company's revenue agreements include license fees, upfront payments, milestone payments, reimbursement for research and development activities, option exercise fees, transfer of drug substance, consulting and related technology transfer fees and royalties on sales of commercialized products. Arrangements that include upfront payments 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 obligations under these arrangements. The event-based milestone payments represent variable consideration, and the Company uses the most likely amount method to estimate this variable consideration because the Company will either receive the milestone payment or will not, which makes the potential milestone payment a binary event. The most likely amount method requires the Company to determine the likelihood of earning the milestone payment. Given the high degree of uncertainty around achievement of these milestones, the Company determines the milestone amounts to be fully constrained and does not recognize revenue until the uncertainty associated with these payments is resolved. The Company will recognize revenue from sales-based royalty payments when or as the sales occur. The Company will re-evaluate the transaction price in each reporting period as uncertain events are resolved and other changes in circumstances occur.

A performance obligation is a promise in a contract to transfer a distinct good or service to the collaborative partner and is the unit of account in Topic 606. A contract's transaction price is allocated to each distinct performance obligation based on relative standalone selling price and recognized as revenue when, or as, the performance obligation is satisfied.

See *"Note 2, Collaboration Revenue"* for specific details surrounding the Company's collaboration arrangements.

Leases

See *"Note 9, Commitments and Contingencies"* for specific details surrounding the Company's leases.

Research and Development, Net

All research and development costs are expensed as incurred. Research and development costs consist primarily of salaries, share-based compensation, employee benefits, costs associated with preclinical studies and clinical trials (including amounts paid to clinical research organizations and other professional services), in process research and development expenses and license agreement expenses, net of any grants, and prelaunch inventory. Payments made
prior to the receipt of goods or services to be used in research and development are capitalized until the goods or services are received.

The Company records accruals for estimated research and development costs, comprising payments for work performed by third party contractors, laboratories, participating clinical trial sites, and others. Some of these contractors bill monthly based on actual services performed, while others bill periodically based upon achieving certain contractual milestones. For the latter, the Company accrues the expenses as goods or services are used or rendered. Clinical trial site costs related to patient enrollment are accrued as patients enter and progress through the trial.

Pre-Launch Inventory

Prior to obtaining initial regulatory approval for an investigational product candidate, the Company expenses costs relating to production of inventory as research and development expense in its condensed consolidated statements of operations and comprehensive loss, in the period incurred. When the Company believes regulatory approval and subsequent commercialization of an investigational product candidate is probable, and the Company also expects future economic benefit from the sales of the investigational product candidate to be realized, it will then capitalize the costs of production as inventory.

Statement of Cash Flows

The following table provides a reconciliation of cash and cash equivalents and restricted cash reported within the condensed consolidated balance sheet to the total of the same such amounts shown in the condensed consolidated statement of cash flows:

(in thousands)	June 30, 2022	June 30, 2021
Cash and cash equivalents	$ 283,491	$ 433,574
Non-current restricted cash	2,078	107
Total cash, cash equivalents and restricted cash shown in the statement of cash flows	$ 285,569	$ 433,681

Net Loss per Share

Basic net loss per share is calculated by dividing the net loss by the weighted-average number of shares of common stock outstanding for the period, without consideration for common stock equivalents. Diluted net loss per share is calculated by dividing the net loss by the weighted-average number of shares of common stock and dilutive common stock equivalents outstanding for the period determined using the treasury-stock method.

No dividends were declared or paid during the reported periods.

Recently Issued Accounting Standards Not Yet Adopted

From time to time, new accounting pronouncements are issued by the FASB or other standard setting bodies and adopted by the Company as of the specified effective date. Unless otherwise discussed, the Company believes that the impact of recently issued standards that are not yet effective will not have a material impact on our condensed consolidated financial statements and disclosures.

Note 2. Revenue

The Company has entered into license agreements and collaborative research and development arrangements with pharmaceutical and biotechnology companies, as well as consulting, related technology transfer, drug substance transfer and product revenue agreements. Under these arrangements, the Company is entitled to receive license fees, consulting fees, product fees, technological transfer fees, upfront payments, milestone payments if and when certain research and development milestones or technology transfer milestones are achieved, royalties on approved product sales and reimbursement for research and development

activities. The Company's costs of performing these services are included within research and development expenses. The Company's milestone payments are typically defined by achievement of certain preclinical, clinical, and commercial success criteria. Preclinical milestones may include in vivo proof of concept in disease animal models, lead candidate identification, and completion of IND-enabling toxicology studies. Clinical milestones may, for example, include successful enrollment of the first patient in or completion of Phase 1, 2 and 3 clinical trials, and commercial milestones are often tiered based on net or aggregate sale amounts. The Company cannot guarantee the achievement of these milestones due to risks associated with preclinical and clinical activities required for development of nucleic acid medicine-based therapeutics and vaccines.

The following table presents changes during the six months ended June 30, 2022 in the balances of contract assets, including receivables from collaborative partners, consulting and related technology transfer partners, and contract liabilities, including deferred revenue, as compared to what was disclosed in the Company's Annual Report.

(in thousands)	Contract Assets
BALANCE - December 31, 2021	$ 3,367
Additions for revenue recognized from billings	863
Deductions for cash collections	(1,983)
BALANCE – June 30, 2022	$ 2,247

(in thousands)	Contract Liabilities
BALANCE - December 31, 2021	$ 63,413
Additions for advanced billings	863
Deductions for promised services provided in current period	(32,337)
BALANCE – June 30, 2022	$ 31,939

The following table summarizes the Company's revenues for the periods indicated (in thousands).

	For the Three Months Ended June 30,		For the Six Months Ended June 30,	
(Dollars in thousands)	2022	2021	2022	2021
Vinbiocare	$ 12,720	$ —	$ 15,578	$ —
Janssen	528	769	1,659	1,593
Ultragenyx	959	925	1,885	1,850
CureVac	225	247	449	472
Israel Ministry of Health	12,500	—	12,500	—
Other	161	60	266	213
Total revenue	$ 27,093	$ 2,001	$ 32,337	$ 4,128

The following paragraphs provide information regarding the nature and purpose of the Company's most significant collaboration arrangements.

Vinbiocare

From June 11, 2021 through August 2, 2021, the Company entered into a series of agreements with Vinbiocare, a member of Vingroup Joint Stock Company (collectively, the "Vinbiocare Agreement"), whereby the Company will provide technical expertise and support services to Vinbiocare to assist in the build out of a mRNA drug product manufacturing facility in Vietnam. Such expertise shall include a specified level of access to the Company's personnel and drug substance necessary to validate the successful set up of the facility. Under the terms of the arrangements, the Company will also provide a specified number of doses of ARCT-154 for use by Vinbiocare in a phase 3 clinical study within Vietnam. The Company received an upfront payment in aggregate of $40.0 million and subsequent to achieving emergency use authorization, the Company will receive low single digit payments per dose for drug substance and related royalties.

In evaluating the Vinbiocare Agreement in accordance with ASC Topic 606, the Company concluded that Vinbiocare is a customer. The Company identified all promised goods/services within the Vinbiocare Agreement, and when combining certain promised goods/services, the Company concluded that there are four distinct performance obligations. The four performance obligations include (i) consulting to support the build out of the manufacturing facility and technical transfer, (ii) shipment of 80 grams of drug substance to validate the manufacturing facility, (iii) the sale of 2,500 vials of drug product to support the phase 3 clinical trial and (iv) consulting to support the phase 3 clinical trial and related regulatory filings. For each performance obligation, the Company estimated the standalone selling price based on cost plus margin for drug substance and drug product as well as estimated headcount and

full-time equivalent ("FTE") rates for consulting services to support the phase 3 clinical trial, the build out of the manufacturing facility and the technology transfer.

As of June 30, 2022, the transaction price consists of upfront consideration received and budgeted reimbursable out-of-pocket costs to support the build out of the manufacturing facility and technology transfer. The Company allocated the transaction price to the performance obligations in proportion to their standalone selling price, the relative standalone selling price basis. The drug substance and drug product performance obligations are recognized at the point in time the goods are transferred. The consulting performance obligations are recognized over a period of time based on the percentage of services rendered, meaning actual costs incurred divided by total costs budgeted to satisfy the performance obligation. Any consideration related to sales-based royalties will be recognized when the drug product is manufactured as they are constrained. The revenue recognized in 2022 relates to the delivery of drug substance, consulting to support the build out of the manufacturing facility and technical transfer and consulting to support the phase 3 clinical trial.

Total deferred revenue as of June 30, 2022 and December 31, 2021 for the Vinbiocare agreement was $20.8 million and $37.2 million, respectively.

Janssen Pharmaceuticals, Inc., Ultragenyx Pharmaceutical Inc., CureVac AG

For each of Janssen Pharmaceuticals, Inc. ("Janssen"), Ultragenyx Pharmaceutical Inc. ("Ultragenyx") and CureVac AG ("CureVac"), the Company evaluated the respective agreement in accordance with ASC Topic 606. The Company concluded that the contract counterparty is a customer. The Company identified all promised goods/services within each agreement, and concluded that the promised goods/services are incapable of being distinct and consequently do not have any value on a standalone basis. Accordingly, the promised goods/services within each agreement were determined to represent a single performance obligation. Lastly, the Company concluded that any options to select additional collaboration targets and to license rights to selected targets were not priced at a discount and therefore do not represent performance obligations for which the transaction price would be allocated.

Janssen

In October 2017, the Company entered into a research collaboration and license agreement with Janssen (the "2017 Agreement") to collaborate on developing candidates for treating HBV with RNA therapeutics. The 2017 Agreement allocated discovery, development, funding obligations, and ownership of related intellectual property among the Company and Janssen.

As of June 30, 2022, the remaining transaction price consisting of upfront consideration received, budgeted reimbursable out-of-pocket costs and a preclinical milestone payment of $1.0 million received in the fourth quarter of 2021, is expected to be recognized using an input method over the remaining research period. None of the remaining development and commercialization milestones were included in the transaction price as they are outside the control of the Company and contingent upon success in future clinical trials and the collaborator's efforts. Any consideration related to sales-based royalties will be recognized when the related sales occur, provided that the reported sales are reliably measurable, and the Company has no remaining promised goods/services, as such sales were determined to relate predominantly to the license granted to Janssen and therefore have also been excluded from the transaction price.

Total deferred revenue as of June 30, 2022 and December 31, 2021 for Janssen was $6.1 million and $6.3 million, respectively.

Ultragenyx

In October 2015 the Company entered into a research collaboration and license agreement with Ultragenyx (as amended, the "Ultragenyx Agreement"), whereby Arcturus granted to Ultragenyx a co-exclusive license to certain Arcturus technology, which is in effect only during the reserve target exclusivity term as discussed in the following paragraphs. This collaboration agreement was amended in 2017, 2018 and during the second quarter of 2019. During the initial phase of the collaboration, the Company will design and optimize therapeutics for certain rare disease targets. Ultragenyx has the option under the Ultragenyx Agreement to add additional rare disease targets during the collaborative development period. Additionally, during the collaborative development period, the Company will participate with Ultragenyx in a joint steering committee.

The current potential development, regulatory and commercial milestone payments for the existing development targets as of June 30, 2022 are $138.0 million. Ultragenyx will pay royalties as a single-digit percentage of net sales on a product-by-product and country-by-country basis during the applicable royalty term. As of June 30, 2022, Ultragenyx is working to identify and enroll patients in a Phase 1/2 study.

As of June 30, 2022, the transaction price included the upfront consideration received, option payments, exclusivity extension payments and additional consideration received pursuant to Amendment 3 of the Ultragenyx Agreement ("Amendment 3"). The Company recognizes the reimbursement of labor and expenses as costs are incurred and none of the development and commercialization milestones were included in the transaction price, as all milestone amounts were fully constrained. As part of its evaluation of the constraint, the Company considered numerous factors, including that the consideration is outside the control of the Company and contingent upon success in future clinical trials, approval from the FDA and the collaborator's efforts. Any consideration related to sales-based royalties will be recognized when the related sales occur as they are constrained, provided that the reported sales are reliably measurable and the Company has no remaining promised goods/services, as such sales were determined to relate predominantly to the license granted to Ultragenyx and therefore have also been excluded from the transaction price. During the three months ended June 30, 2022, no adjustments were made to the transaction price.

Amendment 3 was deemed a contract modification and accounted for as part of the original Ultragenyx Agreement. The transaction price is recognized to revenue on a straight-line basis using an input method over the 4-year reserve target exclusivity period. The reserve target exclusivity period represents the timing over which promised goods/services will be provided. Total deferred revenue at June 30, 2022 and December 31, 2021 from Ultragenyx was $3.7 million and $5.5 million, respectively.

CureVac

In January 2018, the Company entered into a Development and Option Agreement (the "Development and Option Agreement") with CureVac. Under the terms of the Development and Option Agreement, the parties agreed to conduct joint preclinical development programs once CureVac makes a payment to pull down a target on the basis of which CureVac is granted options for taking a license on pre-agreed license terms to develop and commercialize certain products incorporating the Company's patents and know-how related to LUNAR® delivery technology (the "Arcturus Delivery Technology"), and CureVac patents and know-how related to mRNA technology.

As of June 30, 2022, the transaction price included the upfront consideration received. The Company recognizes the reimbursement of labor and expenses as costs are incurred and none of the development and commercialization milestones were included in the transaction price, as all milestone amounts were fully constrained. As part of its evaluation of the constraint, the Company considered numerous factors, including that receipt of the milestones is outside the control of the Company and contingent upon success in future clinical trials and the collaborator's efforts. Any consideration related to sales-based royalties will be recognized when the related sales occur as they are constrained, provided that the reported sales are reliably measurable and the Company has no remaining promised goods/services, as such sales were determined to relate predominantly to the license granted to CureVac and therefore have also been excluded from the transaction price. As of June 30, 2022, no adjustments were made to the transaction price.

The upfront consideration of $5.0 million was recorded as deferred revenue in the Company's condensed balance sheet upon receipt and is currently being recognized as revenue on a straight-line basis using an input method over the remaining 13 month contractual term as of June 30, 2022. Total deferred revenue as of June 30, 2022 and December 31, 2021 for CureVac was $1.0 million and $1.4 million, respectively.

Other Agreements

In January 2022, the Company entered into an agreement with a pharmaceutical company, whereby the pharmaceutical company agreed to fund up to $25 million for a clinical trial for a LUNAR-COV19 vaccine candidate as a booster. As of June 30, 2022, the Company has submitted to such company billings from a third party related to the clinical trial of approximately $4.9 million, which falls under the expected funding of $25.0 million of the booster program, but has not yet been reimbursed as of June 30, 2022.

Israeli Ministry of Health

On August 17, 2020, the Company entered into an agreement with the Israeli Ministry of Health (the "MOH") to supply the Company's COVID-19 vaccine candidate to Israel (the "Israel Supply Agreement") subject to certain conditions, including applicable regulatory approvals. In October 2020, and in association with the Israel Supply Agreement, the Company received a non-refundable payment of $12.5 million from the MOH. This payment of $12.5 million is associated with a specified clinical trial milestone and serves as an initial reserve payment for a specified number of doses of the LUNAR-COV19 vaccine candidate pursuant to the Israel Supply Agreement. As a result of the making of this payment, the MOH became bound to purchase an initial quantity of 500,000 reserved vaccine doses, as set forth in and subject to the terms and conditions of the Israel Supply Agreement. Furthermore, the Israel Supply Agreement permitted termination by the MOH immediately upon written notice to Arcturus if the Company did not obtain certain regulatory approvals by December 31, 2021. On April 14, 2022, Arcturus received notice from the MOH to terminate the Israel Supply Agreement. Therefore, the Company has recognized the payment as revenue during the second quarter of 2022 as there were no remaining performance obligations under the agreement. No termination penalties were incurred by the Company connection therewith.

Note 3. Fair Value Measurements

The Company establishes the fair value of its assets and liabilities using the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The Company established a fair value hierarchy based on the inputs used to measure fair value.

The three levels of the fair value hierarchy are as follows:

Level 1: Quoted prices in active markets for identical assets or liabilities.

Level 2: Inputs, other than the quoted prices in active markets, that are observable either directly or indirectly.

Level 3: Unobservable inputs in which little or no market data exists and are therefore determined using estimates and assumptions developed by the Company, which reflect those that a market participant would use.

The carrying value of cash, restricted cash, accounts receivable, accounts payable, accrued liabilities and the Singapore loan approximate their respective fair values due to their relative short maturities. The carrying amounts of long-term debt for the amount drawn on the Company's debt facility approximates fair value as the interest rate is variable and reflects current market rates.

As of June 30, 2022 and December 31, 2021, all assets measured at fair value on a recurring basis consisted of cash equivalents and money market funds, which were classified within Level 1 of the fair value hierarchy. The fair value of these financial instruments was measured based on quoted prices.

Note 4. Balance Sheet Details

Property and equipment, net balances consisted of the following:

(in thousands)	June 30, 2022	December 31, 2021
Research equipment	$ 7,266	$ 6,735
Computers and software	515	488
Office equipment and furniture	889	574
Leasehold improvements	2,237	44
Construction in progress	2,859	2,058
Total	13,766	9,899
Less accumulated depreciation and amortization	(4,815)	(4,256)
Property and equipment, net	$ 8,951	$ 5,643

Depreciation and amortization expense was $0.4 million and $0.3 million for the three months ended June 30, 2022 and 2021, and $0.6 million for each of the six months ended June 30, 2022 and 2021, respectively. Construction in progress primarily includes research equipment that is expected to be placed into service during 2022.

Accrued liabilities consisted of the following:

(in thousands)	June 30, 2022	December 31, 2021
Accrued compensation	$ 6,850	$ 3,578
Cystic Fibrosis Foundation liability (Note 9)	473	2,777
Current portion of operating lease liability	3,417	1,537
Clinical accruals	2,795	8,675
Manufacturing capacity fees	11,613	—
Other accrued research and development expenses	8,466	6,956
Total	$ 33,614	$ 23,523

Note 5. Debt

Manufacturing Supply Agreement

On November 7, 2020, the Company's wholly-owned subsidiary, Arcturus Therapeutics, Inc., entered into a Manufacturing Support Agreement (the "Support Agreement") with the Economic Development Board of the Republic of Singapore (the "EDB"). Pursuant to the Support Agreement, the EDB agreed to make a term loan (the "Singapore Loan") of S$62.1 million to the Company, subject to the satisfaction of customary deliveries, to support the manufacture of the LUNAR-COV19 vaccine candidate (ARCT-021). The Singapore Loan accrues interest at a rate of 4.5% per annum calculated on a daily basis. The Company elected to borrow the full amount available under the Support Agreement of S$62.1 million ($46.6 million) on January 29, 2021. The EDB agreed to an extension of the reconciliation period to March 31, 2022, with unused funds as of such date returned to the EDB within 30 days following the completion of the customary audit of the Singapore Loan. This audit is expected to be completed by August 31, 2022.

As of June 30, 2022, the Company has reported a portion of the Singapore Loan as current to reflect a potential principal repayment of approximately S$20.9 million ($15.4 million) in fiscal year 2022 based on amounts not used toward the manufacture of ARCT-021, and expects to refund this portion in fiscal year 2022 as described above.

The Singapore Loan was initially recorded as long-term debt at $46.6 million, the amount of cash proceeds at the time the Company received the funding. During the first quarter of 2022, accrued interest of $1.9 million related to 2021 was added to the principal debt balance in accordance with the terms of the Support Agreement and the balance was adjusted to reflect the current exchange rate resulting in an increase in the debt balance to $47.8 million. The Company recorded a net foreign currency transaction gain of $1.4 million for the six months ended June 30, 2022 compared to a net foreign currency transaction gain of $0.4 million for the six months ended June 30, 2021. For the three and six months ended June 30, 2022, the Company recorded interest expense and a corresponding liability of $0.5 million and $1.1 million, respectively, compared to interest expense and a corresponding liability of $0.5 million and $0.9 million, respectively, for the three and six months ended June 30, 2021. As of June 30, 2022, the Company was in compliance with all covenants under the Singapore Loan and related commitments.

Long-term debt with Western Alliance Bank

On October 12, 2018, Arcturus Therapeutics, Inc. entered into the loan with Western Alliance Bank (the "Bank"), whereby it received $10.0 million (the "Loan").

The Loan is collateralized by all of the assets of Arcturus Therapeutics, Inc., excluding intellectual property, which is subject to a negative pledge. The Loan contains customary conditions of borrowing, events of default and covenants, including covenants that restrict Arcturus Therapeutics, Inc.'s ability to dispose of assets, merge with or acquire other entities, incur indebtedness and make distributions to holders of its capital stock. In addition, Arcturus Therapeutics, Inc. is required to maintain at least 100% of its consolidated, unrestricted cash, or $15.0 million, whichever is lower, with the Bank.

On October 30, 2019, Arcturus Therapeutics, Inc. and the Bank entered into a Third Amendment (the "Third Amendment") to the Loan (as amended, the "Loan Agreement").

Pursuant to the amendment, the Bank agreed to make a term loan to Arcturus Therapeutics, Inc. on October 30, 2019, in the amount of $15.0 million (the "Term Loan"). The resulting net increase in the indebtedness of Arcturus Therapeutics, Inc. was $5.0 million. The Term Loan bears interest at a floating rate ranging from 1.25% to 2.75% above the prime rate. The amendment further provides that the Term Loan has a maturity date of October 30, 2023. Arcturus Therapeutics, Inc. will make monthly payments of interest only until October 1, 2021. The Fourth Amendment was executed in connection with the Singapore Loan. In October of 2021, the Company and the Bank entered into a Fifth Amendment to Loan Agreement that provided for a six month extension to the interest only period which moved the first principal payment to May 1, 2022. In April of 2022, the Company and the Bank entered into a Sixth Amendment to Loan Agreement that provided for a three month extension to the interest only period which moved the first principal payment to August 1, 2022.

Arcturus Therapeutics, Inc. paid a loan origination fee of $54,000 which was recorded as a debt discount along with the remaining loan origination fee from the Loan and is being accreted over the term of the Term Loan. In addition, Arcturus Therapeutics, Inc. is required to pay a fee of $525,000 upon certain change of control events.

The Term Loan may be prepaid in full at any time, subject to a prepayment fee ranging from 0.50% to 2.00% of the prepaid principal amount depending upon the date of the prepayment.

Upon maturity or prepayment (as previously discussed), Arcturus Therapeutics, Inc. will be required to pay a 2% fee as a result of the FDA's approval to proceed with the Company's LUNAR-OTC program based on its IND submission. Such fee is accreted to the long-term debt balance using the effective interest method over the term of the Loan Agreement.

Should an event of default occur, including the occurrence of a material adverse effect, the Company could be liable for immediate repayment of all obligations under the Loan Agreement. As of June 30, 2022, the Company was in compliance with all covenants under the Loan Agreement.

Principal payments, including the final payment due at repayment, on the long-term debt are as follows as of June 30, 2022:

2022	$	5,000,000
2023		10,300,000
Total	$	15,300,000

The Company recognized interest expense related to its long-term debt of $0.7 million during each of the three months ended June 30, 2022 and 2021, and $1.4 million and $1.3 million during the six months ended June 30, 2022 and 2021, respectively.

Note 6. Stockholders' Equity

Alexion Pharmaceuticals License Agreement

On February 17, 2021, the Company entered into an exclusive license agreement with Alexion Pharmaceuticals, Inc. ("Alexion") pursuant to which Alexion granted to the Company an exclusive, worldwide license to exploit certain specified Alexion patent applications. In accordance with the terms of the license agreement, and in exchange for the license, the Company issued 74,713 shares of its common stock to Alexion on February 19, 2021 valued at approximately $5.0 million. The number of shares issued under the agreement was calculated by dividing (i) five million dollars ($5.0 million) by (ii) the volume-weighted average price per share of the Company's common stock on the Nasdaq Global Market for the thirty (30) trading days immediately preceding the effective date of the license agreement (rounded to the nearest whole share). The Company recorded the transaction as an asset purchase as management concluded that all of the value received was related to a single identifiable asset. Further, the Company concluded that there was no alternative future use for the asset and recorded a charge at the closing of the transaction for the full $5.0 million value assigned to the shares issued in connection with the license agreement. This non-cash charge was recorded as acquired in-process research and development expense in the statements of operations and comprehensive loss.

Net Loss per Share

Dilutive securities that were not included in the calculation of diluted net loss per share for the three and six months ended June 30, 2022 as they were anti-dilutive totaled 634,312 and 766,589, respectively, and 1,011,031 and 1,242,987 for the three and six months ended June 30, 2021.

Note 7. Share-Based Compensation Expense

In June 2022 at the Company's 2022 Annual Meeting of Stockholders, the stockholders of the Company approved an amendment to the Company's 2019 Omnibus Equity Incentive Plan (as amendment, the "2019 Plan") which, among other things, increases the aggregate number of shares authorized for use in making awards to eligible persons under the 2019 Plan by 3,750,000 shares, for a total of up to 8,750,000 shares available for issuance. As of June 30, 2022, a total of 3,407,873 shares remain available for future issuance under the 2019 Plan, subject to the terms of the 2019 Plan.

In October 2021, the Company adopted the 2021 Inducement Equity Incentive Plan which covers the award of up to 1,000,000 shares of common stock (the "2021 Plan") effective as of October 15, 2021. Approval of the Company's stockholders will not be required as a condition to the effectiveness of the 2021 Plan for so long as the plan is in compliance with applicable Nasdaq inducement plan rules. On October 20, 2021, the Company filed a Form S-8 with the United States Securities and Exchange Commission to register the issuance of up to 1,000,000 shares underlying awards under the 2021 Plan. In April 2022, the compensation committee of the Company's board of directors approved a proposal to reduce the total number of shares available for future issuance under the 2021 Plan to 130,000. As of June 30, 2022, a total of 68,800 shares remain available for future issuance under the 2021 Plan, subject to the terms of the 2021 Plan.

Stock Options

Share-based compensation expense included in the Company's condensed consolidated statements of operations and comprehensive loss for the three and six months ended June 30, 2022 and 2021 was as follows:

	For the Three Months Ended June 30,		For the Six Months Ended June 30,	
(in thousands)	2022	2021	2022	2021
Research and development	$ 3,360	$ 3,582	$ 6,815	$ 6,828
General and administrative	3,914	3,958	7,830	7,699
Total	$ 7,274	$ 7,540	$ 14,645	$ 14,527

Note 8. Income Taxes

The Company is subject to taxation in the United States and various states. The Company computes its quarterly income tax provision by using a forecasted annual effective tax rate and adjusts for any discrete items arising during the quarter. The primary difference between the effective tax rate and the federal statutory tax rate relates to the valuation allowances on the Company's net operating losses.

For the three and six months ended June 30, 2022 and 2021, the Company recorded no income tax expense. No tax benefit was provided for losses incurred in United States because those losses are offset by a full valuation allowance.

Note 9. Commitments and Contingencies

COVID-19 Vaccine Development

On March 4, 2020, the Company was awarded a grant ("Grant 1") from the Singapore EDB to support the co-development of a potential COVID-19 vaccine with the Duke-NUS Medical School. The Grant provides for up to S$14.0 million (approximately US$10.0 million using the exchange rate at the time the grant contract was entered into) in grants to support the development of the vaccine. The Grant has been paid in full by the EDB as a result of the achievement of certain milestones related to the progress of the development of the vaccine, as set forth in the award agreement. The funds received have been recognized as contra research and development expense. The parties are in continued negotiations with respect to amendments of Grant 1. Currently, the Company is liable for certain expenses during the program and is also subject to certain conditions including the requirement to pay an agreed upon royalty rate to Duke-NUS on future net sales of the LUNAR-COV19 vaccine candidate developed with Duke-NUS in markets or jurisdictions outside of Singapore. The Company did not recognize any contra expense related to Grant 1 for the three months ended June 30, 2022 or 2021. The Company did not recognized any contra expense for the six months ended June 30, 2022 and recognized $1.3 million of contra expense for the six months ended June 30, 2021 related to Grant 1. As of June 30, 2022 and December 31, 2021, no amount remained in accrued expenses.

On October 2, 2020, the Company was awarded another grant ("Grant 2") from the Singapore EDB to support the clinical development of a potential COVID-19 vaccine (ARCT-021). The grant provides for up to S$9.3 million (approximately US$6.7 million) to support the clinical development of the vaccine candidate for costs incurred in Singapore subject to certain conditions. The grant is paid in two installments upon the achievement of certain milestones related to the progress of the development of the vaccine candidate. The Company received the first installment of $3.6 million in the fourth quarter of 2020. The funds received are recognized as contra research and development expense as costs are incurred. During 2021, the Company recognized the remaining amount of the first installment as contra research and development expense for Grant 2. During the first quarter of 2022, the Company and EDB concluded negotiations on this Contract, and thereby reduced the overall amount received by the Company under the Grant to the first installment of $3.6 million.

Cystic Fibrosis Foundation Agreement

On August 1, 2019, the Company amended its Development Program Letter Agreement, dated May 16, 2017 and as amended July 13, 2018, with the Cystic Fibrosis Foundation ("CFF"). Pursuant to the amendment, (i) CFF increased the amount it will award to advance LUNAR-CF to $15.0 million from approximately $3.2 million, (ii) the Company will provide $5.0 million in matching funds for remaining budgeted costs, (iii) the related disbursement schedule from CFF to Arcturus will be modified such that (a) $4.0 million will be disbursed upon execution of the CFF Amendment, (b) $2.0 million will be disbursed within 30 days of the first day of each of January, April, July and October 2020 upon Arcturus invoicing CFF to meet project goals, and (c) the last payment of $3.0 million less the prior award previously paid out, equaling approximately $2.3 million, will be disbursed upon Arcturus Sub invoicing CFF to meet good manufacturing practices and opening an Investigational New Drug ("IND") application. The funds received from CFF are recognized as contra research and development expense in proportion to the percentage covered by CFF of the overall budget. For the three months ended June 30, 2022 and 2021, the Company recognized contra expense of $1.3 million and $0.9 million, respectively, and for the six months ended June 30, 2022 and 2021, the Company recognized contra expense of $2.7 million and $1.5 million, respectively. As of June 30, 2022 and December 31, 2021, $0.5 million and $2.8 million, respectively, remained in accrued liabilities.

Leases

In October 2017, the Company entered into a non-cancellable operating lease agreement for office space adjacent to its previously occupied headquarters. The commencement of the lease began in March 2018 and the lease extends for approximately 84 months from the commencement date with a remaining lease term through March 2025. Monthly rental payments are due under the lease and there are escalating rent payments during the term of the lease. The Company is also responsible for its proportional share of operating expenses of the building and common areas. In conjunction with the new lease, the Company received free rent for four months and received a tenant improvement allowance of $74,000. The lease may be extended for one five-year period at the then current market rate with annual escalations; however, the Company deemed the extension option not reasonably certain to be exercised and therefore excluded the option from the lease terms. The Company entered into an irrevocable standby letter of credit with the landlord for a security deposit of $96,000 upon executing the lease which is included (along with additional funds required to secure the letter of credit) in the balance of non-current restricted cash.

In February 2020, the Company entered into a second non-cancellable operating lease agreement for office space near its current headquarters. The lease extended for 13 months from the commencement date and included a right to extend the lease for one twelve-month period. In February 2021, the Company opted to extend the lease through March 2025 to coincide with the lease term of the Company's headquarters.

In February 2021, the Company entered into a third non-cancellable operating lease agreement for office space near its current headquarters. The lease extends for 12 months from the commencement date with monthly base rent of approximately $11,000. During the third quarter of 2021, the Company opted to extend the lease for an additional 12 months.

In September 2021, the Company entered into a fourth non-cancellable lease agreement for office, research and development, engineering and laboratory space near its current headquarters. The initial term of the lease will extend ten years and eight months from the date of possession, and the Company will have the right to extend the term of the lease for an additional five-year period. When the lease term was determined for our operating lease right-of-use assets and lease liabilities, the extension option for the lease was not included. The lease has a monthly base rent ranging from $268,000 to $360,000 which escalates over the lease term. The Company received a free rent period of four months and also pays for various operating costs, including utilities and real property taxes. The Company entered into an irrevocable standby letter of credit with the landlord for a security deposit of $2.0 million upon executing the lease which is included (along with additional funds required to secure the letter of credit) in the balance of non-current restricted cash. As of June 30, 2022, the underlying asset was available for use by the Company to construct tenant improvements and therefore, the lease term is considered to have commenced.

Operating lease right-of-use asset and liability on the condensed consolidated balance sheets represent the present value of remaining lease payments over the remaining lease terms. The Company does not allocate lease payments to non-lease components; therefore, payments for common-area-maintenance and administrative services are not included in the operating lease right-of-use asset and liability. The Company uses its incremental borrowing rate to calculate the present value of the lease payments, as the implicit rate in the lease is not readily determinable.

As of June 30, 2022, the remaining payments of the operating lease liability were as follows:

(in thousands)	**Remaining Lease Payments**
2022	$ 2,407
2023	5,482
2024	5,646
2025	4,019
2026	3,603
Thereafter	23,282
Total remaining lease payments	44,439
Less: imputed interest	(8,819)
Total operating lease liabilities	$ 35,620
Weighted-average remaining lease term	9.2 years
Weighted-average discount rate	5.1%

Operating lease costs consist of the fixed lease payments included in operating lease liability and are recorded on a straight-line basis over the lease terms. Operating lease costs were $1.4 million and $0.5 million for the three months ended June 30, 2022 and 2021, respectively, and $2.2 million and $0.9 million for the six months ended June 30, 2022 and 2021, respectively.

Note 10. Related Party Transactions

Equity-Method Investment

In June 2018, the Company completed the sale of its intangible asset related to the ADAIR technology. Pursuant to the asset purchase agreement for ADAIR, the Company received a 30% ownership interest in the common stock of Vallon Pharmaceuticals, Inc. ("Vallon") in consideration for the sale of the ADAIR technology. The Company has no requirement to invest further in Vallon. Vallon completed an initial public offering and began trading on The Nasdaq Stock Market under the ticker "VLON" in February 2021. Additionally, Vallon executed the sale of 3,700,000 shares of common stock through a private placement in May 2022. Arcturus owns 843,750 shares of Vallon, or approximately 8%. Based on the Company's ownership and the Vallon board of directors seat held by an executive of Arcturus, the Company has the ability to exercise significant influence over the operating and financial policies of Vallon; therefore, the Company accounts for this investment as an equity-method investment. The Company accounts for its share of the earnings or losses of the investee with a reporting lag of three months, as the financial statements of the investee are not completed on a basis that is sufficient for the Company to apply the equity method on a current basis. The private placement was at a share price of $1.06, greater than the initial investment which resulted in the Company recording a gain in its equity-method investment. Using a three month lag, the gain has been fully offset by losses incurred by Vallon through March 31, 2022.

See *"Note 1, Joint Ventures, Equity Method Investments and Variable Interest Entities"* for specific details surrounding the Company's agreement with Axcelead to form the joint venture entity, Arcalis, Inc.

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

The following is a discussion of the financial condition and results of operations of Arcturus Therapeutics Holdings Inc. for the three and six month period ended June 30, 2022. Unless otherwise specified herein, references to the "Company," "Arcturus," "we," "our" and "us" mean Arcturus Therapeutics Holdings Inc. and its consolidated subsidiaries. You should read the following discussion and analysis together with the interim condensed consolidated financial statements and related notes included elsewhere herein. For additional information relating to our management's discussion and analysis of financial conditions and results of operations, please see our Annual Report on Form 10-K for the year ended December 31, 2021 (the "2021 Annual Report"), which was filed with the U.S. Securities and Exchange Commission (the "Commission") on March 1, 2022. Unless otherwise defined herein, capitalized words and expressions used herein shall have the same meanings ascribed to them in the 2021 Annual Report.

This report includes forward-looking statements which, although based on assumptions that we consider reasonable, are subject to risks and uncertainties which could cause actual events or conditions to differ materially from those currently anticipated and expressed or implied by such forward-looking statements.

You should read this report and the documents that we reference in this report and have filed as exhibits to this report completely and with the understanding that our actual future results may be materially different from what we expect. You should also review the factors and risks we describe in the reports we will file or submit from time to time with the Commission after the date of this report.

Overview

Arcturus is a global late-stage clinical messenger RNA medicines company focused on the development of infectious disease vaccines and significant opportunities within liver and respiratory rare diseases. In addition to our messenger RNA ("mRNA") platform, our proprietary lipid nanoparticle delivery system, LUNAR®, has the potential to enable multiple nucleic acid medicines, and our proprietary self-amplifying mRNA technology (Self-Transcribing and Replicating RNA or STARR™) technology has the potential to provide longer-lasting RNA and sustained protein expression at lower dose levels.

We are leveraging our proprietary platform relating to LUNAR and our nucleic acid technologies to develop and advance a pipeline of mRNA-based vaccines and therapeutics for the prevention of infectious diseases and treatment of rare genetic disorders with significant unmet medical needs. We continue to expand this platform with innovative delivery solutions that allow us to expand our discovery efforts. Our proprietary LUNAR technology is intended to address major hurdles in RNA drug development, such as the effective and safe delivery of RNA therapeutics to disease-relevant target tissues and for RNA vaccines the mitigation of challenges associated with cold chain storage and distribution via lyophilization. We believe the versatility of our platform to target multiple tissues, its compatibility with various nucleic acid therapeutics, and our expertise in developing scalable manufacturing processes will allow us to deliver on the next generation of nucleic acid medicines.

The following chart represents our current pipeline:

Multiple mRNA Vaccine and Therapeutic Programs in Clinical Development

Franchise	Candidate	Indication	Prevalence	Route of Administration	Cell Target	Stage	Anticipated Milestones
Vaccines	LUNAR-COV19 ARCT-154 as Booster Vaccine	COVID-19	Global	Intramuscular	Myocytes & Dendritic Cells	Phase 3	Booster Study Initiation Q4 2022
	LUNAR-COV19 ARCT-154 as Primary Vaccine	COVID-19	Global	Intramuscular	Myocytes & Dendritic Cells	Phase 3	Vietnam EUA Decision Q4 2022
	LUNAR-FLU	Influenza	Global	Intramuscular	Myocytes & Dendritic Cells	Preclinical	STARR™ Candidate Selection 2022
Hepatic	LUNAR-OTC ARCT-810	Ornithine Transcarbamylase Deficiency	> 10,000	Intravenous	Periportal Hepatocytes	Phase 2	Interim Data H2 2022
Respiratory	LUNAR-CF ARCT-032	Cystic Fibrosis	85,000-100,000	Inhaled	Bronchial Epithelial Cells	Preclinical	CTA Filling Q4 2022

EUA = Emergency Use Authorization; STARR™ = Self-transcribing and replicating RNA, CTA = Clinical Trial Application

Key Updates on our COVID-19 Vaccine Program

Phase 1/2 Study in United States and Singapore

In January 2022, we announced immunogenicity data for participants of a Phase 1/2 study being conducted in the U.S. and Singapore. Results from the arms where participants were dosed with 5 mcg of ARCT-154 as a booster after at least five months of being vaccinated with two doses of Comirnaty showed encouraging increases in levels of neutralizing antibody activity against D614G and several variants of concern (VoCs) and variants of interest (VoIs). In May 2022, we provided additional neutralization antibody activity data at Day 91 showing durability of neutralizing antibody response. Validated pseudovirus microneutralization (MNT) assay results for D614G variant showed a 28- and 40-fold increase in geometric mean fold rise (GMFR) on Day 15 and 29 after booster dose compared to pre-dose levels, respectively. The antibody levels remained elevated at 30-fold for Day 91 over pre-boost levels indicating the durability of the neutralizing antibody response. We also shared immunogenicity data obtained in a validated MNT assay against Beta variant and the data indicated similar durability of the neutralizing antibody response with the increases in GMFR of 26-, 31-, and -24 at Days 15, 29, and 91, respectively.

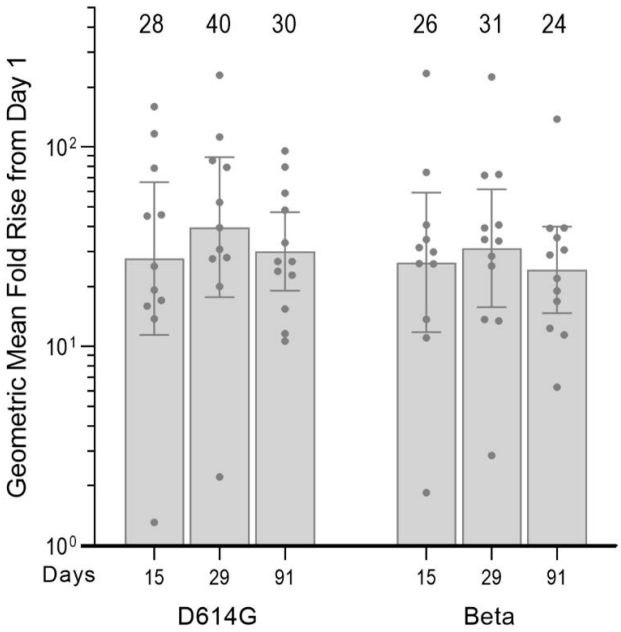

Figure: Validated pseudovirus microneutralization (MNT) assay results (left: D614G; right: Beta), showing GMFR levels of neutralizing antibody responses over Day 1 (baseline levels prior to boosting with ARCT-154) based on geometric mean concentrations (with 95% confidence intervals) obtained for participants (for D614G: n = 12/12 for Days 1, 91 and 11/12 for Days 15 29; For Beta: n = 12/12 for Days 1, 29, 91 and 11/12 for Day 15)

In May 2022, we announced that ARCT-154 booster administered arms also demonstrated robust and durable neutralizing antibody responses against VOCs strains including the Beta and the Delta, and VOIs SARS-CoV-2 strains in a surrogate virus neutralization (sVNT) assay through Day 91.

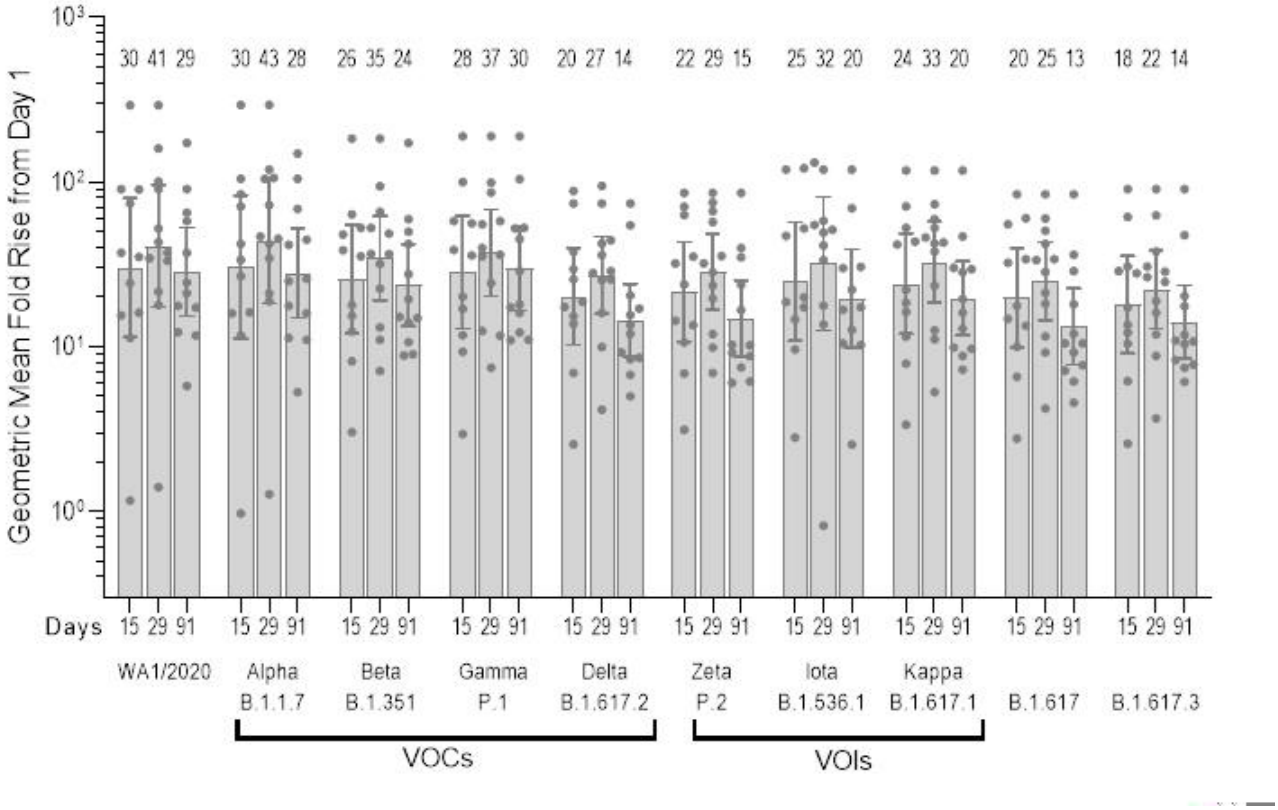

Figure: Surrogate virus neutralization (sVNT) assay results for SARS-CoV-2 variants. The panel shows GMFR on Days 15, 29, and 91 over Day 1 (pre-boost baseline levels; n = 12/12 for Days 1, 29, 91; n = 11/12 for Day 15). VOCs = Variants of Concern; VOIs = Variants of Interest

From the same Phase 1/2 trial, we also reported data (exploratory MNT assay; Moore Laboratory, National Institute for Communicable Diseases and University of the Witwatersrand, South Africa) demonstrating neutralizing antibody immune response to SARS-CoV-2 Omicron variants, BA.1 and BA.2, in participants that received ARCT-154 as booster. Omicron-specific pseudovirus MNT assay results demonstrated neutralizing antibody titers of 54-fold (BA.1) and 46-fold (BA.2) GMFRs over baseline on Day 29 post-boost in ARCT-154 arm (n=12).

In August 2022 we reported additional data (exploratory MNT assay; Moore Laboratory, National Institute for Communicable Diseases and University of the Witwatersrand, South Africa) from the Phase 1/2 trial demonstrating sustained neutralizing antibody immune response to the SARS-CoV-2 Omicron variants, BA.1 and BA.2 at Day 91 post-boost in the ARCT-154 arm (n=12). Omicron-specific pseudovirus MNT assay results demonstrated neutralizing antibody titers of 44-fold (BA.1) and 39-fold (BA.2) at Day 91 post-boost. Six-month data for Omicron variants, including BA.5, is being collected and is expected to be shared during the third quarter of 2022.

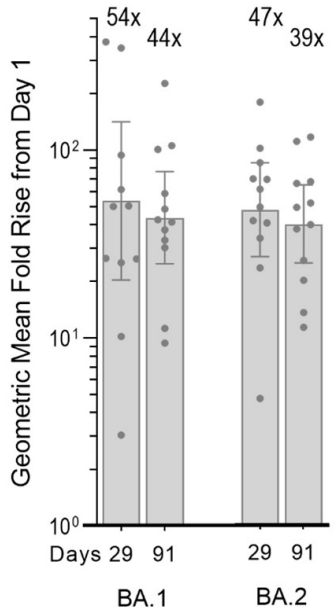

Figure: Exploratory pseudovirus microneutralization (MNT) assay results (left: BA.1, right: BA.2), showing GMFR levels of neutralizing antibody responses over Day 1 (baseline levels prior to boosting with ARCT-154) calculated with virus neutralization concentrations (with 95% confidence intervals) obtained for participants (for BA.1 and BA.2: n = 12/12, Day 91).

Phase 1/2/3 Study in Vietnam

During 2021, we entered into a significant collaboration with Vinbiocare Biotechnology Joint Stock Company (Vinbiocare), a member company of the Vingroup Joint Stock Company (Vingroup) group of companies, whereby we provide technical expertise and support services to Vinbiocare to assist in the build out of a manufacturing facility in Vietnam. Together with Vinbiocare, we advanced ARCT-154, our investigational next generation, self-amplifying mRNA-based vaccine for COVID-19, into a Phase 1/2/3 study in Vietnam, which is being funded and sponsored by Vinbiocare. The trial is randomized, observer-blinded, placebo and active-controlled and is intended to assess the safety, immunogenicity and efficacy of ARCT-154. The Phase 3 arm of the Phase 1/2/3 study was initiated in September 2021. The study enrolled over 19,000 adult subjects in Vietnam, including individuals with medical conditions putting them at higher risk of severe complications of COVID-19. The Phase 3 placebo-controlled efficacy portion of the study enrolled over 16,000 participants.

In February 2022, our partner, Vinbiocare, completed the submission to the Vietnam Ministry of Health of ARCT-154 Emergency Use Authorization (EUA) application, which includes the safety and immunogenicity data from the placebo-controlled Phase 1/2/3a portions of the study with approximately 1,000 participants. In April 2022, Vinbiocare submitted results from the vaccine safety and efficacy analysis of the Phase 3b portion study to the Vietnam Ministry of Health to complement the data package under review for potential EUA of ARCT-154. The vaccine primary efficacy endpoint in the placebo-controlled Phase 3b portion of the study was met. Analysis of the data demonstrated that two 5-mcg doses of ARCT-154 administered 28 days apart resulted in vaccine efficacy of 55.0% (95% CI; 46.9% - 61.9%) for protection against COVID-19 overall and 95.3% (95% CI; 80.4% - 98.9%) against severe and fatal COVID-19, respectively. Nine COVID-19 related deaths were reported in the placebo group and one in the ARCT-154 vaccinated group. The single death in the ARCT-154 vaccination arm occurred in an older age group participant who was also at increased risk of severe COVID-19. During the window when COVID-19 cases in the study were detected, the prevalent SARS-CoV-2 strains associated with COVID-19 infections in Vietnam were Delta and Omicron (https://covariants.org/per-country; https://covid19.who.int/region/wpro/country/vn; https://ourworldindata.org COVID-19 Data Explorer - Vietnam Link).

Review of safety data has been performed by Vinbiocare from over 17,000 participants in the placebo-controlled Phase 1/2/3 portions through one month after second dose of ARCT-154. The incidence of unsolicited events was found to be comparable in the vaccinated and placebo groups and no incidence of myocarditis or pericarditis have been reported so far. Analysis of solicited events also demonstrated that most events were mild or moderate in severity. An independent review by the Data Safety Monitoring Board has advised for the study to continue without modification.

Additional data shared by Vinbiocare shows that the study also met the immunogenicity primary endpoint, with 98.4% 4-fold seroconversion for ancestral (Wuhan) strain, measured by surrogate virus neuralization test (sVNT) 28 days after the second dose of ARCT-154. This analysis was conducted in the first approximately 1,000 participants enrolled in the Phase 1/2/3a study and was provided earlier by Vinbiocare to the Vietnam Ministry of Health as part of the filing for EUA. More comprehensive immunogenicity, efficacy and safety data from the study will be disclosed at a later time.

Pivotal Booster Study

We expect a registrational booster study for ARCT-154 to begin in Q4 2022. Based on recent health authority guidance, Arcturus is considering an updated design consisting of two trials to support global registration of ARCT-154. We have suspended all development activities for our first generation ARCT-021 COVID-19 vaccine, as the global entity initially interested in collaborating with us on the development of ARCT-021 chose not to proceed.

Vaccine Platform Stability Data

New data regarding the product format, stability and cold chain characteristics of our lyophilized COVID-19 vaccine compares favorably to existing COVID-19 vaccine stability requirements. The lyophilized powder demonstrated room temperature stability for 4 days (25°C; 60% RH), refrigerator stability for 6 months (2-8°C), and long-term stability for 18 months (-25°C to -15°C). The vaccines are approved for shipping at 2-8°C and notably, remain stable in the event of temperature cycling.

Key Updates on our Other Development Candidates

- LUNAR-FLU. In early 2022 we added a self-amplifying mRNA approach for our LUNAR-FLU program. A clinical candidate containing mRNA based on our STARR™ platform is expected to be identified by the year end and a Clinical Trial Application is anticipated to be filed in 2023.
- LUNAR-OTC/ARCT-810 - Our rare disease program for ornithine transcarbamylase (OTC) deficiency is continuing to advance. With the improvement of the COVID-19 scenario, there was a significant uptick in recruitment and enrollment activity for the Phase 1b ascending-dose study of ARCT-810 in 12 adults with OTC deficiency. Dosing of the first and second cohorts (0.2 mg/kg and 0.3 mg/kg) have completed, and the Safety Review Committee has recently approved dose escalation to the third cohort (0.4 mg/kg). In addition, health authorities in the UK, Belgium and Spain have approved a randomized, double-blind, placebo-controlled, nested single and multiple ascending dose Phase 2 study of ARCT-810 in 24 adolescent and adult patients with OTC-deficiency. We have identified several dozens of patients in pre-screening, with the goal of obtaining interim proof-of-concept data by year end. On July 18, 2022, Orphan Drug Designation in the EU was granted by the European Commission based on the a positive opinion issued by the EMA.
- LUNAR-CF/ARCT-032 – In our preclinical program for cystic fibrosis, which is being supported in part by the Cystic Fibrosis Foundation, nonclinical and preclinical studies have led to the identification of a Preclinical Candidate and nebulizer system that should allow this product to be advanced into clinical development. We expect to file an application for a first-in-human study for ARCT-032, our mRNA therapeutic candidate for CF, in 2022.

Key Updates on our Research and Platform Activities

- We continue to conduct exploratory platform development activities, including the evaluation of genome editing, and new targeting approaches, where our LUNAR® and STARR™ platforms could potentially be useful for identification and development of additional products for our portfolio.

Results of Operations

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our condensed consolidated financial statements and related notes appearing elsewhere in this Report and our audited financial statements and related notes for the year ended December 31, 2021. Our historical results of operations and the year-to-year comparisons of our results of operations that follow are not necessarily indicative of future results.

Revenue

We enter into arrangements with pharmaceutical and biotechnology partners and government agencies that may contain upfront payments, license fees for research and development arrangements, research and development funding, milestone payments, option exercise and exclusivity fees, royalties on future sales, consulting fees and payments for technology transfers. The following table summarizes our total revenues for the periods indicated (in thousands):

	Three Months Ended June 30,		2021 to 2022	
(Dollars in thousands)	**2022**	**2021**	**$ change**	**% change**
Revenue	$ 27,093	$ 2,001	$ 25,092	*

(Dollars in thousands)	Six Months Ended June 30, 2022	Six Months Ended June 30, 2021	2021 to 2022 $ change	2021 to 2022 % change
Revenue	$ 32,337	$ 4,128	$ 28,209	*

* *Greater than 100%*

Revenue increased by $25.1 million during the three months ended June 30, 2022 as compared to the three months ended June 30, 2021. The increase in revenue primarily relates to an increase in revenue of $12.7 million related to the agreement with Vinbiocare and an increase of $12.5 million related to the recognition of reservation fees from the Israeli MOH.

Revenue increased by $28.2 million during the six months ended June 30, 2022 as compared to the six months ended June 30, 2021. The increase in revenue primarily relates to an increase in revenue of $15.6 million related to the agreement with Vinbiocare and an increase of $12.5 million related to the recognition of reservation fees from the Israeli MOH.

Our operating expenses consist of research and development and general and administrative expenses.

(Dollars in thousands)	Three Months Ended June 30, 2022	Three Months Ended June 30, 2021	2021 to 2022 $ change	2021 to 2022 % change	Six Months Ended June 30, 2022	Six Months Ended June 30, 2021	2021 to 2022 $ change	2021 to 2022 % change
Operating expenses:								
Research and development, net	$ 38,189	$ 45,679	$ (7,490)	-16.4%	$ 83,082	$ 95,729	$ (12,647)	-13.2%
General and administrative	10,993	10,042	951	9.5%	21,723	19,785	1,938	9.8%
Total	$ 49,182	$ 55,721	$ (6,539)	-11.7%	$ 104,805	$ 115,514	$ (10,709)	-9.3%

Research and Development Expenses, net

The following table presents our total research and development expenses by category:

(Dollars in thousands)	Three Months Ended June 30, 2022	Three Months Ended June 30, 2021	2021 to 2022 $ change	2021 to 2022 % change	Six Months Ended June 30, 2022	Six Months Ended June 30, 2021	2021 to 2022 $ change	2021 to 2022 % change
External pipeline development expenses:								
LUNAR-COVID, net	$ 16,939	$ 27,085	$ (10,146)	-37.5%	$ 44,755	$ 56,397	$ (11,642)	-20.6%
Early stage programs	5,087	3,074	2,013	65.5%	8,638	8,027	611	7.6%
Discovery technologies	3,242	5,706	(2,464)	-43.2%	4,607	13,551	(8,944)	-66.0%
External platform development expenses:								
Personnel related expenses	$ 10,533	$ 8,563	$ 1,970	23.0%	$ 20,850	$ 15,472	$ 5,378	34.8%
Facilities and equipment expenses	2,388	1,251	1,137	90.9%	4,232	2,282	1,950	85.5%
Total research and development expenses, net	$ 38,189	$ 45,679	$ (7,490)	-16.4%	$ 83,082	$ 95,729	$ (12,647)	-13.2%

Our research and development expenses consist primarily of external manufacturing costs, in-vivo research studies and clinical trials performed by contract research organizations, clinical and regulatory consultants, personnel related expenses, facility related expenses and laboratory supplies related to conducting research and development activities. Research and development expense was $38.2 million for the three months ended June 30, 2022, respectively, compared with $45.7 million in the comparable period last year, primarily reflecting decreased clinical costs of $13.4 million offset by an increase of $3.3 million in contract manufacturing and lab costs, an increase of facilities expense of $1.1 million and an increase in personnel and consulting expense of $2.0 million. Research and development expense was $83.1 million for the six months ended June 30, 2022, respectively, compared with $95.7 million in the comparable period last year, primarily attributable to decreases in clinical costs of $11.9 million, license fees of $4.9 million and contract manufacturing and lab costs of $3.3 million, offset by increases in personnel costs of $5.4 million and facilities costs of $2.0 million. We expect that our research and development efforts and associated costs will increase and continue to be substantial over the next several years as our pipeline progresses.

Early stage programs represent programs that are in the pre-clinical or Phase 1 clinical stage and may be partnered or unpartnered, including the CF and OTC programs. Discovery technologies represents our efforts to expand our product pipeline and are primarily related to pre-partnered studies and new capabilities assessment. For several of our programs, the activities are part of our collaborative and other relationships and the expenses may be partially offset with funds that have been awarded to the Company.

The expenses primarily consist of external manufacturing costs, lab supplies, equipment, and consulting and professional fees. Both early stage programs and discovery technologies expenses are expected to steadily increase over the coming years.

Personnel related expenses primarily consist of employee salaries and benefits, share-based compensation and consultants and are expected to continue to increase in the near future as we continue increase headcount to meet the needs of our external pipeline, platform and clinical trial efforts.

Facilities and equipment expenses continue to increase as we expand. The three months ended June 30, 2022 includes increased rent and associated costs related to a new facility we took possession of in April 2022. Facilities and equipment expenses are expected to increase in the near term due to increased rent expense related to our new facility.

General and Administrative Expenses

General and administrative expenses primarily consists of salaries and related benefits for our executive, administrative, legal and accounting functions and professional service fees for legal and accounting services as well as other general and administrative expenses. General and administrative expense was $11.0 million and $21.7 million for the three and six months ended June 30, 2022, respectively, compared with $10.0 million and $19.8 million in the comparable periods last year. The increases resulted primarily from personnel expense due to increased headcount and increased rent expense associated with the new facility.

Finance (expense) income, net

	Three Months Ended June 30,		2021 to 2022		Six Months Ended June 30,		2021 to 2022	
(Dollars in thousands)	**2022**	**2021**	**$ change**	**% change**	**2022**	**2021**	**$ change**	**% change**
Interest income	$ 168	$ 190	$ (22)	-11.6%	$ 322	$ 378	$ (56)	-14.8%
Interest expense	(728)	(710)	(18)	2.5%	(1,446)	(1,256)	(190)	15.1%
Total	$ (560)	$ (520)	$ (40)	7.7%	$ (1,124)	$ (878)	$ (246)	28.0%

Interest income is generated on cash and cash equivalents. The decrease in interest income for the three and six months ended June 30, 2022 as compared to the prior year period was a result of decreased cash and cash equivalents balances. Interest expense was incurred in conjunction with our Loan and Security Agreement with Western Alliance Bank and the Singapore Loan. The increase in interest expense for the three and six months ended June 30, 2022 as compared to the prior year period was primarily a result of additional accrued interest expense related to the Singapore Loan that was funded in January 2021.

Other income and expense

	Three Months Ended June 30,		2021 to 2022		Six Months Ended June 30,		2021 to 2022	
(Dollars in thousands)	**2022**	**2021**	**$ change**	**% change**	**2022**	**2021**	**$ change**	**% change**
Gain (loss) from equity-method investment	$ (131)	$ (328)	$ 197	-60.1%	$ (516)	$ 920	$ (1,436)	*
Gain (loss) from foreign currency	1,217	(13)	1,230	*	1,376	417	959	*
Total	$ 1,086	$ (341)	$ 1,427	*	$ 860	$ 1,337	$ (477)	-35.7%

* *Greater than 100%*

Other income and expense items relate to gains and losses from foreign currency transactions and from equity-method investments. We recorded foreign currency gains of $1.2 million and $1.4 million for the three and six months ended June 30, 2022, respectively, compared with a $0.0 million loss and $0.4 million gain in the comparable periods last year which is primarily attributable to the Singapore Loan.

We recorded a loss of $0.1 million and $0.5 million for the three and six months ended June 30, 2022, respectively, compared with a $0.3 million loss and $0.9 million gain in the comparable periods last year in connection with our equity-method investment in Vallon Pharmaceuticals, Inc.

Off-balance sheet arrangements

Through June 30, 2022, we have not entered into and did not have any relationships with unconsolidated entities or financial collaborations, such as entities often referred to as structured finance or special purpose entities, established for the purpose of facilitating off-balance sheet arrangements or other contractually narrow or limited purposes.

Liquidity and Capital Resources

From the Company's inception through the quarter ended June 30, 2022, the Company has funded its operations principally with the proceeds from the sale of capital stock, long-term debt and revenues earned through collaboration agreements. At June 30, 2022, we had $283.5 million in unrestricted cash and cash equivalents.

Loan and Security Agreement

On October 12, 2018, we entered into a Loan and Security Agreement with Western Alliance Bank (the "Loan Agreement"). Pursuant to the Third Amendment, the Bank agreed to increase the Loan Agreement to $15.0 million on October 30, 2019. The Loan Agreement bears interest at a floating rate ranging from 1.25% to 2.75% above the prime rate. The amendment further provides that the Loan Agreement has a maturity date of October 30, 2023. The interest-only period ended on August 1, 2022 and we began making payments towards the principal balance.

Manufacturing Support Agreement

On November 7, 2020, we entered into a Manufacturing Support Agreement (the "Support Agreement") with the EDB. Pursuant to the Support Agreement, the EDB agreed to make a term loan (the "Singapore Loan") of S$62.1 million to us, subject to the satisfaction of customary deliveries, to support the manufacture of the LUNAR-COV19 vaccine candidate (ARCT-021). The Singapore Loan accrues interest at a rate of 4.5% per annum calculated on a daily basis. We elected to borrow the full amount available under the Support Agreement of S$62.1 million ($46.6 million) on January 29, 2021. The EDB agreed to an extension of the reconciliation period to March 31, 2022 with unused funds as of such date returned to the EDB within 30 days of the completion of the audit which is expected to be completed during the third quarter of 2022. The parties are in continued negotiations with respect to amendments of the Singapore Loan terms. As of June 30, 2022, we have reported a portion of the Singapore Loan as current to reflect a potential principal repayment of approximately S$20.9 million ($15.4 million) in fiscal year 2022 based on amounts not used toward the manufacture of ARCT-021, and we expect to refund this portion in fiscal year 2022. According to the Support Agreement, the remaining portion of the Singapore Loan, approximately $31.2 million, is forgivable if we have not obtained regulatory approval by the final payment date and net sales are less than $100 million. We currently anticipate that we will not move forward with obtaining regulatory approval for ARCT-021, and we intend to begin discussions with the EDB during fiscal year 2022 regarding forgiveness of the remaining portion of the Singapore Loan.

The Singapore Loan was initially recorded as long-term debt at $46.6 million, the amount of cash proceeds at the time we received the funding. During the first quarter of 2022, accrued interest of $1.9 million related to 2021 was added to the principal debt balance in accordance with the terms of the Support Agreement and the balance was adjusted to reflect the current exchange rate resulting in an increase in the debt balance to $47.8 million. We recorded a net foreign currency transaction gain of $1.4 million for the six months ended June 30, 2022 compared to a net foreign currency transaction gain of $0.4 million for the six months ended June 30, 2021. For the three and six months ended June 30, 2022, we recorded interest expense and a corresponding liability of $0.5 million and $1.1 million, respectively, compared to interest expense and a corresponding liability of $0.5 million and $0.9 million, respectively, for the three and six months ended June 30, 2021. As of June 30, 2022, the Company was in compliance with all covenants under the Singapore Loan and related commitments.

Vinbiocare Agreement

On August 2, 2021, we announced an agreement with Vinbiocare, a member of Vingroup Joint Stock Company, to establish a manufacturing facility in Vietnam for the manufacture of our investigational COVID-19 vaccine program, for sale and use within Vietnam. In addition, Vinbiocare agreed to execute a phase 1/2/3 study in Vietnam.

Under the terms of the arrangement, Vinbiocare is building out a manufacturing facility in Vietnam, and we have provided to Vinbiocare access to proprietary technologies and processes for the manufacture of our investigational COVID-19 vaccine candidate. We also provided Vinbiocare with an exclusive license to manufacture the vaccines in Vietnam at the facility solely for distribution in Vietnam. The license and technology transfer applies toward drug product manufacturing but not toward mRNA drug substance manufacturing. Vinbiocare made an upfront payment of $40 million and is responsible for costs associated with the technology transfer. Vinbiocare will also pay for mRNA drug substance supplied by us and royalties on vaccines produced at the manufacturing facility.

General Financial Resources

A significant portion of our current unrestricted cash and cash equivalents balance of $283.5 million is expected to be utilized during fiscal year 2022 to fund (i) a portion of the COVID Booster trial, (ii) further progress of our FLU vaccine programs, (iii) the

continued Phase 2 trial of ARCT-810, our LUNAR-OTC candidate, (iv) advances to our LUNAR-CF program toward submission of a CTA during the second half of 2022 and (v) continued expansion of our platform and other general administrative activities.

Our future capital requirements are difficult to forecast and will depend on many factors that are out of our control. If we are unable to maintain sufficient financial resources, our business, financial condition and results of operations will be materially and adversely affected. There can be no assurance that we will be able to obtain additional needed financing on acceptable terms or at all. Additionally, equity or debt financings may have a dilutive effect on the holdings of our existing shareholders.

We expect to continue to incur additional losses for the foreseeable future, and we will need to raise additional debt or equity financing or enter into additional partnerships to fund development. The ability of our Company to transition to profitability is dependent on identifying and developing successful mRNA drug candidates. If we are not able to achieve planned milestones, incur costs in excess of our forecasts, or do not meet covenant requirements of our debt, we will need to reduce discretionary spending, discontinue the development of some or all of our products, which will delay part of our development programs, all of which will have a material adverse effect on our ability to achieve our intended business objectives.

Funding Requirements

We anticipate that we will continue to generate losses for the foreseeable future, and we expect the losses to increase as we continue the development of, and seek regulatory approvals for, our product candidates, and begin commercialization of our products. As a result, we will require additional capital to fund our operations in order to support our long-term plans. We believe that our current cash position will be sufficient to meet our anticipated cash requirements through at least the next twelve months, assuming, among other things, no significant unforeseen expenses, continued funding from partners at anticipated levels and our payment obligations continuing to follow the current maturity schedule under our long-term credit facility referenced in Note 5. We intend to seek additional capital through equity and/or debt financings, collaborative or other funding arrangements with partners or through other sources of financing. Should we seek additional financing from outside sources, we may not be able to raise such financing on terms acceptable to us or at all. If we are unable to raise additional capital when required or on acceptable terms, we may be required to scale back or discontinue the advancement of product candidates, reduce headcount, liquidate our assets, file for bankruptcy, reorganize, merge with another entity, or cease operations.

Our future funding requirements are difficult to forecast and will depend on many factors, including the following:

- the development of our LUNAR-COV19 and LUNAR-FLU vaccine candidates;
- the achievement of milestones under our strategic alliance agreements;
- maintaining and/or expanding our manufacturing network and capabilities;
- the terms and timing of any other strategic alliance, licensing and other arrangements that we may establish;
- the initiation, progress, timing and completion of preclinical studies and clinical trials for our 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 and timing of procuring clinical and commercial supplies of our product candidates;
- the costs and timing of establishing sales, marketing and distribution capabilities;
- the costs associated with legal proceedings;
- the extent to which we acquire or invest in businesses, products or technologies;
- market disruptions, including significant volatility in the financial markets caused by the Russia/Ukraine conflict.

Critical Accounting Policies and Estimates

We prepare our condensed consolidated financial statements in conformity with GAAP. As such, we make certain estimates, judgments and assumptions that we believe are reasonable, based upon information available to us. These judgements involve making estimates about the effect of matters that are inherently uncertain and may significantly impact our reported results of operations and financial condition. We describe our significant accounting policies more fully in Note 2 to our consolidated financial statements for the year ended December 31, 2021.

There have been no material changes to our critical accounting policies and estimates from the information provided in Item 7, Management's Discussion and Analysis of Financial Condition and Results of Operations, included in the 2021 Annual Report.

Item 3. Quantitative and Qualitative Disclosures About Market Risk.

Our primary exposure to market risk is interest income and expense sensitivity and foreign currency exchange rates. Interest income and expense sensitivity is affected by changes in the general level of interest rates in the United States. Foreign exchange market risks relate to the grants and loan from the Singapore Economic Development Board which is discussed in this Quarterly Report in "Notes to Condensed Consolidated Financial Statements, Note 1. Description of Business." When deemed appropriate, we may manage our exposure to foreign exchange market risks through the use of derivative financial instruments. We may utilize such derivative financial instruments for hedging or risk management purposes. Due to the nature of our cash and cash equivalents and our evaluation of the potential impact of foreign currency exchange rates, we believe that we are not currently subject to any material market risk exposure.

Item 4. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

As required by Rule 13a-15(b) and Rule 15d-15(b) of the Exchange Act, our management, including our principal executive officer, our principal financial officer and our principal accounting officer, conducted an evaluation as of the end of the period covered by this Quarterly Report on Form 10-Q of the effectiveness of the design and operation of our disclosure controls and procedures. Based on that evaluation, management has concluded that as of June 30, 2022, the Company's disclosure controls and procedures were effective at the reasonable assurance level, and we believe the condensed consolidated financial statements included in this Form 10-Q for the quarterly periods ended June 30, 2022 fairly present, in all material respects, our financial position, results of operations, comprehensive loss, statements of stockholders' equity and cash flows for the periods presented in conformity with U.S. generally accepted accounting principles.

Changes in Internal Control over Financial Reporting

As required by Rule 13a-15(d) and Rule 15d-15(d) of the Exchange Act, our management, including our principal executive officer, our principal financial officer and our principal accounting officer, conducted an evaluation of the internal control over financial reporting to determine whether any other changes occurred during the period covered by this Quarterly Report on Form 10-Q that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting. Based on that evaluation, our principal executive officer, principal financial officer and principal accounting officer concluded that there were no changes in our internal controls over financial reporting during the periods covered by this Quarterly Report on Form 10-Q that materially affected, or were reasonably likely to materially affect, our internal control over financial reporting.

PART II—OTHER INFORMATION

Item 1. Legal Proceedings.

From time to time, we may be involved in various legal proceedings and subject to claims that arise in the ordinary course of business, including those related to governmental inquiries, intellectual property and commercial relationships. The subject matter of any such legal proceedings or claims are or will be highlight complex and subject to substantial uncertainties. The outcome of any such proceedings or claims, regardless of the merits, are and will be inherently uncertain; therefore, assessing the likelihood of loss and any estimated damages is difficult and subject to considerable judgment.

Item 1A. Risk Factors.

Our business is subject to various risks, including those described in Item 1A of our Annual Report on Form 10-K for the fiscal year ended December 31, 2021, which we strongly encourage you to review. Other than as set forth below, there have been no material changes to the risk factors described in our Annual Report on Form 10-K for the year ended December 31, 2021 filed with the Commission on March 1, 2022.

We have terminated development efforts for our initial COVID-19 vaccine candidate ARCT-021. Further studies for our successor COVID-19 candidate, ARCT-154 will require substantial additional resources and funding and we may not be able to continue the program unless and until we identify funding for the completion of our studies.

The planned multinational Phase 3 vaccine trial against COVID-19 with a global entity, for which our initial COVID-19 vaccine candidate, ARCT-021, was selected, has not and will not proceed. We do not plan to sponsor additional development studies of ARCT-021. Advancing our next generation candidate, ARCT-154 has taken significant time and resources. Further, the existence of several other COVID-19 vaccines that have achieved approval and widespread global adoption makes it significantly more challenging for us to run clinical trials on, and to achieve marketing approvals (including emergency use authorizations) for, any of our COVID-19 vaccine candidates. A significant portion of our current cash balance is expected to be utilized during 2022 to fund our continued preclinical and clinical development activities for our pipeline, including manufacturing activities to support such development activities and corresponding manufacturing activities and resources to preparing filings with regulatory authorities. Any additional Phase 3 trial of our LUNAR-COV19 vaccine candidate, if any, may need to be primarily or exclusively funded through our cash reserves. We will need to raise additional funds through equity transactions, additional debt or prepayments from potential customers, a partnering transaction, among other options, to fund commercialization of LUNAR-COV19. If we are unable to identify any such opportunities, we may make a determination to terminate the COVID-19 program. The terms associated with any such opportunity would likely reduce the value to us of the eventual commercialization of ARCT-154.

Data from our ongoing Phase 1/2/3 clinical trials of ARCT-154 in Vietnam may not provide sufficient evidence to the Vietnamese regulatory authorities, the US FDA or regulatory authorities in other jurisdictions that it is sufficiently safe and effective to achieve any marketing approval (including any emergency use authorization) or to have a plausible clinical path to an approval.

The completion of these clinical trials in Vietnam and their review by Vietnamese regulatory authorities may be delayed substantially because of a recently exposed scandal involving COVID-19 testing kits. The scandal has resulted in expulsions of high-level officials in the Ministry of Health as well as Center for Disease Control directors & health officials in 14 provinces. Clinical trial results are inherently uncertain, and a significant portion of our potential success and business prospects currently depend on our COVID-19 vaccine program. If we cannot demonstrate sufficient safety and efficacy and complete these clinical trials on a timely basis, we likely will have missed a substantial market opportunity for COVID-19 vaccines, after dedicating significant efforts and financial resources to this program.

Item 2. Unregistered Sales of Equity Securities and Use of Proceeds.

None.

Item 3. Defaults Upon Senior Securities.

None.

Item 4. Mine Safety Disclosures.

Not applicable.

Item 5. Other Information.

None.

Item 6. Exhibits.

Exhibit Index

Exhibit Number	Description
3.1	Certificate of Incorporation. Incorporated by reference to Annex B to the proxy statement/prospectus which forms part of the Registration Statement on Form S-4 filed on March 18, 2019 (File No. 333-230353).
3.2	Certificate of Amendment, dated November 25, 2020. Incorporated by reference to Exhibit 3.1 to Form 8-K filed on November 25, 2020 (File No. 001-38942).
3.3	Bylaws of Arcturus Therapeutics Holdings Inc. Incorporated by reference to Exhibit 3.2 to the Company's Registration Statement on Form S-3, filed with the SEC on May 8, 2020 (File No. 333-238139).
4.1	Description of Registrant's Securities. Incorporated by reference to Exhibit 4.1 to the Company's Annual Report on Form 10-K for the year ended December 31, 2021 filed on February 28, 2022 (File No. 001-38942).
10.1†	Form of Indemnification Agreement. Incorporated by reference to Exhibit 10.1 to the Company's Annual Report on Form 10-K for the year ended December 31, 2019 filed on March 16, 2020 (File No. 001-38942).
10.2†	Amended and Restated 2019 Omnibus Equity Incentive Plan. Incorporated by reference Exhibit 4.3 to the Registration Statement on Form S-8 filed on August 5, 2020 (File No. 333-240397).
10.3**	Loan and Security Agreement, dated October 12, 2018, by and between Western Alliance Bank and Arcturus Therapeutics, Inc. Incorporated by reference to Exhibit 10.1 to the Company's Report of Foreign Private Issuer on Form 6-K filed on October 15, 2018 (File No. 001-35932).
10.4**	Amended and Restated Amendment to Development and Option Agreement, dated as of September 28, 2018, by and between CureVac AG and Arcturus Therapeutics Inc. Incorporated by reference to Exhibit 99.2 to the Company's Report of Foreign Private Issuer on Form 6-K filed on October 1, 2018 (File No. 001-35932).
10.5**	Research Collaboration and License Agreement, by and between Arcturus Therapeutics, Inc. and Janssen Pharmaceuticals, Inc., dated October 18, 2017. Incorporated by reference to Exhibit 4.7 to Form 20-F filed on May 14, 2018 (File No. 001-35932).
10.6**	Research and Exclusive License Agreement, by and between Arcturus Therapeutics, Inc. and Synthetic Genomics, Inc., effective October 24, 2017. Incorporated by reference to Exhibit 4.8 to Form 20-F filed on May 14, 2018 (File No. 001-35932).
10.7**	Research Agreement, by and between Arcturus Therapeutics, Inc. and Millennium Pharmaceuticals, Inc., a wholly-owned subsidiary of Takeda Pharmaceutical Company Limited, effective December 6, 2016, as amended December 21, 2017. Incorporated by reference to Exhibit 4.9 to Form 20-F filed on May 14, 2018 (File No. 001-35932).
10.8**	Research Collaboration and License Agreement, by and between Arcturus Therapeutics, Inc. and Ultragenyx Pharmaceutical Inc., entered into as of October 26, 2015, as amended October 17, 2017 and April 20, 2018. Incorporated by reference to Exhibit 4.10 to Form 20-F filed on May 14, 2018 (File No. 001-35932).
10.9**	Third Amendment to Research Collaboration and License Agreement, by and between Arcturus Therapeutics, Inc. and Ultragenyx Pharmaceutical Inc., effective June 18, 2019. Incorporated by reference to Exhibit 10.2 to Form 8-K filed on June 20, 2019 (File No. 001-38942).
10.10**	Letter Agreement, by and between Arcturus Therapeutics, Inc. and the Cystic Fibrosis Foundation, dated May 16, 2017. Incorporated by reference to Exhibit 4.11 to Form 20-F filed on May 14, 2018 (File No. 001-35932).
10.11**	Amendment No. 2 to Letter Agreement, by and between Arcturus Therapeutics, Inc. and the Cystic Fibrosis Foundation, dated August 1, 2019. Incorporated by reference to Exhibit 10.16 to Form 10-Q filed on August 14, 2019.
10.12**	Development and Option Agreement, by and between Arcturus Therapeutics, Inc. and CureVac AG, dated January 1, 2018, as amended May 3, 2018. Incorporated by reference to Exhibit 4.12 to Form 20-F filed on May 14, 2018 (File No. 001-35932).
10.13**	Third Amendment to Development and Option Agreement, by and between Arcturus Therapeutics, Inc. and CureVac AG, dated July 26, 2019. Incorporated by reference to Exhibit 10.20 to Form 10-Q filed on August 14, 2019 (File No. 001-38942).

10.14**	License Agreement, by and between Arcturus Therapeutics, Inc., as successor-in-interest to Marina Biotech, Inc., and Protiva Biotherapeutics Inc., dated as of November 28, 2012. Incorporated by reference to Exhibit 4.14 to Form 20-F/A filed on July 10, 2018 (File No. 001-35932).
10.15**	Patent Assignment and License Agreement, by and between Arcturus Therapeutics, Inc. and Marina Biotech, Inc., dated as of August 9, 2013. Incorporated by reference to Exhibit 4.15 to Form 20-F filed on May 14, 2018 (File No. 001-35932).
10.16	Share Exchange Agreement, dated as of February 11, 2019, by and between Arcturus Therapeutics Ltd. and Arcturus Therapeutics Holdings Inc. Incorporated by reference to Exhibit 10.13 to the Company's Annual Report on Form 10-K for the year ended December 31, 2018 filed on March 18, 2019 (File No. 001-35932).
10.17**	Amended and Restated Joint Venture, Research Collaboration and License Agreement, dated as of July 14, 2018 by and between Arcturus Therapeutics, Inc. and Providence Therapeutics, Inc. Incorporated by reference to Exhibit 10.14 to the Company's Amendment No. 1 to Annual Report on Form 10-K for the year ended December 31, 2018 filed on April 10, 2019 (File No. 001-35932).
10.18**	Research Collaboration Agreement, dated as of March 8, 2019 by and between Arcturus Therapeutics, Inc. and Millennium Pharmaceuticals, Inc., a wholly-owned subsidiary of Takeda Pharmaceutical Company Limited. Incorporated by reference to Exhibit 10.15 to the Company's Annual Report on Form 10-K for the year ended December 31, 2018 filed on March 18, 2019 (File No. 001-35932).
10.19	Lease Agreement, by and between Arcturus Therapeutics, Inc. and ARE-SD Region No. 44, LLC, dated October 4, 2017. Incorporated by reference to Exhibit 4.6 to Form 20-F filed on May 14, 2018 (File No. 001-35932).
10.20	First Amendment to Lease Agreement, by and between Arcturus Therapeutics Holdings Inc. and ARE-SD Region No. 44, LLC dated February 1, 2020. Incorporated by reference to Exhibit 10.23 to the Company's Annual Report on Form 10-K for the year ended December 31, 2019 filed on March 16, 2020 (File No. 001-38942).
10.21**	Acceptance Letter, dated March 4, 2020, by and between Arcturus Therapeutics Holdings Inc. and the Economic Development Board of Singapore. Incorporated by reference to Exhibit 10.24 to the Company's Annual Report on Form 10-K for the year ended December 31, 2019 filed on March 16, 2020 (File No. 001-38942).
10.22**	Supply Agreement, dated August 17, 2020, by and between Arcturus Therapeutics, Inc. and the Israeli Ministry of Health. Incorporated by reference to Exhibit 10.32 to Quarterly Report on Form 10-Q filed on November 9, 2020 (File No. 001-38942).
10.23**	Manufacturing Support Agreement, dated November 7, 2020, by and between Arcturus Therapeutics Holdings Inc. and the Economic Development Board of Singapore. Incorporated by reference to Exhibit 10.33 to Quarterly Report on Form 10-Q filed on November 9, 2020 (File No. 001-38942).
10.24	Fourth Amendment to Loan and Security Agreement, dated December 1, 2020, by and between Arcturus Therapeutics, Inc. and Western Alliance Bank. Incorporated by reference to Exhibit 10.1 to Form 8-K filed on December 7, 2020 (File No. 001-38942).
10.25†	2020 Employee Stock Purchase Plan. Incorporated by reference to Exhibit 4.3 to Form S-8 filed on August 5, 2020 (File No. 333-240392).
10.26	Second Amendment to Lease, by and between Arcturus Therapeutics, Inc. and ARE-SD Region No. 44, LLC, dated November 13, 2020. Incorporated by reference to Exhibit 10.29 to the Company's Annual Report on Form 10-K for the year ended December 31, 2020 filed on March 1, 2020 (File No. 001-38942).
10.27	Third Amendment to Lease, by and between Arcturus Therapeutics, Inc. and ARE-SD Region No. 44, LLC, dated February 25, 2021. Incorporated by reference to Exhibit 10.30 to the Company's Annual Report on Form 10-K for the year ended December 31, 2020 filed on March 1, 2020 (File No. 001-38942).
10.28	Arcturus Therapeutics Holdings Inc. Severance Policy for Executives. Incorporated by reference to Exhibit 10.1 to Current Report on Form 8-K filed on April 26, 2021 (File No. 001-38942).
10.29	Technology License and Technical Support Agreement, signed July 29, 2021 and effective July 30, 2021, by and between Arcturus Therapeutics, Inc. and Vinbiocare Research and Manufacture Joint Stock Company. Incorporated by reference to Exhibit 10.32 to Quarterly Report on Form 10-Q filed on August 10, 2021 (File No. 001-38942).

10.30	Framework Drug Substance Supply Agreement, signed July 29, 2021 and effective July 30, 2021, by and between Arcturus Therapeutics, Inc. and Vinbiocare Research and Manufacture Joint Stock Company. Incorporated by reference to Exhibit 10.33 to Quarterly Report on Form 10-Q filed on August 10, 2021 (File No. 001-38942).
10.31	Fifth Amendment to Loan and Security Agreement, dated October 27, 2021, by and between Arcturus Therapeutics, Inc. and Western Alliance Bank. Incorporated by reference to Exhibit 10.34 to Form 10-Q filed on November 9, 2021 (File No. 001-38942).
10.32	Lease, by and between Arcturus Therapeutics, Inc. and TPSC IX, LLC, dated September 29, 2021. Incorporated by reference to Exhibit 10.35 to Form 10-Q filed on November 9, 2021 (File No. 001-38942).
10.33†	Arcturus Therapeutics Holdings Inc. 2021 Inducement Equity Incentive Plan. Incorporated by reference to Exhibit 4.1 to the Registration Statement on Form S-8 filed on October 20, 2021 (File No. 333-260391).
10.34*	Sixth Amendment to Loan and Security Agreement, dated April 19, 2022, by and between Arcturus Therapeutics, Inc. and Western Alliance Bank. Incorporated by reference to Exhibit 10.36 to Form 10-Q filed on May 8, 2022 (File No. 001-38942).
10.35	Amended and Restated 2019 Omnibus Equity Incentive Plan, as amended. Incorporated by reference to Exhibit 4.3 to the Registration Statement on Form S-8 filed on June 30, 2022.
31.1*	Certification of Principal Executive Officer Pursuant to Rule 13a-14(a) or 15d-14(a) under the Securities Exchange Act of 1934, as amended.
31.2*	Certification by Principal Financial Officer pursuant to Rule 13a-14(a) or 15d-14(a) under the Securities Exchange Act of 1934, as amended.
32.1*	Certification of Principal Executive Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2*	Certification of Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101*	The following financial statements and footnotes from the Registrant's Quarterly Report on Form 10-Q for the fiscal quarter ended June 30, 2022 formatted in Inline Extensible Business Reporting Language (Inline XBRL): 101.INS Inline XBRL Instance Document - the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document 101.SCH Inline XBRL Taxonomy Extension Schema 101.CAL Inline XBRL Taxonomy Extension Calculation Linkbase 101.DEF Inline XBRL Taxonomy Extension Definition Linkbase 101.LAB Inline XBRL Taxonomy Extension Label Linkbase 101.PRE Inline XBRL Taxonomy Extension Presentation Linkbase
104	Cover Page Interactive Data File (embedded within the Inline XBRL document)

* Filed herewith.

** Certain confidential portions of this exhibit have been redacted from the publicly filed document because such portions are (i) not material and (ii) would be competitively harmful of publicly disclosed.

† Management compensatory plan, contract or arrangement.

SIGNATURE

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.

ARCTURUS THERAPEUTICS HOLDINGS INC.

Date: August 9, 2022

By: /s/ Andy Sassine
Andy Sassine
Chief Financial Officer

Exhibit 31.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER

I, Joseph E. Payne, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Arcturus Therapeutics Holdings Inc.;

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

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

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

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

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

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

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

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

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

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

Date: August 9, 2022

By: /s/ Joseph E. Payne

Joseph E. Payne
President and Chief Executive Officer

Exhibit 31.2

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER

I, Andy Sassine, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Arcturus Therapeutics Holdings Inc.;

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

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

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

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

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

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

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

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

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

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

Date: August 9, 2022

By: /s/ Andy Sassine

Andy Sassine
Chief Financial Officer

Exhibit 32.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER
PURSUANT TO
18 U.S.C. SECTION 1350
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

The undersigned, the President and Chief Executive Officer of Arcturus Therapeutics Holdings Inc. (the "Company"), hereby certifies on the date hereof, pursuant to 18 U.S.C. 1350(a), as adopted pursuant to Section 906 of The Sarbanes-Oxley Act of 2002, that the Quarterly Report on Form 10-Q for the period ended June 30, 2022 (the "Form 10-Q"), filed concurrently herewith by the Company, fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended, and that the information contained in the Form 10-Q fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: August 9, 2022

By: /s/ Joseph E. Payne
Joseph E. Payne
President and Chief Executive Officer

Exhibit 32.2

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER
PURSUANT TO
18 U.S.C. SECTION 1350
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

The undersigned, the Chief Financial Officer of Arcturus Therapeutics Holdings Inc. (the "Company"), hereby certifies on the date hereof, pursuant to 18 U.S.C. 1350(a), as adopted pursuant to Section 906 of The Sarbanes-Oxley Act of 2002, that the Quarterly Report on Form 10-Q for the period ended June 30, 2022 (the "Form 10-Q"), filed concurrently herewith by the Company, fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended, and that the information contained in the Form 10-Q fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: August 9, 2022

By: /s/ Andy Sassine
Andy Sassine
Chief Financial Officer