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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-Q

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

For the quarterly period ended March 31, 2020

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 000-14656

REPLIGEN CORPORATION
(Exact Name of Registrant as Specified in its Charter)

Delaware	**04-2729386**
(State or Other Jurisdiction of Incorporation or Organization)	**(I.R.S. Employer Identification No.)**
41 Seyon Street, Bldg. 1, Suite 100 Waltham, MA	**02453**
(Address of Principal Executive Offices)	**(Zip Code)**

(781) 250-0111
Registrant's Telephone Number, Including Area Code

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 $0.01 per share	**RGEN**	**The Nasdaq Global Select Market**

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

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

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

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

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

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

The number of shares outstanding of the registrant's common stock on May 4, 2020 was 52,305,744.

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PART I – FINANCIAL INFORMATION

ITEM 1. Financial Statements

REPLIGEN CORPORATION
CONSOLIDATED BALANCE SHEETS
(Unaudited, amounts in thousands, except share data)

	March 31, 2020	December 31, 2019
Assets		
Current assets:		
Cash and cash equivalents	$ 529,525	$ 528,392
Restricted cash	9,041	9,015
Accounts receivable, net of allowances of $658 and $525 at March 31, 2020 and December 31, 2019, respectively	44,726	43,068
Royalties and other receivables	30	148
Unbilled receivables	456	456
Inventories, net	61,781	54,832
Prepaid expenses and other current assets	5,819	5,917
Total current assets	651,378	641,828
Property, plant and equipment, net	50,373	48,455
Intangible assets, net	208,526	212,552
Goodwill	468,382	468,413
Deferred tax assets	2,904	2,920
Operating lease right of use assets	24,688	25,707
Other assets	230	238
Total assets	$1,406,481	$ 1,400,113
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	$ 10,176	$ 11,425
Operating lease liability	3,747	3,557
Accrued liabilities	27,930	33,331
Total current liabilities	41,853	48,313
Convertible senior notes, net	235,458	232,767
Deferred tax liabilities	29,868	29,944
Operating lease liability, long-term	27,038	26,995
Other liabilities, long-term	2,506	2,326
Total liabilities	336,723	340,345
Commitments and contingencies (Note 10)		
Stockholders' equity:		
Preferred stock, $0.01 par value, 5,000,000 shares authorized, no shares issued or outstanding	—	—
Common stock, $0.01 par value; 80,000,000 shares authorized; 52,278,083 shares at March 31, 2020 and 52,078,258 shares at December 31, 2019 issued and outstanding	523	521
Additional paid-in capital	1,074,183	1,068,431
Accumulated other comprehensive loss	(20,606)	(15,027)
Accumulated earnings	15,658	5,843
Total stockholders' equity	1,069,758	1,059,768
Total liabilities and stockholders' equity	$1,406,481	$ 1,400,113

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

REPLIGEN CORPORATION
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(Unaudited, amounts in thousands, except per share data)

	For the Three Months Ended March 31,	
	2020	**2019**
Revenue:		
Products	$ 76,060	$ 60,612
Royalty and other revenue	30	22
Total revenue	76,090	60,634
Costs and operating expenses:		
Cost of product revenue	31,982	26,845
Research and development	4,702	3,620
Selling, general and administrative	27,500	18,998
Total costs and operating expenses	64,184	49,463
Income from operations	11,906	11,171
Other income (expenses):		
Investment income	1,364	713
Interest expense	(2,976)	(1,726)
Other income	382	358
Other expenses, net	(1,230)	(655)
Income before income taxes	10,676	10,516
Income tax provision	861	2,463
Net income	$ 9,815	$ 8,053
Earnings per share:		
Basic	$ 0.19	$ 0.18
Diluted	$ 0.18	$ 0.17
Weighted average common shares outstanding:		
Basic	52,139	43,968
Diluted	53,109	46,279
Net income	$ 9,815	$ 8,053
Other comprehensive income (loss):		
Foreign currency translation adjustment	(5,579)	(1,891)
Comprehensive income	$ 4,236	$ 6,162

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

REPLIGEN CORPORATION
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(Unaudited, amounts in thousands, except share data)

	Common Stock					
	Number of Shares	Par Value	Additional Paid - In Capital	Accumulated Other Comprehensive Loss	Accumulated Earnings	Total Stockholders' Equity
Balance at December 31, 2019	52,078,258	$ 521	$1,068,431	$ (15,027)	$ 5,843	$ 1,059,768
Net income	—	—	—	—	9,815	9,815
Exercise of stock options and releases of restricted stock	199,825	2	1,587	—	—	1,589
Stock-based compensation expense	—	—	4,165	—	—	4,165
Translation adjustment	—	—	—	(5,579)	—	(5,579)
Balance at March 31, 2020	52,278,083	$ 523	$1,074,183	$ (20,606)	$ 15,658	$ 1,069,758

	Common Stock					
	Number of Shares	Par Value	Additional Paid - In Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit	Total Stockholders' Equity
Balance at December 31, 2018	43,917,378	$ 439	$ 642,590	$ (11,893)	$ (15,568)	$ 615,568
Net income	—	—	—	—	8,053	8,053
Exercise of stock options and releases of restricted stock	156,620	2	42	—	—	44
Stock-based compensation expense	—	—	3,251	—	—	3,251
Translation adjustment	—	—	—	(1,891)	—	(1,891)
Balance at March 31, 2019	44,073,998	$ 441	$ 645,883	$ (13,784)	$ (7,515)	$ 625,025

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

REPLIGEN CORPORATION
CONSOLIDATED STATEMENTS OF CASH FLOWS
(Unaudited, amounts in thousands)

	Three Months Ended March 31,	
	2020	2019
Cash flows from operating activities:		
Net income	$ 9,815	$ 8,053
Adjustments to reconcile net income to net cash provided by operating activities:		
Depreciation and amortization	6,390	4,213
Non-cash interest expense	2,691	1,107
Stock-based compensation expense	4,165	3,251
Deferred tax expense	—	892
Other	140	—
Changes in operating assets and liabilities, excluding impact of acquisitions:		
Accounts receivable	(2,399)	(6,692)
Royalties and other receivables	148	112
Unbilled receivables	—	2,602
Inventories	(7,191)	(1,478)
Prepaid expenses and other assets	36	215
Operating lease right of use assets	919	784
Accounts payable	(709)	(570)
Accrued expenses	(4,989)	(1,855)
Operating lease liability	334	(840)
Long-term liabilities	180	(6)
Total cash provided by operating activities	9,530	9,788
Cash flows from investing activities:		
Additions to capitalized software costs	(911)	(1,740)
Purchases of property, plant and equipment	(4,126)	(2,088)
Total cash used in investing activities	(5,037)	(3,828)
Cash flows from financing activities:		
Exercise of stock options	1,599	44
Payment of tax withholding obligation on vesting of restricted stock	(10)	—
Total cash provided by financing activities	1,589	44
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(4,923)	(3,691)
Net increase in cash, cash equivalents and restricted cash	1,159	2,313
Cash, cash equivalents and restricted cash, beginning of period	537,407	193,822
Cash, cash equivalents and restricted cash, end of period	$538,566	$196,135
Supplemental disclosure of cash flow information:		
Income taxes paid	$ 1,756	$ 1,055
Interest paid	$ 527	$ —
Supplemental disclosure of non-cash investing and financing activities:		
Assets acquired under operating leases	$ 17	$ —

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

REPLIGEN CORPORATION
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(Unaudited)

1. Summary of Significant Accounting Policies

Basis of Presentation

The consolidated financial statements included herein have been prepared by Repligen Corporation (the "Company", "Repligen" or "we") in accordance with generally accepted accounting principles in the United States ("GAAP") and pursuant to the rules and regulations of the Securities and Exchange Commission ("SEC"), for Quarterly Reports on Form 10-Q and Article 10 of Regulation S-X and do not include all of the information and footnote disclosures required by GAAP. These consolidated financial statements should be read in conjunction with the audited consolidated financial statements and accompanying notes thereto included in the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2019.

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions 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 period. Actual results could differ from those estimates.

The consolidated financial statements include the accounts of the Company and its wholly-owned subsidiaries, Repligen Sweden AB, Repligen GmbH, Spectrum LifeSciences, LLC and its subsidiaries ("Spectrum"), C Technologies, Inc. ("C Technologies") , and Repligen Singapore Pte. Ltd. All significant intercompany accounts and transactions have been eliminated in consolidation.

In the opinion of management, the accompanying unaudited consolidated financial statements include all adjustments, consisting of only normal, recurring adjustments necessary for a fair presentation of the financial position, results of operations and cash flows. The results of operations for the interim periods presented are not necessarily indicative of results to be expected for the entire year.

Risks and Uncertainties

There are many uncertainties regarding the current pandemic of the novel coronavirus ("COVID-19"), and the Company is closely monitoring the impact of COVID-19 on all aspects of its business, including how it will impact its customers, employees, suppliers, vendors, business partners and distribution channels. While COVID-19 did not materially affect the Company's financial results and business operations in the Company's first quarter ended March 31, 2020, the Company is unable to predict the impact that COVID-19 may have on its financial position and operations moving forward due to numerous uncertainties. These estimates may change as new events occur and additional information is obtained, and actual results could differ materially from these estimates under different assumptions or conditions. The Company will continue to assess the evolving impact of COVID-19 and will make adjustments to its operations as necessary.

Recent Accounting Standards Updates

We consider the applicability and impact of all Accounting Standards Updates on our consolidated financial statements. Updates not listed below were assessed and determined to be either not applicable or are expected to have minimal impact on our consolidated financial position or results of operations. Recently issued Accounting Standards Updates that we feel may be applicable to us are as follows:

Recently Issued Accounting Standard Updates – Adopted During the Period

In August 2018, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update No. ("ASU") 2018-13, *"Fair Value Measurement (Topic 820): Disclosure Framework – Changes to the Disclosure Requirements for Fair Value Measurement."* ASU 2018-13 includes amendments that aim to improve the effectiveness of fair value measurement disclosures. The amendments in this guidance modify the disclosure requirements on fair value measurements based on the concepts in FASB Concepts Statement, *"Conceptual Framework for Financial Reporting—Chapter 8: Notes to Financial Statements , "* including the consideration of costs and benefits. The Company adopted ASU 2018-13 on January 1, 2020. The adoption did not have a material impact on the Company's consolidated financial statements as of and for the three months ended March 31, 2020.

In August 2018, the FASB issued ASU 2018-15, *"Intangibles – Goodwill and Other – Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract."* ASU 2018-15 aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software (and hosting arrangements that include an internal-use software license). The guidance also requires the entity to expense the capitalized implementation costs of a hosting arrangement that is a service contract over the term of the hosting arrangement, which includes reasonably certain renewals. The Company adopted ASU 2018-13 on January 1, 2020. The adoption did not have a material impact on the Company's consolidated financial statements as of and for the three months ended March 31, 2020.

In June 2016, the FASB issued ASU 2016-13, " *Financial Instruments-Credit Losses (Topic 326).*" ASU 2016-13 significantly changes how entities will account for credit losses for most financial assets and certain other instruments that are not measured at fair value through net income. ASU 2016-13 replaces the existing incurred loss model with an expected credit loss model that requires entities to estimate an expected lifetime credit loss on most financial assets and certain other instruments, including short-term trade receivables and contract assets, and expands disclosure requirements for credit quality of financial assets. The Company adopted ASU 2016-13 on January 1, 2020. The Company assessed all potential impacts that the adoption of this guidance has on its consolidated financial statements. Based on the composition of the Company's investment portfolio, accounts receivable, current market conditions and historical credit loss activity, the adoption of ASU 2016-13 by the Company does not have a material impact on its consolidated financial position, results of operations or cash flows as of and for the three months ended March 31, 2020. The Company continues to monitor processes and controls for indications of an adjustment for future economic conditions at quarterly and annual reporting periods. See Note 5, *"Credit Losses,"* below for more information on the Company's adoption of ASC 326.

In November 2018, the FASB issued ASU 2018-18, *"Collaborative Arrangements (Topic 808): Clarifying the Interaction between Topic 808 and Topic 606."* ASU 2018-18 clarifies the interaction between Topic 808, *"Collaborative Arrangements,"* and Topic 606, *"Revenue from Contracts with Customers,"* by making targeted improvements to GAAP for collaborative arrangements and providing guidance on whether certain transactions between collaborative arrangement participants should be accounted for with revenue under Topic 606. This includes improving comparability in the presentation of revenue for certain transactions between collaborative arrangement participants by allowing presentation of the units of account in collaborative arrangements that are within the scope of Topic 606 together with revenue accounted for under Topic 606. The Company adopted ASU 2018-13 on January 1, 2020. The adoption did not have a material impact on the Company's consolidated financial statements as of and for the three months ended March 31, 2020.

In December 2019, the FASB issued ASU 2019-12, " *Income Taxes (Topic 740) – Simplifying the Accounting for Income Taxes."* ASU 2019-12 simplifies the accounting for income taxes by removing certain exceptions to the general principles in Topic 740, including, but not limited to, the exception to the incremental approach for intraperiod tax allocation when there is a loss from continuing operations and income or a gain from other items, the exceptions related to the recognition of a deferred tax liability related to an equity method investment and the exception to methodology for calculating income taxes in an interim period when a year-to-date loss exceeds the anticipated loss for the year. The Company adopted ASU 2018-13 on January 1, 2020. The adoption did not have a material impact on the Company's consolidated financial statements as of and for the three months ended March 31, 2020.

2. Fair Value Measurements

The Company uses various valuation approaches in determining the fair value of its assets and liabilities. The Company employs a hierarchy for inputs used in measuring fair value that maximizes the use of observable inputs and minimizes the use of unobservable inputs by requiring that observable inputs be used when available. Observable inputs are inputs that market participants would use in pricing the asset or liability based on market data obtained from sources independent of the Company. Unobservable inputs are inputs that reflect the Company's assumptions about the inputs that market participants would use in pricing the asset or liability and are developed based on the best information available in the circumstances. The fair value hierarchy is broken down into three levels based on the source of inputs as follows:

Level 1 – Valuations based on unadjusted quoted prices in active markets for identical assets or liabilities that the Company has the ability to access.

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

Level 3 – Valuations based on inputs that are unobservable and significant to the overall fair value measurement.

The availability of observable inputs can vary among the various types of financial assets and liabilities. To the extent that the valuation is based on models or inputs that are less observable or unobservable in the market, the determination of fair value requires more judgment. In certain cases, the inputs used to measure fair value may fall into different levels of the fair value hierarchy. In such cases, for financial statement disclosure purposes, the level in the fair value hierarchy within which the fair value measurement is categorized is based on the lowest level input that is significant to the overall fair value measurement.

As of March 31, 2020 and December 31, 2019, cash and cash equivalents on the Company's consolidated balance sheets included $414.2 million and $415.6 million, respectively, in a money market account. These funds are valued on a recurring basis using Level 1 inputs.

In July 2019 , the Company issued $ 287.5 million aggregate principal amount of the Company's 0.375 % Convertible Senior Notes due July 15 , 2024 (the " 2019 Notes"). Interest is payable semi-annually in arrears on January 15 and July 15 of each year. The 2019 Notes will mature on July 15, 2024 unless earlier converted or repurchased in accordance with their terms. As of March 31 , 2020 , the carrying value of the 2019 Notes was $ 235.5 million, net of unamortized discount, and the fair value of the 2019 Notes was $ 304.1 million. The fair value of the 2019 Notes is a Level 1 valuation and was determined based on the most recent trade activity of the 2019 Notes as of March 31 , 2020 . The 2019 Notes are discussed in more detail in Note 8 , *"Convertible Senior Notes"* to these consolidated financial statements.

D uring the three months ended March 31, 2020 , t here were no remeasurements to fair value of financial assets and liabilities that are not measured at fair value on a recurring basis.

3. Acquisition of C Technologies, Inc.

On April 25, 2019, Repligen agreed to acquire C Technologies, pursuant to the terms of a Stock Purchase Agreement (the "Agreement"), by and among Repligen, C Technologies and Craig Harrison, an individual and sole stockholder of C Technologies (such acquisition, the "C Technologies Acquisition").

C Technologies' business consists of two major product categories (i) biotechnology, or Biotech, and (ii) Legacy and Other. Through its Biotech category, C Technologies sells instruments, consumables and accessories that are designed to allow bioprocessing technicians to measure the protein concentration of a liquid sample using C Technologies' Slope Spectroscopy ® method, which eliminates the need for manual sample dilution. C Technologies' lead product, the SoloVPE instrument platform, was launched in 2008 for off-line and at-line protein concentration measurements conducted in quality control, process development and manufacturing labs in the production of biological therapeutics. C Technologies' FlowVPE platform, an extension of the SoloVPE technology, was designed to allow end users to make in-line protein concentration measurements in filtration, chromatography and fill-finish applications, designed to allow for real-time process monitoring.

Consideration Transferred

The C Technologies Acquisition was accounted for as a purchase of a business under Accounting Standards Codification No. 805, *"Business Combinations"* ("ASC 805 ") . The C Technologies Acquisition was funded through payment of approximately $195.0 million in cash, $186.0 million of which is consideration transferred pursuant to ASC 805, and $9.0 million of which will be compensation expense for future employment, and 779,221 unregistered shares of the Company's common stock totaling $53.9 million for a total purchase price of $239.9 million. Under the acquisition method of accounting, the assets of C Technologies were recorded as of the acquisition date, at their respective fair values, and consolidated with those of Repligen . The fair value of the net tangible assets acquired was $ 6.8 million, the fair value of the intangible assets acquired was $ 90.8 million, and the residual goodwill was $ 142.3 million. The consideration and purchase price information has been prepared using a valuation that required the use of significant assumptions and estimates. Critical estimates included, but were not limited to, future expected cash flows, including projected revenues and expenses, and the applicable discount rates. These estimates were based on assumptions that Repligen believes to be reasonable , h owever, actual results may differ from these estimates.

Total consideration transferred is as follows (amounts in thousands):

Cash consideration	$185,949
Equity consideration	53,938
Fair value of net assets acquired	**$239,887**

Acquisition-related costs are not included as a component of consideration transferred but are expensed in the periods in which the costs are incurred. The Company incurred $4.0 million in transaction costs in 2019. The transaction costs are included in selling, general and administrative expenses in the consolidated statements of comprehensive income. In connection with the transaction, an additional $9.0 million in cash will be due to employees based on their continued employment with the Company one year after the date of the close of the C Technologies Acquisition. For the period ended March 31, 2020, the Company recognized $2.2 million of compensation expense associated with this amount due to employees. The Company has recognized a total of $7.5 million of compensation expense associated with this amount due to employees since the C Technologies Acquisition.

Fair Value of Net Assets Acquired

The allocation of purchase price is based on the fair value of assets acquired and liabilities assumed as of the acquisition date, based on the preliminary valuation. The Company obtains this information during due diligence and through other sources. In the months after closing, the Company may obtain additional information about these assets and liabilities as it learns more about C Technologies and will refine the estimates of fair value to more accurately allocate the purchase price. Only items identified as of

the acquisition date are considered for subsequent adjustment. We will make appropriate adjustments to the purchase price allocation, if any, prior to the completion of the measurement period, which is up to one year from the acquisition date. The components and allocation of the purchase price consists of the following amounts (amounts in thousands):

Cash and cash equivalents	$ 3,795
Restricted cash	26,933
Accounts receivable	3,044
Inventory	3,783
Prepaid expenses and other current assets	93
Fixed assets	40
Operating lease right of use asset	3,836
Customer relationships	59,680
Developed technology	28,920
Trademark and tradename	1,570
Non-competition agreements	660
Goodwill	142,314
Deferred taxes	895
Accounts payable	(436)
Accrued liabilities	(2,767)
Accrued bonus	(26,928)
Deferred revenue	(1,709)
Operating lease liability	(51)
Operating lease liability, long-term	(3,785)
Fair value of net assets acquired	**$239,887**

Acquired Goodwill

The goodwill of $ 142.3 million represents future economic benefits expected to arise from synergies from combining operations and commercial organizations to increase market presence and the extension of existing customer relationships. Substantially all of the goodwill recorded is expected to be deductible for income tax purposes. Pursuant to the Company's business combination accounting policy included in Note 2 , *"Summary of Significant Accounting Policies – Business Combinations, Goodwill and Intangible Assets,"* of our Annual Report on Form 10-K for the fiscal year ended December 31, 2019 , the Company recorded goodwill adjustments for the effects on goodwill of changes to net assets acquired during the period that such change is identified, provided that any such change is within the measurement period (up to one year from the date of the acquisition). In December 2019 , the Company recorded a deferred tax asset for the C Technologies Acquisition of $ 0.9 million as an adjustment to goodwill. In March 2020 , the Company recorded an additional adjustment to goodwill of $ 0.3 million related to additional state income tax liabilities to be paid to the seller, which were incurred from the Company's finalized 338 (h) (10) tax election.

Intangible Assets

The following table sets forth the components of the identified intangible assets associated with the C Technologies Acquisition and their estimated useful lives:

	Useful life	Fair Value (Amounts in thousands)
Customer relationships	17 years	$ 59,680
Developed technology	18 years	28,920
Trademark and tradename	20 years	1,570
Non-competition agreements	4 years	660
		$ 90,830

Revenue, Net Income and Pro Forma Presentation

The Company recorded revenue from C Technologies of $6.6 million for the three months ended March 31, 2020 and $16.4 million from May 31, 2019, the date of acquisition, to December 31, 2019. The Company recorded a net loss from C Technologies' results of operations of $2.2 million for the three months ended March 31, 2020 and a net loss of $7.4 million from May 31, 2019 to December 31, 2019. The Company has included the operating results of C Technologies in its consolidated statements of comprehensive income since the May 31, 2019 acquisition date. The following pro forma financial information presents the

combined results of operations of Repligen and C Technologies as if the acquisition had occurred on January 1 , 2019 after giving effect to certain pro forma adjustments. The pro forma adjustments reflected herein include only those adjustments that are directly attributable to the C Technologies Acquisition, factually supportable and have a recurring impact. These pro forma adjustments include amortization expense on the acquired identifiable intangible assets, adjustments to stock-based compensation expense for equity compensation issued to C Technologies employees and the income tax effect of the adjustments made. In addition, acquisition-related transaction costs and an accounting adjustment to record inventory at fair value were excluded from pro forma net income in 2019 .

Prior to the C Technologies Acquisition, C Technologies did not generate monthly or quarterly financial statements that were prepared in accordance with GAAP.

The following pro forma financial information does not reflect any adjustments for anticipated expense savings resulting from the acquisition and is not necessarily indicative of the operating results that would have actually occurred had the transaction been consummated on January 1, 2019 or of future results:

	Three Months Ended March 31, 2019
Total revenue	$ 66,052
Net income	$ 10,664
Earnings per share:	
Basic	$ 0.24
Diluted	$ 0.23

4. Revenue Recognition

We generate revenue from the sale of bioprocessing products, equipment devices, and related consumables used with these equipment devices to customers in the life science and biopharmaceutical industries. Under ASC 606, *"Revenue from Contracts with Customers,"* revenue is recognized when, or as, obligations under the terms of a contract are satisfied, which occurs when control of the promised products or services is transferred to customers.

Disaggregation of Revenue

Revenues for the three months ended March 31, 2020 and 2019 were as follows:

	Three Months Ended March 31,	
	2020	2019
	(Amounts in thousands)	
Product revenue	$ 76,060	$ 60,612
Royalty and other income	30	22
Total revenue	$ 76,090	$ 60,634

When disaggregating revenue, the Company considered all of the economic factors that may affect its revenues. Because all of its revenues are from bioprocessing customers, there are no differences in the nature, timing and uncertainty of the Company's revenues and cash flows from any of its product lines. However, given that the Company's revenues are generated in different geographic regions, factors such as regulatory and geopolitical factors within those regions could impact the nature, timing and uncertainty of the Company's revenues and cash flows. In addition, a significant portion of the Company's revenues are generated from two customers; therefore, economic factors specific to these two customers could impact the nature, timing and uncertainty of the Company's revenues and cash flows.

Disaggregated revenue from contracts with customers by geographic region can be found in Note 15, *"Segment Reporting,"* below.

Revenue from significant customers that represent 10% or more of the Company's total revenue is as follows:

	Three Months Ended March 31,	
	2020	2019
	(Amounts in thousands)	
MilliporeSigma	$ 10,873	$ 9,407
GE Healthcare	N/A	$ 7,666

Chromatography Products

The Company's chromatography products include a number of products used in the downstream purification and quality control of biological drugs. The majority of chromatography revenue relates to the OPUS ® pre-packed chromatography column line. OPUS columns typically consist of the outer hardware of the column with a resin as ordered by the customer packed inside of the column. OPUS columns may also be ordered without the packed resin. In either scenario, the OPUS column and resin are not interdependent of one another and are therefore considered distinct products that represent separate performance obligations. Chromatography product revenue is generally recognized at a point in time upon transfer of control to the customer.

Filtration Products

The Company's filtration products generate revenue through the sale of KrosFlo ® hollow fiber TFF systems, KrosFlo flat sheet TFF systems, TangenX ™ flat sheet cassettes, Spectrum ® hollow fiber filters, membranes and modules, XCell ATF ™ devices and related consummables and ProConnex ® single-use flow path assemblies.

The Company's KrosFlo systems are used in the filtration, isolation, purification and concentration of biologics and diagnostic products. TFF is a rapid and efficient method for separation and purification of biomolecules that is widely used in laboratory, process development and process scale applications in biopharmaceutical manufacturing. Sales of large-scale systems generally include components and consumables as well as training and installation services at the request of the customer. Because the initial sale of components and consumables are necessary for the operation of the system, such items are combined with the systems as a single performance obligation. Training and installation services do not significantly modify or customize these systems and therefore represent a distinct performance obligation.

The Company's TangenX flat sheet cassettes (SIUS ™, SIUS Gamma and SIUS Pro) are not highly interdependent on one another and are therefore considered distinct products that represent separate performance obligations. Product revenue from the sale of TangenX flat sheet cassettes are generally recognized at a point in time upon transfer of control of the customer.

The Company's other filtration product offerings are not highly interdependent of one another and are therefore considered distinct products that represent separate performance obligations. Revenue on these products is generally recognized at a point in time upon transfer of control to the customer. The Company invoices the customer for the installation and training services in an amount that directly corresponds with the value to the customer of the Company's performance to date; therefore, revenue recognized is based on the amount billable to the customer in accordance with the practical expedient under ASC 606-10-55-18.

The Company also markets the XCell ATF system, a technologically advanced filtration device used in upstream processes to continuously remove cellular metabolic waste products during the course of a fermentation run, freeing healthy cells to continue producing the biologic drug of interest. XCell ATF systems typically include a filtration system and consumables (i.e., tube devices, metal stands) as well as training and installation services at the request of the customer. The filtration system and consumables are considered distinct products and therefore represent separate performance obligations. First time purchasers of the systems typically purchase a controller that is shipped with the tube device(s) and metal stand(s). The controller is not considered distinct as it is a proprietary product that is highly interdependent with the filtration system; therefore, the controller is combined with the filtration system and accounted for as a single performance obligation. The training and installation services do not significantly modify or customize the XCell ATF system and therefore represent a distinct performance obligation. XCell ATF system product revenue related to the filtration system (including the controller if applicable) and consumables is generally recognized at a point in time upon transfer of control to the customer. XCell ATF system service revenue related to training and installation services is generally recognized over time, as the customer simultaneously receives and consumes the benefits as the Company performs. The Company invoices the customer for the installation and training services in an amount that directly corresponds with the value to the customer of the Company's performance to date; therefore, revenue recognized is based on the amount billable to the customer in accordance with the practical expedient under ASC 606-10-55-18.

Process Analytics Products

On May 31, 2019, the Company consummated its acquisition of C Technologies and added a fourth franchise, Process Analytics, to its bioprocessing business. The Process Analytics franchise generates revenue primarily through the sale of the SoloVPE and FlowVPE Slope Spectroscopy systems. These products complement and support the Company's existing Filtration, Chromatography and Proteins franchises as they allow end users to make in-line protein concentration measurements in filtration, chromatography and fill-finish applications, designed to allow for real-time process monitoring.

Protein Products

The Company's Protein franchise generates revenue through the sale of Protein A affinity ligands and growth factors. Protein A ligands are an essential component of Protein A chromatography resins (media) used in the purification of virtually all mAb-based drugs on the market or in development. The Company manufactures multiple forms of Protein A ligands under long-term supply agreements with major life sciences companies, who in turn sell their Protein A chromatography media to end users (biopharmaceutical manufacturers). The Company also manufactures growth factors for sale under long-term supply agreements with certain life sciences companies as well as direct sales to its customers. Each protein product is considered distinct and therefore represents a separate performance obligation. Protein product revenue is generally recognized at a point in time upon transfer of control to the customer.

Other Products

The Company's other products include operating room products sold to hospitals. Other product revenue is generally recognized at a point in time upon transfer of control to the customer.

Transaction Price Allocated to Future Performance Obligations

Remaining performance obligations represents the transaction price of contracts for which work has not been performed or has been partially performed. The Company's future performance obligations relate primarily to the installation and training of certain of its systems sold to customers. These performance obligations are completed within one year of receipt of a purchase order from its customers. Accordingly, the Company has elected to not disclose the value of these unsatisfied performance obligations as provided under ASC 606-10-50-14.

Contract Balances from Contracts with Customers

The following table provides information about receivables and deferred revenues from contracts with customers as of March 31, 2020 (amounts in thousands):

	2020
Balances from contracts with customers only:	
Accounts receivable	$44,726
Deferred revenue (included in accrued liabilities in the consolidated balance sheets)	6,305
Revenue recognized for the three months ended March 31, 2020 relating to:	
The beginning deferred revenue balance	$ 1,911
Changes in pricing related to products or services satisfied in previous periods	—

The timing of revenue recognition, billings and cash collections results in the accounts receivables and deferred revenue balances on the Company's consolidated balance sheets. There were no impairment losses recognized on receivables during the three months ended March 31, 2020 or for the same period in 2019.

A contract asset is created when the Company satisfies a performance obligation by transferring a promised good to the customer. Contract assets may represent conditional or unconditional rights to consideration. The right is conditional, and recorded as a contract asset, if the Company must first satisfy another performance obligation in the contract before it is entitled to payment from the customer. Contract assets are transferred to billed receivables once the right becomes unconditional. If the Company has the unconditional right to receive consideration from the customer, the contract asset is accounted for as a billed receivable and presented separately from other contract assets. A right is unconditional if nothing other than the passage of time is required before payment of that consideration is due.

When consideration is received, or such consideration is unconditionally due, from a customer prior to transferring goods or services to the customer under the terms of a contract, a contract liability is recorded. Contract liabilities are recognized as revenue after control of the products or services is transferred to the customer and all revenue recognition criteria have been met.

Costs to Obtain or Fulfill a Customer Contract

The Company's sales commission structure is based on achieving revenue targets. The commissions are driven by revenue derived from customer purchase orders which are short term in nature.

Applying the practical expedient in paragraph 340-40-25-4, the Company recognizes the incremental costs of obtaining contracts as an expense when incurred if the amortization period of the assets that the Company otherwise would have recognized is one year or less. These costs are included in selling, general, and administrative expenses. When shipping and handling costs are incurred after a customer obtains control of the products, the Company accounts for these as costs to fulfill the promise and not as a separate performance obligation.

5. Credit L o s ses

Effective January 1, 2020, the Company adopted ASU 2016-13, *"Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments,"* prospectively. ASU 2016-13 replaces the incurred loss impairment model with an expected credit loss impairment model for financial instruments, including trade receivables. The guidance requires entities to consider forward-looking information to estimate expected credit losses, resulting in earlier recognition of losses for receivables that are current or not yet due. Upon adoption, changes in the allowance were not material for the transition period starting January 1, 2020 through the three months ended March 31, 2020.

The Company is exposed to credit losses primarily through sales of products and services. The Company's expected loss allowance methodology for accounts receivable is developed using historical collection experience, current and future economic and market conditions and a review of the current status of customers' trade accounts receivables. Customers are pooled based on sharing specific risk factors, including geographic location. Due to the short-term nature of such receivables, the estimated accounts receivable that may not be collected is based on aging of the accounts receivable balances.

Customers are assessed for credit worthiness upfront through a credit review, which includes assessment based on our analysis of their financial statements when a credit rating is not available. The Company evaluates contract terms and conditions, country and political risk, and may require prepayment to mitigate risk of loss. Specific allowance amounts are established to record the appropriate provision for customers that have a higher probability of default. The Company monitors changes to the receivables balance on timely basis, and balances are written off as they are determined to be uncollectable after all collection efforts have been exhausted. Estimates of potential credit losses are used to determine the allowance. It is based on assessment of anticipated payment and all other historical, current and future information that is reasonably available.

The accounts receivable balance on our consolidated balance sheet as of March 31, 2020 was $44.7 million, net of $0.7 million of allowances. Changes in the allowance were not material for the three months ended March 31, 2020. The following table provides a roll-forward of the allowance for credit losses that is deducted from the amortized cost basis of accounts receivable to present the net amount expected to be collected (amounts in thousands):

	2020
Balance at January 1, 2020	$(525)
Current period change for expected credit losses	(133)
Balance at March 31, 2020	$(658)

6. Goodwill and Intangible Assets

Goodwill

Goodwill represents the difference between the purchase price and the estimated fair value of identifiable assets acquired and liabilities assumed. Goodwill acquired in a business combination and determined to have an indefinite useful life is not amortized, but instead is tested for impairment at least annually in accordance with ASC 350. The following table represents the change in the carrying value of goodwill for the three months ended March 31, 2020 (amounts in thousands):

Balance as of December 31, 2019	$468,413
Goodwill adjustment related to C Technologies, Inc.	293
Cumulative translation adjustment	(324)
Balance as of March 31, 2020	$468,382

During each of the fourth quarters of 2019, 2018 and 2017, we completed our annual impairment assessments and concluded that goodwill was not impaired in any of those years. The Company has not identified any "triggering" events which indicate an impairment of goodwill in the three months ended March 31, 2020.

Intangible Assets

Intangible assets with a definitive life are amortized over their useful lives using the straight-line method, and the amortization expense is recorded within cost of product revenue and selling, general and administrative expense s in the Company's statements of comprehensive income. Intangible assets and their related useful lives are reviewed at least annually to determine if any

adverse conditions exist that would indicate the carrying value of these assets may not be recoverable. More frequent impairment assessments are conducted if certain conditions exist, including a change in the competitive landscape, any internal decisions to pursue new or different technology strategies, a loss of a significant customer, or a significant change in the marketplace, including changes in the prices paid for our products or changes in the size of the market for our products. An impairment results if the carrying value of the asset exceeds the estimated fair value of the asset. If the estimate of an intangible asset's remaining useful life is changed, the remaining carrying amount of the intangible asset is amortized prospectively over the revised remaining useful life. The Company continues to believe that its intangible assets are recoverable at March 31, 2020.

Indefinite-lived assets are reviewed for impairment at least annually. There has been no impairment of our intangible assets for the periods presented.

Intangible assets, net consisted of the following at March 31, 2020:

	March 31, 2020			
	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in years)
	(Amounts in thousands)			
Finite-lived intangible assets:				
Technology—developed	$ 82,095	$ (10,725)	$ 71,370	19
Patents	240	(240)	—	8
Customer relationships	160,425	(27,970)	132,455	15
Trademarks	3,752	(380)	3,372	20
Other intangibles	1,696	(1,067)	629	3
Total finite-lived intangible assets	248,208	(40,382)	207,826	16
Indefinite-lived intangible asset:				
Trademarks	700	—	700	—
Total intangible assets	$248,908	$ (40,382)	$208,526	

Intangible assets consisted of the following at December 31, 2019:

	December 31, 2019			
	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in years)
	(Amounts in thousands)			
Finite-lived intangible assets:				
Technology—developed	$ 82,169	$ (9,669)	$ 72,500	19
Patents	240	(240)	—	8
Customer relationships	160,825	(25,642)	135,183	15
Trademarks	3,752	(333)	3,419	20
Other intangibles	1,697	(947)	750	3
Total finite-lived intangible assets	248,683	(36,831)	211,852	16
Indefinite-lived intangible asset:				
Trademarks	700	—	700	—
Total intangible assets	$249,383	$ (36,831)	$212,552	

The increase in intangible assets during 2019 is related to the acquisition of C Technologies on May 31, 2019. See Note 3, *"Acquisition of C Technologies, Inc."* for more information.

Amortization expense for finite-lived intangible assets was $ 3.9 million and $ 2.6 million for the three months ended March 31, 2020 and 2019, respectively. As of March 31, 2020, the Company expects to record the following amortization expense (amounts in thousands):

For the Three Months Ended March 31,	Estimated Amortization Expense
2020 (remaining nine months)	$ 11,348
2021	14,728
2022	14,726
2023	14,630
2024	14,188
2025 and thereafter	138,206
Total	$ 207,826

7. Consolidated Balance Sheet Detail

Inventories, net

Inventories, net consists of the following:

	As of	
	March 31, 2020	December 31, 2019
	(Amounts in thousands)	
Raw materials	$ 34,752	$ 29,328
Work-in-process	7,227	8,360
Finished products	19,802	17,144
Total inventories, net	$ 61,781	$ 54,832

Property, Plant and Equipment

Property, plant and equipment consist of the following:

	As of	
	March 31, 2020	December 31, 2019
	(Amounts in thousands)	
Land	$ 1,023	$ 1,023
Buildings	764	764
Leasehold improvements	28,652	23,905
Equipment	36,987	36,257
Furniture, fixtures and office equipment	6,441	6,312
Computer hardware and software	9,007	8,810
Construction in progress	4,703	6,707
Other	50	56
Total property, plant and equipment	87,627	83,834
Less—Accumulated depreciation	(37,254)	(35,379)
Total property, plant and equipment, net	$ 50,373	$ 48,455

Depreciation expenses totaled $2.5 million and $1.6 million for the three months ended March 31, 2020 and 2019, respectively.

Accrued Liabilities

Accrued liabilities consist of the following:

	As of	
	March 31, 2020	December 31, 2019
	(Amounts in thousands)	
Employee compensation	$ 16,770	$ 19,850
Taxes	2,148	3,874
Royalty and license fees	887	123
Warranties	762	1,500
Professional fees	546	1,081
Deferred revenue	6,305	5,005
Other	512	1,898
Total accrued liabilities	$ 27,930	$ 33,331

8. Convertible Senior Notes

0.375% Convertible Senior Notes due 2024

On July 19, 2019, the Company issued $287.5 million aggregate principal amount of 0.375% Convertible Senior Notes due 2024 (“2019 Notes”), which includes the underwriters’ exercise in full of an option to purchase an additional $37.5 million aggregate principal amount of 2019 Notes (the “Notes Offering”). The net proceeds of the Notes Offering, after deducting underwriting discounts and commissions and other related offering expenses payable by the Company, were approximately $278.5 million.

The 2019 Notes are senior, unsecured obligations of the Company, and bear interest at a rate of 0.375% per year. Interest is payable semi-annually in arrears on January 15 and July 15 of each year, beginning on January 15, 2020. The 2019 Notes will mature on July 15, 2024, unless earlier repurchased or converted in accordance with their terms. The initial conversion rate for the 2019 Notes is 8.6749 shares of the Company’s common stock per $1,000 principal amount of 2019 Notes (which is equivalent to an initial conversion price of approximately $115.28 per share). Prior to the close of business on the business day immediately preceding April 15, 2024, the 2019 Notes will be convertible at the option of the holders of 2019 Notes only upon the satisfaction of specified conditions and during certain periods. Thereafter until the close of business on the second scheduled trading day immediately preceding the maturity date, the 2019 Notes will be convertible at the options of the holders of 2019 Notes at any time regardless of these conditions. Conversion of the 2019 Notes will be settled in cash, shares of the Company’s common stock or a combination thereof, at the Company’s election. The 2019 Notes are not redeemable by the Company prior to maturity.

Holders of 2019 Notes may require the Company to repurchase their 2019 Notes upon the occurrence of a fundamental change prior to maturity at a repurchase price equal to 100% of the principal amount thereof, plus accrued and unpaid interest to, but excluding, the date of repurchase. In connection with certain corporate events, the Company will, under certain circumstances, increase the conversion rate for holders of 2019 Notes who elect to convert their 2019 Notes in connection with such corporate events.

As of March 31, 2020, the conditions allowing holders of the 2019 Notes to convert have not been met and therefore the 2019 Notes are not yet convertible and are recorded as a long-term liability in our consolidated balance sheet at March 31, 2020. N o 2019 Notes were converted by the holders of such notes in the first quarter of 2020. In the event the closing price conditions are met in the second quarter of 2020 or a future fiscal quarter, the 2019 Notes will be convertible at a holder’s option during the immediately following fiscal quarter.

The Company accounts for the 2019 Notes as separate liability and equity components. We determined the carrying amount of the liability component as the present value of its cash flows using a discount rate of 4.5% based on comparative convertible transactions for similar companies. The proceeds allocated to the debt conversion feature were $52.1 million. This amount was calculated by deducting the carrying value of the liability component from the principal amount of the 2019 Notes as a whole. The difference represents a debt discount that is amortized to interest expense on our consolidated statement of comprehensive income over the term of the 2019 Notes using the effective interest rate method. The Company will assess the equity classification of the cash conversion feature quarterly, and it is not re-measured as long as it continues to meet the conditions for equity classification.

The Company allocate s transaction costs related to the issuance of the 2019 Notes to the liability and equity components using the same proportions as the initial carrying value of the 2019 Notes. Transaction costs related to the liability component were $7.4 million and are being amortized to interest expense using the effective interest method over the term of the 2019 Notes. Transaction costs attributable to the equity component were $1.6 million and are netted with the equity component of the 2019 Notes in stockholders' equity of our consolidated balance sheet at March 31, 2020.

The net carrying value of the liability component of the 2019 Notes is as follows:

	As of	
	March 31, 2020	December 31, 2019
	(Amounts in thousands)	
0.375% convertible senior notes due 2024:		
Principal amount	$287,500	$ 287,500
Less: unamortized debt discount	(45,565)	(47,921)
Less: unamortized debt issuance costs	(6,477)	(6,812)
Total debt	235,458	232,767
Less: current portion	—	—
Net carrying amount	$235,458	$ 232,767

The net carrying value of the equity component of the 2019 Notes is as follows:

	March 31, 2020	December 31, 2019
	(Amounts in thousands)	
Proceeds allocated to the conversion feature	$ 52,062	$ 52,062
Less: transaction costs allocated to the conversion feature	(1,621)	(1,621)
Less: deferred taxes	(11,371)	(11,371)
Net carrying value	$ 39,070	$ 39,070

Interest expense recognized on the 2019 Notes for the three months ended March 31, 2020 was $0.3 million, $2.4 million and $0.3 million for the contractual coupon interest, the accretion of the debt discount and the amortization of the debt issuance costs, respectively. The effective interest rate on the 2019 Notes is 5.1%, which included the interest on the 2019 Notes, amortization of the debt discount and debt issuance costs. As of March 31, 2020, the carrying value of the 2019 Notes was $235.5 million and the fair value of the principal was $304.1 million. The fair value of the 2019 Notes was determined based on the most recent trade activity of the 2019 Notes as of March 31, 2020.

Conversion of the 2.125% Convertible Senior Notes due 2021

The Company utilized a portion of the proceeds from the issuance of the 2019 Notes to settle its outstanding 2.125% Convertible Senior Notes due 2021 (the "2016 Notes") during the third quarter of 2019. On July 16, 2019, the Company entered into separate privately negotiated agreements with certain holders of the 2016 Notes to exchange an aggregate of $92.0 million principal aggregate amount of the 2016 Notes for shares of the Company's common stock, together with cash, in private placement transactions (the "Note Exchanges"). On July 19, 2019 and July 22, 2019, the Company used approximately $92.3 million (including $0.3 million of accrued interest) and 1,850,155 shares of its common stock valued at $161.0 million to settle the Note Exchanges for total consideration of $253.3 million, of which $163.6 million was allocated to reacquiring the equity component of the 2016 Notes. The Company allocated the consideration transferred to the liability and equity components using the same proportions as the initial carrying value of the 2016 Notes. The transaction resulted in a loss on extinguishment of debt of $4.6 million in the Company's consolidated statements of comprehensive income in 2019.

On July 19, 2019, the Company issued a Notice of Redemption in respect of the 2016 Notes, which provided that, on September 23, 2019, the Company would redeem all 2016 Notes that had not been converted, repurchased or exchanged prior to such date at a redemption price in cash equal to 100% of the principal amount thereof plus accrued and unpaid interest. On September 23, 2019, the Company used $23.0 million and 466,045 shares of its common stock valued at $37.8 million to settle the remaining 2016 Notes for a total of $60.8 million, of which $38.3 million was allocated to reacquiring the equity component of the 2016 Notes. This transaction resulted in a loss on extinguishment of debt of $1.1 million recorded on the Company's consolidated statements of comprehensive income. The total loss in 2019 of $5.7 million represents the difference between the fair value of the liability component of the 2016 Notes and its related carrying value immediately before the exchange.

The fair value of the liability component was calculated using a discounted cash flow technique with an effective interest rate of 3.9%, representing the estimated nonconvertible debt borrowing rate with a maturity as of the measurement date consistent with the 2016 Notes maturity date of June 1, 2021. In addition, in accordance with this guidance, a portion of the fair value of the

consideration transferred is allocated to the reacquisition of the equity component, which is the difference between the fair value of the consideration transferred and the fair value of the liability component immediately before the exchange. As a result, on a gross basis, $200.1 million was allocated to the reacquisition of the equity component of the original instrument, which is recorded net of deferred taxes within additional paid-in capital on the Company's consolidated balance sheet.

The cash conversion feature of the 2016 Notes required bifurcation from the 2016 Notes and was initially accounted for as an equity instrument classified to stockholders' equity, as the conversion feature was determined to be clearly and closely related to the Company's stock. Based on market data available for publicly traded, senior, unsecured corporate bonds issued by companies in the same industry and asset base and with similar maturity, the Company estimated the implied interest rate, assuming no conversion option. Assumptions used in the estimate represent what market participants would use in pricing the liability component, including market interest rates, credit standing, and yield curves, all of which are defined as Level 2 observable inputs. The estimated implied interest rate was applied to the 2016 Notes, which resulted in a fair value of the liability component of $96.3 million upon issuance, calculated as the present value of implied future payments based on the $115.0 million aggregate principal amount. The equity component of the 2016 Notes was recognized as a debt discount, recorded in additional paid-in capital, and represents the difference between the aggregate principal of the 2016 Notes and the fair value of the 2016 Notes without conversion option on their issuance date. The debt discount was amortized to interest expense using the effective interest method over five years, or the life of the 2016 Notes.

Interest expense recognized on the 2016 Notes for the three months ended March 31, 2019 was $0.6 million, $0.9 million and $0.2 million for the contractual coupon interest, the accretion of the debt discount and the amortization of the debt issuance costs, respectively. The effective interest rate on the 2016 Notes was 6.6%, which included the interest on the 2016 Notes, amortization of the debt discount and debt issuance costs.

9. Stockholders' Equity

Public Offerings of Common Stock

On July 19, 2019, the Company completed a public offering in which 1,587,000 shares of its common stock, including the underwriters' exercise in full of an option to purchase an additional 207,000 shares, were sold to the public at a price of $87.00 per share (the "Stock Offering"). The net proceeds of the Stock Offering, after deducting underwriting discounts and commissions and other estimated offering expenses payable by the Company, were approximately $131.1 million.

On May 3, 2019, the Company completed a public offering in which 3,144,531 shares of its common stock, which includes the underwriters' exercise in full of an option to purchase up to an additional 410,156 shares, were sold to the public at a price of $64.00 per share. The total proceeds received by the Company from this offering, net of underwriting discounts and commissions and other estimated offering expenses payable by the Company, totaled approximately $189.6 million.

Stock Option and Incentive Plans

At our 2018 annual meeting of shareholders held on May 16, 2018, our shareholders approved the 2018 Stock Option and Incentive Plan (the "2018 Plan"). Under the 2018 Plan the number of shares of our common stock that are reserved and available for issuance is 2,778,000 plus the number of shares of common stock available for issuance under our Amended and Restated 2012 Stock Option and Incentive Plan (the "2012 Plan"). The shares of common stock underlying any awards under the 2018 Plan and 2012 Plan (together, the "Plans") that are forfeited, canceled or otherwise terminated (other than by exercise) shall be added back to the shares of stock available for issuance under the 2018 Plan. At March 31, 2020, 2,419,406 shares were available for future grant under the 2018 Plan.

Stock-Based Compensation

For the three months ended March 31, 2020 and 2019, the Company recorded stock-based compensation expense of $4.2 million and $3.3 million, respectively, for share-based awards granted under the Plans. The following table presents stock-based compensation expense in the Company's consolidated statements of comprehensive income:

	Three Months Ended March 31,	
	2020	2019
	(Amounts in thousands)	
Cost of product revenue	$ 433	$ 324
Research and development	372	321
Selling, general and administrative	3,360	2,606
Total stock-based compensation	$ 4,165	$ 3,251

The 2018 Plan allows for the granting of incentive and nonqualified options to purchase shares of common stock, restricted stock and other equity awards. Employee grants under the Plans generally vest over a three to five-year period, with 20%-33% vesting on the first anniversary of the date of grant and the remainder vesting in equal yearly installments thereafter. Nonqualified options issued to non-employee directors and consultants under the Plans generally vest over one year. In the first quarter of 2018, to create a longer-term retention incentive, the Company's Compensation Committee granted long-term incentive compensation awards to its Chief Executive Officer consisting of both stock options and restricted stock units (" RSU s") that are subject to time-based vesting over nine years. Options granted under the Plans have a maximum term of ten years from the date of grant and generally, the exercise price of the stock options equals the fair market value of the Company's common stock on the date of grant. At March 31, 2020, options to purchase 915,518 shares and 716,630 stock units were outstanding under the Plans.

The Company uses the Black-Scholes option pricing model to calculate the fair value of stock option awards on the grant date, and the Company uses the value of the common stock as of the grant date to value RSUs. The Company measures stock-based compensation cost at the grant date based on the estimated fair value of the award. The Company recognizes expense on awards with service-based vesting over the employee's requisite service period on a straight-line basis. In the third quarter of 2017, the Company issued performance stock units to certain employees related to the Spectrum Acquisition which were tied to the achievement of certain 2018 revenue and gross margin metrics and the passage of time. Additionally, in the first quarter of 2018 and again in the first quarter of 2019, the Company issued performance stock units to certain individuals which are tied to the achievement of certain annual revenue and return on invested capital metrics. The Company recognizes expense on performance-based awards over the vesting period based on the probability that the performance metrics will be achieved. The Company recognizes stock-based compensation expense for options that are ultimately expected to vest, and accordingly, such compensation expense has been adjusted for estimated forfeitures.

Information regarding option activity for the three months ended March 31, 2020 under the Plans is summarized below:

	Shares	Weighted average exercise price	Weighted-Average Remaining Contractual Term (in Years)	Aggregate Intrinsic Value (in Thousands)
Options outstanding at December 31, 2019	957,559	$ 30.81		
Granted	25,836	$ 86.10		
Exercised	(67,877)	$ 23.56		
Forfeited/expired/cancelled	—	$ —		
Options outstanding at March 31, 2020	915,518	$ 32.91	6.64	$ 58,257
Options exercisable at March 31, 2020	555,159	$ 26.77	5.65	$ 38,734
Vested and expected to vest at March 31, 2020 (1)	885,461		6.59	$ 56,522

(1) Represents the number of vested options as of March 31, 2020 plus the number of unvested options expected to vest as of March 31, 2020 based on the unvested outstanding options at March 31, 2020 adjusted for estimated forfeiture rates of 8% for awards granted to non-executive level employees and 3% for awards granted to executive level employees.

The aggregate intrinsic value in the table above represents the total pre-tax intrinsic value (the difference between the closing price of the common stock on March 31, 2020, the last business day of the first quarter of 2020, of $96.54 per share and the exercise price of each in-the-money option) that would have been received by the option holders had all option holders exercised their options on March 31, 2020. The aggregate intrinsic value of stock options exercised during the three months ended March 31, 2020 and 2019 was $4.7 million and $0.1 million, respectively.

The weighted average grant date fair value of options granted during the three months ended March 31, 2020 and 2019 was $41.77 and $30.21, respectively. The total fair value of stock options that vested during the three months ended March 31, 2020 and 2019 was $2.0 million and $2.2 million, respectively.

The fair value of stock units is calculated using the closing price of the Company's common stock on the date of grant. Information regarding stock unit activity, which includes activity for restricted stock units and performance stock units, for the three months ended March 31, 2020 under the Plans is summarized below:

	Shares	Weighted-Average Remaining Contractual Term (in Years)	Aggregate Intrinsic Value (in Thousands)
Unvested at December 31, 2019	734,984		
Awarded	127,286		
Vested	(132,053)		
Forfeited/expired/cancelled	(13,587)		
Unvested at March 31, 2020	716,630	3.69	$ 69,183
Vested and expected to vest at March 31, 2020 (1)	656,225	3.43	$ 63,352

(1) Represents the number of vested stock units as of March 31, 2020 plus the number of unvested stock units expected to vest as of December 31, 2019 based on the unvested outstanding stock units at December 31, 2019 adjusted for estimated forfeiture rates of 8% for awards granted to non-executive level employees and 3% for awards granted to executive level employees.

The aggregate intrinsic value in the table above represents the total pre-tax intrinsic value (equal to the closing price of the common stock on March 31, 2020, the last business day of the first quarter of 2020, of $96.54 per share, as stock units do not have an exercise price) that would have been received by the stock unit holders had all holders exercised on March 31, 2020. The aggregate intrinsic value of stock units vested during the three months ended March 31, 2020 and 2019 was $11.8 million and $9.5 million, respectively.

The weighted average grant date fair value of stock units vested during the three months ended March 31, 2020 and 2019 was $57.85 and $31.79, respectively. The total fair value of stock units that vested during the three months ended March 31, 2020 and 2019 was $5.3 million and $4.9 million, respectively.

As of March 31, 2020, there was $43.7 million of total unrecognized compensation cost related to unvested share-based awards. This cost is expected to be recognized over a weighted average remaining requisite service period of 3.90 years. The Company expects 1,721,681 unvested options and stock units to vest over the next five years.

10. Commitments and Contingencies

Licensing and Research Agreements

The Company licenses certain technologies that are, or may be, incorporated into its technology under several agreements and also has entered into several clinical research agreements which require the Company to fund certain research projects. Generally, the license agreements require the Company to pay annual maintenance fees and royalties on product sales once a product has been established using the technologies. Research and development expenses associated with license agreements were immaterial amounts for the years ended December 31, 2019, 2018 and 2017.

In September 2018, the Company entered into a collaboration agreement with Sartorius Stedim Biotech ("SSB"), a leading international supplier for the biopharmaceutical industry, to integrate our XCell ATF cell retention control technology into Sartorius's BIOSTAT ® STR large-scale, single-use bioreactors to create novel perfusion-enabled bioreactors. As a result of this collaboration, end-users will stand to benefit from a single control system for 50L to 2,000L bioreactors used in perfusion cell culture applications. The single interface is designed to control cell growth, fluid management and cell retention in continuous and intensified bioprocessing and, ultimately, simplify the development and manufacture of biotechnological drugs under current good manufacturing practices.

In June 2018, the Company secured an agreement with Navigo for the exclusive co-development of multiple affinity ligands for which Repligen holds commercialization rights. The Company is manufacturing and has agreed to supply the first of these ligands, NGL-Impact ™ A, exclusively to Purolite Life Sciences ("Purolite"), who will pair the Company's high-performance ligand with Purolite's agarose jetting base bead technology used in their Jetted A50 Protein A resin product. We also signed a long-term supply agreement with Purolite for NGL-Impact A and other potential additional affinity ligands that may advance from the Company's Navigo collaboration. The Navigo and Purolite agreements are supportive of the Company's strategy to secure and reinforce the Company's proteins business. The Company made no payments to Navigo during the three months ended March 31, 2020 and 2019. Payments of $1.0 million and $2.4 million to Navigo during the years ended December 31, 2019 and 2018, respectively, in connection with this program, were recorded to research and development expenses in the Company's consolidated statements of comprehensive income.

11. Accumulated Other Comprehensive Loss

The following shows the changes in the components of accumulated other comprehensive loss for the three months ended March 31, 2020 which consisted of only foreign currency translation adjustments for the periods shown (amounts in thousands):

	Foreign Currency Translation Adjustment
Balance as of December 31, 2019	$ (15,027)
Other comprehensive loss	(5,579)
Balance as of March 31, 2020	$ (20,606)

12. Income Taxes

The Company's effective tax rate for the three months ended March 31, 2020 was 8.1%, compared to 23.4% for the corresponding period in the prior year. The effective tax rate for the three months ended March 31, 2020 was lower than the U.S. statutory rate of 21% due primarily to windfall benefits on stock option exercises and the vesting of stock units. The effective tax rate for the three months ended March 31, 2019 was higher than the U.S. statutory rate of 21% due to state tax effects and the impact of the Global Intangible Low-Taxed Income ("GILTI") tax enacted as part of the of the Tax Cuts and Jobs Act ("TCJA") enacted in December 2017 .

At December 31, 2019, the Company had federal business tax credit carryforwards of $ 1.2 million and state business tax credit carryforwards of $ 0.9 million available to reduce future domestic income taxes, if any. The business tax credits carryforwards will expire at various dates through December 2039. The net operating loss and business tax credit carryforwards are subject to review and possible adjustment by the Internal Revenue Service and may be limited in the event of certain changes in the ownership interest of significant stockholders.

The Company is subject to a territorial tax system under the TCJA, in which the Company is required to provide for tax on GILTI earned by certain foreign subsidiaries. The Company has adopted an accounting policy to provide for the tax expense related to GILTI in the year the tax is incurred as a period expense.

On March 27, 2020, President Trump signed the $2.2 trillion bipartisan Coronavirus Aid, Relief, and Economic Security ("CARES") Act. The CARES Act, the third congressional bill to address COVID-19 , provides for loans and other benefits to businesses, expanded unemployment insurance, direct payments to those with middle-income and below wages, new appropriations funding for healthcare and other priorities, and tax changes, including deferrals of employer payroll tax liabilities, coupled with an employee retention tax credit and rollbacks of TCJA limitations on net operating losses ("NOLs") and the Section 163(j) business interest limitation and a TCJA technical correction on qualified improvement property. The Company evaluated the provisions of the CARES Act and no provision had a material effect on the Company's financial position or results of operations at March 31, 2020 and the three months then ended.

The Company's tax returns are subject to examination by federal, state and international tax authorities for the following periods:

Jurisdiction	Fiscal Years Subject to Examination
United States—federal and state	2016-2019
Sweden	2013-2019
Germany	2019
Netherlands	2013-2019

13. Earnings Per Share

The Company reports earnings per share in accordance with ASC 260, *"Earnings Per Share,"* which establishes standards for computing and presenting earnings per share. Basic earnings per share is computed by dividing net income available to common shareholders by the weighted average number of common shares outstanding during the period. Diluted earnings per share is computed by dividing net income available to common shareholders by the weighted-average number of common shares and dilutive common share equivalents then outstanding. Potential common share equivalents consist of restricted stock awards and the incremental common shares issuable upon the exercise of stock options. Under the treasury stock method, unexercised "in-the-money" stock options and warrants are assumed to be exercised at the beginning of the period or at issuance, if later. The assumed proceeds are then used to purchase common shares at the average market price during the period. In periods when the Company has a net loss, stock awards are excluded from the calculation of earnings per share as their inclusion would have an antidilutive effect.

Basic and diluted weighted average shares outstanding were as follows:

	Three Months Ended March 31,	
	2020	2019
	(Amounts in thousands, except per share data)	
Net income	$ 9,815	$ 8,053
Weighted average shares used in computing net income per share—basic	52,139	43,968
Effect of dilutive shares:		
Stock options and restricted stock awards	970	725
Convertible senior notes	—	1,586
Dilutive potential common shares	970	2,311
Weighted average shares used in computing net income per share—diluted	53,109	46,279
Earnings per share:		
Basic	$ 0.19	$ 0.18
Diluted	$ 0.18	$ 0.17

At March 31, 2020, there were outstanding options to purchase 915,518 shares of the Company's common stock at a weighted average exercise price of $32.91 per share and 716,630 shares of common stock issuable upon the vesting of stock units, which include RSU s and performance stock units. For the three months ended March 31, 2020, 39,711 shares of the Company's common stock were excluded from the calculation of diluted earnings per share because the exercise prices of the stock options were greater than or equal to the average price of the common shares and were therefore anti-dilutive.

At March 31, 2019, there were outstanding options to purchase 1,027,831 shares of the Company's common stock at a weighted average exercise price of $28.53 per share and 680,549 shares issuable upon the vesting of stock units. For the three months ended March 31, 2019, 210,388 shares of the Company's common stock were excluded from the calculation of diluted earnings per share because the exercise prices of the stock options were greater than or equal to the average price of the common shares and were therefore anti-dilutive.

As provided by the terms of the indenture underlying the 2016 Notes, the Company had a choice to settle the conversion obligation for the 2016 Notes in cash, shares or any combination of the two. During the third quarter of 2019, the Company settled the remaining 2016 Notes for a total aggregate principal of $ 115.0 million a nd 2,316,200 shares of its common stock. As of March 31, 2019, the par value of the 2016 Notes is not included in the calculation of diluted earnings per share, but the dilutive effect of the conversion premium is considered in the calculation of diluted earnings per share using the treasury stock method. The dilutive impact of the 2016 Notes was based on the difference between the Company's current period average stock price and the conversion price of the 2016 Notes, provided there was a premium.

In July 2019, the Company issued $287.5 million aggregate principal amount of the 2019 Notes. As provided by the terms of the indenture underlying the 2019 Notes, conversion of the 2019 Notes will be settled in cash, shares of the Company's common stock or a combination thereof, at the Company's election. As of March 31, 2020, the 2019 Notes were not convertible. The Company currently intends to settle the par value of the 2019 Notes in cash and any excess conversion premium in shares. The Company applies the provisions of ASC 260, *"Earnings Per Share",* Subsection 10-45-44, to determine the diluted weighted average shares outstanding as it relates to the conversion spread on the 2019 Notes. Accordingly, the par value of the 2019 Notes is not included in the calculation of diluted income per share, but the dilutive effect of the conversion premium is considered in the calculation of diluted net income per share using the treasury stock method. The dilutive impact of the 2019 Notes is based on the difference between the Company's current period average stock price and the conversion price of the 2019 Notes, provided there is a premium. Pursuant to this accounting standard, there is no dilution from the accreted principal of the 2019 Notes for the periods shown.

14. Related Party Transactions

Certain facilities leased by Spectrum are owned by Roy Eddleman, the former owner of Spectrum. As of March 31, 2020, Mr. Eddleman owned greater than 5% of the Company's outstanding shares and the Company considers him to be a related party. The lease amounts paid to this shareholder prior to the public offering were negotiated in connection with the Spectrum Acquisition. The Company incurred rent expense totaling $0.2 million for the three months ended March 31, 2020 related to these leases.

15. Segment Reporting

The Company views its operations, makes decisions regarding how to allocate resources and manages its business as one reportable segment and one reporting unit. As a result, the financial information disclosed herein represents all of the material financial information related to the Company.

The following table represents the Company's total revenue by geographic area (based on the location of the customer):

	Three Months Ended March 31,	
	2020	2019
Revenue by customers' geographic locations:		
North America	48%	47%
Europe	41%	40%
APAC	11%	13%
Other	0%	0%
Total revenue	100%	100%

Concentrations of Credit Risk and Significant Customers

Financial instruments that subject the Company to significant concentrations of credit risk primarily consist of cash and cash equivalents, marketable securities and accounts receivable. Per the Company's investment policy, cash equivalents and marketable securities are invested in financial instruments with high credit ratings and credit exposure to any one issue, issuer (with the exception of U.S. treasury obligations) and type of instrument is limited. At March 31, 2020 and December 31, 2019, the Company had no investments associated with foreign exchange contracts, options contracts or other foreign hedging arrangements.

Concentration of credit risk with respect to accounts receivable is limited to customers to whom the Company makes significant sales. While a reserve for the potential write-off of accounts receivable is maintained, the Company has not written off any significant accounts to date. To control credit risk, the Company performs regular credit evaluations of its customers' financial condition.

Revenue from significant customers that represent 10% or more of the Company's total revenue is as follows:

	Three Months Ended March 31,	
	2020	2019
MilliporeSigma	14%	16%
GE Healthcare	N/A	13%

There were no accounts receivable balances as of March 31, 2020 representing 10% or more of the Company's total trade accounts receivable and royalties and other receivables balances. As of December 31, 2019, the accounts receivable balance with GE Healthcare represented 18% of the Company's total trade accounts receivable and royalties and other receivables balances.

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

Overview

Repligen and its subsidiaries, collectively doing business as Repligen Corporation ("Repligen", "we", "our", or "the Company") is a global life sciences company that develops and commercializes highly innovated bioprocessing technologies and systems that increase efficiencies and flexibility in the process of manufacturing biological drugs.

As the overall market for biologics continues to grow and expand, our customers – primarily large biopharmaceutical companies and contract development and manufacturing organizations – face critical production cost, capacity, quality and time pressures. Built to address these concerns, our products are helping to set new standards for the way biologics are manufactured. We are committed to inspiring advances in bioprocessing as a trusted partner in the production of critical biologic drugs – including monoclonal antibodies ("mAb"), recombinant proteins, vaccines and gene therapies – that are improving human health worldwide.

We currently operate as one bioprocessing business, with a comprehensive suite of products to serve both upstream and downstream processes in biological drug manufacturing. Building on over 35 years of industry expertise, we have developed a broad and diversified product portfolio that reflects our passion for innovation and the customer-first culture that drives our entire organization. We continue to capitalize on opportunities to maximize the value of our product platform through both organic growth initiatives (internal innovation and commercial leverage) and targeted acquisitions.

Our Products

Our bioprocessing business is comprised of four main franchises, three of which we sell directly to end-users (Chromatography, Filtration and Process Analytics) and one that we sell through supply agreements (Proteins).

Direct-to-Customer Products

Since 2012, we have significantly expanded our direct-to-customer presence through our Chromatography, Filtration and Process Analytics franchises, each of which includes novel and differentiated technologies. We have diversified and grown our direct-to-customer product offering through internal innovation and through strategic, accretive acquisitions of assets or businesses that leverage existing product lines and/or expand our customer and geographic scope.

To support our sales growth goals for these products, we make ongoing investments in our commercial organization, our research and development ("R&D") team and our manufacturing capacity. Our commercial and R&D teams work together to develop and launch new products and applications that address specific biomanufacturing challenges, and to build new markets for acquired technologies. We have six key manufacturing sites across the United States, Sweden and Germany, with additional capacity being added by the end of 2020 in the Netherlands. We regularly evaluate and invest in capacity as needed to ensure timely deliveries and to stay ahead of increased customer demand for our products.

A substantial piece of our revenue comes from consumable and/or single-campaign ("single-use") products as compared to associated equipment. The customization, scalability and plug-and-play convenience of consumable and/or single-use products, and in many cases the closed nature of our technologies, make them ideal for use in biologics manufacturing processes where contamination risk is a critical concern of our customers.

Chromatography

Our Chromatography franchise includes a number of products used in downstream purification, development, manufacturing and quality control of biological drugs. The main driver of growth in this portfolio is our OPUS ® Column product line.

Additional chromatography products include our affinity capture resins, such as CaptivA ® Protein A Resins, that are used in a small number of commercial drug processes and our ELISA test kits, used by quality control departments to detect and measure the presence of leached Protein A and/or growth factor in the final product.

OPUS Pre-Packed Columns

Our Chromatography franchise features a wide range of OPUS columns, which we deliver to our customers sealed and pre-packed with their choice of resin. These are single-use or multiple-use disposable columns that replace the use of customer-packed glass columns used in downstream purification processes. By designing OPUS columns to be a technologically advanced and flexible option for the purification of biologics from process development through clinical and commercial-scale manufacturing, Repligen has become a leader in the pre-packed column ("PPC") market. Our biomanufacturing customers value the significant cost savings that OPUS columns deliver by reducing set up time, labor, equipment and facility costs – in addition to delivering product consistency and "plug and play" convenience.

We launched our first production-scale OPUS columns in 2012 and have since added larger diameter options that scale up to use with 2,000 liter bioreactors. Our OPUS 80R column is the largest available PPC on the market for use in late-stage clinical or commercial purification processes. We have also introduced next-generation features such as a resin recovery port on our larger columns, which allows our customers to remove and reuse the recovered resin in other applications. We believe the OPUS 5-80R product line is the most flexible and platformable PPC product offered in the marketplace today, and is serving the purification needs of customers manufacturing monoclonal antibodies ("mAb") and other biologics such as cell and gene therapies ("C&GT").

In addition to our larger scale OPUS columns, our portfolio includes our smaller-scale OPUS columns, including specifically RoboColumn ®, MiniChrom ™ and ValiChrom ™ columns for process development and validation. These columns are used in high-throughput process development screening, viral clearance validation studies and scale down validation of chromatography processes.

We maintain customer-facing centers in both the United States and Europe for OPUS columns, and offer our customers an unmatched ability to pack any of over 100 resins in our OPUS 5-80R range and any of over 300 resin choices in our small-scale OPUS columns.

Other Chromatography

Our Chromatography portfolio also includes ELISA kits, which are analytical test kits to quantitate the proteins and growth factors, and chromatography resins, including our CaptivA brand.

Filtration

XCell ATF ™ Cell Retention Systems

Our Filtration products offer a number of advantages to manufacturers of biologic drugs and are used in development, clinical and commercial-scale production. We first moved into Filtration technology with our acquisition of XCell Alternating Tangential Flow ("ATF") assets from Refine Technology ("Refine") in 2014. XCell ATF systems are used primarily in upstream perfusion (continuous) cell culture processing.

XCell ATF is a cell retention technology. The system is comprised of an advanced hollow fiber ("HF") filtration device, a low shear pump and a controller. The XCell ATF system is connected to a bioreactor and enables the cell culture to be run continuously, with cells being retained in the bioreactor, fresh nutrients (cell culture media) being fed into the reactor continuously and clarified biological product and cell waste being removed continuously. The cells are maintained in a consistent nutrient-rich environment and can reach cell densities two- and three-times higher than those achieved by standard fed-batch culture. By continuously removing waste products from the fermenter, the XCell ATF systems routinely increases cell densities to two- or three-times the levels achieved by standard fed-batch culture. As a result, product yield is increased, which improves facility utilization and can reduce the size of a bioreactor required to manufacture a given volume of biologic drug product. XCell ATF systems are available in a wide range of sizes that can easily scale from laboratory use through full production with bioreactors as large as 5,000 liters.

Through internal innovation, we developed and launched single-use formats of the original stainless steel XCell ATF devices to address increasing industry demand for single-use sterile systems with "plug-and-play" technology. The XCell ATF device is now available to customers in both its original configuration (steel housing and single-use filters) in all sizes (2, 4, 6 and 10), and/or as a single-use device (disposable housing/filter combination) in most sizes (2, 6, and 10). The availability of XCell ATF technology in a single-use format eliminates the time intensive workflow associated with autoclaving, leading to an 80% reduction in implementation speed. The single-use format also enables our customers to accelerate evaluations of the product with a lower initial overall cost of ownership.

In September 2018, we entered into a collaboration agreement with industry leader Sartorius Stedim Biotech ("SSB") to integrate our XCell ATF controller technology into SSB's BIOSTAT ® STR large-scale, single-use bioreactors, to create novel perfusion-enabled bioreactors.

TangenX ™ Flat Sheet Cassettes

In December 2016, we acquired TangenX ™ Technology Corporation ("TangenX"), balancing our upstream XCell ATF systems with a portfolio of flat-sheet tangential flow filtration ("TFF") cassettes used in downstream biologic drug concentration and formulation processes. The TangenX product portfolio includes our single-use SIUS ™ brand, providing customers with a high-performance, cost saving alternative to reusable TFF cassettes.

TFF is a rapid and efficient method for the concentration and formulation of biomolecules that is widely used in many applications in biopharmaceutical development and manufacturing. SIUS cassettes are the only purpose built single-use TFF cassettes on the market. The cassette features a high performing membrane and unique cartridge construction that enables a lower price point. Each disposable cassette is delivered pre-sanitized and ready to be equilibrated and used for tangential flow, ultrafiltration and diafiltration applications. Use of SIUS TFF cassettes eliminates non-value added steps of cleaning, testing between uses, storage and flushing required in reusable TFF products, providing cost and time savings. The cassettes are interchangeable with filter hardware from multiple manufacturers, simplifying customer trial and adoption of SIUS products.

Spectrum ® Hollow Fibers

We acquired Spectrum Life Sciences LLC ("Spectrum") and its subsidiaries in August 2017 to strengthen our filtration business with the addition of a leading portfolio of HF filtration solutions, including fully integrated KrosFlo ® TFF Systems with Konduit sensing and ProConnex ® Flow Path single-use assemblies. KrosFlo family of TFF systems for product concentration is fully scalable from 2 milliliters to 5,000 liters – from lab-scale to commercial manufacturing. Designed for purification and formulation applications, KrosFlo Systems enable robust downstream ultrafiltration and microfiltration.

We also gained the Spectra/Por ® portfolio of laboratory and process dialysis products and in 2019, we launched the SpectraFlo ™ Dynamic Dialysis Systems. Also, in 2019 we introduced the KrosFlo ® TFDF ™ (Tangential Flow Depth Filtration) Systems, which we believe have the potential to disrupt and displace traditional harvest clarification operations. The KrosFlo TFDF system includes control hardware, novel high throughput tubular depth filters and ProConnex single-use TFDF flow paths. When used for cell culture clarification, single-use KrosFlo TFDF technology delivers unprecedented high flux (>1,000 LMH), high capacity, low turbidity, and minimal dilution, making the technology a high-performance alternative to traditional centrifugation and depth filtration approaches to harvest clarification. TFDF technology also provides benefits such as low hold-up volume, high recovery, small footprint, simple set up and disposal, scalability and reduced process time.

The Spectrum product line of HF filters is used in bench-top through commercial-scale processes, primarily for the filtration, purification and concentration of biologics and diagnostic products. Our KrosFlo filtration systems and equipment offer both standard and customized solutions to bioprocessing customers, with particular strength in consumable and single-use offerings.

With the acquisition of Spectrum, we substantially increased our direct sales presence in Europe and Asia, and we diversified our end markets to include all biologic classes, including mAb, vaccines, recombinant proteins and gene therapies.

Other Filtration

In 2018, we introduced our Konduit monitor to automate concentration and buffer exchange. We have broadened the application for Konduit monitor to include use with both HF TFF from Spectrum and our TangenX flat sheet TFF systems. We also self-manufacture HF filters that are used in our XCell ATF, KrosFlo TFF and KrosFlo TFDF systems.

Process Analytics Products

In May 2019, we consummated our acquisition of C Technologies, Inc. ("C Technologies") and added a fourth franchise, Process Analytics, to our bioprocessing business. Our Process Analytics products complement and support our Filtration, Chromatography and Proteins franchises as they allow end-users to make at-line or in-line absorbance measurements allowing for the determination of protein concentration in filtration, chromatography formulation and fill-finish applications.

SoloVPE ® Device

Our SoloVPE Slope Spectroscopy ® system is the industry standard for offline and at-line absorbance measurements for protein concentration determination in process development, manufacturing and quality control settings.

FlowVPE ® Device

Our FlowVPE Slope Spectroscopy system enhances the power of Slope Spectroscopy and provides in-line protein concentration measurement for filtration, chromatography and fill-finish applications. A key benefit of this in-line solution is the ability to monitor a manufacturing process in real time. We are developing a next-generation FlowVPE to incorporate GMP-compliant software for production-scale biologics manufacturing.

Use of VPE Slope Spectroscopy delivers multiple process benefits for our biopharmaceutical manufacturing customers, compared to traditional UV-Vis approaches. Key benefits include: the elimination of manual dilutions and sample transfers from process development/manufacturing to labs, rapid time to results (minutes versus hours), improved precision, built-in data quality for improved reporting and validation, and ease of use.

OEM Products (Proteins)

Our OEM products are represented by our Protein A affinity ligands, which are a critical component of Protein A chromatography resins used in downstream purification of mAb, and cell culture growth factor products, which are a key component of cell culture media used in upstream bioprocessing to increase cell density and improve product yield.

Proteins—Ligands

Through our Proteins business, we are a leading provider of Protein A affinity ligands and cell culture growth factors to life sciences companies. Protein A ligands are an essential "binding" component of Protein A affinity chromatography resins used in the purification of virtually all monoclonal antibody-based drugs on the market or in development. We manufacture multiple forms of Protein A ligands under long-term supply agreements with major life sciences companies including GE Healthcare ("GE"), MilliporeSigma and Purolite Life Sciences ("Purolite"), who in turn sell their Protein A chromatography resins to end users (mAb manufacturers). We have two manufacturing sites supporting overall global demand for our Protein A ligands: one in Lund, Sweden and another in Waltham, Massachusetts.

Protein A chromatography resins are considered the industry standard for purification of antibody-based therapeutics due to the ability of the Protein A ligand to very selectively bind to or "capture" antibodies from crude protein mixtures. Protein A resins are packed into the first chromatography column of typically three columns used in a mAb purification process. As a result of Protein A's high affinity for antibodies, the mAb product is highly purified and concentrated within this first capture step before moving to polishing steps.

In June 2018, we entered into an agreement with Navigo Proteins GmbH ("Navigo") for the exclusive co-development of multiple affinity ligands for which Repligen holds commercialization rights. We are manufacturing and have agreed to supply the first of these ligands, NGL-Impact ® A, exclusively to Purolite, who will pair our high-performance ligand with Purolite's agarose jetting base bead technology used in their Jetted A50 Protein A resin product. We also signed a long-term supply agreement with Purolite for NGL-Impact A and potential additional affinity ligands that may advance from our Navigo collaboration. The Navigo and Purolite agreements are supportive of our strategy to secure and reinforce our Proteins franchise.

Proteins—Growth Factors

Most biopharmaceuticals are produced through an upstream mammalian cell culture process. In order to stimulate increased cell growth and maximize overall yield from a bioreactor, manufacturers often add growth factors, such as insulin, to their cell culture media. Our cell culture growth factor additives include LONG ® R ^{3} IGF 1 ("LR3"), our insulin-like growth factor that has been shown to be up to 100 times more biologically potent than insulin (the industry standard), thereby increasing recombinant protein production in cell culture fermentation applications. LR3 is currently sold through a distribution partnership with MilliporeSigma.

C Technologies Acquisition

On April 25, 2019, we entered into a Stock Purchase Agreement ("Purchase Agreement") with C Technologies, Inc. ("C Technologies"), a New Jersey corporation, and Craig Harrison, an individual and sole stockholder of C Technologies. The deal was consummated on May 31, 2019, the acquisition date (the "C Technologies Acquisition").

C Technologies sells instruments, consumables and accessories that are designed to allow bioprocessing technicians to measure the protein concentration of a liquid sample using C Technologies' Slope Spectroscopy ® method, which eliminates the need for manual sample dilution. C Technologies' lead product, the SoloVPE ® Device, was launched in 2008 for off-line and at-line protein concentration measurements conducted in quality control, process development and manufacturing labs in the production of biological therapeutics. C Technologies' FlowVPE ® Device, an extension of the SoloVPE technology, was designed to allow end users to make in-line protein concentration measurements in filtration, chromatography and fill-finish applications, designed to allow for real-time process monitoring.

Critical Accounting Policies and Estimates

A "critical accounting policy" is one which is both important to the portrayal of our financial condition and results and requires management's most difficult, subjective or complex judgments, often as a result of the need to make estimates about the effect of matters that are inherently uncertain. For a description of our critical accounting policies that affect our more significant judgments and estimates used in the preparation of our consolidated financial statements, refer to Management's Discussion and Analysis of Financial Condition and Results of Operations and our significant accounting policies in Note 2 to the consolidated financial statements included in our Annual Report on Form 10-K for the year ended December 31, 2019 filed with the SEC.

Results of Operations

We did not observe significant impacts on our results of operations for the three months ended March 31, 2020 due to the global outbreak of novel strain of coronavirus, SARS-CoV-2, which causes coronavirus disease 2019 ("COVID-19"). The ultimate impacts of COVID-19 on our business and results of operations are currently unknown. We expect to continue to actively monitor the situation and may take further precautionary and preemptive actions as may be required by federal, state or local authorities or that we determine are in the best interests of public health and safety and that of our patient community, employees, partners, suppliers and stockholders. We cannot predict the effects that such actions, or the impact of COVID-19 on global business operations and economic conditions, may have on our business or strategy, including the effects on our financial and operating results.

The following discussion of the financial condition and results of operations should be read in conjunction with the accompanying consolidated financial statements and the related footnotes thereto.

Revenues

Total revenue for the three months ended March 31, 2020 and 2019 were as follows:

	Three Months Ended March 31,		Increase/ (Decrease)	
	2020	2019	$ Change	% Change
	(Amounts in thousands, except for percentage data)			
Revenue:				
Product	$ 76,060	$ 60,612	$ 15,448	25.5%
Royalty and other	30	22	8	36.4%
Total revenue	$ 76,090	$ 60,634	$ 15,456	25.5%

Product revenues

Since 2016, we have been increasingly focused on selling our products directly to customers in the pharmaceutical industry and to our contract manufacturers. Direct sales represent approximately 76% and 73% of our product revenue in the three months ended March 31, 2020 and 2019, respectively. We expect that direct sales will continue to account for an increasing percentage of our product revenues, as the largest customer of our OEM products has begun to diversify its supply chain in 2020. Sales of our bioprocessing products can be impacted by the timing of large-scale production orders and the regulatory approvals for such antibodies, which may result in significant quarterly fluctuations.

Revenue from our chromatography products includes the sale of our OPUS chromatography columns, chromatography resins and ELISA test kits. Revenue from our filtration products includes the sale of our XCell ATF systems and consumables, KrosFlo filtration products and SIUS filtration products. Revenue from protein products includes the sale of our Protein A ligands and cell culture growth factors. Revenue from our Process Analytics products includes the sale of our SoloVPE and FlowVPE systems and consumables. Other revenue primarily consists of revenue from the sale of our operating room products to hospitals as well as freight revenue.

During the three months ended March 31, 2020, product revenue increased by $15.4 million, or 25.5%, as compared to the same period of 2019. The increase is due to the continued adoption of our products by our key bioprocessing customers, particularly our chromatography and filtration products. Sales of our bioprocessing products are impacted by the timing of orders, development efforts at our customers or end-users and regulatory approvals for biologics that incorporate our products, which may result in significant quarterly fluctuations. Such quarterly fluctuations are expected, but they may not be predictive of future revenue or otherwise indicate a trend. Additionally, there was a $6.6 million increase in revenue for the three months ended March 31, 2020, as compared to the same period of 2019 due to revenues generated by C Technologies, which was acquired in May 2019.

Royalty revenues

Royalty revenues in the three months ended March 31, 2020 and 2019 relate to royalties received from a third-party systems manufacturer associated with our OPUS PD chromatography columns. Royalty revenues are variable and are dependent on sales generated by our partner.

Costs of product revenue and operating expenses

Total costs and operating expenses for the three months ended March 31, 2020 and 2019 were comprised of the following:

	Three Months Ended March 31,		Increase/ (Decrease)	
	2020	2019	$ Change	% Change
	(Amounts in thousands, except for percentage data)			
Cost of product revenue	$ 31,982	$ 26,845	$ 5,137	19.1%
Research and development	4,702	3,620	1,082	29.9%
Selling, general and administrative	27,500	18,998	8,502	44.8%
Total costs and operating expenses	$ 64,184	$ 49,463	$ 14,721	29.8%

Cost of product revenue

Cost of product revenue increased 19.1% in the three months ended March 31, 2020, compared to the same period of 2019 due primarily to the increase in product revenue mentioned above.

Gross margins were 58.0% and 55.7% in the three months ended March 31, 2020 and 2019, respectively. The increase in gross margins is a result of the increase in revenue mentioned above, and favorable product mix, partially offset by an increase in manufacturing headcount subsequent to March 31, 2019. Gross margins may fluctuate in future quarters based on expected production volume and product mix.

Research and development expenses

Research and development ("R&D") expenses are related to bioprocessing products, which include personnel, supplies and other research expenses. Due to the size of the Company and the fact that these various programs share personnel and fixed costs, we do not track all of our expenses or allocate any fixed costs by program, and therefore, have not provided historical costs incurred by project. In addition to the legacy product R&D, the current single-use XCell ATF technology incurs expenses related to product development, sterilization, validation testing, and other research related expenses.

R&D expenses increased 29.9% during the three months ended March 31, 2020, compared to the same period of 2019. The increase during the period is primarily due to increased costs associated with an increase in R&D headcount, an increase in stock-based compensation expense resulting from the increased headcount and the higher share price period over period, as well as the addition of $0.8 million in R&D expenses related to C Technologies' operations.

We expect our R&D expenses for the remainder of 2020 to increase in order to support new product development.

Selling, general and administrative expenses

Selling, general and administrative ("SG&A") expenses include the costs associated with selling our commercial products and costs required to support our marketing efforts, including legal, accounting, patent, shareholder services, amortization of intangible assets and other administrative functions.

During the three months ended March 31, 2020, SG&A costs increased by $8.5 million, or 44.8%, as compared to the same period of 2019. The increase is due to the addition of $4.9 million SG&A costs from C Technologies' operations, the continued expansion of our customer-facing activities to drive sales of our bioprocessing products, and the continued buildout of our administrative infrastructure, primarily through increased headcount, to support expected future growth. Stock-based compensation expense increased during the three months ended March 31, 2020, as compared to the same period in 2019 resulting from an increase in headcount and higher share prices period over period.

Other expenses, net

The table below provides detail regarding our other expenses, net:

	Three Months Ended March 31,		Increase/ (Decrease)	
	2020	2019	$ Change	% Change
	(Amounts in thousands, except for percentage data)			
Investment income	$ 1,364	$ 713	$ 651	91.3%
Interest expense	(2,976)	(1,726)	(1,250)	72.4%
Other income	382	358	24	6.7%
Total other expense, net	$ (1,230)	$ (655)	$ (575)	87.8%

Investment income

Investment income includes income earned on invested cash balances. The increase of $0.7 million for the three months ended March 31, 2020, as compared to the same period of 2019 was attributable to higher average invested cash balances partially offset by a decrease in interest rates during the three months ended March 31, 2020. We expect investment income to vary based on changes in the amount of funds invested and fluctuation of interest rates. In March 2020, in response to the recent outbreak of COVID-19 and to stay ahead of disruptions and economic slowdown, the Federal Reserve reduced the federal funds rate to a range of 0.0% to 0.25%, which will continue to affect our investment income in future periods.

Interest expense

Interest expense primarily includes interest related to our 2016 Notes, which were settled during the third quarter of 2019, and our 0.375% Convertible Senior Notes due 2024 (the "2019 Notes"), which were issued in July 2019. Interest expense increased $1.3 million for the three months ended March 31, 2020, as compared to the same period in 2019. Contractual coupon interest incurred on the 2019 Notes for the three months ended March 31, 2020 was $0.3 million and there was no comparable amount for the same period of 2019. Contractual coupon interest incurred on the 2016 Notes was $0.6 million in the three months ended March 31, 2019. Since the 2016 Notes were settled during July 2019, interest no longer accrued on the 2016 Notes subsequent to their settlement.

The amortization of debt issuance costs on the 2019 Notes was $2.7 million for the three months ended March 31, 2020. There were no comparable amounts during the same period of 2019 as the 2019 Notes were issued in July 2019. The amortization of the debt issuance costs on the 2016 Notes was $1.1 million for the three months ended March 31, 2019 for which there was no comparable amount recorded during the same period of 2020.

Other income

The change in other income during the three months ended March 31, 2020, compared to the same period of 2019, is primarily attributable to foreign currency gains related to amounts due from non-Swedish krona-based customers and cash balance denominated in U.S. dollars and British pounds held by Repligen Sweden AB.

Income tax provision

Income tax provision for the three months ended March 31, 2020 and 2019 was as follows:

	Three Months Ended March 31,		Increase/ (Decrease)	
	2020	2019	$ Change	% Change
	(Amounts in thousands, except for percentage data)			
Income tax provision	$ 861	$ 2,463	$ (1,602)	(65.0%)
Effective tax rate	8.1%	23.4%		

For the three months ended March 31, 2020 and 2019, we recorded an income tax provision of $0.9 million and $2.5 million, respectively. The effective tax rate is based upon the estimated taxable income for the years ended December 31, 2020 and 2019, respectively, as well as the composition of the taxable income in different jurisdictions. The effective tax rate was lower than the U.S. statutory rate of 21% in the three months ended March 31, 2020 due primarily to windfall benefits on stock option exercises and the vesting of restricted stock units. The effective tax rate for the three months ended March 31, 2019 was higher than the U.S. statutory rate of 21% due to state tax effects and the impact of the Global Intangible Low-Taxed Income ("GILTI") tax enacted as part of the of the Tax Cuts and Jobs Act ("TCJA") enacted in December 2017.

On March 27, 2020, President Trump signed the $2.2 trillion bipartisan Coronavirus Aid, Relief, and Economic Security ("CARES") Act. The CARES Act, the third congressional bill to address COVID-19 , provides for loans and other benefits to businesses, expanded unemployment insurance, direct payments to those with middle-income and below wages, new appropriations funding for healthcare and other priorities, and tax changes, including deferrals of employer payroll tax liabilities, coupled with an employee retention tax credit and rollbacks of TCJA limitations on net operating losses and the Section 163(j) business interest limitation and a TCJA technical correction on qualified improvement property. The Company evaluated the provisions of the CARES Act and no provision had a material effect on the Company's financial position or results of operations at March 31, 2020 and the three months then ended.

Non-GAAP Financial Measures

We provide non-GAAP adjusted income from operations; adjusted net income; and adjusted EBITDA as supplemental measures to GAAP measures regarding our operating performance. These financial measures exclude the items detailed below and, therefore, have not been calculated in accordance with GAAP. A detailed explanation and a reconciliation of each non-GAAP financial measure to its most comparable GAAP financial measure is provided below.

We include this financial information because we believe these measures provide a more accurate comparison of our financial results between periods and more accurately reflect how management reviews its financial results. We excluded the impact of certain acquisition-related items because we believe that the resulting charges do not accurately reflect the performance of our ongoing operations for the period in which such charges are incurred.

Non-GAAP adjusted income from operations

Non-GAAP adjusted income from operations is measured by taking income from operations as reported in accordance with GAAP and excluding acquisition and integration costs and intangible amortization booked through our consolidated statements of comprehensive income. The following is a reconciliation of income from operations in accordance with GAAP to non-GAAP adjusted income from operations for the three months ended March 31, 2020 and 2019:

	Three Months Ended March 31,	
	2020	2019
	(Amounts in thousands)	
GAAP income from operations	$ 11,906	$ 11,171
Non-GAAP adjustments to income from operations:		
Acquisition and integration costs	2,553	1,799
Intangible amortization	3,878	2,611
Non-GAAP adjusted income from operations	$ 18,337	$ 15,581

Non-GAAP adjusted net income

Non-GAAP adjusted net income is measured by taking net income as reported in accordance with GAAP and excluding acquisition and integration costs, intangible amortization, non-cash interest expense and the tax effects of these items. The following are reconciliations of net income in accordance with GAAP to non-GAAP adjusted net income for the three months ended March 31, 2020 and 2019:

	Three Months Ended March 31,			
	2020		2019	
	Amount	Fully Diluted Earnings per Share*	Amount	Fully Diluted Earnings per Share
	(Amounts in thousands, except per share data)			
GAAP net income	$ 9,815	$ 0.18	$ 8,053	$ 0.17
Non-GAAP adjustments to net income:				
Acquisition and integration costs	2,553	0.05	1,799	0.04
Intangible amortization	3,878	0.07	2,611	0.06
Non-cash interest expense	2,691	0.05	1,107	0.02
Tax effect of intangible amortization and acquisition costs	(2,177)	(0.04)	(1,351)	(0.03)
Non-GAAP adjusted net income	$16,760	$ 0.32	$12,219	$ 0.26

* Per share totals may not add due to rounding.

Adjusted EBITDA

Adjusted EBITDA is measured by taking net income as reported in accordance with GAAP, excluding investment income, interest expense, taxes, depreciation and amortization and acquisition and integration costs booked through our consolidated statements of comprehensive income. The following is a reconciliation of net income in accordance with GAAP to adjusted EBITDA for the three months ended March 31, 2020 and 2019:

	Three Months Ended March 31,	
	2020	2019
	(Amounts in thousands)	
GAAP net income	$ 9,815	$ 8,053
Non-GAAP EBITDA adjustments to net income:		
Investment income	(1,364)	(713)
Interest expense	2,976	1,726
Tax provision	861	2,463
Depreciation	2,485	1,575
Amortization	3,905	2,638
EBITDA	18,678	15,742
Other non-GAAP adjustments:		
Acquisition and integration costs	2,553	1,799
Adjusted EBITDA	$ 21,231	$ 17,541

Liquidity and Capital Resources

We have financed our operations primarily through revenues derived from product sales, the issuance of the 2016 Notes in May 2016 and our 2019 Notes (defined below) in July 2019 and the issuance of common stock in our July 2019, May 2019 and July 2017 public offerings. Our revenue for the foreseeable future will primarily be limited to our bioprocessing product revenue.

At March 31, 2020, we had non-restricted cash and cash equivalents of $529.5 million compared to non-restricted cash, cash equivalents of $528.4 million at December 31, 2019.

We acquired C Technologies on May 31, 2019 for $239.9 million in cash and shares of our common stock. The C Technologies Acquisition was funded through payment of approximately $195.0 million in cash and 779,221 unregistered shares of the Company's common stock totaling $53.9 million.

On May 3, 2019, the Company completed a public offering in which 3,144,531 shares of its common stock, which includes the underwriters' exercise in full of an option to purchase up to an additional 410,156 shares, were sold to the public at a price of $64.00 per share. The total proceeds received by the Company from this offering, net of underwriting discounts and commissions and other estimated offering expenses payable by the Company, totaled approximately $189.6 million. Proceeds from this public offering were partially used to fund the C Technologies Acquisition on May 31, 2019.

On July 19, 2019, the Company completed a public offering in which 1,587,000 shares of its common stock, which includes the underwriters' exercise in full of an option to purchase an additional 207,000 shares, were sold to the public at a price of $87.00 per share for $131.1 million in net proceeds to the Company, after deducting underwriting discounts and commissions and other estimated offering expenses payable by the Company (the "Stock Offering").

On July 19, 2019, the Company issued $287.5 million aggregate principal amount of 0.375% Convertible Senior Notes due 2024 ("2019 Notes"), which included the underwriters' exercise in full of an option to purchase an additional $37.5 million aggregate principal amount of 2019 Notes (the "Notes Offering" and, together with the Stock Offering, the "Offerings"). The net proceeds of the Notes Offering, after deducting underwriting discounts and commissions and other offering expenses payable by the Company, were $278.5 million. See Note 8, *"Convertible Senior Notes,"* included in this report for more information on this transaction. The Company utilized a portion of the proceeds from the Offerings to settle its outstanding 2016 Notes during the third quarter of 2019. On July 16, 2019, the Company entered into separate privately negotiated agreements with certain holders of the 2016 Notes to exchange an aggregate of $92.0 million principal aggregate amount of the 2016 Notes for shares of the Company's common stock, together with cash, in private placement transactions (the "Note Exchanges"). On July 19, 2019 and July 22, 2019, the Company used approximately $92.3 million (including $0.3 million of accrued interest) and 1,850,155 shares of its common stock valued at $161.0 million to settle the Note Exchanges for total consideration of $253.3 million, of which $163.6 million was allocated to the equity component of the 2016 Notes. The Company allocated the consideration transferred to the liability and equity components using the same proportions as the initial carrying value of the 2016 Notes.

During the first quarter of 2020, the closing price of the Company's common stock did not exceed 130% of the conversion price of the 2019 Notes for more than 20 trading days of the last 30 consecutive trading days of the quarter. Therefore, the 2019 Notes are not convertible at the option of the holders of the 2019 Notes during the second quarter of 2020 per the First Supplemental Indenture underlying the 2019 Notes. The 2019 Notes have a face value of $287.5 million and a carrying value of $235.5 million and are classified as long-term liabilities on the Company's consolidated balance sheet as of March 31, 2020.

We intend to use the remaining net proceeds from the Offerings for working capital and other general corporate purposes, including to fund possible acquisitions of, or investments in, complementary businesses, products, services and technologies. It is the Company's policy and intent to settle the face value of the 2019 Notes in cash and any excess conversion premium in shares of our common stock.

Cash flows

	Three Months Ended March 31,		Increase/(Decrease)
	2020	2019	$ Change
	(Amounts in thousands)		
Operating activities	$ 9,530	$ 9,788	$ (258)
Investing activities	(5,037)	(3,828)	(1,209)
Financing activities	1,589	44	1,545
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(4,923)	(3,691)	(1,232)
Net increase in cash, cash equivalents and restricted cash	$ 1,159	$ 2,313	$ (1,154)

Operating activities

For the three months ended March 31, 2020, our operating activities provided cash of $9.5 million reflecting net income of $9.8 million and non-cash charges totaling $13.4 million primarily related to depreciation, amortization, non-cash interest expense and stock-based compensation charges. An increase in accounts receivable consumed $2.4 million of cash and was primarily driven by the 25.5% year-to-date increase in revenues. An increase in inventory consumed $7.2 million to support future revenue, as well as inventory acquired in the acquisition of C Technologies Acquisition. A decrease in accounts payable and accrued liabilities of $5.7 million was due to accrued liabilities acquired in the acquisition of C Technologies Acquisition, the timing of payments of payables, payment of the 2019 incentive compensation programs and an adjustment to the tax liability for the quarter. The remaining cash provided by operating activities resulted from favorable changes in various other working capital accounts.

For the three months ended March 31, 2019, our operating activities provided cash of $9.8 million reflecting net income of $8.1 million and non-cash charges totaling $9.5 million primarily related to depreciation, amortization, non-cash interest expense, deferred tax expense and stock-based compensation charges. An increase in accounts receivable consumed $6.7 million of cash and was primarily driven by the 35% quarter over quarter increase in revenues. Payments of accounts payable and accrued liabilities consumed $2.4 million of cash and were mainly due to the timing of payments of payables and payment of 2018 incentive compensation programs. These were offset by a decrease in unbilled receivables of $2.6 million. The remaining cash used in operating activities resulted from net unfavorable changes in various other working capital accounts.

Investing activities

Our investing activities consumed $5.0 million and $3.8 million of cash during the three months ended March 31, 2020 and 2019, respectively, related to capital expenditures. Of these capital expenditures, $0.9 million and $1.7 million represented capitalized costs related to our internal-use software, respectively.

Financing activities

Cash provided by financing activities of $1.6 million for the three months ended March 31, 2020 included proceeds from stock option exercises during the period.

Working capital increased by approximately $16.0 million to $609.5 million at March 31, 2020 from $593.5 million at December 31, 2019 due to the various changes noted above.

Our future capital requirements will depend on many factors, including the following:

- the expansion of our bioprocessing business;
- the ability to sustain sales and profits of our bioprocessing products;
- our ability to acquire additional bioprocessing products;
- our identification and execution of strategic acquisitions or business combinations;
- the scope of and progress made in our R&D activities;
- the extent of any share repurchase activity; and
- the success of any proposed financing efforts.

Absent acquisitions of additional products, product candidates or intellectual property, we believe our current cash balances are adequate to meet our cash needs for at least the next 24 months from the date of this filing. We expect operating expenses for the rest of the year to increase as we continue to expand our bioprocessing business. We expect to incur continued spending related to the development and expansion of our bioprocessing product lines and expansion of our commercial capabilities for the foreseeable future. Our future capital requirements may include, but are not limited to, purchases of property, plant and equipment, the acquisition of additional bioprocessing products and technologies to complement our existing manufacturing capabilities, and continued investment in our intellectual property portfolio.

We plan to continue to invest in our bioprocessing business and in key R&D activities associated with the development of new bioprocessing products. We actively evaluate various strategic transactions on an ongoing basis, including licensing or acquiring complementary products, technologies or businesses that would complement our existing portfolio. We continue to seek to acquire such potential assets that may offer us the best opportunity to create value for our shareholders. In order to acquire such assets, we may need to seek additional financing to fund these investments. If our available cash balances and anticipated cash flow from operations are insufficient to satisfy our liquidity requirements, including because of any such acquisition-related financing needs or lower demand for our products, we may seek to sell common or preferred equity or convertible debt securities, enter into a credit facility or another form of third-party funding, or seek other debt funding. The sale of equity and convertible debt securities may result in dilution to our stockholders, and those securities may have rights senior to those of our common shares. If we raise additional funds through the issuance of preferred stock, convertible debt securities or other debt financing, these securities or other debt could contain covenants that would restrict our operations. Any other third-party funding arrangement could require us to relinquish valuable rights. We may require additional capital beyond our currently anticipated amounts. Additional capital may not be available on reasonable terms, if at all.

Off-Balance Sheet Arrangements

We do not have any special purpose entities or off-balance sheet financing arrangements as of March 31, 2020.

Net Operating Loss Carryforwards

At December 31, 2019, we had net operating loss carryforwards of $0.2 million remaining. We had business tax credits carryforwards of $2.1 million available to reduce future federal income taxes, if any. The business tax credits carryforwards will continue to expire at various dates through December 2039. Net operating loss carryforwards and available tax credits are subject to review and possible adjustment by the Internal Revenue Service, state and foreign jurisdictions and may be limited in the event of certain changes in the ownership interest of significant stockholders.

Effects of Inflation

Our assets are primarily monetary, consisting of cash, cash equivalents and marketable securities. Because of their liquidity, these assets are not directly affected by inflation. Since we intend to retain and continue to use our equipment, furniture and fixtures and leasehold improvements, we believe that the incremental inflation related to replacement costs of such items will not materially affect our operations. However, the rate of inflation affects our expenses, such as those for employee compensation and contract services, which could increase our level of expenses and the rate at which we use our resources.

Cautionary Statement Regarding Forward-Looking Statements

This Quarterly Report on Form 10-Q contains forward-looking statements which are made pursuant to the safe harbor provisions of 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”). The forward-looking statements in this Quarterly Report on Form 10-Q do not constitute guarantees of future performance. Investors are cautioned that statements in this Quarterly Report on Form 10-Q which are not strictly historical statements, including, without limitation, express or implied statements or guidance regarding current or future financial performance and position, potential impairment of future earnings, management’s strategy, plans and objectives for future operations or acquisitions, product

development and sales, product candidate research, development and regulatory approval, SG&A expenditures, intellectual property, development and manufacturing plans, availability of materials and product and adequacy of capital resources, the projected impact of, and response to, the coronavirus pandemic, and financing plans constitute forward-looking statements. These forward-looking statements are based on current expectations, estimates, forecasts and projections about the industry and markets in which the Company operates, and management's beliefs and assumptions. The Company undertakes no obligation to publicly update or revise the statements in light of future developments. In addition, other written and oral statements that constitute forward-looking statements may be made by the Company or on the Company's behalf. Words such as "expect," "seek," "anticipate," "intend," "plan," "believe," "could," "estimate," "may," "target," "project," or variations of such words and similar expressions are intended to identify forward-looking statements. Such forward-looking statements are subject to a number of risks and uncertainties that could cause actual results to differ materially from those anticipated, including, without limitation, risks associated with the following: the ultimate impact of the coronavirus pandemic on our business or financial results; the success of current and future collaborative or supply relationships, including our agreements with GE Healthcare and MilliporeSigma; our ability to successfully grow our bioprocessing business, including as a result of acquisitions, commercialization or partnership opportunities, and our ability to develop and commercialize products; our ability to obtain required regulatory approvals; our compliance with all U.S. Food and Drug Administration regulations, our ability to obtain, maintain and protect intellectual property rights for our products; the risk of litigation regarding our patent and other intellectual property rights; the risk of litigation with collaborative partners; our limited manufacturing capabilities and our dependence on third-party manufacturers and value-added resellers; the effect of the pandemic of the novel coronavirus disease, including mitigation efforts and economic effects, on our business operations; our ability to hire and retain skilled personnel; the market acceptance of our products, reduced demand for our products that adversely impacts our future revenues, cash flows, results of operations and financial condition; our ability to compete with larger, better financed life sciences companies; our history of losses and expectation of incurring losses; our ability to generate future revenues; our ability to successfully integrate our recently acquired businesses; our ability to raise additional capital to fund potential acquisitions; our volatile stock price; and the effects of our anti-takeover provisions. Further information on potential risk factors that could affect our financial results are included in the filings made by us from time to time with the Securities and Exchange Commission including under the sections entitled "Risk Factors" in this Quarterly Report on Form 10-Q and in our Annual Report on Form 10-K for the year ended December 31, 2019.

ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Interest Rate Risk

We have historically held investments in commercial paper, U.S. Government and agency securities as well as corporate bonds and other debt securities. As a result, we have been exposed to potential loss from market risks that may occur as a result of changes in interest rates, changes in credit quality of the issuer or otherwise. We do not have any such investments as of March 31, 2020. As a result, a hypothetical 100 basis point increase in interest rates would have no effect on our cash position as of March 31, 2020.

We generally place our marketable security investments in high quality credit instruments, as specified in our investment policy guidelines. We believe that the conservative nature of our investments mitigates our interest rate exposure, and our investment policy limits the amount of our credit exposure to any one issue, issuer (with the exception of U.S. agency obligations) and type of instrument. We do not expect any material losses from our marketable security investments and therefore believe that our potential interest rate exposure is limited.

Foreign Exchange Risk

The reporting currency of the Company is U.S. dollars, and the functional currency of each of our foreign subsidiaries is its respective local currency. Our foreign currency exposures include the Swedish krona, Euro, British pound, Chinese yuan, Japanese yen, Singapore dollar, South Korean won and Indian rupee; of these, the primary foreign currency exposures are the Swedish krona, Euro and British pound. Exchange gains or losses resulting from the translation between the transactional currency and the functional currency are included in net income. Fluctuations in exchange rates may adversely affect our results of operations, financial position and cash flows. We currently do not seek to hedge this exposure to fluctuations in exchange rates.

ITEM 4. CONTROLS AND PROCEDURES

Disclosure Controls and Procedures

The Company's management, with the participation of the principal executive officer and the principal financial officer, has evaluated the effectiveness of the Company's disclosure controls and procedures (as defined in Rules 13a-15(e) or 15d-15(e) under the Exchange Act) as of the end of the period covered by this report. Based on such evaluation, the principal executive officer and principal financial officer have concluded that, as of the end of such period, the Company's disclosure controls and procedures were effective at the reasonable assurance level.

C hanges in Internal Control

There have been no changes in our internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Securities Exchange Act Rule 13a-15 or Rule 15d-15 that occurred in the three months ended March 31, 2020 that have materially affected, or are 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 subject to legal proceedings and claims in the ordinary course of business. We are not currently aware of any such proceedings or claims that we believe will have, individually or in the aggregate, a material adverse effect on our business, financial condition or results of operations.

ITEM 1A. RISK FACTORS

The matters discussed in this Quarterly Report on Form 10-Q include forward-looking statements that involve risks or uncertainties. These statements are neither promises nor guarantees, but are based on various assumptions by management regarding future circumstances, over many of which Repligen has little or no control. A number of important risks and uncertainties, including those identified under the caption *"Risk Factors"* in Part I, Item 1A of our Annual Report on Form 10-K for the period ended December 31, 2019 and in subsequent filings, could cause our actual results to differ materially from those in the forward-looking statements. Other than the additional risk factors set forth below, there are no material changes to the risk factors described in our Annual Report on Form 10-K for the period ended December 31, 2019.

The COVID-19 pandemic, or similar public health crises, could have a material adverse impact on our business, financial condition and results of operations, including our product sales, and our stock price.

Since December 2019, an outbreak of a novel strain of coronavirus, SARS-CoV-2, which causes coronavirus disease 2019 (" COVID-19"), has since spread to countries in which we or our customers and suppliers operate, including the United States. The global spread of COVID-19 has led local and national governmental authorities to implement various responses to combat the virus, including government-imposed quarantines, extended business closures, travel restrictions and other public health safety measures. The COVID-19 outbreak continues to rapidly evolve. The extent to which the outbreak impacts our business, including our financial results, will depend on future developments, which are highly uncertain and cannot be predicted at this time with confidence, such as the continued geographic spread of the disease, the duration of the outbreak, and actions taken in the United States and elsewhere to contain the outbreak and treat the disease, such as social distancing and quarantines, business closures or business disruptions.

In response to the COVID-19 pandemic, in accordance with direction from state and local government authorities, we have restricted access to our facilities mostly to personnel and third parties who must perform critical activities that must be completed on-site, limited the number of such personnel that can be present at our facilities at any one time, and requested that most of our personnel work remotely. In the event that governmental authorities were to further modify current restrictions, our employees conducting research and development or manufacturing activities may not be able to access our manufacturing space. Certain of our third-party suppliers have also temporarily closed facilities and have experienced work stoppages due to the spread of COVID-19. Our revenues and other operating results depend in large part on our ability to manufacture and assemble our products in sufficient quantities and in a timeline manner. Business closures and work stoppages at our facilities and our third-supply suppliers' facilities as a result of COVID-19 may lead to interruptions in our manufacturing activities and our product supply and could have a material adverse effect on our business and our results of operation and financial condition.

We operate on a global basis with offices or activities in Japan, South Korea, China, India, Europe and North America, and global health crises, such as COVID-19, could result in a widespread economic downturn in the industries in which we and our customers operate. Such an economic downturn could result in delays or otherwise adversely affect the completion of our customers' preclinical activities and clinical trials, as well as the healthcare industry generally. In addition, the diversion of financial resources in the healthcare system away from routine patient treatment, drug development and clinical trials in order to focus on pandemic concerns could result in reduced demand for our products or our customer's products and could significantly impact our operating results.

In addition, the trading prices for our common stock and other bioprocessing and life sciences companies have been highly volatile as a result of the COVID-19 pandemic. As a result, we may face difficulties raising capital through sales of our common stock or such sales may be on unfavorable terms.

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

(a) Exhibits

Exhibit Number	Document Description
3.1	Restated Certificate of Incorporation, dated September 30, 1992 and amended September 17, 1999 (filed as Exhibit 3.1 to Repligen Corporation's Quarterly Report on Form 10-Q for the quarter ended September 30, 1999 and incorporated herein by reference).
3.2	Certificate of Amendment to the Certificate of Incorporation of Repligen Corporation, effective as of May 16, 2014 (filed as Exhibit 3.1 to Repligen Corporation's Current Report on Form 8-K filed on May 19, 2014 and incorporated herein by reference).
3.3	Second Amended and Restated Bylaws (filed as Exhibit 3.1 to Repligen Corporation's Current Report on Form 8-K filed on May 23, 2017 and incorporated herein by reference).
10.1+#	Repligen Corporation Amended and Restated Non-Employee Directors' Compensation Policy.
31.1 +	Rule 13a-14(a)/15d-14(a) Certification.
31.2 +	Rule 13a-14(a)/15d-14(a) Certification.
32.1*	Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS+	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 Document.
101.CAL+	Inline XBRL Taxonomy Extension Calculation Linkbase Document.
101.DEF+	Inline XBRL Taxonomy Extension Definition Linkbase Document.
101.LAB+	Inline XBRL Taxonomy Extension Label Linkbase Document.
101.PRE+	Inline XBRL Taxonomy Extension Presentation Linkbase Document.
104+	Cover Page Interactive Data File (formatted as Inline XBRL with applicable taxonomy extension information contained in Exhibits 101.*).

Management contract or compensatory plan or arrangement.
+ Filed herewith.
* Furnished herewith.

SIGNATURES

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

REPLIGEN CORPORATION

Date: May 6, 2020

By: /s/ TONY J. HUNT

Tony J. Hunt
President and Chief Executive Officer
(Principal executive officer)
Repligen Corporation

Date: May 6, 2020

By: /s/ JON SNODGRES

Jon Snodgres
Chief Financial Officer
(Principal financial officer)
Repligen Corporation

EXHIBIT 10.1

REPLIGEN CORPORATION

AMENDED AND RESTATED
NON-EMPLOYEE DIRECTORS' COMPENSATION POLICY

Cash Fees

Annual Retainer:

	Annual Retainer
Board of Directors (the "*Board*")	
Each Non-Employee Member of the Board	$ 55,000
Additional Retainer for the Chairperson	$ 95,000
Audit Committee	
Committee Chairperson	$ 30,000
Other Committee Members	$ 10,000
Compensation Committee	
Committee Chairperson	$ 20,000
Other Committee Members	$ 10,000
Nominating and Corporate Governance Committee	
Committee Chairperson	$ 16,000
Other Committee Members	$ 5,000

The Annual Retainer will be paid quarterly, in arrears, or upon the earlier resignation or removal of the non-employee director. Amounts owing to non-employee directors as Annual Retainer shall be annualized, meaning that for non-employee directors who join the Board during the calendar year, such amounts shall be pro rated based on the number of calendar days served by such director.

Per Meeting fees:

None, unless otherwise specifically duly approved by the Board or any committee thereof hereafter.

Equity

Initial Equity Grant for a Non-Employee Director:

On the effective date of a new director's appointment or first election to the Board, such new director shall receive an option to purchase shares of Common Stock with an aggregate value of $150,000 on the date he or she joins the Board (the "***Initial Award***"). The "strike price" for the Initial Award shall be the Closing Price. The Initial Award shall vest annually in three equal installments on the first, second and third anniversary of the date of grant, provided that if a new director is first elected to the Board at an annual meeting of stockholders, then each vesting date in respect of such Initial Award shall be on such anniversary of the date of grant or the date of the annual meeting of stockholders during such year, whichever is earlier, subject in all cases to service on the Board on such date.

Annual Equity Grant for each Non-Employee Director:

Each non-employee director reelected to the Board at any annual meeting of stockholders shall receive an award of a stock option to purchase shares of Common Stock and an award of restricted stock units on such date (collectively, the "***Annual Award***").

The stock option to be granted in the Annual Award (i) to the Chairperson of the Board shall have an aggregate value of $92,500 and (ii) to all other non-employee directors shall each have an aggregate value of $67,500. The number of shares subject to each such stock option shall be determined by the Company using a Black Scholes methodology and its customary assumptions therefor.

The number of restricted stock units to be granted in the Annual Award (i) to the Chairperson of the Board shall $92,500 divided by the Closing Price and (ii) to all other non-employee directors shall each be equal to shall be equal to $67,500 divided by the Closing Price.

Each Annual Award shall be fully vested on the anniversary of the date of grant or the date of the next annual meeting of stockholders, whichever is earlier, subject to service on the Board on such date.

Sale Event Acceleration

In the event of a Sale Event (as defined in the Company's 2018 Stock Option and Incentive Plan), the equity retainer awards, including the Initial Award and each Annual Award, granted to non-employee directors pursuant to this policy shall become 100% vested and exercisable or nonforfeitable immediately prior to such Sale Event.

Definitions

"***Closing Price***" shall mean the reported closing price of Repligen Corporation's Common Stock on the Nasdaq Global Market on any grant date, or the preceding business date if there are no market quotations on such date.

"***Common Stock***" shall mean the common stock of Repligen Corporation, par value $0.01 per share.

* * *

ADOPTED BY THE BOARD OF DIRECTORS on February 26, 2020.

Exhibit 31.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER PURSUANT TO RULE 13a-14(a) / RULE 15d-14(a) OF THE SECURITIES EXCHANGE ACT OF 1934, AS AMENDED

I, Tony J. Hunt, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Repligen Corporation;

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: May 6, 2020

/S/ TONY J. HUNT

Tony J. Hunt
President and Chief Executive Officer
(Principal executive officer)

Exhibit 31.2

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER PURSUANT TO RULE 13a-14(a) / RULE 15d-14(a) OF THE SECURITIES EXCHANGE ACT OF 1934, AS AMENDED

I, Jon Snodgres, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Repligen Corporation;

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: May 6, 2020

/S/ JON SNODGRES

Jon Snodgres
Chief Financial Officer
(Principal financial officer)

Exhibit 32.1*

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

In connection with the Quarterly Report of Repligen Corporation (the "Company") on Form 10-Q for the period ending March 31, 2020 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned officers of the Company hereby certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, to my knowledge, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

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

Date: May 6, 2020 By: /S/ TONY J. HUNT

Tony J. Hunt
Chief Executive Officer and President
(Principal executive officer)

Date: May 6, 2020 By: /S/ JON SNODGRES

Jon Snodgres
Chief Financial Officer
(Principal financial officer)

* This certification shall not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, or otherwise subject to the liability of that section, nor shall it be deemed to be incorporated by reference into any filing under the Securities Act of 1933 or the Securities Exchange Act of 1934.