2022 ANNUAL REPORT

REPLIGEN

INSPIRING ADVANCES IN BIOPROCESSING

Inspiring Advances in Bioprocessing

In our 2021 annual report we spoke to "opening doors to new opportunities" and I'm happy to say that many of those opportunities are being realized. In 2022, we made significant progress on our strategic priorities and established new growth drivers for the company. We reported record revenue of $802 million, with our base organic business up 39%, as our technologies were further embedded in monoclonal antibody, cell & gene therapy (C&GT) and mRNA markets.

'22 KEY HIGHLIGHTS

$802M
Reported Revenue

+22%
Organic Revenue Growth

+39%
Base Organic Revenue Growth

>50%
Cell & Gene Therapy Revenue Growth

>350
Cell & Gene Therapy Accounts

3
Capacity Expansion Projects Completed

10
New Product Launches

2
Strategic Partnerships

8 of 18
Sites Converted to 100% Renewable Electricity

Dear Shareholders

Welcome to Repligen's 2022 annual report. I'm very pleased to share our company's performance and progress made in 2022, as we continue on our path of "inspiring advances in bioprocessing" as the industry's innovation leader.

During the year, we made significant progress on our strategic priorities and established new growth drivers for the company. We gained commercial traction with our 2021 product launches, which contributed 7% to our overall revenues in 2022. Through our R&D efforts, an additional 10 products hit the market in 2022. We further expanded our production capacity, completing facility buildouts at three key sites on both U.S. coasts, to ensure business continuity. Our systems strategy continued to take shape as we introduced additional filtration and chromatography skids for both upstream and downstream processes; 2022 was a key year for integrating a growing number of fluid management and consumable products into these advanced systems offerings. On the Sustainability front, we're seeing high interest across our global employee base, making impactful steps forward in several areas, including renewable electricity use. I'll cover all of these areas in this report, and share our priorities for 2023, where our products are continuing to be adopted across a broad range of modalities and customers.

Record revenue, strong base despite macro challenges

We finished the year at a record $802 million in total revenue, of which $642 million, or 80%, came from our base business, which excludes COVID and M&A contributions. Our base organic growth was 39%, driven by the success of our Filtration and Chromatography franchises.

Our total revenue growth for 2022 was 20% as reported and 22% organic, including $141 million of COVID-related revenue. COVID-related revenues decreased to 18% of total revenues in 2022, from 28% in 2021, as demand for vaccines progressively softened with the pandemic shifting to endemic status.

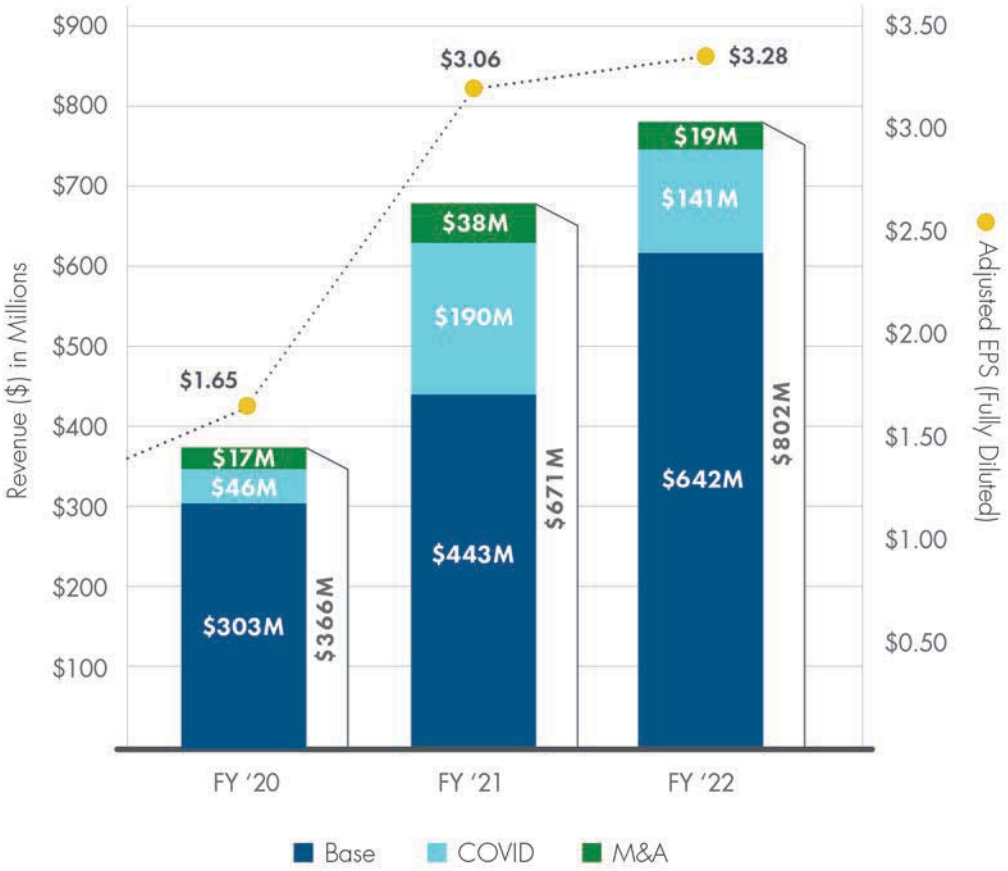
Overall, we are very pleased with these industry leading growth figures and the way 2022 played out for Repligen, especially given the market dynamics in the bioprocessing industry that presented a number of macro challenges and impacts. As demand for COVID vaccines slowed down, we saw a fairly significant drop of approximately $50 million in COVID-related revenues for the company, and we expect another $100 million-plus ramp down in COVID-related revenues in 2023. Through the year, we managed significant foreign currency headwinds, which deflated our reported revenue growth by 5 points. In addition, we navigated the impacts of significant material cost inflation, certain areas of supply constraint, and inventory stocking by many of the contract development and manufacturing organization (CDMO) accounts supporting COVID vaccine supply.

Through it all, we stayed focused on our long term strategy of driving growth through innovation and disruptive technologies, which resulted in another highly successful year for the company. Our overall business performance was outstanding. Our Filtration and Chromatography revenues were up 23% and 45% respectively and within each of these franchises, our base business was up over 50%. Before moving into more detailed franchise level discussion of our 2022 performance, I first want to highlight our progress against the strategic priorities we set for the year. There were many important achievements that our team of dedicated employees made possible.

A Year of Strong Base Revenue Growth and Earnings

In 2022, our base business — which excludes COVID-related revenue and M&A contribution — grew organically by 39%, and represented 82% of our total revenue, while COVID-related demand accounted for approximately 18% of our total revenue.

Our overall organic revenue growth in 2022 was 22%. Our 3-year revenue CAGR is 44%, and in 2022 we grew adjusted earnings per share (EPS) by 7%, even as COVID-related revenues tapered down with global vaccine demand.



- Advance innovation
- Build market presence in cell & gene therapy (C&GT) and mRNA
- Integrate and support our fluid management acquisitions
- Pursue M&A opportunities and strategic partnerships
- Complete capacity expansions at three key facilities

Strategic Priorities in 2022

Priority 1: Advance innovation

Over the last few years, we have focused on increasing the pace of new product launches; 2022 was no exception as our R&D team delivered 10 new products.

- We introduced four ARTeSYN® systems, three in our Filtration franchise and one in Chromatography. We now offer a complete, scalable set of systems, with low hold-up volumes and a common software architecture. This positions us well to sell system consumables and flow paths, increasing the recurring consumable stream for the company.

- We launched a first-to-market downstream system late in the fourth quarter of 2022. The KrosFlo® KR2i RPM™ system, where RPM stands for Real-time Process Management, gives customers the ability to measure, monitor and control drug concentration, not only in real time, but also in a fully automated way.

- Leveraging our Avitide acquisition, we developed and launched four AviPure® affinity ligands and resins in 2022; three focused on adeno-associated virus (AAV) vector purification, and one focused on monoclonal antibody (mAb) fragment purification.

- Finally, we completed the technical launch of our next-generation, large scale GMP ATF controllers, providing our customers with a more automated solution for ATF applications.

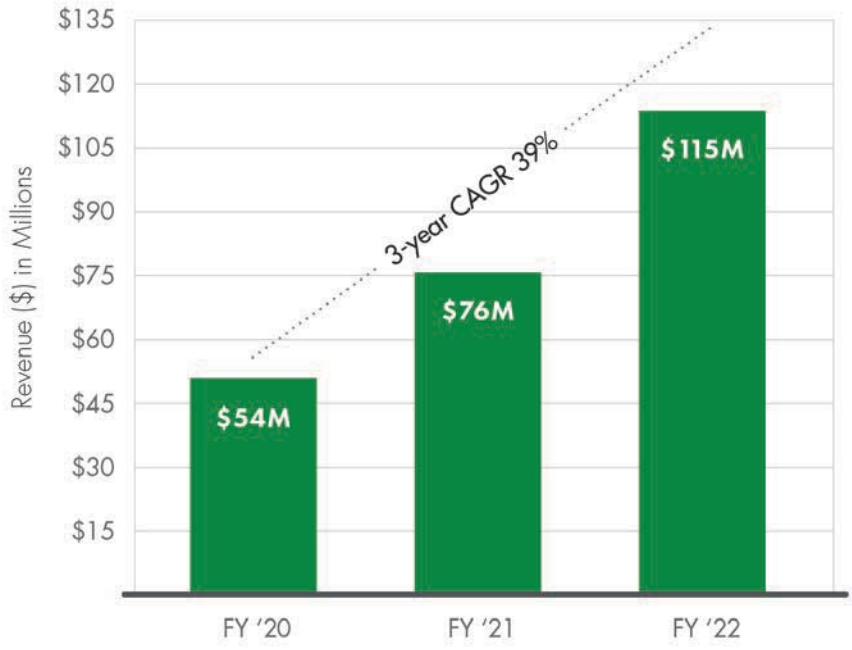
New products continue to have a very positive impact on our business. Products launched since 2021 generated 7% of our revenues in 2022, and we expect this number to increase to 14% in 2023.

Priority 2: Build our market presence in cell & gene therapy and mRNA

2022 was a stellar year for us in cell & gene therapy (C&GT). The business grew over 50% as our top accounts scaled and implemented Repligen technologies. We finished the year with over 350 active C&GT accounts, with more than 20 accounts generating greater than $1 million in revenues each — reinforcing our position in this market. We also made inroads into mRNA markets, building off of our success in serving the needs of the leading mRNA-based COVID vaccine manufacturers. We are strategically positioning our portfolio to capture additional market share, as demand and volume related to these emerging modalities continues to increase.

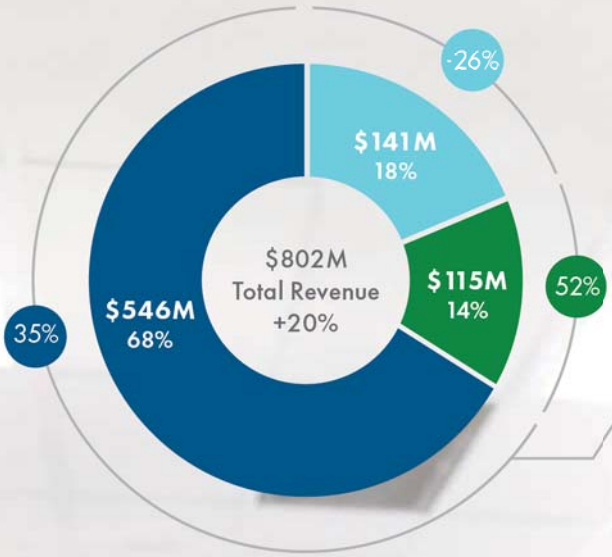
Cell & Gene Therapy Revenue

2022 was an outstanding year for advancing our technologies into the C&GT market. Our total revenue from C&GT accounts grew by over 50% in 2022, compared to 2021.



Revenue by Biologic Type

In 2022, established monoclonal antibody markets continued to drive the majority of our revenue. Demand from developers of cell and gene therapies (C&GT) accounted for 14% of our revenue, as customers adopted and scaled up Repligen technologies in manufacturing processes for this emerging market.

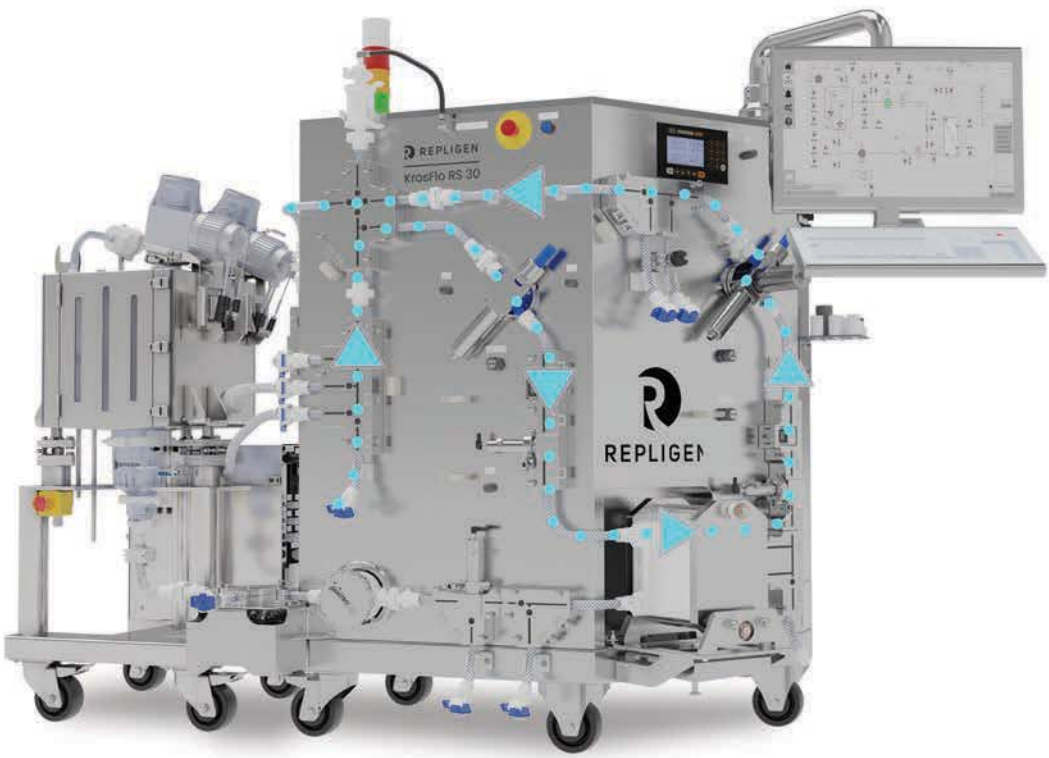


- Monoclonal Antibodies
- COVID
- Cell & Gene Therapy

Growth by biologic type: 2022 vs. 2021

Priority 3: Integrate and support our fluid management acquisitions

The fluid management acquisitions that we made in 2020 and 2021 — Engineered Molding Technology ("EMT"), Non-Metallic Solutions ("NMS") and BioFlex Solutions — are now fully integrated, with support coming from the buildout in 2022 of our assembly center in Hopkinton, Massachusetts and the ongoing buildout of our LEED-certified site in Waterford, Ireland. In 2022, we formed a dedicated management and commercial team, focused on our growing portfolio of fluid management products that are synergistic with our systems strategy. We have assembled a diverse portfolio of single-use (su) fluid management assemblies and components for easy plug-and-play use with our chromatography and filtration skids. We are seeing increased awareness in the bioprocessing community of these integrated capabilities, and even with destocking on the components side of our fluid management offering from CDMO's and integrators, we delivered 17% organic growth for this group of products, which were captured in our Filtration franchise in 2022.



KrosFlo® RS TFF System

- *Precision-engineered high recovery systems*
- *Process Analytics Technology (PAT-enabled)*
- *Integrated su flow paths and consumables*
- *Intuitive HMI control software*
- *Conductivity/pH sensors*
- *Dedicated flow meters at pump outlet*

Priority 4: Pursue M&A opportunities and strategic partnerships

Following on the string of fluid management acquisitions, we signed two important strategic partnerships with DRS Daylight Solutions (Daylight) and Purolite (now an Ecolab company) in 2022, to strengthen our Process Analytics and Proteins portfolios.

- The Daylight agreement provides us with an exclusive license to another real-time in-line Process Analytics Technology (PAT) that complements our existing analytics portfolio from C Technologies, including the CTech™ FlowVPX® system. Repligen assumes responsibility for the commercialization of Daylight's Culpeo® instrument as well as the development of future products in partnership with Daylight. Both companies are focused on expanding the portfolio of Quantum Cascade Laser mid-infrared (QCL-IR) based solutions, which facilitate rapid, "in seconds" readouts of critical attributes in biological manufacturing processes, including measurement of protein aggregation, concentration and nucleic acid content. We plan to integrate this technology into Repligen's filtration and chromatography systems to further expand our companies' presence in the fast-growing PAT segment of the bioprocessing market.

- The Purolite deal both extends our current partnership through 2032 and expands our relationship to include new ligands developed by Avitide for the monoclonal antibody (mAb) and mAb fragment market. The resin products that pair our NGL ligands (identified through our partnership with Navigo GmbH) with Purolite's proprietary Jetted® bead technology, continues to do well in the market. The combination of our partnership with Purolite and the content generated through Avitide and Navigo has helped us to transform our ligands strategy over the last five years.

Culpeo® QCL-IR

Priority 5: Complete capacity expansions at three key facilities

Our assembly center in Hopkinton, Massachusetts was completed in June 2022 and fully qualified in September. This buildout, which is part of a 64,000 square foot manufacturing site, gives us an important foundation to support increased demand for our flow paths and assemblies in the market, ultimately supporting our systems strategy and other single-use workflow products which are recurring consumable sales.

We also expanded capacity for our XCell® ATF devices, ProConnex assemblies, TangenX® flat sheet cassettes, KrosFlo® hollow fiber and KrosFlo systems at both our Marlborough, Massachusetts and Rancho Dominguez, California sites, which together provide over 200,000 square feet of space. As a key part of our business plan over the last three years, we have built out dual manufacturing capabilities that provide our customers with a robust business continuity plan. Over the past two years, depending on the product line, we have increased our manufacturing capabilities between three- and nine-fold and now have ample capacity for the next several years to meet expected increases in demand for our products.

Elevating Operational Excellence Through RPS

In 2022, we formalized the Repligen Performance System (RPS), to provide the tools and a framework for engaging employees across the organization to "find a better way every day" to continuously improve operational performance, with a focus on product quality, customer lead times, material supply, production costs and sustainability. Through a standard implementation network, all teams were empowered to implement Just Do It (JDI) improvements, solve priority problems through stand-up meetings and improve key processes through kaizen events. We believe RPS improved our teams' ability to continuously resolve customer challenges, enhance product quality and improve operational efficiencies. The impact of RPS was seen during 2022 in productivity savings, customer lead-time reductions, manufacturing capacity expansions, product quality improvements and significant reductions in manufacturing scrap at several key sites.

Franchise Level Performance in 2022

Filtration – Strong base offsetting COVID headwinds

Our Filtration revenues of $496 million in 2022 were up 23% compared to 2021. Filtration is our largest and most diverse franchise, which includes several first-to-market technologies such as XCell® ATF cell retention devices, KrosFlo® TFDF® systems for harvest and clarification, TangenX® flat sheet TFF systems and consumables, and KrosFlo hollow fiber TFF systems. In 2022, we saw increased base demand for our filtration products, while we continued to serve the needs of the leading mRNA-based COVID vaccine manufacturers and associated CDMOs. Although COVID-related demand decreased as we progressed through the year, it accounted for approximately 26% of overall Filtration revenue. The base Filtration business performance was outstanding, delivering over 50% growth for the full year, driven by strength in systems, XCell ATF and hollow fiber consumables.

While we manage through additional COVID-related revenue declines in 2023 — which mostly impact this franchise — we anticipate a decrease in Filtration revenue overall, but a healthy increase in the base component.

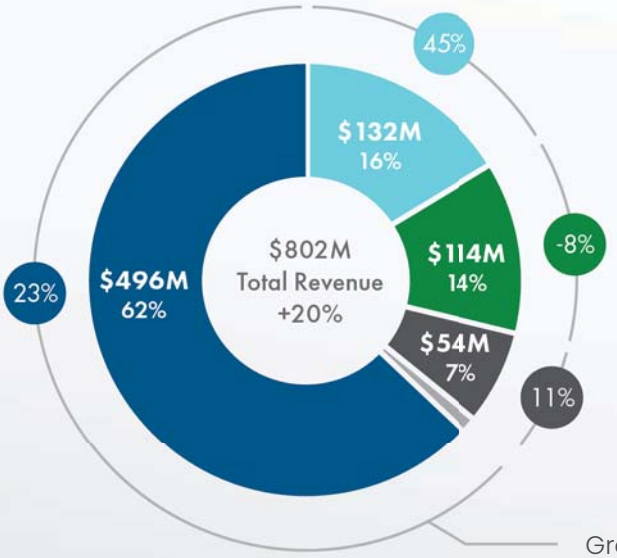
Filtration Advances in 2022

The advances we made with our ARTeSYN filtration skids was a highlight in 2022, as we launched multiple new systems including those for flat sheet TFF applications. Toward year end, we also launched the KrosFlo RS 20 Filtration system for gene therapy and mRNA applications.

XCell ATF strength was driven by scaling this technology into commercial processes and developing new accounts, along with launching new products into the marketplace such as our GMP large scale ATF controllers.

Revenue and Growth by Franchise

In 2022, overall business performance was outstanding, driven primarily by our Filtration and Chromatography franchises, which were up 23% and 45%, respectively. Within each of these franchises, our base business revenues increased by more than 50%.



- Filtration
- Chromatography
- Proteins
- Process Analytics
- Other

Growth by franchise: 2022 vs. 2021

KrosFlo® RS 20

Chromatography – Excellent growth year amidst supply constraints

Our Chromatography revenues of $132 million in 2022 were up 45% compared to 2021. This outstanding performance was driven by increased demand for OPUS® pre-packed columns as resin availability improved, enabling us to address order backlogs, especially in the second half of 2022. We were encouraged to see OPUS revenue and orders pick up significantly at cell and gene therapy accounts, with large scale OPUS sales into these accounts up more than 80% in the fourth quarter versus the prior year period.

The availability of the chromatography resins that we pack into OPUS columns was a challenge during 2021 and 2022, and although we saw a significant pick-up in resin deliveries to Repligen's packing suites in the second half of the year, we are again seeing that supply is tight early in 2023. Resin supply lead-times have come down compared to twelve months ago, however they remained elevated at year end 2022 and this may limit OPUS growth in 2023. We expect supply to open up as more resin manufacturing capacity comes on-line and our customers are able to procure their resins of choice.

We expected another growth year for our Chromatography business in 2023, as we work through supply challenges, and remain confident that the unique attributes of our OPUS line (any resin, any bed height) will secure our leading position in the pre-packed column market. We also see positive signals for future growth as our pipeline of opportunities has expanded to include integrated chromatography systems.

Chromatography Advances in 2022

2022 was an exciting year for launches of state-of-the-art, configurable ARTeSYN® chromatography systems that can integrate a wide range of hardware, components and consumable products including OPUS columns. Our precision-engineered KRM™ chromatography systems feature closed single-use flow paths to mitigate risk of contamination and product loss, advanced fluid management technologies (including over-molded connectors, pump heads, filters and pressure sensors) and intuitive software. These systems are now process analytics technology enabled, and we expect them to become a meaningful driver of our Chromatography franchise growth in the years ahead.


REPLIGEN
KRM 10
Chromatography Systems
EMERGENCY STOP
REPLIGEN
REPLIOPUS D


KrosFlo® RPM™
Welcome to the future of real-time process management.
KR2i
FlowVPX
REPLIGEN
REPLIGEN

Process Analytics – Exciting new platforms set to drive future growth

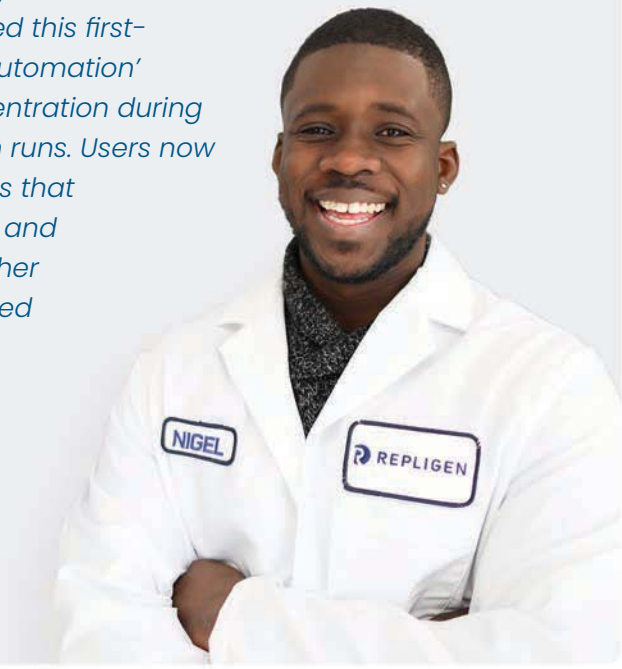
Our Process Analytics revenues of $54 million in 2022 were up 11% compared to 2021. This was a modest growth year as our customers had fewer year-end dollars for capital equipment purchases relative to prior years. We look forward to introducing new high value process analytics solutions to accelerate and expand adoption of off-line and in-line process monitoring in the bioprocessing industry.

Analytics Advances in 2022

In 2022, we completed the development of a hollow fiber system with integrated CTech™ FlowVPX® process monitoring and measurement technology. The KrosFlo® KR2i RPM™ system includes Real-time Process Management (RPM) for in-line protein concentration management.

"It's very rewarding to work with customers on implementing this breakthrough technology. Our team at Repligen has advanced this first-to-market, 'walk-away automation' system to monitor concentration during ultrafiltration/diafiltration runs. Users now have key process insights that can reduce cycling time and minimize batch risk—further mitigated by fully enclosed ProConnex® flow paths."

Nigel Herbert
Senior Bioanalytics Applications Specialist

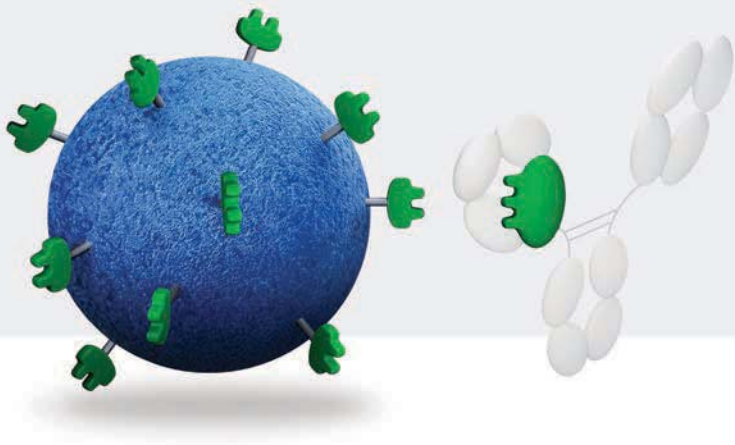


Proteins – Solidifying partnerships, entering new products and markets

Our Proteins revenues of $114 million in 2022 were down 8% compared to 2021, very much in line with our expectations in light of decreased Protein A ligand demand from Cytiva, a long time OEM customer of Repligen who has transitioned to in-house ligand manufacturing over the past five years. The lower Cytiva volumes were in part offset by strong demand for our NGL-Impact® family of Protein A ligands, which we own and supply to Purolite as the critical affinity component of their Praesto® resin product line. As these high-performance resins continue to do well in the marketplace, we expect the stepdown in Cytiva demand to be more than offset by the strength in NGL-Impact ligand demand, growth factors, and our own AviPure® family of resins referenced above (see Priority 1).

Proteins Advances in 2022

In October 2022, we extended our long-term supply agreement with Purolite through 2032 and broadened its scope to include affinity ligands targeting monoclonal antibody (mAb) fragments in addition to those targeting full mAbs and Fc-fusion proteins. In addition, we were excited to move forward our internal plans to develop and commercialize novel Repligen-owned affinity resins focused on new modalities and gene therapy (see Priority 1).



Sustainability

In 2022, our Sustainability initiatives took on fresh energy and momentum, as we hired full time talent and established an employee resource group focused on sustainability. Our ESG Ambassadors at each site continued to populate our financial grade ESG reporting software, enabling more robust analyses across critical ESG metrics.

During 2022, we were gratified to be upgraded to "AA" by MSCI ESG Ratings, from our previous "BBB". We also received honors from Corporate Register for our initial 2020 Sustainability Report (published November 2021), and importantly, we completed a second Communication on Progress (COP) to the United Nations Global Compact (UNGC). We are now preparing our next report, for publication during the second half of 2023. We will again report against SASB Standards and Global Reporting Initiative (GRI) Standards, with an added ambition to also include Task Force on Climate-Related Disclosures (TCFD) and CDP disclosures.

In our next report, you can expect to learn more about our company's ESG goals and where we have made meaningful progress, for example: our transition to 100% renewable electricity at additional key sites; the diversion of waste streams from landfills to recyclers; steps forward on a single-use recycling pilot program, outcomes from our most recent employee engagement survey, advances in our diversity, equity and inclusion (DEI) initiatives and more.

"Our ESG successes in 2022 are proof that intention combined with action can truly yield significant positive impacts."

***Erica Roper**, Global Sustainability Manager*

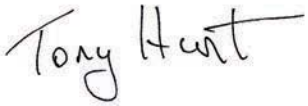
2023 Outlook

As we advance through 2023, our strategic priorities will be centered on four key areas.

1. Seeding our 2022 new product launches and introducing additional new products, with a focus on filtration, advanced analytics and integrated systems;
2. Completing the build out of our assembly center in Waterford, Ireland and our customer experience center in Waltham, Massachusetts, further extending our dual manufacturing capabilities;
3. Bringing additional ligand capacity on-line in Hopkinton, Massachusetts and opening a new facility in Estonia to serve our rapidly growing systems business;
4. Optimizing our portfolios to make further inroads into mRNA and C&GT markets, and finally;
5. Strategically managing key accounts – particularly large biopharmaceutical accounts – with an aim to accelerate adoption of our technologies.

We continue to be uniquely positioned in bioprocessing, with highly differentiated products driving above-industry growth.

We believe we have the right mix of differentiated products and the right business plans and teams in place to continue to win share and disrupt bioprocessing with innovation that matters.



Tony J. Hunt
President and CEO


NELLY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FORM
10-K

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

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

For the fiscal year ended December 31, 2022

OR

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

For the transition period from to

Commission File Number 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)

Registrant's telephone number, including area code: (781) 250-0111

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

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐.

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐ No ☒.

Indicate by checkmark 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. Yes ☐ No ☐.

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐.

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to §240.10D-1(b). ☐

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

The aggregate market value of the voting and non-voting common equity held by non-affiliates as of June 30, 2022, the last business day of the registrant's most recently completed second fiscal quarter, was $8,911,722,244.

The number of shares of the registrant's common stock outstanding as of February 17, 2023, was 55,562,583.

Documents Incorporated By Reference

The registrant intends to file a proxy statement pursuant to Regulation 14A within 120 days of the end of the fiscal year ended December 31, 2022. Portions of such proxy statement are incorporated by reference into Part III of this Annual Report on Form 10-K.

Auditor Firm Id	Auditor Name	Auditor Location
42	Ernst & Young LLP	Boston, Massachusetts, United States

TABLE OF CONTENTS

Summary of the Material Risks Associated with Our Business

Our business is subject to numerous risks and uncertainties that you should be aware of in evaluating our business. These risks include, but are not limited to, the following:

- Our product revenue may be negatively impacted by a number of factors, including without limitation, competition in the bioprocessing market, our historical reliance on a limited number of large customers, our ability to develop or acquire additional bioprocessing products in the future, our ability to manufacture our bioprocessing products sufficiently and timely, supply chain issues and/or disruption, and our ability to effectively penetrate the bioprocessing products market.
- We rely on a limited number of suppliers or, for certain of our products, one supplier, and we may not be able to find replacements or immediately transition to alternative suppliers, which could have a material adverse effect on our financial condition, results of operations and reputation.
- The market may not be receptive to our new bioprocessing products upon their introduction.
- If our products do not perform as expected or the reliability of the technology on which our products are based is questioned, we could experience lost revenue, delayed or reduced market acceptance, increased cost and damage to our reputation.
- If we are unable to manufacture our products in sufficient quantities and in a timely manner, our operating results will be harmed, our ability to generate revenue could be diminished and our gross margin may be negatively impacted.
- Our acquisitions expose us to risks that could adversely affect our business, and we may not achieve the anticipated benefits of acquisitions of businesses or technologies.
- Our results of operations could be negatively affected by potential fluctuations in foreign currency exchange rates.
- If we are unable to continue to hire and retain skilled personnel, then we will have trouble developing and marketing our products.
- If we are unable to obtain, maintain and protect our intellectual property rights related to our products, we may not be able to succeed commercially.
- Climate change, climate change-related regulation and sustainability concerns could adversely affect our businesses and the operations of our subsidiaries, and any actions we take or fail to take in response to such matters could damage our reputation.
- Natural disasters, geopolitical unrest, war, terrorism, public health issues, including the COVID-19 pandemic, including all emerging variants of the SARS-CoV-2 coronavirus and the ongoing conflict between Russia and Ukraine, or other catastrophic events could disrupt the supply, delivery or demand of products, which could negatively affect our operations and performance.
- Our internal computer systems, or those of our customers, collaborators or other contractors, may be subject to cyber-attacks or security breaches, which could result in a material disruption of our product development programs.

FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K ("Form 10-K") contains forward-looking statements which are made pursuant to the safe harbor provisions of Section 27A of the Securities Act of 1933, as amended, (the "Securities Act") and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). The forward-looking statements in this Form 10-K do not constitute guarantees of future performance. Investors are cautioned that express or implied statements in this Form 10-K that are not strictly historical statements, including, without limitation, statements regarding current or future financial performance, potential impairment of future earnings, management's strategy, plans and objectives for future operations or acquisitions, product development and sales, research and development, selling, general and administrative expenditures, intellectual property and adequacy of capital resources and financing plans constitute 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, the risks identified under the caption "Risk Factors" and other risks detailed in this Form 10-K and our other filings with the Securities and Exchange Commission (the "SEC"). We assume no obligation to update any forward-looking information contained in this Form 10-K, except as required by law.

PART I

ITEM 1. BUSINESS

The following discussion of our business contains forward-looking statements that involve risks and uncertainties. When used in this report, the words "intend," "anticipate," "believe," "estimate," "plan" and "expect" and similar expressions as they relate to us are included to identify forward-looking statements. Our actual results could differ materially from those anticipated in these forward-looking statements and are a result of certain factors, including those set forth under "Risk Factors" and elsewhere in this Annual Report on Form 10-K ("Form 10-K").

References throughout this Form 10-K to "Repligen Corporation", "Repligen", "we", "us", "our", or the "Company" refer to Repligen Corporation and its subsidiaries, taken as a whole, unless the context otherwise indicates.

Overview

Repligen Corporation is a global life sciences company that develops and commercializes highly innovative 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 primary customers – global biopharmaceutical companies, contract development and manufacturing organizations and other life science companies (integrators) – face critical production cost, capacity, quality and time pressures. Built to address these concerns, our products help 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 ("mAbs"), recombinant proteins, vaccines, and cell and gene therapies ("C&GT") – that are improving human health worldwide. Increasingly, our technologies are being implemented to overcome challenges in processing plasmid DNA (a starting material for the production of mRNA) and gene delivery vectors such as lentivirus and adeno-associated viral vectors.

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 40 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 corporate headquarters are located in Waltham, Massachusetts, with additional administrative and manufacturing operations worldwide. The majority of our 18 manufacturing sites and assembly centers are located in the United States (California, Massachusetts, New Hampshire, New Jersey, New York and Texas). Outside the United States, we have sites in Estonia, France, Germany, Ireland, the Netherlands and Sweden. Our primary warehouse and distribution centers are located in Massachusetts and California.

Our Products

Our bioprocessing business is comprised of four main franchises: filtration; chromatography; process analytics; and proteins.

Since 2012, we have purposely built a highly diversified portfolio of products offered under these franchises, developing high-value technologies that enable more efficient drug manufacturing processes for our customers, through internal research and development ("R&D") programs and strategic acquisitions. We are committed to sustainable innovation and have earned a reputation as an innovation leader in bioprocessing. We have consistently introduced disruptive new products that solve for specific bioprocessing challenges faced by customers. Our growth strategy continues to expand our geographic scope and customer base and broaden the applications of our technologies.

To support our sales goals for these products, we make ongoing investments in our commercial organization, our R&D programs, our business systems and our manufacturing capacity. We regularly evaluate and invest in these areas as needed to ensure timely deliveries and to stay ahead of increased customer demand for our products.

A majority of our revenue is derived from consumable and/or single-campaign ("single-use") product sales, as compared to associated equipment. The customization, scalability and plug-and-play convenience of these 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.

Filtration

Filtration is our largest franchise with the broadest product offering covering upstream and downstream technologies. Below is a description of some of our key products:

XCell ATF® Cell Retention Systems

Our filtration products offer a number of advantages to manufacturers of biologic drugs and are used in process development and process scale (clinical and commercial) production. Our XCell ATF systems are used in upstream perfusion (continuous) and N-1 (intensified fed-batch or hybrid perfusion) 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 (harvested) 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. 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 reduces implementation time by eliminating the time intensive workflow associated with autoclaving and enables our customers to accelerate evaluations of the product with a lower initial overall cost of ownership.

Tangential Flow Filtration Systems and Consumables

Our systems for tangential flow filtration ("TFF") combine significant configurability with premium quality manufacturing. System designs maximize scalability from small to large (up to 5,000 liters) volumes, flexibility between HF and flat sheet ("FS") filter formats, and ability to use the same system in different unit operations while deploying ready-to-use application-specific flow path assemblies. Our team of sales specialists and applications experts help support rapid start-up and robust operation in cGMP processes.

TangenX® Flat Sheet Cassettes

Our TangenX portfolio of FS TFF cassettes are used primarily in downstream, ultrafiltration processes, e.g., biologic drug concentration, buffer exchange and formulation processes. The TangenX product portfolio includes our single-use SIUS® line and our reusable PRO line of cassettes, providing customers with a high-performance, cost saving alternative to other companies' TFF cassette offerings.

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. Our TangenX FS TFF cassettes feature high performing-membrane chemistries that offer superior selectivity for a wide range of applications. A controlled manufacturing process that balances flux and selectivity delivers maximum flux for increased productivity and tight control of the membrane pore size for enhanced selectivity and recovery. Each single-use 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 (cleaning, testing between uses, storage and flushing) that are required with reusable TFF products, providing cost and time savings. For process economics requiring reusable

cassettes, TangenX PRO cassettes are available with the same high performance membranes used in SIUS cassettes. Our TangenX cassettes are interchangeable with filter hardware from multiple manufacturers, simplifying customer trial and adoption.

In 2020, we introduced SIUS Gamma single-use device, which we engineered to harness the performance and efficiencies of TangenX SIUS membranes and cassettes, while also providing the convenience of a fully assembled, aseptically closed and gamma-irradiated, sterile device. The device is delivered as a single unit composed of the cassette, fluid manifold, clamps, tubing and aseptic connectors. The SIUS Gamma device is ideal for adenovirus C&GT and other processes where large volumes need to be concentrated in a sterile, closed environment.

KrosFlo® TFF Systems - Flat Sheet and Hollow Fiber

Our systems for TFF combined significant configurability with premium quality manufacturing. Our TFF systems are designed for scalability from small to large (up to 5,000 liters) volumes, flexibility between HF and FS filter formats, and the ability to use the same system in different unit operations while deploying ready-to-use application-specific flow paths.

Our KrosFlo TFF systems are turnkey solutions for TFF, offered with either TangenX FS cassettes or with our HF filters.

KrosFlo® Flat Sheet TFF Systems

Our 2020 acquisition of ARTeSYN Biosolutions Holdings Ireland Limited ("ARTeSYN") enabled us to develop and market KrosFlo RS TFF systems that integrate our consumable and equipment offering, providing greater convenience and efficiency for our customers.

We launched our KrosFlo RS 20 series systems in 2022, focusing their use in mRNA and C&GT therapy applications, where they are used primarily in downstream formulation. These responsive TFF systems completely automate sanitization, concentration and product recovery processes. The combination of injection molded tubing, over-molded connectors and valve blocks significantly lowers product hold-up volume to maximize product recovery. With the same software, hardware, controls and cGMP compliance built into every system, and with preassembled flow kits for error-free installation, the KrosFlo RS platform offers operational simplicity that can easily scalable from lab- through production-scale use. KrosFlo FS systems integrate over 10 components with specifications to process volumes between 140 milliliters and 500 liters.

KrosFlo® Hollow Fiber TFF Systems

Our filtration business is strengthened by a leading portfolio of Spectrum® HF filtration solutions, including fully integrated KrosFlo TFF systems with Konduit automated process monitoring and ProConnex® Flow Path single-use assemblies. The KrosFlo family of HF TFF systems integrate multiple components with specifications to process volume between 2 milliliters and 5,000 liters – from lab-scale through commercial manufacturing.

KrosFlo systems enable robust downstream ultrafiltration and microfiltration.

KrosFlo® TFDF® Systems

We believe our KrosFlo Tangential Flow Depth Filtration ("TFDF") systems, have the potential to disrupt and displace traditional upstream harvest clarification operations. The KrosFlo TFDF system includes control hardware, novel high throughput tubular depth filters and ProConnex 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.

Strengthening our Filtration Franchise through Acquisitions

With our acquisition of Engineered Molding Technology LLC ("EMT") on July 13, 2020, we added EMT's silicone-based, single-use components and manifolds to our filtration franchise. These fluid management products are key components in single-use filtration and

chromatography systems and will help expand our line of single-use ProConnex flow paths, streamline our supply chain for XCell ATF and provide more flexibility as we scale and expand our single-use and systems portfolios.

With our acquisition of Non-Metallic Solutions, Inc., ("NMS") on October 20, 2020, we expanded our line of single-use systems and associated integrated flow path assemblies, streamlining our supply chain, and giving us more flexibility to scale and expand single-use and systems portfolios.

With our acquisition of ARTeSYN on December 3, 2020, we expanded our filtration offering with state-of-the-art, configurable filtration. With this acquisition we also added single-use components and flow path assemblies for fluid management, providing greater flexibility and market opportunity as we scale and expand our systems portfolio.

With our acquisition of Polymem S.A. ("Polymem") on July 1, 2021, we further expanded our HF membrane and module production capabilities and added core R&D, engineering and production expertise in HF technology for both industrial and bioprocessing markets. The Polymem business complements our Spectrum HF product line, which includes KrosFlo HF TFF systems and ProConnex fluid management. The acquisition of Polymem accelerated our HF manufacturing buildout and added a Europe-based HF manufacturing center of excellence.

With our acquisition of BioFlex Solutions LLC ("BioFlex") and Newton T&M Corp. ("NTM") on December 16, 2021, we complemented and expanded our filtration franchise, as both BioFlex and NTM focus on single-use fluid management components, including single-use clamps, adapters, end caps and hose assemblies. These products are essential components in our upstream and downstream product offerings – especially our systems with line-sets and flow paths. These acquisitions streamline and increase our control over many components in our single-use supply chain, which ultimately should drive reduced lead-times for our customers in the coming years.

The growth of our filtration business has allowed us to substantially increase our direct sales presence in Europe and Asia and diversify our end markets to include all biologic classes, including mAbs, vaccines, recombinant proteins and C&GT.

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® pre-packed column ("PPC") product line.

In addition to OPUS, with our acquisition of ARTeSYN in 2020, we added chromatography systems to our offerings, providing greater flexibility and market opportunity as we scale and expand our systems portfolio.

Additional chromatography products include our affinity capture resins, such as CaptivA® Protein A resins, which 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 campaign-use disposable columns that replace the use of customer-packed glass columns for downstream purification. 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 PPC market. Our biomanufacturing customers value the significant cost savings that OPUS columns can 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 offer unique 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 product line

available in the market, serving the purification needs of customers manufacturing mAbs and other biologics such as vaccines and C&GT.

In addition to our larger scale OPUS columns, our portfolio includes our smaller-scale OPUS columns, including our RoboColumn®, MiniChrom® and ValiChrom® columns used for process development ("PD") and validation. These columns are used in high-throughput PD 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 our OPUS column customers, and offer a premier ability to pack any of hundreds of chromatography capture resins available, as per our customers' choice.

KRM™ Chromatography Systems

Through our acquisition of ARTeSYN in 2020, we gained state-of-the-art, configurable chromatography systems that can integrate a wide range of hardware, components and consumable products to simplify bioprocessing operations for our customers. Our KRM chromatography systems are precision engineered for high product recovery (low hold-up volumes), high bioactivity (less stress on the product of interest) and reduced risk of deviation (simple changeovers and pre-assembled flow kits). The KRM systems contain closed single-use flow paths (less risk of contamination and product loss) and other advanced fluid management technologies (over-molded connectors, pump heads, filters and pressure sensors), intuitive software and our process analytics technology enabled.

Process Analytics Technologies

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.

FlowVPX® System

FlowVPX slope spectroscopy system is our next-generation FlowVPE launched at the beginning of 2021 and designed to meet the rigors of regulatory GMP requirements. FlowVPX offers reliable real-time results with integrated ease for concentration measurements during every stage of the downstream GMP-compliant production-scale biologics manufacturing.

Use of slope spectroscopy systems 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.

KrosFlo® KR2i RPM™ System with integrated FlowVPX® Technology

In 2022, we completed the development of a HF system with integrated FlowVPX processing monitoring and measurement technology, which launched in January 2023. The KrosFlo® KR2iRPM™ system includes first-to-market real-time process monitoring for in-line protein concentration management. This "walk-away automation" system monitors concentration during ultrafiltration/diafiltration runs without having to depend on mass inputs and off-line fixed pathlength UV-Vis spectrophotometers. Risk is mitigated with fully enclosed

ProConnex custom flow paths a part of the automated TFF process. This system allows for processing of volumes from 10 milliliters to 10 liters to meet both lab and clinical production requirements, enabling low volume, high concentration applications. This solution provides key process insights to the users to reduce cycling time and minimize batch risks, both highly value attributes for bioprocessing users.

Culpeo® QCL-IR Liquid Analyzer

Pursuant to a 15-year license agreement that we entered into with DRS Daylight Solutions, Inc. ("Daylight") in September 2022, we obtained the exclusive right to use Daylight's quantum cascade laser technology ("QCL"), including its Culpeo® QCL-IR Liquid Analyzer ("Culpeo") specifically in the field of bioprocessing. Culpeo is a compact, intelligent spectrometer that uses the power of QCL to analyze and identify chemicals. Our in-licensing of these rights complements our existing process analytics franchise. Adding mid-IR (higher sensitivity QCL-IR) to UV spectroscopy, we believe this will serve to accelerate and expand adoption of off-line and in-line process monitoring in the bioprocessing industry. Additionally, we are focused on expanding the QCL portfolio, with plans to integrate these solutions into our chromatography and filtration systems.

Proteins

Our proteins franchise is represented by our Protein A affinity ligands and viral vector affinity ligands and resins. Our proteins franchise also includes 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.

Protein A Affinity Ligands

We are a leading provider of Protein A affinity ligands to other life sciences companies (integrators), whose final products are Protein A resins. Protein A ligands are an essential “binding” component of Protein A affinity chromatography resins used in the purification of virtually all mAb-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 Cytiva (a standalone operating company owned by Danaher Corporation), MilliporeSigma and Purolite, an Ecolab Inc. company ("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 the other in Waltham, Massachusetts.

Protein A chromatography resins are considered the industry "gold 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.

Our Affinity Ligand Collaborations

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 manufacture and exclusively supply the first of these ligands, NGL-Impact® A, to Purolite, for use with their Praesto® Jetted A50 Protein A resin product.

In September 2021, the Company and Navigo successfully completed co-development of a novel affinity ligand that addresses aggregation issues associated with pH sensitive antibodies and Fc-fusion proteins. We are manufacturing and supplying this ligand, NGL-Impact® HipH, to Purolite for use in a platform use resin product.

We have a long-term supply agreement with Purolite for NGL-Impact and potential additional affinity ligands that may advance from our Navigo collaboration.

Our Purolite Agreement

In October 2022, we extended our long-term supply agreement with Purolite through 2032 and broadened its scope to include affinity

ligands targeting antibody fragments in addition to those targeting mAbs and Fc-fusion proteins. This extension and product line expansion aligns with our Proteins strategy and supports the acceleration in market adoption of the Praesto® affinity resin portfolio. It provides Purolite with exclusive access to mAb fragment ligands developed at Avitide, Inc. ("Avitide"), in addition to the NGL portfolio developed at Navigo. Repligen will continue to receive access to Purolite's leading-edge base bead technology, as we proceed with the development and commercialization of novel affinity resins focused on new modalities and C&GT.

mAb Fragment Affinity Ligands and Resins from Avitide

Our acquisition of Avitide also led to our development and 2022 launch of AVIPure® CH1, a cross-linked agarose-based resin specifically engineered for the capture of the CH1 region of antigen-binding fragments (Fabs) from human immunoglobins (IgGs) and monoclonal antibodies 9mAbs). We believe that the high dynamic binding capacity for Fab and IgG1 even at short residence times position these resins well for market success.

Adeno-Associated Virus Affinity Ligands and Resins from Avitide

In September 2021, we completed our strategic acquisition of Avitide, a market leader in affinity ligand discovery and development. This acquisition was a major step forward in building our proteins franchise, moving Repligen into affinity resin solutions for C&GT and other emerging modalities.

In February 2022, we launched three advanced affinity chromatography resins for use in gene therapy manufacturing workflows. The resins AVIPure®-AAV9; AVIPure®-AAV8; and AVIPure®-AAV2, were developed by Avitide and are specific to the major adeno-associated virus ("AAV") C&GT vectors used today. AAV vectors are the leading platform for gene delivery for the treatment of a variety of human diseases.

We are integrating these high performance AVIPure® resins with our OPUS PPC and ARTeSYN chromatography systems to provide our customers with a seamless chromatography solutions. Caustic stability has been a challenge that the AVIPure resins are designed to overcome without sacrificing high dynamic binding capacity. We believe customers will benefit from superior process economics, including multi-cycle resin capabilities.

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, 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.

Corporate Information

We are a Delaware corporation with our global headquarters in Waltham, Massachusetts. We were incorporated in 1981 and became a publicly traded company in 1986. Our common stock is listed on the Nasdaq Global Market under the symbol “RGEN”. We have over 2,000 employees and operate globally with offices and manufacturing sites located at multiple locations in the United States, Europe and Asia. Our principal executive offices are located at 41 Seyon Street, Waltham, Massachusetts 02453, our website is www.repligen.com and our telephone number is (781) 250-0111.

2021 Acquisitions

BioFlex Solutions LLC and Newton T&M Corp.

On November 29, 2021, the Company entered into an Equity Purchase Agreement with BioFlex, NTM and each of Ralph Meola and Jason Nisler, to acquire 100% of the outstanding securities of BioFlex and NTM (collectively, the “NTM Acquisition”). The NTM acquisition closed on December 16, 2021.

NTM, which is headquartered in Newton, New Jersey, is the parent company of BioFlex and focuses on manufacturing of products, while BioFlex, also headquartered in Newton, New Jersey, commercializes branded products to biotechnology companies. The NTM Acquisition is a strong fit with the Company's fluid management portfolio of products as the industry migrates to single-use flow paths solutions for mAb, vaccine and C&GT applications, with a focus on single-use fluid management components, including single-use clamps, adapters, end caps and hose assemblies. The NTM Acquisition streamlines and increases our control over many components in our single-use supply chain which ultimately should drive reduced lead-times for Repligen customers in the coming years.

Avitide, Inc.

On September 16, 2021, the Company entered into an Agreement and Plan of Merger and Reorganization ("Avitide Merger Agreement") with Avalon Merger Sub, Inc., a Delaware corporation and a wholly owned direct subsidiary of the Company, Avalon Merger Sub LLC, a Delaware limited liability company and a wholly owned direct subsidiary of the Company, Avitide, and Shareholder Representative Services LLC, a Colorado limited liability company, solely in its capacity as the representative, agent and attorney-in-fact of Avitide's securityholders to purchase Avitide for $150.0 million in upfront consideration, comprised of cash and our common stock, and up to an additional $125.0 million (undiscounted) in contingent consideration for performance-based earnout payments over the three years following the transaction closing on September 20, 2021.

Avitide, which is headquartered in Lebanon, New Hampshire, offers diverse libraries and leading technology in affinity ligand discovery and development resulting in best-in-class ligand discovery and development lead-times. The acquisition gives the Company a new platform for affinity resin development, including C&GT, and advances and expands the Company's proteins and chromatography franchise to address the unique purification needs of gene therapies and other emerging modalities.

Polymem S.A.

On June 22, 2021, the Company entered into a Stock Purchase Agreement with Polymem, a company organized under the laws of France, and Jean-Michel Espenan and Franc Saux, acting together jointly and severally as the representatives of the sellers pursuant to which we acquired all of the outstanding common stock of Polymem for approximately $47 million in cash. The transaction closed on July 1, 2021.

Polymem, which is headquartered outside of Toulouse, France, is a manufacturer of HF membranes, membrane modules and systems for industrial and bioprocessing applications. Polymem products complement and expand the Company's portfolio of HF systems and consumables. This acquisition substantially also increases the Company's membrane and module manufacturing capacity and establishes a world-class center of excellence in Europe to address the accelerating global demand for these innovative products.

2020 Acquisitions

ARTeSYN Biosolutions Holdings Ireland Limited

On October 27, 2020, we entered into an Equity and Asset Purchase Agreement with ARTeSYN, a company organized under the laws of Ireland, Third Creek Holdings, LLC, a Nevada limited liability company, Alphinity, LLC, a Nevada limited liability company ("Alphinity", and together with Third Creek Holdings, LLC the "ARTeSYN Sellers"), and Michael Gagne, solely in his capacity as the representative of the ARTeSYN Sellers, pursuant to which we acquired (i) all of the outstanding equity securities of ARTeSYN and (ii) certain assets from Alphinity related to the business of ARTeSYN (collectively, the "ARTeSYN Acquisition") for approximately $200 million in cash and the Company's common stock. The transaction closed on December 3, 2020.

ARTeSYN, which is headquartered in Waterford, Ireland, conducts its operations in Ireland, the United States and Estonia. Its suite of single-use solutions has been developed with the goal of enabling "abundance in medicine" by allowing greater efficiency in biologics manufacturing. The ARTeSYN team has created a number of solutions targeting the single-use space from single-use valves with fully disposable valve liners, XO® skeletal supports, a hybrid small parts offering for de-bottlenecking traditional facilities, to fully automated SU process systems that have quickly become leading solutions in the bioprocessing industry. ARTeSYN has established downstream processing leadership with its portfolio of state of the art single-use systems for chromatography, filtration, continuous manufacturing and media/buffer prep workflows. In addition, the Company has integrated unique flow path assemblies utilizing the Company's silicone extrusion and molding technology, to deliver highly differentiated, low hold-up volume systems that minimize product loss during

processing. The ARTeSYN portfolio expands on the market success of the Company's HF systems and complements its chromatography and TFF filtration product lines.

Non-Metallic Solutions, Inc.

On October 15, 2020, we entered into a Stock Purchase Agreement with NMS, and each of William Malloneé and Derek Masser, the legal and beneficial owners of NMS, to purchase NMS, which transaction subsequently closed on October 20, 2020.

NMS, which is headquartered in Auburn, Massachusetts, is a manufacturer of fabricated plastics, custom containers, and related assemblies and components used in the manufacturing of biologic drugs. NMS's fluid management products complement and expand Repligen's single-use product offerings. Effective December 31, 2021, NMS was absorbed into the Company by way of "short-form" merger pursuant to Massachusetts and Delaware law, which did not require a vote of the Company's shareholders.

Engineered Molding Technology LLC

On June 26, 2020, we entered into a Membership Interest Purchase Agreement with EMT and each of Michael Pandori and Todd Etesse, the legal and beneficial owners of EMT to purchase EMT, a manufacturer of single-use silicone assemblies and components used in the manufacturing of biologic drugs. This transaction closed on July 13, 2020.

Effective July 11, 2021, EMT was absorbed into the Company by way of "short-form" merger pursuant to New York and Delaware law, which did not require a vote of the Company's shareholders.

Our Market Opportunity

Bioprocessing Addressable Market

The global addressable market for bioprocessing products is estimated to be approximately $25 billion of which we estimate Repligen's addressable market to be approximately $8.5 billion at year end 2022. This market includes products used to manufacture therapeutic antibodies, recombinant proteins and vaccines, as well as C&GTs.

Monoclonal Antibody Market

Antibody-based biologics alone accounted for approximately $169 billion of global biopharma revenue in 2021. Industry sources project the mAbs market to grow in the range of approximately 10% to 12% annually through 2026, driven by new approvals and expanded clinical uses for marketed antibodies, as well as the emergence of biosimilar versions of originator mAbs. As of December 31, 2022, over 140 mAbs were approved by the U.S. Food and Drug Administration ("FDA") to treat a diverse range of diseases. Biological R&D remains robust, with more than 1,500 active mAb clinical trials ongoing to address a wide range of medical conditions.

In addition to investments in the discovery and development of novel biologic drugs, there has been substantial investment in follow-on products (biosimilars) by generic and specialty pharmaceutical as well as large biopharmaceutical companies. Development of follow-on products accelerated as the first major mAbs came off patent in the European Union and United States. Due to the high cost of biologic drugs, many countries in developing and emerging markets have been aggressively investing in biomanufacturing capabilities to supply lower cost biosimilars for the local markets. For both originator and follow-on biologics manufacturing, Repligen products are well-positioned to enable greater manufacturing flexibility, production yields and lower costs through improved process efficiencies.

Cell and Gene Therapy Market

C&GT has emerged in the past few years to become a rapidly growing area of biological drug development, with over 1,100 active clinical trials underway at year-end 2021 according to industry sources. Statements by the FDA are supported by industry reports that estimate annual revenue growth of over 25% for the C&GT market over the next several years. This scientifically advanced therapeutic approach has unique manufacturing challenges that many of our products can help address. We believe we are well positioned to participate in C&GT production, particularly in the manufacture of plasmids and viral vectors. Within the C&GT market, mRNA-based therapeutic programs have become an area of focus and investment by several large biopharmaceutical companies, following the

regulatory approval of mRNA-based vaccines for the COVID-19 pandemic, including all subsequent variants of the SARS-CoV-2 coronavirus ("COVID-19").

Our Strategy

We are focused on the development, production and commercialization of highly differentiated, technology-leading systems and solutions that address specific pressure points in the biologics manufacturing process and deliver substantial value to our customers. Our products are designed to optimize our customers' workflow to maximize productivity and we are committed to supporting our customers with strong customer service and applications expertise.

We intend to build on our history of developing market-leading solutions and delivering strong financial performance through the following strategies:

- *Continued innovation*. We plan to capitalize on our internal technological expertise to develop products that address unmet needs in upstream and downstream bioprocessing. We continue to invest in platform and derivative products to support our proteins, filtration, chromatography and process analytics franchises. We plan to strengthen our existing product lines with complementary products and technologies, including fluid management products, that are designed to allow us to provide customers with an integrated, more automated and more efficient manufacturing process on one or more measures including flexibility, convenience, time savings, cost reduction and product yield.
- *Platforming our products*. A key strategy for accelerating market adoption of our products is delivery of enabling technologies that become the standard, or "platform," technology in markets where we compete. We focus our efforts on winning early-stage technology evaluations through direct interaction with the key biomanufacturing decision makers in process development labs. This strategy is designed to establish early adoption of our enabling technologies at key accounts, with opportunity for customers to scale up as the biologic advances to later stages of development and potential commercialization. We believe this approach can accelerate the implementation of our products as platform products, thereby strengthening our competitive advantage and contributing to long-term growth.
- *Targeted acquisitions*. We intend to continue to selectively pursue acquisitions of innovative technologies and products. We intend to leverage our balance sheet to acquire technologies and products that improve our overall financial performance by improving our competitiveness in filtration, chromatography, fluid management or process analytics or by moving us into adjacent markets with common commercial call points.
- *Geographical expansion*. We intend to expand our global commercial presence by continuing to selectively build out our global sales, marketing, field applications and services infrastructure.
- *Operational efficiency*. We seek to expand operating margins through capacity utilization and process optimization strategies designed to increase our manufacturing yields. We plan to invest in systems to support our global operations, optimizing resources across our global footprint to maximize productivity.

Research and Development

Our research activities are focused on developing new high-value bioprocessing products across all of our franchises. We strive to continue to introduce truly differentiated products that address specific pain points in the biologics manufacturing process. Our commitment to innovation is core to the Repligen culture and our success as a company.

Sales and Marketing

Our sales and marketing strategy supports our objective of strengthening our position as a leading provider of products and services, addressing upstream, downstream and quality control needs of bioprocessing customers in the biopharmaceutical industry.

Our Commercial Team

To support our sales goals for our direct-to-consumer products, we have invested in our commercial organization. Since 2018, we have significantly expanded our global commercial organization from 103, to a commercial team of 322 employees as of December 31, 2022. This includes 257 people in field positions (sales, field applications and field service), 40 people in customer service and 25 in marketing. Geographically, 177 members of our commercial team are located in North America, 69 in Europe and 76 in Asia-Pacific ("APAC") regions.

Our bioprocess account managers are supported in each region by bioprocess sales specialists with expertise in filtration, chromatography or process analytics, and by technically trained field applications specialists and field service providers, who can work closely with customers on product demonstrations, implementation and support. We believe that this model helps drive further adoption at our key accounts and also open up new sales opportunities within each region.

Ligand Supply Agreements

For our proteins franchise, we are committed to be a partner of choice for our customers with distributor and supply agreements in place with large life sciences companies such as Cytiva, MilliporeSigma and Purolite. The Cytiva Protein A supply agreement relating to our Waltham, Massachusetts facility was amended in September 2021 and pursuant to its amended terms, runs through 2025. Cytiva moved a portion of its ligand manufacturing in house in 2020 and under the terms of our existing long-term supply agreements, Cytiva has the ability to move additional manufacturing in house in 2023. Our Protein A supply agreement with MilliporeSigma runs, pursuant to its terms, through 2023, and our Protein A amended supply agreement with Purolite that runs, pursuant to its amended terms, to August 2026 with an option for renewal through 2028 was amended again in October 2022 and extended through 2032. Our dual manufacturing capability provides strong business continuity and reduces overall supply risk for our ligand customers.

COVID-19 Considerations and Responses

In March 2020, the World Health Organization declared the COVID-19 outbreak to be a pandemic. COVID-19 resulted in government authorities around the world implementing numerous unprecedented measures such as travel restrictions, quarantines, shelter in place orders, factory shutdowns and vaccine mandates. During 2021 and 2020, our revenues were positively affected by demand related to Repligen products used by developers and manufacturers of COVID-19 vaccines, particularly mRNA vaccines. We continued to generate COVID-19 related revenue in 2022. COVID-19 related revenue represented approximately $141 million, or 18% of our total revenue in 2022, approximately $190 million, or 28% of total revenue in 2021, and approximately $46 million, or 13% of total revenue in 2020. While we anticipate additional COVID-19 related revenue in 2023, we expect that, as in 2022, COVID-19 related revenue will be at a reduced level from 2021, as the pandemic has evolved and global demand for COVID-19 vaccines is declining. We also intend to pursue other mRNA therapeutic development opportunities, which have increased following the success of mRNA-based vaccines for COVID-19. The extent to which COVID-19 will continue to affect our future financial results and operations will depend on future developments, which are highly uncertain and cannot be predicted, including the recurrence, severity and/or duration of COVID-19, and current or future domestic and international actions to contain and treat COVID-19.

For further discussion of the risks relating to COVID-19, see *"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"* in Item 1A. "Risk Factors," below.

Significant Customers and Geographic Reporting

Customers for our bioprocessing products include major life sciences companies, contract manufacturing organizations, biopharmaceutical companies, diagnostics companies and laboratory researchers.

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

	For the Years Ended December 31,		
	2022	2021	2020
Revenue by customers' geographic locations:			
North America	43%	41%	48%
Europe	37%	40%	38%
APAC/Other	20%	19%	14%
Total revenue	100%	100%	100%

There was no revenue from customers that represented 10% or more of the Company's total revenue for the year ended December 31, 2022. Revenue from Pfizer Inc. accounted for 10% of total revenue for the year ended December 31, 2021, and MilliporeSigma accounted for 11% of total revenues in the year ended December 31, 2020.

Human Capital

Employees

Repligen performs in a highly competitive industry and recognizes that our continued success hinges upon our ability to attract, develop and retain a diverse team of talented individuals. We place high value on the satisfaction and well-being of our employees and operate with fair labor standards and industry-competitive compensation and benefits globally. As of December 31, 2022, we employed 2,025 full-time and part-time employees, an increase of 173 since December 31, 2021. This total includes 322 employees in our commercial organization (257 field and 65 internal), 239 in engineering and R&D, 853 in manufacturing, 221 in quality, 93 in supply chain roles and 297 in administrative functions. Each of our employees has signed a confidentiality agreement. None of our U.S. employees are covered by collective bargaining agreements. We have one collective bargaining agreement with two unions that covers our 114 employees in Sweden, comprising approximately 6% of our total workforce. We renewed this collective bargaining agreement in November 2020, and it expires at the end of March 2023. In France, 86 employees are under the relevant national and local collective bargaining agreements for metallurgy, comprising approximately 4% of our total workforce.

Code of Business Conduct and Ethics

Repligen is committed to conducting business in accordance with the highest ethical standards. This means how we conduct ourselves and our global work is more than just a matter of policy and law; it's a reflection of our core principles. Our Second Amended and Restated Code of Business Conduct and Ethics reflects Repligen's five core principles – (1) trustworthiness, (2) respectfulness, (3) responsibility, (4) fairness and (5) corporate citizenship. Our Second Amended and Restated Code of Business Conduct and Ethics applies to all Repligen employees, including those who are integrated into the Company through acquisitions.

Diversity, Equity and Inclusion

Repligen supports the values of diversity, equity and inclusion ("DE&I"), reflecting our resolute commitment to a diverse, equitable and inclusive workplace. We have established talent acquisition processes, as well as training and employee engagement resources, including the formation of a DE&I council, to drive the promotion of diversity and inclusion at all levels of our organization.

Employee Engagement

We regularly conduct engagement surveys to gain insight on employee perspectives. Additional channels for employee engagement include CEO-led town halls and Company-wide all-hands meetings. We are committed to colleague recognition, which includes acknowledging, appreciating and celebrating each other's contributions and achievements. Our CEO-led town halls and Company-wide all-hands meetings serve as a platform for CEO awards and platinum awards, which reward and recognize both teams and individual colleagues who have made significant and notable contributions to Repligen's success.

Health, Safety and Well-Being

We actively promote the safety, health and well-being of our employees and end users of our products. Creating a culture where all employees feel supported and valued is paramount to our corporate mission. Our well-being goals are for employees to physically thrive, flourish mentally and emotionally, be socially connected and achieve financial security. We are proud to provide all of our full time employees in the United States with access to an employee assistance program ("EAP"). Our EAP offers employees and their eligible dependents counseling and well-being resources 24 hours a day, seven days a week by phone, online or via the mobile site. Our environmental health and safety policy advances our vision of zero workplace incidents and our efforts to reduce our environmental impacts.

Repligen Performance System

In 2022, we formalized the Repligen Performance System ("RPS"), to provide the tools and a framework for engaging employees across the organization to "find a better way every day" to continuously improve operational performance, with a focus on product quality, customer lead times, material supply, production costs and sustainability. Through a standard implementation network, all teams were empowered to implement just-do-it process improvements, solve priority problems through stand-up meetings and improve key processes through kaizen events. We believe RPS improved our teams' ability to continuously resolve customer challenges, enhance product quality and improve operational efficiencies. The impact of RPS was seen during 2022 in productivity savings, customer lead-

time reductions, manufacturing capacity expansions, product quality improvements and significant reductions in manufacturing scrap at several key sites.

Sustainability - Environmental, Social and Governance Matters

Our Commitment to Sustainability

We believe our commitment to Environmental, Social and Governance ("ESG") matters at all our global facilities is an important part of creating long-term business value for all stakeholders. We are strongly committed to corporate responsibility and transparency, and we continue to factor sustainability into our business decisions and operations.

In establishing a formal approach to ESG, we joined the United Nations Global Compact in 2020 in support of its Ten Principles related to human rights, labor, the environment, and anti-corruption. The actions we have taken as we have built our ESG strategy demonstrate our long-term commitment to being a responsible global corporate citizen.

In preparation of our initial sustainability report, published in 2021, we formed a Corporate Responsibility Team ("CRT") with oversight by our Board of Directors. The CRT is headed by a member of our operations leadership team and represents multiple disciplines within the organization. We completed our first materiality assessment gleaning insights from internal and external stakeholders, and we established a financial grade ESG software platform to inform current and future ESG-related reporting and decisions.

In 2022, we established a dedicated internal ESG team to build out our sustainability initiatives and enhance related processes and reporting capabilities.

Our Reporting Frameworks

We have become an active participant in the sustainability reporting ecosystem through membership with the Sustainability Accounting Standards Board ("SASB"), part of the Value Reporting Foundation, and the Global Reporting Initiative ("GRI"). By extension and through their own efforts to integrate reporting standards, these organizations also keep us connected to guidance and criteria of the Greenhouse Gas Protocol, the Science Based Targets Initiative and the Task Force on Climate-related Financial Disclosures, among others.

Our initial sustainability report reflects the ambitious nature of our company and employees. We included both SASB and GRI reporting indexes and committed to embedding the UN Global Compact Ten Principles into our core business strategies and operations to advance the Sustainability Development Goals.

Oversight of ESG Matters

The Nominating and Corporate Governance ("N&CG") Committee of our Board oversees our ESG program. The N&CG Committee meets regularly and reviews and advises on ESG strategy and apprises the full Board in order to ensure that our ESG program and strategy align with the Company's mission. In addition, the Audit Committee of the Board regularly reviews ESG-related topics such as enterprise risk management, anticorruption, ethics and compliance, supply chain management, human rights protections, and cybersecurity and data privacy.

The CRT, under strategic direction of our Chief Executive Officer, is responsible for the development and implementation of our expanding ESG program. With representation across all key business functions, the mandate of the CRT is to consider our existing ESG efforts, understand stakeholder perspectives, identify business-relevant areas of opportunity to make a positive impact on global ESG efforts, and work collaboratively to support programs designed to accelerate our ESG initiatives.

Our Sustainability Pillars

Our sustainability initiatives are organized around four pillars that reflect our ESG priorities: Principles, People, Product and Planet. Our "4Ps" embody the belief shared by our Board and the executive leadership team that corporate responsibility is essential to sustaining business and economic growth in a manner that can also deliver positive environmental and social impact.

Our ESG pillars are as follows:

1. *Principles*. Our core principles guide how we operate, respecting that our stakeholders depend on us to conduct business honestly, fairly and responsibly.

2. *People*. We recognize that our success as a company depends on the skills and contributions of a diverse group of employees who are engaged as individuals and teams. We perform in a highly competitive industry and recognize that our continued success and growth hinges upon our ability to attract, develop and retain an all-inclusive team of talented and diverse individuals.

3. *Product*. Our diversified portfolio of bioprocessing technology solutions unlocks opportunity by enabling our customers to speed the development and manufacture of biological drugs. Our products empower biopharmaceutical manufacturers to generate more product in less space and with less waste, ultimately making a positive impact on overall human health and well-being.

4. *Planet*. Social and environmental impacts of business are a growing concern for our stakeholders and a priority for us. We are vigorously working to ingrain sustainability into our corporate culture, and with respect to the environment, we are taking company-wide action to reduce our climate impact.

Intellectual Property

We are committed to protecting our intellectual property through a combination of patents, trade secrets, copyrights and trademarks, as well as confidentiality and material transfer agreements. As further described below, we own or have exclusive rights to at least 263 active patent grants and 353 pending patent applications in the United States and other foreign jurisdictions including Australia, Canada, China, France, Germany, India, Japan, South Korea, Sweden and the United Kingdom.

Our policy is to require each of our employees, consultants, business partners, potential collaborators and customers to execute confidentiality agreements upon the commencement of an employment, consulting, business relationship, or product related audit or research evaluation. These agreements provide that all confidential information developed or made known to the other party during the course of the relationship with us is to be kept confidential and not disclosed to third parties except in specific circumstances. In the case of employees and consultants, the agreements generally provide that all inventions conceived by the individual in the course of rendering services to Repligen shall be our exclusive property and must be assigned to Repligen.

Filtration

For our filtration franchise, our patent grants include coverage for, ATF filtration, TFDF and TFF HF and FS systems, membranes, filters, flow paths and single-use technologies. We continually seek to improve upon these technologies and have multiple new patent filings including patents covering next generation TFDF filters, next generation ATF filtration technologies, and proprietary reduced cost system components.

Chromatography

Our patent grants include coverage for certain unique methods and features of our OPUS PPC, including methods of manufacturing column components, systems for removing air using specialized tubing and valve systems, medium recovery systems, methods for packing, as well as systems for testing chromatography columns. We strive to improve upon our chromatography technologies, including developing potentially disruptive technology related to gamma irradiated columns and resin packing methods.

Through the ARTeSYN Acquisition in 2020, our patent portfolio includes exo-technology, valves, integrated sensors and integrated flow path systems. We also have multiple patent grants pertaining to our single-use replacement valves and liners used in combination with our modular configurable encapsulated flow systems to provide sterilized flow paths for various bioprocessing applications.

Process Analytics

Through our 2019 acquisition of C Technologies, Inc. ("C Technologies"), we hold patent grants to various slope spectroscopy instruments, including interactive variable pathlength devices and related methods of use. C Technologies' scientists are continually developing new analytical tools using our state-of-the-art slope spectroscopy technology, which we continue to file patent applications for.

Proteins

We currently hold a patent grant for "Nucleic Acids Encoding Recombinant Protein A," which claims sequences that encode a truncated recombinant Protein A but are otherwise identical to the natural Protein A, which is used for bioprocessing applications.

Pursuant to our collaboration with Navigo, we also have multiple patent grants and multiple pending patent applications globally covering Protein A-based affinity ligands through our collaboration with Navigo. These include ligands for antibody purification, as well as ligands for purifying COVID-19 vaccines.

In addition, following the acquisition of Avitide in September 2021, we continue to file multiple patent applications globally covering affinity ligands.

Trademarks

We procure and maintain trademark registrations globally for the Repligen trademark and our various product brands. We prioritize our "housemarks", (e.g., Repligen, the stylized "R" logo, Spectrum, TangenX, C Technologies, ARTeSYN, Polymem, Avitide, etc.), and ensure continued protection globally. We also have trademark registrations for various product lines, including OPUS, XCell, XCell ATF, TFDF, KrosFlo, SIUS, ProConnex, Spectra/Por, NGL-Impact, SoloVPE, FlowVPE, FlowVPX, XO and AVIPure, that provide valuable company recognition and goodwill with our customers.

We have a comprehensive branding policy that includes trademark usage guidelines to ensure Repligen trademarks are used in accordance with our worldwide registrations and we actively police any unauthorized trademark usage as well as enforce the rights we have under our trademarks.

Licensing Agreements

We have entered into multiple licensing and collaboration relationships with third-party business partners in an effort to fully exploit our technology and advance our bioprocessing business strategy. Most recently, we entered into a 15-year exclusive License Agreement with Daylight (the "Daylight Agreement"), giving us exclusive license and commercialization rights to use certain technology and intellectual property subject to conditions set forth in the Daylight Agreement. See Note 12, *"Commitments and Contingencies"* to our consolidated financial statements included in this report for more information on this license agreement.

Competition

Our bioprocessing products compete on the basis of value proposition, performance, quality, cost effectiveness, and application suitability with numerous established technologies. Additional products using new technologies that may be competitive with our products may also be introduced. Many of the companies selling or developing competitive products have greater financial and human resources, R&D, manufacturing and marketing experience than we do. They may undertake their own development of products that are substantially similar to or compete with our products and they may succeed in developing products that are more effective or less costly than any that we may develop. These competitors may also prove to be more successful in their production, marketing and commercialization activities. We cannot be certain that the research, development and commercialization efforts of our competitors will not render any of our existing or potential products obsolete.

Manufacturing

A majority of our 18 manufacturing sites are located in the United States (California, Massachusetts, New Jersey, New Hampshire, New York and Texas). Outside the United States, we have manufacturing sites in Estonia, France, Germany, Ireland, the Netherlands and Sweden.

The proteins products we provide are manufactured at our sites in Waltham, Massachusetts and Lund, Sweden. Native Protein A ligands and our growth factor products are manufactured in Lund, while recombinant Protein A ligands are manufactured in both Waltham and Lund. Our primary chromatography assembly and manufacturing sites are located in Waltham, Massachusetts, Ravensburg, Germany and Breda, the Netherlands. Our primary filtration manufacturing sites are located in Marlborough, Massachusetts, Rancho Dominguez, California and Toulouse, France. The Repligen facility in Marlborough, is focused on XCell ATF and FS TFF products, while in Rancho

Dominguez the focus is on Spectrum HF, TFDF and ProConnex products. Our process analytics products are manufactured in Bridgewater, New Jersey. Our operating room products are manufactured in Irving, Texas. As part of our capacity expansion activities, we have added a site in Hopkinton, Massachusetts that serves as an assembly center for single-use products and will also have the capacity to manufacture our protein products when the current buildout is completed. With our three acquisitions in 2021, we gained manufacturing sites in Toulouse, France (Polymem), Newton, New Jersey (NTM and BioFlex) and Lebanon, New Hampshire (Avitide). With our three acquisitions in 2020, we gained manufacturing sites in Clifton Park, New York (EMT) and Auburn, Massachusetts (NMS) for fluid management consumables. ARTeSYN's primary manufacturing sites for fluid management products and systems are located in Waterford, Ireland and Tallinn, Estonia, with additional sites in California.

We utilize our facilities in Waltham, Massachusetts and Lund, Sweden to carry out fermentation and recovery operations, and purification, immobilization, packaging and quality control testing of our protein-based bioprocessing products. Our facilities located in Waltham, Massachusetts; Marlborough, Massachusetts; Lund, Sweden; Ravensburg, Germany; Bridgewater, New Jersey; Clifton Park, New York; and Rancho Dominguez, California among other sites, are ISO® 9001:2015 certified and maintain formal quality systems to maintain process control, traceability, and product conformance. Additionally, our facilities in Irving, Texas and Auburn, Massachusetts are ISO® 13485:2016 certified. We practice continuous improvement initiatives based on routine internal audits as well as external feedback and audits performed by our partners and customers. In addition, we maintain a business continuity management system that focuses on key areas such as contingency planning, security stocks and off-site storage of raw materials and finished goods to ensure continuous supply of our products.

Available Information

We maintain a website with the address www.repligen.com. We are not including the information contained on our website as a part of, or incorporating it by reference into, this Form 10-K. We make available free of charge through our website our Form 10-Ks, Quarterly Reports on Form 10-Q and Current Reports on Form 8-K, and amendments to these reports, as soon as reasonably practicable after we electronically file such materials with, or furnish such materials to, the SEC. Our Second Amended and Restated Code of Business Conduct and Ethics is also available free of charge through our website.

Our filings with the SEC may be accessed through the SEC's Electronic Data Gathering, Analysis and Retrieval ("EDGAR") system at www.sec.gov.

ITEM 1A. RISK FACTORS

Investors should carefully consider the risk factors described below before making an investment decision.

If any of the events described in the following risk factors occur, our business, financial condition or results of operations could be materially harmed. In that case, the trading price of our common stock could decline and investors may lose all or part of their investment. Additional risks and uncertainties that we are unaware of or that we currently deem immaterial may also become important factors that affect Repligen.

This Annual Report on Form 10-K ("Form 10-K") contains forward looking statements that involve risks and uncertainties. Our actual results could differ materially from those anticipated in these forward-looking statements as a result of certain factors, including the risks faced by us described below and elsewhere in this Form 10-K.

Risks Related to Our Business

Risks Related to Competition, Sales and Marketing

We compete with life sciences, pharmaceutical and biotechnology companies who are capable of developing new approaches that could make our products and technology obsolete.

The bioprocessing market is intensely competitive, subject to rapid change and significantly affected by new product introductions and other market activities of industry participants.

We compete with several medium and small companies in each of our product categories as well as several large companies, including Danaher Corporation (Pall Corporation and Cytiva), Thermo Fisher Scientific Inc., MilliporeSigma and Sartorius. Many of our competitors are large, well-capitalized companies that may have greater financial, manufacturing, marketing, research and development ("R&D") resources than we have, as well as stronger name recognition, longer operating histories and benefits derived from greater economies of scale. As a consequence, they are able to spend more aggressively on product development, marketing, sales and other product initiatives than we can, and may have additional lines of products and the ability to bundle products.

These factors, among others, may enable our competitors to market their products at lower prices or on terms more advantageous to customers than what we can offer. Competition may result in price reduction, reduced gross margins and loss of market share, any of which could have a material adverse effect on our business, financial condition and results of operations.

Our current and future competitors, including certain of our customers, may at any time develop additional products that compete with our products. If any company develops products that compete with or are superior to our products, our revenue may decline. Additionally, new approaches by these competitors may make our products and technologies obsolete or noncompetitive.

As we evolve from a company dependent on others to commercialize our products to a company selling directly to end users, we may encounter difficulties in expanding our product portfolio and our commercial marketing capabilities.

Prior to 2016, we generated most of our revenues through sales of bioprocessing products to a limited number of life sciences companies, such as Cytiva, MilliporeSigma and other individual integrators or distributors. However, due in part to our recent strategic acquisitions, an increasing amount of our revenue is attributable to our commercialization of bioprocessing products that we sell directly to end-users, including biopharmaceutical companies and contract manufacturing organizations. This has required and will continue to require us to invest additional resources in our sales and marketing capabilities. We may not be able to attract and retain additional sales and marketing professionals, and the cost of building the sales and marketing function may not generate our anticipated revenue growth. In addition, our sales and marketing efforts may be unsuccessful. Our failure to manage these risks may have a negative impact on our financial condition, or results of operations and may cause our stock price to decline.

If we are unable to continue to hire and retain skilled personnel, then we will have trouble developing and marketing our products.

Our success depends largely upon the continued service of our management and scientific staff and our ability to attract, retain and motivate highly skilled technical, scientific, management and marketing personnel. We also face significant competition in the hiring

and retention of such personnel from other companies, research and academic institutions, government and other organizations who have superior funding and resources. The loss of key personnel or our inability to hire and retain skilled personnel could materially adversely affect our product development efforts and our business.

Despite our increasingly diversified client base, we have historically depended on a limited number of customers for a high percentage of our revenues.

The loss of, or a significant reduction in orders from, any of our large customers, including following any termination or failure to renew a long-term supply contract, would significantly reduce our revenues and harm our results of operations. If a large customer purchases fewer of our products, defers orders or fails to place additional orders with us for any reason, including for business continuity purposes, our revenue could decline, and our operating results may not meet market expectations.

In addition, if our customers order our products, but fail to pay on time or at all, our liquidity and operating results could be materially and adversely affected.

Certain of our products are used by customers in the production of gene therapies, which represent a relatively new and still-developing mode of treatment. Unforeseen adverse events, negative clinical outcomes, or increased regulatory scrutiny of cell and gene therapy ("C&GT") and its financial cost may damage public perception of the safety, utility, or efficacy of gene therapies and may harm our customers' ability to conduct their business. Such events may negatively impact our revenues and have an adverse effect on our performance.

C&GT remains a relatively new and developing treatment method, with only a few gene therapies approved to date by regulatory authorities. Public perception may be influenced by claims that C&GT is unsafe or ineffective, and C&GT may not gain the acceptance of the public or the medical community. In addition, ethical, social, legal, and financial concerns about C&GT and genetic testing could result in additional regulations, limitations or even prohibitions on certain C&GTs or C&GT-related products. More restrictive regulations or negative public perception could reduce certain of our customers' use of our products, which could negatively affect our revenue and performance.

Risks Related to the COVID-19 Pandemic

In response to the ongoing COVID-19 pandemic, including all emerging variants of the SARS-CoV-2 coronavirus ("COVID-19"), certain of our products are used by customers in the development or manufacture of COVID-19 vaccines and therapeutics, some of which have not yet received regulatory approval or authorization. A deceleration in demand from customers focused on manufacturing COVID-19 vaccinations, unforeseen adverse events, regulatory interventions, the emergence of new variants of the virus rendering current vaccines and therapeutics ineffective and the development of next generation vaccines and therapeutics that do not incorporate our products may negatively impact our revenues and have an adverse effect on our performance.

Certain of our products are used by our customers in the development or manufacture of COVID-19 vaccines and therapies. As COVID-19 has evolved and demand for COVID-19 vaccinations has decelerated, we have seen a corresponding decrease in our revenues attributable to such products. Furthermore, the level of future demand for COVID-19 vaccinations is uncertain and dependent on many factors including the emergence of new variants of the virus, the continued development of variant-specific vaccines and boosters and public demand and acceptance of variant-specific vaccines and boosters. Additionally, negative outcomes in clinical trials, unforeseen adverse events in patients and decreased effectiveness in new and emerging COVID-19 variants may result in increased regulatory scrutiny, reduced public trust or withdrawals, pauses or restrictions on approvals or authorizations of vaccines and therapies that use our products and could reduce certain of our customers' use of such products. Such events would have a negative impact on our revenues. In addition, if failure to obtain certain regulatory approvals or authorization or increased competition in the production of COVID-19 vaccines and therapies causes our customers to discontinue the use of our products in the development or manufacture of such therapies, our product revenues may decline, which would negatively impact our financial performance.

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, COVID-19 has continued to spread to countries in which we or our customers and suppliers operate, including the United States. New variants of the virus are evolving, and to date, COVID-19 has led to the implementation of various responses, including government-imposed quarantines, extended business closures, travel restrictions and other public health safety measures, as well as reported adverse impacts on healthcare resources, facilities and providers, across the United States and in other countries.

Our business operations were impacted by such restrictions. For example, many of our facilities have undergone brief closures and/or severe limitations of onsite activities throughout 2020 and 2021 due to government-imposed restrictions as a result of COVID-19. In the event that governmental authorities were to further modify current restrictions, our employees conducting R&D, or manufacturing activities may not be able to access certain of our manufacturing space. In addition, certain of our third-party suppliers have experienced labor shortages and supply chain delays due to the spread of COVID-19. Such shortages and delays 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. 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 timely manner.

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 contribute to a widespread economic downturn in the industries in which we and our customers operate. The extent to which the pandemic impacts our business and the businesses of our customers will depend on future developments, which remain highly uncertain and cannot be predicted with confidence, such as the impact of new and emerging variants of the virus, and actions taken in the United States and elsewhere to contain the pandemic and treat the disease, such as social distancing and quarantines, business closures or business disruptions.

Risks Related to Product Development and Acquisitions

If we are unable to expand our product portfolio, our ability to generate revenue could be adversely affected.

We are increasingly seeking to develop and commercialize our portfolio of products. Our future financial performance will depend, in part, on our ability to successfully develop and acquire additional bioprocessing products. There is no guarantee that we will be able to successfully acquire or develop additional bioprocessing products, and our financial performance will likely suffer if we are unable to do so.

Our acquisitions expose us to risks that could adversely affect our business, and we may not achieve the anticipated benefits of acquisitions of businesses or technologies.

As a part of our growth strategy, we may make selected acquisitions of complementary products and/or businesses, such as our most recent acquisitions of Polymem, Avitide, BioFlex and NTM. Any acquisition involves numerous risks and operational, financial, and managerial challenges, including the following, any of which could adversely affect our business, financial condition, or results of operations:

- difficulties in integrating new operations, technologies, products, and personnel;
- problems maintaining uniform procedures, controls and policies with respect to our financial accounting systems;
- lack of synergies or the inability to realize expected synergies and cost-savings;
- difficulties in managing geographically dispersed operations, including risks associated with entering foreign markets in which we have no or limited prior experience;
- underperformance of any acquired technology, product, or business relative to our expectations and the price we paid;
- negative near-term impacts on financial results after an acquisition, including acquisition-related earnings charges;
- the potential loss of key employees, customers, and strategic partners of acquired companies;
- claims by terminated employees and shareholders of acquired companies or other third parties related to the transaction;
- the assumption or incurrence of additional debt obligations or expenses, or use of substantial portions of our cash;

- the issuance of equity securities to finance or as consideration for any acquisitions that dilute the ownership of our stockholders;
- the issuance of equity securities to finance or as consideration for any acquisitions may not be an option if the price of our common stock is low or volatile which could preclude us from completing any such acquisitions;
- any collaboration, strategic alliance and licensing arrangement may require us to relinquish valuable rights to our technologies or product candidates, or grant licenses on terms that are not favorable to us;
- diversion of management's attention and company resources from existing operations of the business;
- inconsistencies in standards, controls, procedures, and policies;
- assumption of, or exposure to, historical liabilities of the acquired business, including unknown contingent or similar liabilities that are difficult to identify or accurately quantify; and
- risks associated with acquiring intellectual property, including potential disputes regarding acquired companies' intellectual property.

In addition, the successful integration of acquired businesses requires significant efforts and expense across all operational areas, including sales and marketing, R&D, manufacturing, finance, legal, and information technologies. There can be no assurance that any of the acquisitions we may make will be successful or will be, or will remain, profitable. Our failure to successfully address the foregoing risks may prevent us from achieving the anticipated benefits from any acquisition in a reasonable time frame, or at all.

If intangible assets and goodwill that we recorded in connection with our acquisitions become impaired, we may have to take significant charges against earnings.

In connection with the accounting for our completed acquisitions, we recorded a significant amount of intangible assets, including developed technology and customer relationships relating to the acquired product lines, and goodwill. Under accounting principles generally accepted in the United States ("GAAP"), we must assess, at least annually and potentially more frequently, whether the value of intangible assets and goodwill has been impaired. Intangible assets and goodwill will be assessed for impairment in the event of an impairment indicator. Any reduction or impairment of the value of intangible assets and goodwill will result in a charge against earnings, which could materially adversely affect our results of operations and shareholders' equity in future periods.

Risks Related to Manufacturing and Supply

If we are unable to manufacture our products in sufficient quantities and in a timely manner, our operating results will be harmed, our ability to generate revenue could be diminished and our gross margin may be negatively impacted.

Our revenues and other operating results will depend in large part on our ability to manufacture and assemble our products in sufficient quantities and in a timely manner. Any interruptions we experience in the manufacturing or shipping of our products could delay our ability to recognize revenues in a particular quarter. Manufacturing problems can and do arise, and as demand for our products increases, any such problems could have an increasingly significant impact on our operating results. While we have not generally experienced problems with, or delays in, our production capabilities that resulted in delays in our ability to ship finished products, there can be no assurance that we will not encounter such problems in the future. We may not be able to quickly ship products and recognize anticipated revenues for a given period if we experience significant delays in the manufacturing process. In addition, we must maintain sufficient production capacity in order to meet anticipated customer demand, which carries fixed costs that we may not be able to offset if orders slow, which would adversely affect our operating margins. If we are unable to manufacture our products consistently, in sufficient quantities, and on a timely basis, our bioprocessing revenue, gross margins and our other operating results will be materially and adversely affected.

We rely on a limited number of suppliers or, for certain of our products, one supplier, and we may not be able to find replacements or immediately transition to alternative suppliers, which could have a material adverse effect on our financial condition, results of operations and reputation.

There are only a limited number of suppliers of materials for certain of our products. An interruption in operations of the business related to these products could occur if we encounter delays or difficulties in securing the required materials, or if we cannot then obtain an

acceptable substitute. Any such interruption could significantly affect the business related to these products and our financial condition, results of operations and reputation. For example, we believe that only a small number of suppliers are currently qualified to supply materials for the XCell ATF® systems. The use of materials furnished by these replacement suppliers would require us to alter our operations related to the XCell ATF systems. Transitioning to a new supplier for our products would be time-consuming and expensive, may result in interruptions in our operations, could affect the performance specifications of our product lines or could require that we revalidate the materials.

There can be no assurance that we will be able to secure alternative materials and bring such materials online and revalidate them without experiencing interruptions in our workflow. If we should encounter delays or difficulties in securing, reconfiguring or revalidating the materials required for our products, our business related to these products and our financial condition, results of operations and reputation could be adversely affected.

Risks Related to Our Financial Position and Need for Additional Capital

Servicing our debt will require a significant amount of cash, and we may not have sufficient cash flow from our business to make payments on our debt.

In 2019, we incurred significant indebtedness in the amount of $287.5 million in aggregate principal with additional accrued interest under our 0.375% Convertible Senior Notes due 2024 (the "2019 Notes"). Our ability to make scheduled payments of the principal of, to pay interest on, or to refinance our indebtedness, including the 2019 Notes, depends on our future performance, which is subject to economic, financial, competitive and other factors that may be beyond our control. Our business may not generate cash flow from operations in the future sufficient to service our debt and make necessary capital expenditures. If we are unable to generate such cash flow, we may be required to adopt one or more alternatives, such as selling assets, restructuring debt or obtaining additional equity capital on terms that may be onerous or highly dilutive. Our ability to refinance our indebtedness will depend on the capital markets and our financial condition at such time. In addition, in the event of a fundamental change or a default under the 2019 Notes, the holders and/or the trustee under the indentures governing the 2019 Notes may accelerate the payment obligations or trigger the holders' repurchase rights under the 2019 Notes. We may not be able to engage in any of these activities or engage in these activities on desirable terms, which could result in a default on our debt obligations, including the 2019 Notes.

If a make-whole fundamental change, such as an acquisition of our company, occurs prior to the maturity of the 2019 Notes, under certain circumstances, the conversion rate for the 2019 Notes will increase such that additional shares of our common stock will be issued upon conversion of the 2019 Notes in connection with such make-whole fundamental change. The increase in the conversion rate will be determined based on the date on which the make-whole fundamental change occurs or becomes effective, and the price paid (or deemed paid) per share of our common stock in such transaction. Upon conversion of the 2019 Notes, unless we elect to deliver solely shares of our common stock to settle such conversion (other than paying cash in lieu of delivering any fractional share), we will be required to make cash payments in respect of the 2019 Notes being converted. We may not have enough available cash or be able to obtain financing at the time we are required to make repurchases of 2019 Notes surrendered therefor or notes being converted. Our failure to repurchase 2019 Notes at a time when the repurchase is required by the indenture or to pay any cash payable on future conversions of the 2019 Notes as required by the indenture would constitute a default under the indenture. If the repayment of the related indebtedness were to be accelerated after any applicable notice or grace periods, we may not have sufficient funds to repay the indebtedness and repurchase the 2019 Notes or make cash payments upon conversions thereof.

In addition, our significant indebtedness, combined with our other financial obligations and contractual commitments, could have other important consequences. For example, it could:

- make us more vulnerable to adverse changes in general U.S. and worldwide economic, industry and competitive conditions and adverse changes in government regulation;
- limit our flexibility in planning for, or reacting to, changes in our business and our industry;
- place us at a disadvantage compared to our competitors who have less debt; and
- limit our ability to borrow additional amounts for working capital and other general corporate purposes, including to fund possible acquisitions of, or investments in, complementary businesses, products, services and technologies.

Any of these factors could materially and adversely affect our business, financial condition and results of operations. In addition, if we incur additional indebtedness, the risks related to our business and our ability to service or repay our indebtedness would increase.

Future strategic transactions or acquisitions may require us to seek additional financing, which we may not be able to secure on favorable terms, if at all.

We plan to continue a strategy of growth and development for our bioprocessing business, and 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 of development programs. In order to complete such strategic transactions, we may need to seek additional financing to fund these investments and acquisitions. Should we need to do so, we may not be able to secure such financing, or obtain such financing on favorable terms because of the volatile nature of the biotechnology marketplace. In addition, future acquisitions may require the issuance or sale of additional equity or debt securities, which may result in additional dilution to our stockholders.

Our exposure to political, economic and other risks that arise from operating a multinational business has and may continue to increase.

We operate on a global basis with offices or activities in Japan, South Korea, China, India, Europe and North America. Our operations and sales outside of the United States have increased as a result of our strategic acquisitions and the continued expansion of our commercial organization. Risks related to these increased foreign operations include:

- fluctuations in foreign currency exchange rates, which may affect the costs incurred in international operations and could harm our results of operations and financial condition;
- changes in general economic and political conditions in countries where we operate, particularly as a result of ongoing economic instability within foreign jurisdictions;
- the occurrence of a trade war, or other governmental action related to tariffs or trade agreements;
- differing protection of intellectual property in foreign jurisdictions;
- difficulty in staffing and managing widespread operations;
- being subject to complex and restrictive employment and labor laws and regulations, as well as union and works council restrictions;
- changes in tax laws or rulings in the United States or other foreign jurisdictions that may have an adverse impact on our effective tax rate;
- being subject to burdensome foreign laws and regulations, including regulations that may place an increased tax burden on our operations;
- being subject to longer payment cycles from customers and experiencing greater difficulties in timely accounts receivable collections; and
- required compliance with a variety of foreign laws and regulations, such as data privacy requirements, real estate and property laws, anti-competition regulations, import and trade restrictions, export requirements, U.S. laws such as the Foreign Corrupt Practices Act of 1977 (the "FCPA") and the U.S. Department of Commerce's Export Administration Regulations, and other U.S. federal laws and regulations established by the Office of Foreign Assets Control, local laws such as the U.K. Bribery Act of 2010 or other local laws that prohibit corrupt payments to governmental officials or certain payments or remunerations to customers.

Our business success depends in part on our ability to anticipate and effectively manage these and other related factors. We cannot assure you that these and other related factors will not materially adversely affect our international operations or business as a whole.

In addition, a deterioration in diplomatic relations between the United States and any country where we conduct business could adversely affect our future operations and lead to a decline in profitability. In 2018 and 2019, the United States imposed tariffs on goods imported from China and certain other countries. Although the United States and China signed a new trade agreement in January 2020, most of the previously-implemented tariffs on goods imported from China remain in place. Additional tariffs or further retaliatory trade

measures taken by China or other countries in response, could affect the demand for our products and services, impact the competitive position of our products, prevent us from being able to sell products in certain countries or otherwise adversely impact our results of operations.

We may be unable to efficiently manage our growth as a larger and more geographically diverse organization.

Our strategic acquisitions, the continued expansion of our commercial sales operations, and our organic growth have increased the scope and complexity of our business. As a result, we will face challenges inherent in efficiently managing a more complex business with an increased number of employees over large geographic distances, including the need to implement appropriate systems, policies, benefits and compliance programs. Our inability to manage successfully the geographically and culturally diverse, and substantially larger combined organization could materially adversely affect our operating results and, as a result, the market price of our common stock.

Our results of operations could be negatively affected by potential fluctuations in foreign currency exchange rates.

We conduct a large portion of our business in international markets. For the fiscal year ended December 31, 2022, 38.2% of our revenues were denominated in foreign currencies. We are exposed to the risk of an increase or decrease in the value of the foreign currencies relative to the U.S. dollar, which could decrease the value of our revenue and increase the value of our expenses and costs when measured in U.S. dollars. These fluctuations could also adversely affect the demand for products and services provided by us. As a result, our results of operation may be influenced by the effects of future exchange rate fluctuations and such effects may have an adverse impact on our common stock price.

Natural disasters, geopolitical unrest, war, terrorism, public health issues or other catastrophic events could disrupt the supply, delivery or demand of products, which could negatively affect our operations and performance.

We are subject to the risk of disruption by earthquakes, floods and other natural disasters, fire, power shortages, geopolitical unrest, war, terrorist attacks and other hostile acts, public health issues, epidemics or pandemics and other events beyond our control and the control of the third parties on which we depend. Any of these catastrophic events may have a strong negative impact on our employees, facilities, partners, suppliers, distributors or customers, and could decrease demand for our products, create delays and inefficiencies in our supply chain and make it difficult or impossible for us to deliver products to our customers.

For example, COVID-19 has continued to disrupt our and our customer's supply chain, resulting in disruption to our business operations.

In addition, a catastrophic event that results in the destruction or disruption of our data centers or our critical business or information technology systems would severely affect our ability to conduct normal business operations and, as a result, our operating results would be adversely affected.

Our business, financial condition and results from operations could be adversely affected by disruptions in the global economy caused by geopolitical events, such as the ongoing conflict between Russia and Ukraine.

Global conflicts could increase costs and limit availability of fuel, energy, and other resources we depend upon for our business operations. For example, while we do not operate in Russia or Ukraine, the increasing tensions between the United States and Russia and the other effects of the ongoing conflict of Ukraine, have resulted in many broader economic impacts such as the United States and European Union imposing sanctions and bans against Russia and Russian products imported into the United States and Europe, respectively. Such sanctions and bans have impacted and may continue to impact commodity pricing such as fuel and energy costs, making it more expensive for us and our partners to deliver products to our customers. Further sanctions, bans or other economic actions in response to the ongoing conflict between Russia and Ukraine or in response to any other global conflict could result in, among other things, cyber-attacks, supply disruptions, lower consumer demand, and changes to foreign exchange rates and financial markets, any of which may adversely affect our business and supply chain. In addition, the effects of the ongoing conflict could heighten many of our known risks described in this section.

Risks Related to Ownership of Our Common Stock

Risks Related to Investment in Our Securities

Our operating results may fluctuate significantly, our customers' future purchases are difficult to predict and any failure to meet financial expectations may result in a decline in our stock price.

Our quarterly operating results may fluctuate in the future due to many factors, such as the impact of seasonal spending patterns, changes in overall spending levels in the life sciences industry, the inability of some of our customers to consummate anticipated purchases of our products due to changes in end-user demand, and other unpredictable factors that may affect ordering patterns. Because our revenue and operating results are difficult to predict, we believe that our past results of operations are not necessarily a good indicator of our future performance. Additionally, if revenue declines in a quarter, whether due to a delay in recognizing expected revenue, adverse economic conditions or otherwise, our results of operations will be harmed because many of our expenses are relatively fixed. In particular, a large portion of our manufacturing costs, our R&D, sales and marketing and general and administrative expenses are not significantly affected by variations in revenue. Further, our gross margins are dependent on product mix. A shift in sales away from our higher-margin products to lower margin products will adversely affect our gross margins. If our quarterly operating results fail to meet investor expectations, the price of our common stock may decline.

Securities or industry analysts may not publish favorable research or reports about our business or may publish no information, which could cause our stock price or trading volume to decline.

The trading market for our common stock is influenced by the research and reports that industry or securities analysts publish about us and our business. We do not have any control over these analysts, and we cannot provide any assurance that analysts will cover us or provide favorable coverage. If any of the analysts who cover us issue an adverse opinion regarding our stock price, our business or stock price would likely decline. If one or more of these analysts cease coverage of our company or fail to regularly publish reports covering us, we could lose visibility in the market, which in turn could cause our stock price or trading volume to decline.

Our stock price could be volatile, which could cause shareholders to lose part or all of their investment.

The market price of our common stock, like that of the common stock of many other companies with similar market capitalizations, is highly volatile. The stock market in general, and the market for life sciences, biotechnology and pharmaceutical companies in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of specific companies, including recently in connection with the ongoing COVID-19 pandemic, the conflict in Ukraine and rising inflation and interest rates in the United States, which have resulted in decreased stock prices for many companies notwithstanding the lack of a fundamental change in their underlying business models or prospects. Broad market and industry factors, including potentially worsening economic conditions, may adversely affect the market price of our common stock, regardless of our actual operating performance.

If we fail to maintain an effective system of internal controls, we may not be able to accurately report financial results or prevent fraud. If we identify a material weakness in our internal control over financial reporting, our ability to meet our reporting obligations and the trading price of our stock could be negatively affected.

Effective internal controls are necessary to provide reliable financial reports and to assist in the effective prevention of fraud. Any inability to provide reliable financial reports or prevent fraud could harm our business. We regularly review and update our internal controls, disclosure controls and procedures, and corporate governance policies. In addition, we are required under the Sarbanes-Oxley Act of 2002 to report annually on our internal control over financial reporting. Any system of internal controls, however well designed and operated, is based in part on certain assumptions and can provide only reasonable, not absolute, assurances that the objectives of the system are met. If we, or our independent registered public accounting firm, determine that our internal controls over financial reporting are not effective, discover areas that need improvement in the future or discover a material weakness, these shortcomings could have an adverse effect on our business and financial results, and the price of our common stock could be negatively affected. A material weakness is a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of our annual or interim financial statements will not be prevented or detected on a timely basis. Accordingly, a material weakness increases the risk that the financial information we report contains material errors.

If we cannot conclude that we have effective internal control over our financial reporting, or if our independent registered public accounting firm is unable to provide an unqualified opinion regarding the effectiveness of our internal control over financial reporting, investors could lose confidence in the reliability of our financial statements, which could lead to a decline in our stock price. Failure to comply with reporting requirements could also subject us to sanctions and/or investigations by the SEC, the Nasdaq Global Select Market or other regulatory authorities. We have previously implemented several significant ERP modules and expect to implement additional ERP modules in the future. The implementation of the ERP system represents a change in our internal control over financial reporting. Although we continue to monitor and assess our internal controls in the new ERP system environment as changes are made and new modules are implemented, and we have taken additional steps to modify and enhance the design and effectiveness of our internal control over financial reporting, there is a risk that deficiencies may occur that could aggregate to a material weakness.

If we fail to remedy any deficiencies or maintain the adequacy of our internal controls, we could be subject to regulatory scrutiny, civil or criminal penalties or shareholder litigation. In addition, failure to maintain adequate internal controls could result in financial statements that do not accurately reflect our operating results or financial condition.

Risks Related to Our Charter and By-laws

Anti-takeover provisions in our charter documents, certain of our contracts with third parties, and under Delaware law could make an acquisition of us, even one that may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management.

Provisions in our certificate of incorporation and by-laws may delay or prevent an acquisition of us or a change in our management. These provisions include the ability of our Board of Directors (the "Board") to issue preferred stock without stockholder approval. In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which limits the ability of stockholders owning in excess of 15% of our outstanding voting stock to merge or combine with us. Although we believe these provisions collectively provide for an opportunity to obtain greater value for stockholders by requiring potential acquirers to negotiate with the Board, they would apply even if an offer rejected by our board was considered beneficial by some stockholders. Additionally, certain of our contracts with third parties allow for termination upon specified change of control transactions. Anti-takeover provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of the Board, which is responsible for appointing the members of our management, and anti-takeover or change of control contract termination rights may frustrate or prevent any attempts by a third-party to acquire or attempt to acquire us.

Risks Related to Tax Matters

The enactment of legislation implementing changes in taxation of international business activities, the adoption of other corporate tax reform policies, or changes in tax legislation or policies, or interpretations thereof, could materially impact our financial position and results of operations.

Corporate tax reform, base-erosion efforts and tax transparency continue to be high priorities in many tax jurisdictions where we have business operations. As a result, policies regarding corporate income and other taxes in numerous jurisdictions are under heightened scrutiny and tax reform legislation is being proposed or enacted in a number of jurisdictions. There is no assurance that our actual income tax liability will not be materially different than what is reflected in our income tax provisions and accruals as a result of changes in tax laws.

In addition, many countries are beginning to implement legislation and other guidance to align their international tax rules with the Organisation for Economic Co-operation and Development's Base Erosion and Profit Shifting recommendations and action plan that aim to standardize and modernize global corporate tax policy, including changes to cross-border tax, transfer pricing documentation rules, and nexus-based tax incentive practices. Because of the heightened scrutiny of corporate taxation policies, prior decisions by tax authorities regarding treatments and positions of corporate income taxes could be subject to enforcement activities, and legislative investigation and inquiry, which could also result in changes in tax policies or prior tax rulings. Any such changes in policies or rulings may also result in the taxes we previously paid being subject to change.

Due to the large scale of our international business activities, any substantial changes in international corporate tax policies, enforcement activities or legislative initiatives may materially adversely affect our business, the amount of taxes we are required to pay and our financial condition and results of operations generally.

Our ability to use net operating loss and tax credit carryforwards and certain built-in losses to reduce future tax payments is limited by provisions of the Internal Revenue Code, and it is possible that certain transactions or a combination of certain transactions may result in material additional limitations on our ability to use our net operating loss and tax credit carryforwards.

Section 382 and 383 of the Internal Revenue Code of 1986, as amended, contain rules that limit the ability of a company that undergoes an ownership change, which is generally any change in ownership of more than 50 percentage points of its stock over a three-year period, to utilize its net operating loss and tax credit carryforwards and certain built-in losses recognized in years after the ownership change. These rules generally operate by focusing on ownership changes involving stockholders owning directly or indirectly 5% or more of the stock of a company and any change in ownership arising from a new issuance of stock by the company. Generally, if an ownership change occurs, the yearly taxable income limitation on the use of net operating loss and tax credit carryforwards and certain built-in losses is equal to the product of the applicable long-term, tax-exempt rate and the value of the company's stock immediately before the ownership change. We may be unable to offset our taxable income with losses, or our tax liability with credits, before such losses and credits expire and therefore would incur larger federal income tax liability. While our most recent Section 382 analysis did not show any current limitations, future transactions or combinations of future transactions may result in a change in control under Section 382 in the future. Federal net operating losses generated after December 31, 2017, are not subject to expiration and generally may not be carried back to prior taxable years except that, under the Coronavirus Aid, Relief, and Economic Security Act, net operating losses generated in 2018, 2019 and 2020 may be carried back five taxable years. Additionally, for taxable years beginning after December 31, 2020, the deductibility of such deferral net operating losses is limited to 80% of our taxable income in any future taxable year.

Risks Related to Government Regulation

Risks Related to Regulations and Compliance

We are subject to export and import control laws and regulations that could impair our ability to compete in international markets or subject us to liability if we violate such laws and regulations.

We are subject to U.S. export controls and sanctions regulations that restrict the shipment or provision of certain products and services to certain countries, governments, and persons. While we take precautions to prevent our products and services from being exported in violation of these laws, we cannot guarantee that the precautions we take will prevent violations of export control and sanctions laws. We believe that, in the past, we and our subsidiaries may have exported certain products without a required export license in apparent violation of U.S. export control laws. As a result, we have submitted to the U.S. Department of Commerce's Bureau of Industry and Security various notices of voluntary self-disclosure concerning potential violations. If we are found to be in violation of U.S. sanctions or export control laws, it could result in substantial fines and penalties for us and for the individuals working for us. We may also be adversely affected through other penalties, reputational harm, loss of access to certain markets, or otherwise.

Complying with export control and sanctions regulations may be time-consuming and may result in the delay or loss of sales opportunities or impose other costs. Any change in export or import regulations, economic sanctions or related legislation, or change in the countries, governments, persons or technologies targeted by such regulations, could result in our decreased ability to export or sell certain products to existing or potential customers in affected jurisdictions.

Our business is subject to a number of environmental risks.

Our manufacturing business involves the controlled use of hazardous materials and chemicals and is therefore subject to numerous environmental and safety laws and regulations and periodic inspections for possible violations of these laws and regulations. In addition to these hazardous materials and chemicals, our facility in Sweden also uses Staphylococcus aureus and toxins produced by Staphylococcus aureus in some of its manufacturing processes. Staphylococcus aureus and the toxins it produces, particularly enterotoxins, can cause severe illness in humans. The costs of compliance with environmental and safety laws and regulations are significant. Any violations, even if inadvertent or accidental, of current or future environmental and safety laws or regulations and the cost of compliance with any resulting order or fine could adversely affect our operations.

Climate change, climate change-related regulation and sustainability concerns could adversely affect our businesses and the operations of our subsidiaries, and any actions we take or fail to take in response to such matters could damage our reputation.

Investor advocacy groups, certain institutional investors, investment funds, other market participants and other stakeholders have focused increasingly on the Environmental, Social and Governance ("ESG") practices of companies, including those associated with climate change. These parties have placed increased importance on the importance on the implications of the social cost of their investments. If our ESG practices do not meet investor or other industry stakeholder expectations and standards, which continue to evolve, our reputation and associate retention may be negatively impacted based on an assessment of our ESG practices. Any sustainability disclosures we make may include our policies and practices on a variety of social and ethical matters, including corporate governance, environmental compliance, employee health and safety practices, human capital management, product quality, supply chain management, and workforce inclusion and diversity. It is possible that stakeholders may not be satisfied with our ESG practices or the speed of their adoption, or that we may not sufficiently communicate our ESG practices sufficiently to stakeholders. We could also incur additional costs and require additional resources to monitor, report, and comply with various ESG practices. In addition, investors may decide to refrain from investing in us as a result of their assessment of our approach to and consideration of the ESG factors.

Health care reform measures could adversely affect our business.

The efforts of governmental and third-party payors to contain or reduce the costs of health care may adversely affect the business and financial condition of pharmaceutical and biotechnology companies, including ours. Specifically, in both the United States and some foreign jurisdictions, there have been a number of legislative and regulatory proposals to change the health care system in ways that could affect our ability to sell our products profitably. For the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010 (together, the "ACA"), substantially changed the way health care is financed by both governmental and private insurers. The ACA and other federal and state proposals and health care reforms could limit the prices that can be charged for the products we develop and may limit our commercial opportunity.

In August 2022, the Inflation Reduction Act of 2022 (the "IRA") was signed into law. The IRA includes several provisions that will impact our business to varying degrees, including provisions that create a $2,000 out-of-pocket cap for Medicare Part D beneficiaries, impose new manufacturer financial liability on all drugs in Medicare Part D, allow the U.S. government to negotiate Medicare Part B and Part D pricing for certain high-cost drugs and biologics without generic or biosimilar competition, require companies to pay rebates to Medicare for drug prices that increase faster than inflation, and delay the rebate rule that would require pass through of pharmacy benefit manager rebates to beneficiaries. The effect of IRA on our business and the healthcare industry in general is not yet known.

Additionally, the federal government and individual states in the United States have also become increasingly active in passing legislation and implementing regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. Legally mandated price controls on payment amounts by third-party payors or other restrictions could harm our business, financial condition, results of operations and prospects. In addition, regional healthcare authorities and individual hospitals are increasingly using bidding procedures to determine what pharmaceutical products and which suppliers will be included in their prescription drug and other healthcare programs. This could reduce the ultimate demand for our products or put pressure on drug pricing, which could negatively affect our business, financial condition, results of operations and prospects. We expect that additional state and federal healthcare reform measures will be adopted in the future.

We may be exposed to liabilities under the Foreign Corrupt Practices Act, and any determination that we violated the Foreign Corrupt Practices Act could have a material adverse effect on our business.

We are subject to the FCPA and other laws that prohibit improper payments or offers of payments to foreign governments and their officials and political parties by U.S. persons and issuers as defined by the statute for the purpose of obtaining or retaining business. We have operations and agreements with third parties and make sales in jurisdictions outside of the United States, which may experience corruption. Our activities in jurisdictions outside of the United States create the risk of unauthorized payments or offers of payments by one of our employees, consultants, sales agents or distributors, because these parties are not always subject to our control. These risks have increased following our recent acquisitions of overseas operations and facilities. It is our policy to implement safeguards to

discourage these practices by our employees. However, our existing safeguards and any future improvements may prove to be less than effective, and the employees, consultants, sales agents or distributors of Repligen may engage in conduct for which we might be held responsible. Violations of the FCPA may result in severe criminal or civil sanctions, and we may be subject to other liabilities, which could negatively affect our business, operating results and financial condition. In addition, the government may seek to hold us liable for successor liability FCPA violations committed by any companies in which we invest or that we acquire.

Changes in accounting standards and subjective assumptions, estimates, and judgments by management related to complex accounting matters could significantly affect our financial results or financial condition.

Generally accepted accounting principles and related accounting pronouncements, implementation guidelines, and interpretations with regard to a wide range of matters that are relevant to our business, such as revenue recognition, asset impairment and fair value determinations, inventories, business combinations and intangible asset valuations, leases, and litigation, are highly complex and involve many subjective assumptions, estimates, and judgments. Changes in these rules or their interpretation or changes in underlying assumptions, estimates, or judgments could significantly change our reported or expected financial performance or financial condition.

Risks Related to Data and Privacy

Our internal computer systems, or those of our customers, collaborators or other contractors, may be subject to cyber-attacks or security breaches, which could result in a material disruption of our product development programs.

Despite the implementation of security measures, our internal computer systems and those of our customers, collaborators cloud-based platform service providers, and other contractors are vulnerable to damage from unauthorized access and from cyber-attacks, such as computer viruses, malware, ransomware, phishing denial-of-service attacks, social engineering and other means to affect service reliability and threaten the confidentiality, integrity and availability of information. A material cyber-attack or security breach could cause interruptions in our operations and could result in a material disruption of our business operations, damage to our reputation or a loss of revenues.

In the ordinary course of our business, we collect and store sensitive data, including, among other things, personally identifiable information about our employees, intellectual property, and proprietary business information. In addition, we could be subject to risks caused by misappropriation, misuse, leakage, falsification or intentional or accidental release or loss of information maintained in the information systems and networks of our company and our vendors, including personal information of our employees, and company and vendor confidential data. Like other companies, we have on occasion experienced, and believe we will continue to experience, data security incidents involving access to company data threats to our data and systems. If a material breach of our information technology systems or those of our vendors occurs, the market perception of the effectiveness of our security measures could be harmed and our reputation and credibility could be damaged.

We could be required to expend significant amounts of money and other resources to respond to these threats or breaches, and to repair or replace information systems or networks and could suffer financial loss or the loss of valuable confidential information. In addition, we could be subject to regulatory actions and/or claims made by individuals and groups in private litigation involving privacy issues related to data collection and use practices and other data privacy laws and regulations, including claims for misuse or inappropriate disclosure of data, as well as unfair or deceptive practices. Moreover, despite our efforts, the possibility of these events occurring cannot be eliminated entirely and there can be no assurance that any measures we take will prevent cyber-attacks or security breaches that could adversely affect our business.

Changes in laws and regulations governing the privacy and protection of data and personal information could adversely affect our business.

We are subject to data privacy and protection laws and regulations that apply to the collection, transmission, storage and use of proprietary information and personally-identifying information, which among other things, imposes certain requirements relating to the privacy, security and transmission of certain individually identifiable information. In addition, numerous other federal and state laws, including state security breach notification laws, state health information privacy laws and federal and state consumer protection laws,

govern the collection, use, disclosure and security of personal information. These laws continue to change and evolve and are increasing in breadth and impact.

For example, the European Union's ("EU") General Data Protection Regulations ("GDPR") and the California Consumer Privacy Act ("CCPA") impose significant requirements on how we collect, process and transfer personal data, as well as significant regulatory penalties and legal liability for non-compliance.

Additionally, effective January 1, 2023, the California Privacy Rights Act ("CPRA") imposes additional obligations on companies covered by the legislation and will significantly modify the CCPA by expanding consumers' rights with respect to certain sensitive personal information. These current and future data privacy laws and regulations may require us to modify our data collection or processing practices and policies, incur substantial costs and expenses in an effort to comply and increase our potential exposure to regulatory enforcement and/or litigation.

Also, our customers may be subject to different privacy laws, rules and legislation, which may mean that they require us to be bound by varying contractual requirements applicable to certain other jurisdictions. Adherence to such contractual requirements may impact our collection, use, processing, storage, sharing and disclosure of information. As we expand our customer base, these requirements may vary from customer to customer, further increasing the cost of compliance and doing business.

Risks Related to Our Products and Technology

Risks Related to Our Intellectual Property

If we are unable to obtain or maintain our intellectual property, we may not be able to succeed commercially.

We endeavor to obtain and maintain trade secrets and pursue strategic patent protection in order to protect our products and processes from unauthorized use, and to produce a financial return consistent with the significant time and expense required to bring our products to market and continue to be competitive in our technical fields. Our success depends, in part, on our ability to:

- preserve our trade secrets, know-how and confidential information;
- operate without infringing the proprietary rights of third parties;
- obtain and maintain patent protection for our products and processes; and
- secure any necessary licenses from others on acceptable terms.

We consider trade secrets, know-how and other forms of market protection to be among the most important elements of our proprietary position, in particular, as it relates to many of the products that currently account for a majority of our revenue. We also own or have exclusive rights to U.S. patents and U.S. pending patent applications as well as corresponding foreign patents and patent applications. We continue to actively and selectively pursue patent protection and seek to expand our patent estate, particularly for our products currently in development, and we cannot be sure that any patent applications that we will file in the future or that any currently pending applications will issue on a timely basis, if ever. We cannot be certain that we were the first to conceive the invention(s) described by each of our pending patent applications or that we were the first to file patent applications for such invention(s). Even if patents are issued, the degree of protection afforded by such patents will depend upon the:

- scope of the patent claims;
- validity and enforceability of the claims obtained in such patents; and
- our willingness and financial ability to enforce and/or defend them.

Patents that may be granted to us in certain foreign countries may be subject to opposition proceedings brought by third parties or result in suits by us, which may be costly and result in adverse consequences for us.

In some cases, litigation or other proceedings may be necessary to assert claims of infringement, to enforce patents issued to us or our licensors, to protect trade secrets, know-how or other intellectual property rights we own or to determine the scope and validity of the

proprietary rights of third parties. Such litigation could result in substantial costs to us and diversion of our resources. An adverse outcome in any such litigation or proceeding could have a material adverse effect on our business, financial condition and results of operations. If our competitors prepare and file patent applications that claim technology also claimed by us, we may be required to participate in interference proceedings declared by Patent Offices to determine priority of invention, which would result in substantial costs to us.

While one of our U.S. patents covering recombinant Protein A had its term adjusted to expire in 2028, our other U.S. patents covering recombinant Protein A have expired, and as a result, we may face increased competition, which could harm our results of operations, financial condition, cash flow and future prospects.

Other companies could begin manufacturing and selling native or some of the commercial forms of recombinant Protein A in the United States and may directly compete with us on certain Protein A products. This may induce us to sell Protein A at lower prices and may erode our market share, which could adversely affect our results of operations, financial condition, cash flow and future prospects.

Our freedom to develop our products may be challenged by others, and we may have to engage in litigation to determine the scope and validity of competitors' patents and proprietary rights, which, if we do not prevail, could harm our business, results of operations, financial condition, cash flow and future prospects.

We have been a party to, and in the future may become a party to, patent litigation or other proceedings regarding intellectual property rights.

We may become involved in patent litigation or other intellectual property proceedings, including the following situations:

- We may initiate litigation or other proceedings against third parties to seek to invalidate the patents held by such third parties or to obtain a judgment that our products or services do not infringe on such third parties' patents.
- We may initiate litigation or other proceedings against third parties to seek to enforce our patents against infringers.
- If our competitors file patent applications that claim technology also claimed by us, we may participate in interference or opposition proceedings to determine the priority of invention.
- If third parties initiate litigation claiming that our processes or products infringe their patent or other intellectual property rights, we will need to defend against such claims.

The cost to us of any patent litigation or other proceeding, even if resolved in our favor, could be substantial. Some of our competitors may be able to sustain the cost of such litigation or proceedings more effectively than we can because of their substantially greater financial resources. If a patent litigation or other intellectual property proceeding is resolved in a way that is unfavorable to us, we or our collaborative or strategic partners may be enjoined from manufacturing or selling our products and services without a license from the other party and be held liable for significant damages. The failure to obtain any required license on commercially acceptable terms or at all may harm our business, results of operations, financial condition, cash flow and future prospects.

Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace. Patent litigation and other proceedings may also absorb significant management time, attention and resources.

Risks Related to Our Products

The market may not be receptive to our new bioprocessing products upon their introduction.

We expect a portion of our future revenue growth to come from introducing new bioprocessing products, including line extensions and new features for our OPUS® disposable chromatography columns, our XCell ATF system, our SIUS® tangential flow filtration ("TFF") cassettes, our Spectrum® hollow fiber modules TFF line of cassettes and our growth factors. The commercial success of all of our products will depend upon their acceptance by the life science and biopharmaceutical industries. Many of the bioprocessing products that we are developing are based upon new technologies or approaches. As a result, there can be no assurance that these new products, even if successfully developed and introduced, will be accepted by customers. If customers do not adopt our new products and technologies, our results of operations may suffer and, as a result, the market price of our common stock may decline.

Our products are subject to quality control requirements.

Whether a product is produced by us or purchased from outside suppliers, it is subjected to quality control procedures, including the verification of porosity and with certain products, the complete validation for good manufacturing practices, FDA, CE and ISO® compliance, prior to final packaging. Quality control is performed by a staff of technicians utilizing calibrated equipment. In the event we, or our manufacturers, produce products that fail to comply with required quality standards, it may incur delays in fulfilling orders, write-downs, damage to our reputation and damages resulting from product liability claims.

If our products do not perform as expected or the reliability of the technology on which our products are based is questioned, we could experience lost revenue, delayed or reduced market acceptance of our products, increased costs and damage to our reputation.

Our success depends on the market's confidence that we can provide reliable, high-quality bioprocessing products. We believe that customers in our target markets are likely to be particularly sensitive to product defects and errors. Our reputation and the public image of our products and technologies may be impaired if our products fail to perform as expected. Although our products are tested prior to shipment, defects or errors could nonetheless occur in our products. Furthermore, the Protein A that we manufacture is subsequently incorporated into products that are sold by other life sciences companies and we have no control over the manufacture and production of those products. In the future, if our products experience, or are perceived to experience, a material defect or error, this could result in loss or delay of revenues, delayed market acceptance, damaged reputation, diversion of development resources, legal claims, increased insurance costs or increased service and warranty costs, any of which could harm our business. Such defects or errors could also narrow the scope of the use of our products, which could hinder our success in the market. Even after any underlying concerns or problems are resolved, any lingering concerns in our target market regarding our technology or any manufacturing defects or performance errors in our products could continue to result in lost revenue, delayed market acceptance, damaged reputation, increased service and warranty costs and claims against us.

Risks Related to Litigation

We may become involved in litigation or other proceedings with collaborative partners, which may be time consuming, costly and could result in delays in our development and commercialization efforts.

In connection with our decision to focus efforts on the growth of our core bioprocessing business, we sought development and commercialization partnerships for our remaining portfolio of clinical stage assets. Any disputes with such partners that lead to litigation or similar proceedings may result in us incurring legal expenses, as well as facing potential legal liability. Such disputes, litigation or other proceedings are also time-consuming and may cause delays in our development and commercialization efforts. If we fail to resolve these disputes quickly and with terms that are no less favorable to us than the current terms of the arrangements, our business, results of operations, financial condition, cash flow and future prospects may be harmed.

We may become subject to litigation, which could result in substantial costs and divert management's attention and resources from our business.

From time to time, we may become involved in litigation or other legal proceedings relating to claims arising from the ordinary course of business. Litigation is subject to inherent risks and uncertainties that may cause actual results to differ materially from our expectations. If we receive an adverse judgment in any litigation, we could be required to pay substantial damages. With or without merit, litigation

can be complex, can extend for a protracted period of time, can be very expensive and the expense can be unpredictable. Litigation initiated by us could also result in counterclaims against us, which could increase the costs associated with the litigation and result in our payment of damages or other judgments against us. In addition, litigation, and any related publicity, may divert the efforts and attention of some of our management and key personnel, which could adversely affect our business.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

Our material office and manufacturing leases are detailed below:

Location	Square Feet	Principal Use	Lease Expiration
Waltham, Massachusetts	182,243 (1)	Corporate headquarters, manufacturing, research and development, marketing and administrative offices	October 31, 2030
Marlborough, Massachusetts	130,700	Manufacturing operations	November 30, 2033(2)
Rancho Dominguez, California	68,908	Manufacturing, research and development, marketing and administrative operations	July 15, 2035(3)
Lund, Sweden	65,240	Manufacturing and administrative operations	June 30, 2028
Hopkinton, Massachusetts	64,000	Manufacturing, assembly site	July 13, 2034
Toulouse, France	62,980	Manufacturing and administrative operations	May 31, 2030
Bridgewater, New Jersey	57,485 (4)	Manufacturing and administrative operations	February 1, 2034
Compton, California(9)	54,060	Warehouse	May 31, 2029
Waterford, Ireland	50,311 (5)	Manufacturing, administrative operations and assembly site	January 31, 2037
Clifton Park, New York	34,386 (6)	Manufacturing operations	November 30, 2029
Lebanon, New Hampshire	31,053	Research and development and administrative operations	July 31, 2026

(1) In September 2021, we signed the Sixth Amendment of Lease for our facility in Waltham, Massachusetts, which extended our lease term to October 31, 2030, and expanded the facility by 74,108 square feet. This expansion is needed to accommodate our need for additional office and manufacturing space.

(2) In 2022, we assessed our lease for the Marlborough facility and decided to exercise one of the two 5-year options to extend the lease to November 30, 2033.

(3) In 2018, we expanded our facility in Rancho Dominguez, California by approximately 15,000 square feet. The lease for the expanded portion of the facility expires on November 30, 2025. In 2022, after assessing this lease under Accounting Standards Codification No. 842, *"Leases"*, we became reasonably certain that we would exercise our option to extend the lease for ten years. This lease now expires in 2035.

(4) In 2022, we expanded the facility in Bridgewater, New Jersey by approximately 24,000 square feet for additional office and lab space.

(5) On February 1, 2022, we expanded our space in Waterford, Ireland by approximately 8,000 square feet for additional office space.

(6) On August 1, 2022, we expanded our facility in Clifton Park, New York by approximately 4,000 square feet for additional office space.

On December 29, 2022, the Company entered into a Purchase and Sale Agreement to purchase an 11,000 square foot building in Fredon (Newton), New Jersey from the former owners of BioFlex for approximately $1.0 million.

During the year ended December 31, 2022, we incurred total rental costs for all facilities of $29.2 million.

ITEM 3. 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 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market Information for Common Stock

Our common stock is traded on the Nasdaq Global Select Market under the symbol "RGEN."

Stockholders and Dividends

As of February 17, 2023, there were 260 stockholders of record of our common stock. We have not paid any dividends since our inception and do not intend to pay any dividends on our common stock in the foreseeable future. We anticipate that we will retain all earnings, if any, to support our operations. Any future determination as to the payment of dividends will be at the sole discretion of our Board of Directors (the "Board") and will depend on our financial condition, results of operations, capital requirements and other factors the Board deems relevant.

Equity Compensation Plan Information

The following table sets forth information as of December 31, 2022, regarding shares of common stock that may be issued under the Company's equity compensation plans, consisting of the Second Amended and Restated 2001 Repligen Corporation Stock Plan, the Amended and Restated 2012 Stock Option and Incentive Plan and the 2018 Stock Option and Incentive Plan.

Plan Category	Number of securities to be issued upon exercise of outstanding options, warrants and rights (a)		Weighted-average exercise price of outstanding options, warrants and rights (b)		Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a)) (c)
Equity compensation plans approved by security holders	1,140,999	(1)	$ 71.74	(2)	1,904,702

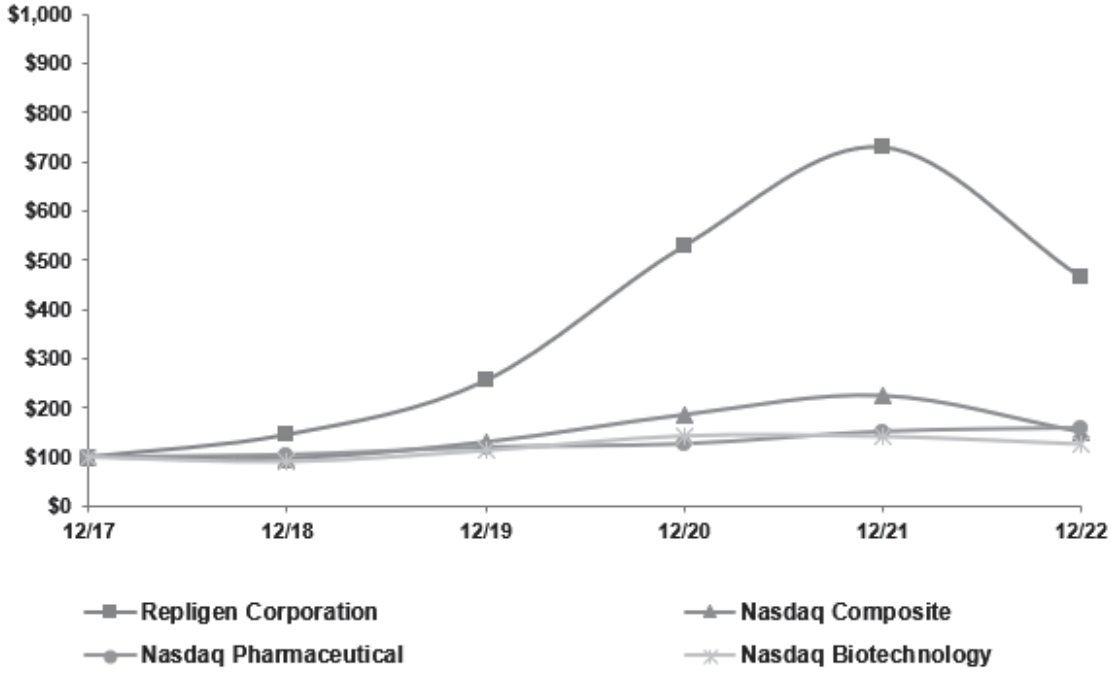
(1) Includes 609,965 shares of common stock issuable upon the exercise of outstanding options and 531,034 shares of common stock issuable upon the vesting of stock units, which include restricted stock units and performance stock units. No shares of restricted stock are outstanding.

(2) Since stock units do not have any exercise price, such units are not included in the weighted average exercise price calculation.

Stock Performance Graph

The graph below matches Repligen Corporation's cumulative 5-year total shareholder return on common stock with the cumulative total returns of the Nasdaq Composite index, the Nasdaq Pharmaceutical index, and the Nasdaq Biotechnology index. The graph tracks the performance of a $100 investment in our common stock and in each index (with the reinvestment of all dividends) from December 31, 2017 to December 31, 2022. The comparisons shown in the graph below are based upon historical data. We caution that the stock price performance shown in the graph below is not necessarily indicative of, nor is it intended to forecast, the potential future performance of our common stock.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*
Among Repligen Corporation, the Nasdaq Composite Index,
the Nasdaq Pharmaceutical Index and the Nasdaq Biotechnology Index



*$100 invested on 12/31/17 in stock or index, including reinvestment of dividends. Fiscal year ending December 31.

The information contained in the performance graph shall not be deemed to be "soliciting material" or to be "filed" with the Securities and Exchange Commission, and such information shall not be incorporated by reference into any future filing under the Securities Act of 1933, as amended (the "Securities Act") or the Securities Exchange Act of 1934, as amended (the "Exchange Act"), except to the extent that Repligen specifically incorporates it by reference into such filing.

Issuer Purchases of Equity Securities

In June 2008, the Board of Directors authorized a program to repurchase up to 1.25 million shares of our common stock to be repurchased at the discretion of management from time to time in the open market or through privately negotiated transactions. The repurchase program has no set expiration date and may be suspended or discontinued at any time. We did not repurchase any shares of common stock during the year ended December 31, 2022. In prior years, we repurchased a total of 592,827 shares, leaving 657,173 shares remaining under this authorization.

ITEM 6. RESERVED

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Information pertaining to fiscal years 2021 and 2020 was included in the Company's Annual Report on Form 10-K ("Form 10-K") for the year ended December 31, 2021, on pages 37 through 52 under Part II, Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations," which was filed with the SEC on February 17, 2022.

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 technology 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 primary customers – global biopharmaceutical companies and contract development and manufacturing organizations and other life sciences companies (integrators) – face critical production cost, capacity, quality and time pressures. Built to address these concerns, our products help 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 ("mAbs"), recombinant proteins, vaccines and cell and gene therapies ("C&GT") – that are improving human health worldwide. Increasingly, our technologies are being implemented to overcome challenges in processing plasmid DNA (a starting material for the production of mRNA) and gene delivery vectors such as lentivirus and adeno-associated viral vectors. For more information regarding our business, products and acquisitions, see above sections in Part I, Item 1. *"Business"* including "Overview", "Our Products", "2021 Acquisitions", "2020 Acquisitions" and "Our Market Opportunity" sections therein.

Macroeconomic Trends

As a result of our global presence, a significant portion of our revenue and expenses is denominated in currencies other than the U.S. dollar. We are therefore subject to non-U.S. currency risks and non-U.S. exchange exposure. Exchange rates can be volatile and a substantial weakening or strengthening of foreign currencies against the U.S. dollar could increase or reduce our revenue and gross profit margin and impact the comparability of results from period to period.

We have experienced, and expect to continue to experience, cost inflation, primarily in raw materials, and other supply chain costs, as a result of global macroeconomic trends, including the conflict between Russia and Ukraine, government-mandated actions in response to the COVID-19 pandemic, including all subsequent variants of the SARS-CoV-2 coronavirus ("COVID-19"), and labor shortages. Actions taken to mitigate supply chain disruptions and inflation, including price increases and productivity improvements, have generally been successful in offsetting the impact of these trends. In addition, decreasing demand for COVID-19 vaccination is driving a reduction in future demand of our products related to these vaccines. We expect that these trends will continue to impact our results for 2023 as well.

License Agreement

On September 19, 2022, we entered into a 15-year exclusive License Agreement (the "Daylight Agreement") with DRS Daylight Solutions, Inc. ("Daylight"), giving us exclusive license and commercialization rights to use certain technology and intellectual property subject to conditions set forth in the Daylight Agreement. We agreed to pay Daylight (i) an initial, one-time, non-refundable, non-creditable upfront cash payment and (ii) certain quarterly royalty payments.

COVID-19 Pandemic

Our global operations have been and continue to be affected by the COVID-19 pandemic and the resulting volatility and uncertainty it has caused in the United States and international markets. During the year ended December 31, 2022, many businesses and countries, including the United States, continued applying preventative and precautionary measures designed to mitigate the spread of the virus and its variants including government orders and other restrictions on the conduct of business operations. Similar to other companies, from the onset of COVID-19, we implemented measures to support the health and well-being of our employees, customers, partners and communities, including working remotely and operating our business in a fundamentally different way.

While COVID-19 restrictions imposed by state and local governments have largely been lifted, COVID-19 continues to disrupt business and negatively impact consumer and business confidence. COVID-19 continues to be dynamic, and near-term challenges across the

economy remain. The ongoing effects of COVID-19 remain difficult to predict due to numerous uncertainties, including the severity, duration and resurgence of the outbreak, new variants, the effectiveness of health and safety measures including vaccines, the pace and strength of the economic recovery, and supply chain pressures, among others. The Company's commercial operations have not been significantly impacted by COVID-19 to date, although COVID-19 related revenue is expected to continue to decline in 2023 as the demand for vaccines decreases. We will continue to actively monitor the effects of COVID-19 and will continue to take appropriate steps to mitigate the impacts to our employees and on our business results.

Critical Accounting Policies and Estimates

While our significant accounting policies are more fully described in the notes to our consolidated financial statements, we have identified the policies and estimates below as being critical to our business operations and the understanding of our results of operations. These policies require management's most difficult, subjective or complex judgements, often as a result of the need to make estimates about the effect of matters that are inherently uncertain. The impact of and any associated risks related to these policies on our business operations are discussed throughout "Management's Discussion and Analysis of Financial Condition and Results of Operations," specifically in the "Results of Operations" section, where such policies affect our reported and expected financial results. Although we believe that our estimates, assumptions, and judgements are reasonable, they are based upon information presently available. Actual results may differ significantly from these estimates under different assumptions, judgments, or conditions.

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 Accounting Standards Codification No. ("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. Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring products or services to a customer ("transaction price"). To the extent the transaction price includes variable consideration, the Company estimates the amount of variable consideration that should be included in the transaction price utilizing the expected value method or the most likely amount method, depending on the facts and circumstances relative to the contract. Variable consideration is included in the transaction price if, in the Company's judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. Estimates of variable consideration and determination of whether to include estimated amounts in the transaction price are based largely on an assessment of the Company's anticipated performance and all information (historical, current and forecasted) that is reasonably available. Sales, value add, and other taxes collected on behalf of third parties are excluded from revenue.

When determining the transaction price of a contract, an adjustment is made if payment from a customer occurs either significantly before or significantly after performance, resulting in a significant financing component. Applying the practical expedient in paragraph 606-10-32-18, the Company does not assess whether a significant financing component exists if the period between when the Company performs its obligations under the contract and when the customer pays is one year or less. None of the Company's contracts contained a significant financing component as of December 31, 2022.

Contracts with customers may contain multiple performance obligations. For such arrangements, the transaction price is allocated to each performance obligation based on the estimated relative standalone selling prices of the promised products or services underlying each performance obligation. The Company determines standalone selling prices based on the price at which the performance obligation is sold separately. If the standalone selling price is not observable through past transactions, the Company estimates the standalone selling price taking into account available information such as market conditions and internally approved pricing guidelines related to the performance obligations.

The Company recognizes product revenue under the terms of each customer agreement upon transfer of control to the customer, which occurs at a point in time.

Allowance for credit losses

We evaluate our global accounts receivable through a continuous process of assessing our portfolio on an individual customer and overall basis. This process consists of a thorough review of historical collection experience, current aging status of the customer accounts, financial condition of our customers, and whether the receivables involve retainages. We also consider the economic environment of our customers, both from a marketplace and geographic perspective, in evaluating the need for an allowance. Based on our review of these factors, we establish or adjust allowances for specific customers. Credit losses can vary substantially over time and the process involves judgment and estimation that require a number of assumptions about matters that are uncertain. Accordingly, our results of operations can be affected by adjustments to the allowance due to actual write-offs that differ from estimated amounts. See Note 7, *"Credit Losses,"* to our consolidated financial statements included in this report for more information.

Inventories

We value inventory at cost or, if lower, net realizable value, using the first-in, first-out method. We review our inventory at least quarterly and record a provision for excess and obsolete inventory based on our estimates of expected sales volume, production capacity and expiration dates of raw materials, work-in-process and finished products. We write down inventory that has become obsolete, inventory that has a cost basis in excess of its expected net realizable value, and inventory in excess of expected requirements to cost of product revenue in our consolidated statements of comprehensive income. Manufacturing of bioprocessing finished goods is done to order and tested for quality specifications prior to shipment.

A change in the estimated timing or amount of demand for our products could result in additional provisions for excess inventory quantities on hand. Any significant unanticipated changes in demand or unexpected quality failures could have a significant impact on the value of inventory and reported operating results. During all periods presented in the accompanying consolidated financial statements, there have been no material adjustments related to a revised estimate of inventory valuations.

Business combinations

Total consideration transferred for acquisitions is allocated to the tangible and intangible assets acquired and liabilities assumed, if any, based on their fair values at the dates of acquisition. This purchase price allocation process requires management to make significant estimates and assumptions with respect to intangible assets and deferred revenue obligations. The fair value of identifiable intangible assets is based on detailed valuations that use information and assumptions determined by management. Any excess of purchase price over the fair value of the net tangible and intangible assets acquired is allocated to goodwill. While we use our best estimates and assumptions to accurately value assets acquired and liabilities assumed at the acquisition date as well as any contingent consideration, where applicable, our estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which may be up to one year from the acquisition date, we record adjustments to the assets acquired and liabilities assumed with the corresponding offset to goodwill. Upon conclusion of the measurement period or final determination of the values of assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments are recorded to our consolidated statements of comprehensive income. The Company estimates the fair value of the contingent consideration earnouts using the Monte Carlo Simulation and updates the fair value of the contingent consideration at each reporting period based on the estimated probability of achieving the earnout targets and applying a discount rate that captures the risk associated with the expected contingent payments. To the extent that our estimates change in the future regarding the likelihood of achieving these targets, we may need to record material adjustments to our accrued contingent consideration. Such changes in the fair value of contingent consideration are recorded as contingent consideration expense in our consolidated statements of comprehensive income. We recorded an adjustment to the fair value of the contingent consideration obligation for the twelve months ended December 31, 2022 of ($28.7) million related to the change in estimated contingent consideration obligations from the acquisition of Avitide, Inc. ("Avitide") in September 2021.

We use the income approach to determine the fair value of certain identifiable intangible assets including customer relationships and developed technology. This approach determines fair value by estimating after-tax cash flows attributable to these assets over their respective useful lives and then discounting these after-tax cash flows back to a present value. We base our assumptions on estimates of future cash flows, expected growth rates, expected trends in technology, etc. We base the discount rates used to arrive at a present value as of the date of acquisition on the time value of money and certain industry-specific risk factors. We believe the estimated purchased customer relationships, developed technologies, trademark/tradename, patents, non-competition agreements and in-

process research and development ("R&D") amounts so determined represent the fair value at the date of acquisition and do not exceed the amount a third-party would pay for the assets.

Intangible assets and goodwill

Intangible assets

Intangible assets with a definite life are amortized over their useful lives using the straight-line method and the amortization expense is recorded within cost of product revenue, research and development and selling, general and administrative expense in the consolidated 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 the Company's products or changes in the size of the market for the Company's products. If impairment indicators are present, the Company determines whether the underlying intangible asset is recoverable through estimated future undiscounted cash flows. If the asset is not found to be recoverable, it is written down to the estimated fair value of the asset based on the sum of the future discounted cash flows expected to result from the use and disposition 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 definite-lived intangible assets are recoverable at December 31, 2022.

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

Goodwill

We test goodwill for impairment on an annual basis and between annual tests if events and circumstances indicate it is more likely than not that the fair value of a reporting unit is less than its carrying value. Events that would indicate impairment and trigger an interim impairment assessment include, but are not limited to, macroeconomic conditions, industry and market conditions, entity specific factors such as strategies and financial performance, a significant adverse change in legal factors and an adverse action or assessment by a regulator. Goodwill is tested for impairment as of December 31st of each year, or more frequently as warranted by events or changes in circumstances mentioned above. Accounting guidance also permits an optional qualitative assessment for goodwill to determine whether it is more likely than not that the carrying value of a reporting unit exceeds its fair value. If, after this qualitative assessment, we determine that it is not more likely than not that the fair value of a reporting unit is less than its carrying amount, then no further quantitative testing would be necessary. A quantitative assessment is performed if the qualitative assessment results in a more likely than not determination or if a qualitative assessment is not performed. The quantitative assessment considers whether the carrying amount of a reporting unit exceeds its fair value, in which case an impairment charge is recorded to the extent the reporting unit's carrying value exceeds its fair value.

The Company operates as one reporting unit. We performed a qualitative assessment for our reporting unit as of December 31, 2022 and 2021. This assessment considered changes in our projected future cash flows and discount rates, recent market transactions and overall macroeconomic conditions for each period. Based on the assessment, we concluded that it was more likely than not that the estimated fair value of our reporting unit for 2022 and 2021 was higher than its carrying value for such years, and that the performance of the quantitative impairment test was not required. We performed a quantitative test on our goodwill as of December 31, 2020 and concluded that the carrying amount of the reporting unit did not exceed its fair value. Therefore, no impairment was required as of December 31, 2020.

Accrued liabilities

We estimate accrued liabilities by identifying services performed on our behalf, estimating the level of service performed and determining the associated cost incurred for such service as of each balance sheet date. For example, we would accrue for professional and consulting fees incurred with law firms, audit and accounting service providers and other third-party consultants.

These expenses are determined by either requesting those service providers to estimate unbilled services at each reporting date for services incurred or tracking costs incurred by service providers under fixed fee arrangements.

We have processes in place to estimate the appropriate amounts to record for accrued liabilities, which principally involve the applicable personnel reviewing the services provided. In the event that we do not identify certain costs that have begun to be incurred or we under or over-estimate the level of services performed or the costs of such services, the reported expenses for that period may be too low or too high. The date on which certain services commence, the level of services performed on or before a given date, and the cost of such services often require the exercise of judgment. We make these judgments based upon the facts and circumstances known at the date of the financial statements.

A change in the estimated cost or volume of services provided could result in additional accrued liabilities. Any significant unanticipated changes in such estimates could have a significant impact on our accrued liabilities and reported operating results. There have been no material adjustments to our accrued liabilities in any of the periods presented in the accompanying consolidated financial statements.

Debt accounting

Our short-term debt balance is related to our 0.375% Convertible Senior Notes due 2024 (the "2019 Notes"), which were issued in July 2019. Prior to the adoption of Accounting Standards Update No. ("ASU") 2020-06, *"Debt - Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging - Contracts in Entity's Own Equity (Subtopic 815-40)",* the 2019 Notes were carried at their principal amount less unamortized debt discount and unamortized debt issuance costs. We had accounted for our convertible notes as separate liability and equity components prior to the adoption of 2020-06. We estimated the carrying amount of the liability component by estimating the fair value of a similar liability that did not have an associated conversion feature. The Company allocated transaction costs related to the issuance of convertible notes to the liability and equity components using the same proportions as the initial carrying value of the convertible notes. The carrying value of the equity component was calculated by deducting the carrying value of the liability component from the principal amount of the convertible notes as a whole. The difference represented a debt discount that, prior to the adoption of ASU 2020-06, was amortized to interest expense in our consolidated statement of comprehensive income over the term of the convertible notes using the effective interest rate method. We assessed the equity classification of the cash conversion feature quarterly. We allocated 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. Effective January 1, 2022, the Company adopted ASU 2020-06. After adoption, the Company now accounts for the 2019 Notes as a single liability measured at amortized cost. See Note 13, *"Convertible Senior Notes,"* to our consolidated financial statements included in this report for more information on our adoption of ASU 2020-06.

During the fourth quarter of 2022, the closing price of the Company's common stock exceeded 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. As a result, the 2019 Notes are convertible at the option of the holders of the 2019 Notes during the first quarter of 2023, the quarter immediately following the quarter when the conditions are met, as stated in the terms of the 2019 Notes. Expecting to continue meeting these terms, the Company continues to classify the carrying value of the 2019 Notes as current liabilities on the Company's balance sheet as of December 31, 2022. This classification is reassessed each quarter.

Stock-based compensation

We use the Black-Scholes option pricing model to calculate the fair value of stock option awards on the grant date. The expected term of options granted represents the period of time for which the options are expected to be outstanding and is derived from our historical stock option exercise experience and option expiration data. For purposes of estimating the expected term, we have aggregated all individual option awards into one group, as we do not expect substantial differences in exercise behavior among our employees. The expected volatility is a measure of the amount by which our stock price is expected to fluctuate during the expected term of options granted. We determined the expected volatility based upon the historical volatility of our common stock over a period commensurate with the option's expected term. The risk-free interest rate is the implied yield available on U.S. treasury zero-coupon issues with a remaining term equal to the option's expected term on the grant date. We have never declared or paid any cash dividends on any of

our capital stock and do not expect to do so in the foreseeable future. Accordingly, we use an expected dividend yield of zero to calculate the grant-date fair value of a stock option.

The fair value for stock units, which include restricted stock units and performance stock units, is calculated using the closing price of the Company's common stock on the date of grant. We recognize compensation expense on awards that vest based on service conditions on a straight-line basis over the requisite service period based upon the number of options that are ultimately expected to vest, and accordingly, such compensation expense has been adjusted by an amount of estimated forfeitures. We recognize compensation expense on awards that vest based on performance conditions following our assessment of the probability that the performance condition will be achieved over the service period. Forfeitures represent only the unvested portion of a surrendered option. Forfeitures are estimated at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. Based on an analysis of historical data, we have calculated an 8% annual forfeiture rate for non-executive level employees, a 3% annual forfeiture rate for executive level employees, and a 0% forfeiture rate for non-employee members of the Board of Directors, which we believe are reasonable assumptions to estimate forfeitures. However, the estimation of forfeitures requires significant judgment and, to the extent actual results or updated estimates differ from our current estimates, a cumulative adjustment to stock-based compensation expense will be recorded in the period estimates are revised.

For the years ended December 31, 2022, 2021 and 2020, we recorded stock-based compensation expense of $27.3 million, $27.5 million and $17.0 million, respectively, for share-based awards granted under all of the Company's stock plans.

As of December 31, 2022, there was $63.9 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 3.01 years. We expect 2,071,467 unvested options and stock units to vest over the next five years.

Income taxes

Deferred taxes are determined based on the difference between the financial statement and tax basis of assets and liabilities using enacted tax rates in effect in the years in which the differences are expected to reverse. Valuation allowances are provided, if, based upon the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized. We account for uncertain tax positions using a "more-likely-than-not" threshold for recognizing and resolving uncertain tax positions. The evaluation of uncertain tax positions is based on factors including, but not limited to, changes in tax law, the measurement of tax positions taken or expected to be taken in tax returns, the effective settlement of matters subject to audit, new audit activity and changes in facts or circumstances related to a tax position. We evaluate our tax position on a quarterly basis. We also accrue for potential interest and penalties related to unrecognized tax benefits in income tax expense. We are subject to a territorial tax system under the Tax Cuts and Jobs Act enacted in December 2017, in which we are required to provide for tax on Global Intangible Low-Taxed Income ("GILTI") earned by certain foreign subsidiaries. We adopted an accounting policy to provide for the tax expense related to GILTI in the year the tax is incurred as a period expense.

In addition, we are subject to the continual examination of our income tax returns by the U.S. Internal Revenue Service ("IRS") and other domestic and foreign tax authorities. We expect future examinations to focus on our intercompany transfer pricing practices as well as other matters. We regularly assess the likelihood of outcomes resulting from these examinations to determine the adequacy of our provision for income taxes and have reserved for potential adjustments that may result from such examinations. We believe such estimates to be reasonable; however, the final determination of any of these examinations could significantly impact the amounts provided for income taxes in our consolidated financial statements.

Recent accounting standards update

See Note 2, *"Summary of Significant Accounting Policies – Recent Accounting Standards Updates,"* to our consolidated financial statements included in this report for more information.

Results of Operations

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 revenues for years ended December 31, 2022, 2021 and 2020 were comprised of the following:

	For the Years Ended December 31,			2022 vs 2021		2021 vs 2020	
	2022	2021	2020	$ Change	% Change	$ Change	% Change
	(Amounts in thousands, except for percentage data)						
Revenue:							
Product	$ 801,183	$ 670,319	$ 366,136	$ 130,864	19.5%	$ 304,183	83.1%
Royalty and other	353	215	124	138	64.2%	91	73.4%
Total revenue	$ 801,536	$ 670,534	$ 366,260	$ 131,002	19.5%	$ 304,274	83.1%

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. These direct sales have increased to approximately 88% of our total product revenue during 2022 from approximately 83% of our total product revenue in 2021. 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.

Product revenues were comprised of the following:

	For the Years Ended December 31,		
	2022	2021[1]	2020[2]
	(Amounts in thousands)		
Filtration products	$ 495,930	$ 403,505	$ 174,851
Chromatography products[3]	131,680	91,037	70,677
Process analytics products	53,512	48,019	33,346
Proteins products[3]	114,320	123,707	83,317
Other	5,741	4,051	3,945
Total product revenue	$ 801,183	$ 670,319	$ 366,136

(1) 2021 revenue for filtration products includes revenue related to Polymem from July 1, 2021, as well as BioFlex Solutions LLC ("BioFlex") and Newton T&M Corp ("NTM") from December 16, 2021 through December 31, 2021. 2021 revenue for proteins products includes revenue related to Avitide from September 20, 2021 through December 31, 2021.

(2) 2020 revenue for filtration products includes revenue related to Engineered Molding Technology LLC ("EMT") from July 13, 2020, Non-Metallic Solutions, Inc. ("NMS") from October 20, 2020, and ARTeSYN from December 3, 2020 through December 31, 2020.

(3) Revised 2020 revenue in the table above reflects a shift in product revenue from chromatography products to proteins products of approximately $3 million. This change is consistent with the 2022 and 2021 presentations of product revenue.

Revenue from the sale of our products which make up our filtration, chromatography, process analytics and proteins franchises comes from the sale of a number of products as described in Part I, Item 1. *"Business - Our Products"* of this report. Other revenue primarily consists of revenue from the sale of our operating room products to hospitals as well as freight revenue.

For 2022, product revenue increased by $130.9 million, or 19.5%, as compared to 2021, with robust demand for our filtration, chromatography and process analytics products in mAb and C&GT manufacturing, which are not related to the manufacturing of COVID-19 vaccines. There is continued adoption of our products by key bioprocessing customers across all key product lines, though we are seeing a deceleration in demand from customers focused on manufacturing COVID-19 vaccinations. We also experienced an

increase in revenue for 2022, compared to 2021, due to our 2021 acquisitions of Polymem, Avitide and BioFlex, which were acquired in July 2021, September 2021 and December 2021, respectively, and for which revenues related to these acquisitions were included in our results of operations from their respective date of acquisition.

For 2021, product revenue increased by $304.2 million, or 83.1%, as compared to 2020 with robust demand for our filtration, chromatography, process analytics and proteins products. The increase is due to the continued adoption of our products by key bioprocessing customers across all our key product lines. Beginning in the second quarter of 2020, we experienced an increase in overall sales as a result of accelerated demand across all our franchises due to the critical needs of customers working on COVID-19 vaccines and therapeutics. In addition, during 2021 we saw an increase in demand for C&GT and monoclonal antibody manufacturing. Revenue for 2021 also increased due to revenue from Polymem, Avitide, BioFlex and NTM, which we acquired during the second half of 2021. During 2021, we also include twelve months of revenue from our acquisitions executed in the second half of 2020, EMT, NMS and ARTeSYN, for which there was only a partial year of revenue commencing from the respective acquisition dates in 2020, through December 31, 2020.

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.

Royalty revenues

Royalty revenues for all periods presented relate to royalties received from a third-party systems manufacturer associated with our OPUS® chromatography columns. Royalty revenues are variable and are dependent on sales generated by our partner.

Costs and operating expenses

Total costs and operating expenses for the years ended December 31, 2022, 2021 and 2020 were comprised of the following:

	For the Years Ended December 31,			2022 vs 2021		2021 vs 2020	
	2022	2021	2020	$ Change	% Change	$ Change	% Change
	(Amounts in thousands, except for percentage data)						
Cost of product revenue	$ 345,830	$ 279,280	$ 156,634	$ 66,550	23.8%	$ 122,646	78.3%
Research and development	43,936	34,274	20,182	9,662	28.2%	14,092	69.8%
Selling, general and administrative	215,829	183,866	119,621	31,963	17.4%	64,245	53.7%
Contingent consideration expense	(28,729)	5,865	—	(34,594)	(589.8)%	5,865	100.0%
Total costs and operating expenses	$ 576,866	$ 503,285	$ 296,437	$ 73,581	14.6%	$ 206,848	69.8%

Cost of product revenue

Cost of product revenue for 2022 increased $66.6 million, or 23.8%, compared to 2021, due primarily to the increase in product revenue mentioned above and costs associated with higher product volume. Also, in order to support our growth and demand for our products, we continue to invest in our manufacturing infrastructure through an increase in headcount related to manufacturing and occupancy costs. In addition, we experienced cost inflation, primarily in raw materials as well as freight charges due to increased fuel costs and carrier market conditions in 2022, compared to 2021. Our depreciation expense increased in 2022, as compared to 2021, due to manufacturing equipment being placed into service throughout 2021 and 2022. In addition, cost of product revenue increased in 2022 due to the acquisitions of Polymem, Avitide and BioFlex in the second half of 2021 and for which expenses related to these acquisitions were included in our results of operations from their respective dates of acquisition.

Gross margin was 56.9% in 2022, as compared to 58.3% in 2021. The reduction in gross margin in 2022, as compared to the 2021, is due primarily to the increase in employee-related costs from a rise in manufacturing headcount, an increase in occupancy costs due to added capacity in 2021 and 2022 and an increase in depreciation expense, as mentioned above. The gross margin for 2021 also includes $2.1 million of amortization of inventory step-up associated with Polymem Acquisition and ARTeSYN Acquisition in 2020. Gross margins may fluctuate in future quarters based on actual production volume and product mix.

In 2021, cost of product revenue increased $122.6 million, or 78.3%, as compared to 2020, due primarily to the increase in product revenue and costs associated with higher product volume. In addition, to support our rapid growth and increased demand for our products, we

continued to invest in our manufacturing infrastructure through increased manufacturing headcount and increased occupancy costs. There was an approximately 84% increase in manufacturing headcount from December 31, 2020 to December 31, 2021, which resulted in higher employee-related costs. Our depreciation expense increased as manufacturing equipment was placed in service during 2021. The impact on cost of product revenue from our three acquisitions in 2021 was $7.4 million, which has also contributed to the increase in cost of product revenue as there were no comparable costs for these acquisitions in 2020.

Gross margin was 58.3% in 2021, as compared to 57.2% in 2020. The gross margin in 2021 included $2.1 million of amortization of inventory step-up associated with the Polymem Acquisition and ARTeSYN Acquisition and 2020 included $0.7 million of amortization of inventory step-up associated with the ARTeSYN Acquisition and the acquisition of EMT. Excluding the step-up amortization, gross margin for 2021 and 2020 was 58.7% and 57.4%, respectively. The increase in gross margin, excluding the inventory step-up amortization, in 2021, as compared to 2020, was due primarily to the increase in revenue mentioned above, and favorable product mix, partially offset by an increase in employee costs related to an increase in manufacturing headcount subsequent to December 31, 2020, an increase in occupancy costs due to added capacity in 2021 and an increase in depreciation expense mentioned above. 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.

R&D expenses in 2022 increased $9.7 million, or 28.2%, compared to 2021. The increase during the periods is primarily due to increased spending on new product development, increased employee-related costs due to additional headcount, increased depreciation related to R&D assets that were put into service and increased occupancy costs due to added capacity in 2021 and 2022. In addition, the increase in R&D costs in 2022, as compared to 2021, was due to the costs related to our 2021 acquisitions, primarily Polymem and Avitide in July 2021 and September 2021, respectively. R&D expenses increased $14.1 million, or 69.8%, during 2021, as compared to 2020. The increase was due to the addition of R&D expenses related to operations of Avitide, Polymem and ARTeSYN, from their respective acquisition dates to December 31, 2021, including a full year of costs related to ARTeSYN programs for which there were costs from one month in 2020. Additionally, R&D costs increased, due to a rise in R&D headcount and the ramp up of project spending for new product development during 2021.

R&D expense also includes investments made to expand our proteins product offering through our development agreement with Navigo Proteins GmbH ("Navigo"). The Company invested $2.6 million in 2022, $2.3 million in 2021 and $0.9 million in 2020 in the form of milestone payments to Navigo. We expect our R&D expenses in 2023 to modestly increase 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 2022, SG&A costs increased by $32.0 million, or 17.4%, as compared to 2021. The increase is partially due to 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 current and future growth. In addition, SG&A costs increased in 2022 due to the addition of Polymem, Avitide and BioFlex during the second half of 2021. A full year of costs from these acquisitions is included in SG&A expenses in 2022, but only from the date of each respective acquisition for fiscal year 2021. During 2021, SG&A costs increased by $64.2 million, or 53.7%, as compared to 2020. The increase is partially due to 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 and increased occupancy costs as well as an increase in depreciation related to assets placed in service during the year, all to support expected future growth. Employee-related costs during 2021, as compared to the same periods in 2020, resulted from the increase in headcount period over period. These costs include stock-based compensation expense, which

increased $9.1 million in 2021, as compared to 2020. In addition, SG&A costs increased in 2021, due to the addition of EMT, NMS and ARTeSYN in the second half of 2020 and the addition of Polymem, Avitide, BioFlex and NTM during the second half of 2021, for which there were no comparable costs in 2020.

Contingent consideration expense

Contingent consideration expense represents the change in fair value of the contingent consideration obligation included in current and noncurrent contingent consideration on the consolidated balance sheet as of the end of each period. Re-measurement of the contingent consideration obligation is done each quarter and the carrying value of the obligation is adjusted to the current fair value through our consolidated statement of comprehensive income. In 2022 and 2021, a change in market inputs and shifts in revenue and volume projections due to the expected timing of achievement over the three-year performance period resulted in adjustments to the fair value of the contingent consideration obligation for the years ended December 31, 2022 and 2021 of ($28.7) million and $5.9 million, respectively.

Other expenses, net

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

	For the Years Ended December 31,			2022 vs 2021		2021 vs 2020	
	2022	2021	2020	$ Change	% Change	$ Change	% Change
	(Amounts in thousands, except for percentage data)						
Investment income	$ 6,978	$ 176	$ 1,741	$ 6,802	3,864.8%	$ (1,565)	(89.9)%
Interest expense	(1,162)	(11,278)	(10,768)	10,116	(89.7)%	(510)	4.7%
Amortization of debt issuance costs	(1,815)	(1,436)	(1,365)	(379)	26.4%	(71)	5.2%
Other expenses	(9,531)	(1,168)	(214)	(8,363)	716.0%	(954)	445.8%
Total other expenses, net	$ (5,530)	$ (13,706)	$ (10,606)	$ 8,176	(59.7)%	$ (3,100)	29.2%

Investment income

Investment income includes income earned on invested cash balances and short-term investments. Our investment income increased by $6.8 million in 2022, compared to 2021, due to an increase in interest rates on average invested cash balances since December 31, 2021, as well as interest earned on U.S. treasury bills purchased in 2022. We expect investment income to vary based on changes in the amount of funds invested and fluctuation of interest rates. The decrease of $1.6 million in 2021, as compared to 2020, is attributable to a decrease in interest rates on our invested cash balances and to a decrease in our average invested cash balances. In March 2020, in response to the outbreak of COVID-19 and to stay ahead of disruptions and economic slowdown, the Federal Reserve reduced federal funds rates to a range of 0.0% to 0.25%, which affected our investment income.

Interest expense

Interest expense in 2022 and 2021 is primarily from the 2019 Notes, which were issued in July 2019. Interest expense in 2022 includes the contractual coupon interest on the 2019 Notes. In 2021, interest expense includes the amortization of the debt discount as well as the contractual coupon interest. As a result of our adoption of ASU 2020-06, *"Debt - Debt with Conversion Other Options (Subtopic 470-20) and Derivatives and Hedging - Contracts in Entity's Own Equity (Subtopic 815-40),"* effective January 1, 2022, the equity portion of the debt conversion feature recorded upon the issuance of the 2019 Notes, or the debt discount, was reversed along with the total amortization taken on that discount. Since there was no debt discount, no amortization was taken in 2022. Interest expense in 2021 and 2020 is primarily from our 2019 Notes. Interest expense, which includes the amortization of debt issuance costs and contractual coupon interest, increased $0.6 million in 2021, as compared to 2020. This is a result of the decrease in the balance of debt issuance costs that are being amortized. As these costs decrease, the carrying value of the debt increases and interest calculated based on the carrying value increases as well.

Amortization of debt issuance costs

In accounting for the transaction costs related to the issuance of the 2019 Notes, the Company allocated the total costs incurred to the liability and equity components of the 2019 Notes based on their relative values. Transaction costs attributable to the liability component

are amortized to amortization of debt issuance costs on the consolidated statements of comprehensive income. Amortization of debt issuance costs increased during 2022, as compared to 2021. This is a result of the decrease in the balance of debt issuance costs that are being amortized. As these costs decrease, the carrying value of the debt increases and interest calculated based on the carrying value increases as well.

Other expenses, net

The change in other expenses, net in 2022, compared to 2021, is primarily attributable to realized foreign currency losses related to transactions with customers and vendors.

The change in other expenses, net in 2021, as compared to 2020, is primarily attributable to realized foreign currency losses related to amounts due from non-Swedish krona-based customers and vendors.

Income tax provision (benefit)

Income tax provision (benefit) for the years ended December 31, 2022, 2021 and 2020 was as follows:

	For the Years Ended December 31,			2022 vs 2021		2021 vs 2020	
	2022	2021	2020	$ Change	% Change	$ Change	% Change
	(Amounts in thousands, except for percentage data)						
Income tax provision (benefit)	$ 33,181	$ 25,252	$ (709)	$ 7,929	31.4%	$ 25,961	(3,661.6)%
Effective tax rate	15.1%	16.4%	(1.2)%				

For 2022, we recorded an income tax provision of $33.2 million. The effective tax rate was 15.1% for 2022 and is based upon the income for the year ending December 31, 2022, and the composition of income in different jurisdictions. The difference in effective tax rates between 2022 and 2021 was primarily due to increased benefits from business tax credits and nontaxable contingent consideration partially offset by lower windfall benefits recognized on stock option exercises and vesting of stock units. Our effective tax rate for 2022 was lower than the U.S. statutory rate of 21% primarily due to business tax credits, windfall benefits on stock option exercises and the vesting of stock units, benefits from foreign-derived intangible income and nontaxable contingent consideration.

On August 16, 2022, the United States enacted the Inflation Reduction Act of 2022 ("IRA"), which, among other things, implements a 15% alternative minimum tax on global adjusted financial statement income of certain large corporations, a 1% excise tax on net stock repurchases and several tax incentives to promote clean energy and will become effective beginning in 2023. We evaluated the provisions of the IRA, and no provision had a material effect on our consolidated financial position or results of operations as of December 31, 2022.

For 2021, we recorded an income tax provision of $25.3 million. The effective tax rate in 2021 was 16.4% and is based upon the income for the year ending December 31, 2021, and the composition of income in different jurisdictions. The increase in effective tax rates was primarily due to higher income before income taxes, lower windfall benefits recognized on stock option exercises and the vesting of stock units, partially offset by lower U.S. taxation of foreign earnings. Our effective tax rate for 2021 was lower than the U.S. statutory rate of 21% primarily due to business tax credits and windfall benefits on stock option exercises and the vesting of stock units.

In 2020, we recorded an income tax benefit of $0.7 million. Our effective tax rate in 2020 was (1.2%) and was based upon the income for the year ending December 31, 2020, and the composition of income in different jurisdictions. Our effective tax rate in 2020 was lower than the U.S. statutory rate of 21% primarily due to windfall benefits on stock option exercises and the vesting of stock units.

Non-GAAP Financial Measures

In addition to our key financial metrics presented above, 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 measures to its most comparable GAAP financial measures are described below.

We include this financial information because we believe these measures are helpful to investors in providing a comparison of our financial results between periods that more accurately reflects how management reviews its financial results. We excluded the impact of certain acquisition-related items and items related to the issuance of conversion of our 2019 Notes 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 inventory step-up charges, acquisition and integration costs, contingent consideration fair value adjustments 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 years ended December 31, 2022 and 2021:

	For the Years Ended December 31,	
	2022	2021
	(Amounts in thousands)	
GAAP income from operations	$ 224,670	$ 167,249
Non-GAAP adjustments to income from operations:		
Inventory step-up charges	—	2,130
Acquisition and integration costs	9,253	18,001
Contingent consideration expense	(28,729)	5,865
Intangible amortization	27,016	21,941
Non-GAAP adjusted income from operations	$ 232,210	$ 215,186

Non-GAAP adjusted net income and adjusted earnings per share

Non-GAAP adjusted net income and adjusted earnings per share is measured by taking net income as reported in accordance with GAAP and excluding acquisition and integration costs, intangible asset amortization, inventory step-up charges, loss on conversion of debt, non-cash interest expense, amortization of debt issuance costs, contingent consideration fair value adjustments and the tax effects on these items. The following are reconciliations of net income and fully diluted earnings per share in accordance with GAAP to non-GAAP adjusted net income and adjusted fully diluted earnings per share for the years ended December 31, 2022 and 2021:

	For the Years Ended December 31,			
	2022		2021	
	Amount	Fully Diluted Earnings per Share*	Amount	Fully Diluted Earnings per Share*
	(Amounts in thousands, except per share data)			
GAAP net income	$ 185,959	$ 3.24	$ 128,291	$ 2.24
Non-GAAP adjustments to net income:				
Inventory step-up charges	—	—	2,130	0.04
Acquisition and integration costs	9,514	0.17	18,001	0.31
Contingent consideration expense	(28,729)	(0.50)	5,865	0.10
Intangible amortization	27,016	0.47	21,941	0.38
Loss on conversion of debt	—	—	13	0.00
Amortization of debt issuance costs[(1)]	1,815	0.03	1,436	0.02
Non-cash interest expense[(1)]	—	—	10,094	0.18
Tax effect on non-GAAP charges	(7,002)	(0.12)	(12,515)	(0.22)
Non-GAAP adjusted net income	$ 188,573	$ 3.28	$ 175,256	$ 3.06

(1) See Note 2, *"Summary of Significant Accounting Policies - Earnings Per Share,"* in this report, for more information on the effects of adopting ASU 2020-06, *"Debt - Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and*

Hedging - Contracts in Entity's Own Equity (Subtopic 815-40)," which we adopted effective January 1, 2022, to these financial statement line items.

* Note that earnings per share amounts 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 intangible amortization, acquisition and integration costs, inventory step-up charges, loss on conversion of debt and contingent consideration fair value adjustments booked through our consolidated statements of comprehensive income. The following is a reconciliation of net income in accordance with GAAP to adjusted EBITDA for years ended December 31, 2022 and 2021:

	For the Years Ended December 31,	
	2022	2021
	(Amounts in thousands)	
GAAP net income	$ 185,959	$ 128,291
Non-GAAP EBITDA adjustments to net income:		
Investment income	(6,978)	(176)
Interest expense	1,162	1,184
Non-cash interest expense	—	10,094
Amortization of debt issuance costs	1,815	1,436
Income tax provision	33,181	25,252
Depreciation	23,859	16,395
Amortization	27,126	22,052
EBITDA	266,124	204,528
Other non-GAAP adjustments:		
Inventory step-up charges	—	2,130
Acquisition and integration costs	9,514	18,001
Contingent consideration expense	(28,729)	5,865
Loss on conversion of debt	—	13
Adjusted EBITDA	$ 246,909	$ 230,537

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 in July 2019 and the issuance of common stock in our December 2020, July 2019 and May 2019 public offerings. Our revenue for the foreseeable future will primarily be limited to our bioprocessing product revenue.

At December 31, 2022, we had cash and cash equivalents of $523.5 million compared to cash and cash equivalents of $603.8 million at December 31, 2021. Our cash equivalents and short-term investments held to maturity portfolio as of December 31, 2022, consisted of money market funds and U.S. treasury securities. In December 2022, we invested $100.0 million in short-term U.S. treasury bills which we classified as held to maturity because we have the positive intent and ability to hold until maturity. There were no restrictions on cash as of December 31, 2022.

On September 19, 2022, we entered into the Daylight Agreement, giving us exclusive license and commercialization rights to use certain technology and intellectual property subject to conditions set forth in the Daylight Agreement. We agreed to pay Daylight (i) an initial, one-time, non-refundable, non-creditable upfront cash payment and (ii) certain quarterly royalty payments.

In 2021 we acquired three companies for an aggregate of $149.9 million in cash, net of cash acquired. In connection with the acquisitions, the Company has an obligation to pay up to $62.5 million (undiscounted) in contingent consideration earnout payments in cash over a three-year performance period beginning January 1, 2022 and ending December 31, 2024. See Note 3, *"Fair Value Measurements,"* and Note 4, *"Acquisitions,"* for additional information. In 2020, we acquired three companies for an aggregate of $175.0 million in cash, net of cash acquired. All obligations related to these acquisitions have been settled.

On July 19, 2019, the Company issued $287.5 million aggregate principal amount of 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" and, together with the July 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 13, *"Convertible Senior Notes,"* included in this report for more information on this transaction.

During the fourth quarter of 2022, the closing price of the Company's common stock exceeded 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. As a result, the 2019 Notes are convertible at the option of the holders of the 2019 Notes during the first quarter of 2023 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 $284.6 million. The Company expects to continue meeting these terms and has again classified the carrying value of the 2019 Notes as current liabilities on the Company's balance sheet as of December 31, 2022 and 2021. As of the date of this filing, the Company has received requests to convert $30,000 aggregate principal amount of 2019 Notes all of which have been settled. Under the Second Supplemental Indenture to the Base Indenture which we entered into on March 4, 2022, we irrevocably elected to pay the settlement amount to be determined in cash – paying the amount in excess of the aggregate principal portion of the converted notes in shares of our common stock.

In 2022, we had lease arrangements for certain equipment and facilities including corporate and manufacturing sites. As of December 31, 2022, the Company had fixed lease payment obligations of $138.3 million, with $7.0 million payable within 12 months. See Note 5, *"Leases"*, for additional information.

In 2022, we had other purchase obligations primarily consisting of purchase commitments with certain vendors and open purchase orders for the procurement of raw materials for manufacturing. As of December 31, 2022, the Company had other purchase obligations of $72.1 million, payable within 12 months.

Cash flows

	For the Years Ended December 31,			2022 vs 2021	2021 vs 2020
	2022	2021	2020	$ Change	$ Change
	(Amounts in thousands)				
Cash provided by (used in):					
Operating activities	$ 172,083	$ 119,016	$ 62,625	$ 53,067	$ 56,391
Investing activities	(233,236)	(221,169)	(201,385)	(12,067)	(19,784)
Financing activities	(13,337)	961	305,916	(14,298)	(304,955)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(5,866)	(12,286)	12,729	6,420	(25,015)
Net (decrease) increase in cash, cash equivalents and restricted cash	$ (80,356)	$ (113,478)	$ 179,885	$ 33,122	$ (293,363)

Operating activities

For 2022, our operating activities provided cash of $172.1 million reflecting net income of $186.0 million and non-cash charges totaling $49.9 million primarily related to depreciation, amortization, contingent consideration adjustments, amortization of debt discount and issuance costs, deferred income taxes and stock-based compensation charges. An increase in accounts receivable consumed $3.6 million of cash and was primarily driven by the 19.5% year-to-date increase in revenue in 2022, as compared to 2021. Additionally, we had an increase in inventory manufactured of $57.2 million to support expected increases in future revenue. Accounts payable decreased $8.2 million due to the timing of payments to vendors and accrued expenses decreased $2.0 million due to corporate income taxes paid. Offsetting these uses of cash was a $4.1 million net increase in operating lease liabilities due to new operating leases entered into during 2022 and a $2.4 million decrease in prepaid expenses, including corporate income taxes. The remaining cash used in operating activities resulted from unfavorable changes in various other working capital accounts.

For 2021, our operating activities provided cash of $119.0 million reflecting net income of $128.3 million and non-cash charges totaling $92.9 million primarily related to depreciation, amortization, inventory step-up amortization, contingent consideration expense, deferred income taxes, amortization of debt discount and issuance costs and stock-based compensation charges. An increase in accounts receivable consumed $46.5 million of cash and was primarily driven by the 83.1% year-to-date increase in total revenues. An increase in

inventory manufactured of $89.8 million supports expected increases in future revenue and an increase in prepaid expenses, specifically insurance and taxes of $10.2 million. The increases in accounts receivable, prepaid expenses and inventory manufactured are offset by an increase in accounts payable of $19.5 million, which is primarily due to increased inventory purchases to support customer orders, an increase in accrued liabilities of $23.2 million, which was due to an increase in the accrual for expected costs, taxes payable, and to a decrease in deferred revenue related to products shipped during the first half of 2021. The remaining net cash used in operating activities resulted from unfavorable changes in various other working capital accounts.

For 2020, our operating activities provided cash of $62.6 million reflecting net income of $59.9 million and non-cash charges totaling $51.3 million primarily related to depreciation, amortization, non-cash interest expense, deferred taxes and stock-based compensation charges. An increase in accounts receivable consumed $21.0 million of cash and was primarily driven by the 35.5% year-to-date increase in total revenues and an increase in inventory manufactured of $29.3 million to support expected continued growth in future revenues. In addition, $4.9 million was consumed for increases in prepaid expenses for annual software and network contracts, as well as the renewal of the Company's global insurance policies. These were offset by an increase in accounts payable and accrued liabilities of $3.5 million due primarily to increased inventory purchases to support customer orders and year-end tax adjustments, offset by payment of acquisition-related bonuses for C Technologies, Inc. during the second quarter of 2020. The remaining cash source of operating activities resulted from favorable changes in various other working capital accounts.

Investing activities

Our investing activities consumed $233.2 million of cash during 2022, mainly due to $88.3 million of capital expenditures in 2022 as we continue to increase our manufacturing capacity worldwide. Of these expenditures, $3.5 million represented capitalized costs related to our internal-use software for 2022. In addition, in September 2022, the Company paid a one-time, non-refundable, non-creditable upfront payment to Daylight as required under the Daylight Agreement for the commercialization and sale of Culpeo®QCL-IR Liquid Analyzer. In December 2022, the Company invested $100.0 million in short-term U.S. treasury securities.

Our investing activities consumed $221.2 million of cash during 2021. We used $149.9 million in cash (net of cash received) for the acquisitions of Polymem, Avitide, BioFlex and NTM, in the aggregate. Capital expenditures consumed $71.3 million as we continue to increase our manufacturing capacity worldwide. Of these expenditures, $4.2 million represented capitalized costs related to our internal-use software.

Our investing activities consumed $201.4 million of cash during 2020. We used $175.0 million in cash (net of cash received) for the EMT, NMS and ARTeSYN Acquisitions. Capital expenditures consumed $26.3 million as we continue to increase our manufacturing capacity worldwide. Of these expenditures, $3.9 million represented capitalized costs related to our internal-use software.

Financing activities

Our financing activities consumed $13.3 million of cash in 2022, which included cash disbursed in relation to shares withheld to cover employee income tax due upon the vesting and release of restricted stock units of $17.0 million. This was partially offset by proceeds received from stock option exercises during the period of $3.7 million. In 2021, cash provided by financing activities of $1.0 million included proceeds from stock option exercises, offset by cash disbursed in relation to shares withheld to cover employee income taxes due upon the vesting and release of restricted stock units. Proceeds from stock option exercises during 2021 were $3.9 million offset by $2.9 million of cash disbursed to pay tax obligation on the vesting of restricted stock units.

In 2020, cash provided by financing activities of $305.9 million included $297.8 million from the issuance of our common stock resulting from our public offerings completed in December 2020. Proceeds from stock option exercises during 2020 were $8.2 million.

Effect of exchange rate changes on cash, cash equivalents and restricted cash

The effect of exchange rate changes on cash during 2022 is a result of the weakening of the Swedish krona against the U.S. dollar by 15%, the weakening of the Euro against the U.S. dollar by 6% and the weakening of the British pound against the U.S. dollar by 12%.

Off-Balance Sheet Arrangements

We do not have any special purpose entities or off-balance sheet financing arrangements.

Capital Requirements

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 and successfully integrate them into our business;
- our ability to acquire additional bioprocessing products;
- the scope of and progress made in our R&D activities;
- the scope of investment in our intellectual property portfolio;
- contingent consideration earnout payments resulting from our acquisitions;
- the extent of any share repurchase activity;
- the success of any proposed financing efforts;
- general economic and capital markets;
- change in accounting standards;
- the impact of inflation on our operations, including our expenditures on raw material and freight charges;
- fluctuations in foreign currency exchange rates; and
- costs associated with our ability to comply with emerging environmental, social and governance standards.

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. We expect operating expenses in 2023 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, for example, due to acquisition-related financing needs or lower demand for our products, among potential other events, 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 shareholders, 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.

Net Operating Loss Carryforwards

At December 31, 2022, we had federal net operating loss carryforwards of $42.9 million, state net operating loss carryforwards of $0.8 million, and foreign net operating loss carryforwards of $4.9 million. Federal net operating loss carryforwards of $7.3 million will expire at various dates through 2037. The state net operating loss carryforwards will expire at various dates through 2041, while the foreign net operating loss carryforwards do not expire. The other $35.6 million of federal net operating loss carryforwards have unlimited carryforward periods. We had business tax credits carryforwards of $3.8 million available to reduce future federal and state income

taxes, if any. The business tax credits carryforwards will expire at various dates through December 2042. 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.

Foreign Earnings

As of December 31, 2022, we have accumulated undistributed earnings generated by our foreign subsidiaries of approximately $148.2 million. Because $5.7 million of such earnings have previously been subject to the one-time transition tax on foreign earnings required by the Tax Cuts and Jobs Act enacted in December 2017, any additional taxes due with respect to such earnings or the excess of the amount for financial reporting over the tax basis of our foreign investments would generally be limited to foreign and state taxes. At December 31, 2022, we have not provided for taxes on outside basis differences of our foreign subsidiaries as it is not practicable and we have the ability and intent to indefinitely reinvest the undistributed earnings of our foreign subsidiaries, and there are no needs for such earnings in the United States that would contradict our plan to indefinitely reinvest.

Effects of Inflation

Our assets are primarily monetary, consisting of cash and 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, fixtures and office equipment, computer hardware and software 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.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

We are exposed to market risk in the ordinary course of our business. Market risk represents the risk of loss that may impact our financial position due to adverse changes in financial market prices and rates. Our market risk exposure is primarily a result of fluctuations in interest rates and foreign currency exchange rates.

Interest Rate Risk

We have historically held investments in commercial paper, U.S. treasury and government 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. Our investment portfolio consists of cash and cash equivalents (cash and money market funds) that total $523.5 million and marketable securities (U.S. treasury bills) of $100.3 million within short-term marketable securities on the consolidated balance sheet as of December 31, 2022.

Our cash equivalent investments (money market funds) have short-term maturity periods that dampen the impact of market or interest rate risk. Our marketable securities consist of U.S. treasury bills with a short term maturity period of 180 days. As a result, a hypothetical 100 basis point increase in interest rates would have no effect on our cash position as of December 31, 2022.

We manage our investment portfolio in accordance with our investment policy or approval by the Board of Directors. The primary objectives of our investment policy are to preserve principal, maintain a high degree of liquidity to meet operating and other needs, and obtain competitive returns subject to prevailing market conditions without significantly increasing risk. To achieve this objective, we maintain our portfolio of cash equivalents and marketable securities in high-quality securities, including money market funds and U.S. treasury bills. The marketable securities are classified as held-to-maturity and consequently are recorded at amortized cost on our consolidated balance sheet in accordance with accounting principles generally accepted in the United States. We do not expect any material loss 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 kronor, Euro and Chinese

yuan. 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.

Although a majority of our contracts are denominated in U.S. dollars, 38.2% and 37.5% of total revenues were denominated in foreign currencies during 2022 and 2021, respectively.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

Financial statements and supplementary data required by Item 8 are set forth at the pages indicated in Item 15(a) below and are incorporated herein by reference.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE.

None.

ITEM 9A. CONTROLS AND PROCEDURES

(a) Disclosure Controls and Procedures.

The Company's management, with the participation of our principal executive officer and 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 and as required by paragraph (b) of Rules 13a-15 or 15d-15 under the Exchange Act) as of the end of the period covered by this report. Based on such evaluation, our 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.

(b) Report of Management on Internal Control Over Financial Reporting.

Management of the Company is responsible for establishing and maintaining adequate internal control over financial reporting. Internal control over financial reporting is defined in Rule 13a-15(f) and 15d-15(f) under the Exchange Act as a process designed by, or under the supervision of, the Company's principal executive and principal financial officers and effected by the Company's Board of Directors, management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with U.S. generally accepted accounting principles and includes those policies and procedures that:

- pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of the assets of the Company;
- provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company; and
- provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the Company's assets that could have a material effect on the financial statements.

Management assessed the effectiveness of the Company's internal control over financial reporting as of December 31, 2022. In making this assessment, management used the criteria established in *Internal Control – Integrated Framework*, issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (COSO).

In connection with our initiative to integrate and enhance our global information technology systems and business processes, we continued the phased implementation of a new enterprise resource planning ("ERP") system. The Company is implementing the ERP system in phases and will continue until all current and future subsidiaries are using it. The fourth phase of implementation was completed during the first quarter of 2022. In addition, we completed the implementation of a lease accounting system, LeaseQuery, during the first quarter of 2022. As a result of these implementations, we modified certain existing internal controls over financial reporting as well as implemented new controls and procedures related to the new ERP system and LeaseQuery system as of December 31, 2022.

Other than the foregoing, 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 December 31, 2022 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Subject to the foregoing, based on this assessment, our management concluded that, as of December 31, 2022, our internal control over financial reporting is effective based on those criteria. Ernst & Young LLP, the independent registered public accounting firm that audited our financial statements included in this Form 10-K, has issued an attestation report on our internal control over financial reporting as of December 31, 2022.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Projections of any evaluation of effectiveness to future periods are subject to the risks that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

(c) Attestation Report of the Independent Registered Public Accounting Firm.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Repligen Corporation:

Opinion on Internal Control over Financial Reporting

We have audited Repligen Corporation's internal control over financial reporting as of December 31, 2022, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). In our opinion, Repligen Corporation (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2022, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2022 and 2021, the related consolidated statements of comprehensive income, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2022, and the related notes and our report dated February 22, 2023 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Report of Management on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed 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. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Ernst & Young LLP

Boston, Massachusetts
February 22, 2023

(d) Changes in Internal Control Over Financial Reporting

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 December 31, 2022 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

Not applicable.

PART III

Pursuant to General Instructions G to Form 10-K, the information required for Part III, Items 10, 11, 12, 13 and 14, is incorporated herein by reference from the Company's proxy statement for the 2023 Annual Meeting of Stockholders.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

The following documents are filed as part of this Form 10-K:

(a) (1) *Financial Statements*:

The financial statements required by this item are submitted in a separate section beginning on page 65 of this report, as follows:

(a) (2) *Financial Statement Schedules*:

None.

(a) (3) *Exhibits*:

The Exhibits which are filed as part of this Form 10-K or which are incorporated by reference are set forth in the Exhibit Index hereto.

EXHIBIT INDEX

Exhibit Number	Document Description
2.1#	Stock Purchase Agreement, dated April 25, 2019, by and among Repligen Corporation, C Technologies and Craig Harrison (filed as Exhibit 2.1 to Repligen Corporation's Current Report on Form 8-K filed on April 26, 2019 and incorporated herein by reference).
3.1	Restated Certificate of Incorporation dated June 30, 1992, as 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	Third Amended and Restated Bylaws (filed as Exhibit 3.1 to Repligen Corporation's Current Report on Form 8-K filed on January 28, 2021 and incorporated herein by reference).
4.1	Specimen Stock Certificate (filed as Exhibit 4.1 to Repligen Corporation's Annual Report on Form 10-K for the year ended March 31, 2002 and incorporated herein by reference).
4.2	Base Indenture, dated as of July 19, 2019, by and between Repligen Corporation and Wilmington Trust, National Association (filed as Exhibit 4.1 to Repligen Corporation's Current Report on Form 8-K filed on July 22, 2019 and incorporated herein by reference).
4.3	First Supplemental Indenture, dated as of July 19, 2019, by and between Repligen Corporation and Wilmington Trust, National Association (filed as Exhibit 4.2 to Repligen Corporation's Current Report on Form 8-K filed on July 22, 2019 and incorporated herein by reference).
4.4	Second Supplemental Indenture, dated as of March 4, 2022, by and between Repligen Corporation and Wilmington Trust, National Association, as trustee (filed as Exhibit 4.1 to Repligen Corporation's Form 8-K filed on March 8, 2022).
4.5	Form of 0.375% Convertible Senior Note due 2024 (included in Exhibit 4.3).
4.6	Description of Certain Registrant's Securities (filed as Exhibit 4.5 to Repligen Corporation's Annual Report on Form 10-K for the year ended December 31, 2019 and incorporated by reference).
10.1*	Repligen Executive Incentive Compensation Plan (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on December 14, 2005 and incorporated herein by reference).
10.2*	Second Amended and Restated 2001 Repligen Corporation Stock Plan (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on September 18, 2008 and incorporated herein by reference).
10.3.1*	Amended and Restated 2001 Repligen Corporation Stock Option Plan, Form of Incentive Stock Option Agreement (filed as Exhibit 10.14 to Repligen Corporation's Annual Report on Form 10-K for the year ended March 31, 2005 and incorporated herein by reference).
10.3.2*	Amended and Restated 2001 Repligen Corporation Stock Plan, Form of Restricted Stock Agreement (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on January 9, 2006 and incorporated herein by reference).
10.4	Lease Between Repligen Corporation as Tenant and West Seyon LLC as Landlord, 35 Seyon Street, Waltham, MA (as amended to date) (filed as Exhibit 10.4 to Repligen Corporation's Annual Report on Form 10-K for the year ended December 31, 2019 and incorporated herein by reference).

10.5#	Strategic Supplier Alliance Agreement dated January 28, 2010 by and between Repligen Corporation and GE Healthcare Bio-Sciences AB (as amended to date) (filed as Exhibit 10.1 to Repligen Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2016 and incorporated herein by reference).
10.6*	Repligen Corporation Amended and Restated 2012 Stock Option and Incentive Plan (filed as Exhibit 99.1 to Repligen Corporation's Form S-8 filed on June 2, 2014 and incorporated herein by reference).
10.7*	Letter Agreement, dated as of June 10, 2014, by and between Repligen Corporation and Jon K. Snodgres (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on July 15, 2014 and incorporated herein by reference).
10.8*+	Repligen Corporation Amended and Restated Non-Employee Directors' Compensation Policy.
10.9	Form of Indemnification Agreement (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on May 12, 2016 and incorporated herein by reference).
10.10	Lease Agreement, dated February 6, 2018, by and between Repligen Corporation and U.S. REIF 111 Locke Drive Massachusetts, LLC (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on February 8, 2018 and incorporated herein by reference).
10.11*	2018 Repligen Corporation Stock Option and Incentive Plan (filed as Exhibit 10.1 to Repligen Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2018 and incorporated herein by reference).
10.12*	Letter Agreement, dated as of September 3, 2016 by and between Repligen Corporation and Ralf Kuriyel (filed as Exhibit 10.17 to Repligen Corporation's Annual Report on Form 10-K for the year ended December 31, 2018 and incorporated herein by reference).
10.13*	Repligen Corporation Amended and Restated Severance and Change in Control Plan, effective as of May 26, 2022 (filed as Exhibit 10.1 to Repligen Corporation's Form 8-K filed June 1, 2022).
10.14*	Third Amendment and Restated Employment Agreement, dated as of May 26, 2022, by and between Repligen Corporation and Tony J. Hunt (filed as Exhibit 10.2 to Repligen Corporation's Form 8-K filed June 1, 2022).
10.15	First Amendment to Lease Agreement, dated as of July 7, 2020 by and between Repligen Corporation and U.S. REIF 111 Locke Drive Massachusetts, LLC (filed as Exhibit 10.1 to Repligen Corporation's Current Report on Form 8-K filed on July 10, 2020 and incorporated herein by reference).
10.16*	Repligen Corporation 2018 Stock Option and Incentive Plan, Sub-Plan for French-Qualified Restricted Stock Units (filed as Exhibit 10.1 to Repligen Corporation's Form 10-Q for the quarter ended June 30, 2021 and incorporated herein by reference).
21.1+	Subsidiaries of the Registrant.
23.1+	Consent of Ernst & Young LLP, Independent Registered Accounting Firm.
24.1+	Power of Attorney (included on signature page).
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+	Inline XBRL Instance Document-the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.
101.SCH+	Inline XBRL Taxonomy Extension Schema 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.*).

Confidential treatment obtained as to certain portions.
* Management contract or compensatory plan or arrangement.
+ Filed electronically herewith.

The exhibits listed above are not contained in the copy of the Annual Report on Form 10-K distributed to stockholders. Upon the request of any stockholder entitled to vote at the 2023 Annual Meeting, the Registrant will furnish that person without charge a copy of any exhibits listed above. Requests should be addressed to Repligen Corporation, 41 Seyon Street, Waltham, MA 02453.

ITEM 16. 10-K SUMMARY

We may voluntarily include a summary of information required by Form 10-K under Item 16. We have elected not to include such summary information.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) 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: February 22, 2023

By: /S/ TONY J. HUNT

Tony J. Hunt

President and Chief Executive Officer

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below hereby makes, constitutes and appoints Tony J. Hunt and Jon K. Snodgres with full power to act without the other, his true and lawful attorney-in-fact and agent, with full power of substitution and resubstitution, for him and in his name, place and stead, in any and all capacities to sign any or all amendments to this Form 10-K, and to file the same with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorney-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that said attorney-in-fact and agents of any of them, or any substitute or substitutes, lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/S/ TONY J. HUNT **Tony J. Hunt**	President, Chief Executive Officer and Director (Principal executive officer)	February 22, 2023
/S/ JON K. SNODGRES **Jon K. Snodgres**	Chief Financial Officer (Principal financial and accounting officer)	February 22, 2023
/S/ KAREN DAWES **Karen Dawes**	Chairperson of the Board	February 22, 2023
/S/ NICOLAS M. BARTHELEMY **Nicolas M. Barthelemy**	Director	February 22, 2023
/S/ CARRIE EGLINTON MANNER **Carrie Eglinton Manner**	Director	February 22, 2023
/S/ KONSTANTIN KONSTANTINOV **Konstantin Konstantinov**	Director	February 22, 2023
/S/ MARTIN D. MADAUS **Martin D. Madaus**	Director	February 22, 2023
/S/ ROHIN MHATRE **Rohin Mhatre**	Director	February 22, 2023
/S/ GLENN P. MUIR **Glenn P. Muir**	Director	February 22, 2023

INDEX TO FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Repligen Corporation:

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Repligen Corporation (the Company) as of December 31, 2022 and 2021, the related consolidated statements of comprehensive income, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2022, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2022 and 2021, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2022, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2022, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) and our report dated February 22, 2023 expressed an unqualified opinion thereon.

Adoption of ASU No. 2020-06

As discussed in Note 2 to the consolidated financial statements, the Company changed its method for accounting for convertible debt in 2022 due to the adoption of ASU No. 2020-06, *Debt - Debt with Conversion and Other Options (Subtopic 470-20).*

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the US federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matter

The critical audit matter communicated below is a matter arising from the current period audit of the financial statements that was communicated or required to be communicated to the audit committee and that: (1) relates to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective or complex judgments. The communication of the critical audit matter does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Valuation of contingent consideration

Description of the Matter	As disclosed in Note 4 to the consolidated financial statements under the caption "Acquisitions" and Note 3 under the caption "Fair Value Measurements", during 2021, the Company completed the acquisition of Avitide, Inc. for consideration of approximately $246.3 million, net of cash acquired. The Company recognized a

contingent consideration liability at the estimated fair value on the acquisition date in connection with applying the acquisition accounting for business combinations. Subsequent changes to the fair value of the contingent consideration liability are recorded within the consolidated statement of comprehensive income in the period of change. At December 31, 2022, the Company had a $65.5 million contingent consideration liability, which represented a 'Level 3' fair value measurement in the fair value hierarchy due to the significant unobservable inputs used in determining the fair value and the use of management judgement about the assumptions market participants would use in pricing the liability.

Auditing the Company's accounting for its contingent consideration liability was complex and required significant auditor judgment due to the use of a Monte Carlo simulation model and the high degree of subjectivity in evaluating certain assumptions required to estimate the fair value of contingent payments. In particular, the fair value measurement was sensitive to the significant assumptions underlying future revenue and production forecasts, as well as, the probability of achieving such forecasts. These significant assumptions are forward looking and could be affected by future economic and market conditions.

How We Addressed the Matter in Our Audit

We obtained an understanding, evaluated the design and tested the operating effectiveness of controls over the Company's contingent consideration liability process including, among others, management's process to establish the significant assumptions and measure the liability. Our tests included controls over management's review of assumptions used in the valuation model.

To test the estimated fair value of the contingent consideration liability, our audit procedures included, among others, inspecting the terms of the executed purchase agreement, assessing the Monte Carlo simulation model used and testing the key contractual inputs and significant assumptions discussed above. We performed audit procedures that included, among others, evaluating the Company's selection of the valuation methodology, evaluating the methods and significant assumptions used by the Company, and evaluating the completeness and accuracy of the underlying data supporting the significant assumptions and estimates. This includes comparing the significant assumptions to current industry, market and economic trends, to the historical results of the acquired business and to other guidelines used by companies within the same industry. We involved our valuation professionals to assist in our evaluation of the methodology used by the Company and significant assumptions included in the fair value estimates.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2002

Boston, Massachusetts
February 22, 2023

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

	December 31, 2022	December 31, 2021
ASSETS		
Current assets:		
Cash and cash equivalents	$ 523,458	$ 603,814
Marketable securities held to maturity	100,299	—
Accounts receivable, net of reserves of $1,365 and $1,417 at December 31, 2022 and December 31, 2021, respectively	116,247	117,420
Inventories, net	238,277	184,494
Prepaid expenses and other current assets	19,837	25,949
Total current assets	998,118	931,677
Noncurrent assets:		
Property, plant and equipment, net	190,673	124,964
Intangible assets, net	353,676	337,274
Goodwill	855,513	860,362
Deferred tax assets	840	1,903
Operating lease right of use assets	125,023	101,559
Other noncurrent assets	815	615
Total noncurrent assets	1,526,540	1,426,677
Total assets	$ 2,524,658	$ 2,358,354
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 27,554	$ 36,203
Operating lease liability	6,957	8,303
Current contingent consideration	13,950	—
Accrued liabilities	71,120	75,498
Convertible Senior Notes, net	284,615	255,258
Total current liabilities	404,196	375,262
Noncurrent liabilities:		
Deferred tax liabilities	23,000	33,480
Noncurrent operating lease liability	131,389	102,492
Noncurrent contingent consideration	51,559	94,238
Other noncurrent liabilities	3,814	2,815
Total noncurrent liabilities	209,762	233,025
Total liabilities	613,958	608,287
Commitments and contingencies (Note 12)		
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; 55,557,698 shares at December 31, 2022 and 55,321,457 shares at December 31, 2021 issued and outstanding	556	553
Additional paid-in capital	1,547,266	1,572,340
Accumulated other comprehensive loss	(34,394)	(16,886)
Accumulated earnings	397,272	194,060
Total stockholders' equity	1,910,700	1,750,067
Total liabilities and stockholders' equity	$ 2,524,658	$ 2,358,354

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

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

	For the Years Ended December 31,		
	2022	2021	2020
Revenue:			
Products	$ 801,183	$ 670,319	$ 366,136
Royalty and other revenue	353	215	124
Total revenue	801,536	670,534	366,260
Costs and operating expenses:			
Cost of product revenue	345,830	279,280	156,634
Research and development	43,936	34,274	20,182
Selling, general and administrative	215,829	183,866	119,621
Contingent consideration	(28,729)	5,865	—
Total costs and operating expenses	576,866	503,285	296,437
Income from operations	224,670	167,249	69,823
Other (expenses) income:			
Investment income	6,978	176	1,741
Interest expense	(1,162)	(11,278)	(10,768)
Amortization of debt issuance costs	(1,815)	(1,436)	(1,365)
Other expenses	(9,531)	(1,168)	(214)
Other expenses, net	(5,530)	(13,706)	(10,606)
Income before income taxes	219,140	153,543	59,217
Income tax provision (benefit)	33,181	25,252	(709)
Net income	$ 185,959	$ 128,291	$ 59,926
Earnings per share:			
Basic	$ 3.35	$ 2.33	$ 1.14
Diluted	$ 3.24	$ 2.24	$ 1.11
Weighted average common shares outstanding:			
Basic	55,460	55,015	52,554
Diluted	57,455	57,264	53,892
Net income	$ 185,959	$ 128,291	$ 59,926
Other comprehensive income (loss):			
Foreign currency translation adjustment	(17,508)	(18,971)	17,112
Comprehensive income	$ 168,451	$ 109,320	$ 77,038

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

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

	Common Stock					
	Number of Shares (#)	Par Value	Additional Paid-In Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Earnings/ (Deficit)	Total Stockholders' Equity
Balance at December 31, 2019	52,078,258	$ 521	$ 1,068,431	$ (15,027)	$ 5,843	$ 1,059,768
Net income	—	—	—	—	59,926	59,926
Exercise of stock options and vesting of stock units	584,589	6	8,134	—	—	8,140
Issuance of common stock pursuant to the acquisition of ARTeSYN Biosolutions	372,990	4	69,418	—	—	69,422
Proceeds from issuance of common stock, net of issuance costs of $0.4 million	1,725,000	17	297,758	—	—	297,775
Stock-based compensation expense	—	—	17,007	—	—	17,007
Translation adjustment	—	—	—	17,112	—	17,112
Balance at December 31, 2020	54,760,837	$ 548	$ 1,460,748	$ 2,085	$ 65,769	$ 1,529,150
Net income	—	—	—	—	128,291	128,291
Issuance of common stock for debt conversion	7	0	2	—	—	2
Exercise of stock options and vesting of stock units	300,721	3	3,876	—	—	3,879
Issuance of common stock pursuant to the acquisition of Avitide Inc.	271,096	2	82,966	—	—	82,968
Tax withholding on vesting of restricted stock	(11,204)	(0)	(2,897)	—	—	(2,897)
Stock-based compensation expense	—	—	27,500	—	—	27,500
True-up of costs related to the December 2020 issuance of common stock	—	—	145	—	—	145
Translation adjustment	—	—	—	(18,971)	—	(18,971)
Balance at December 31, 2021	55,321,457	$ 553	$ 1,572,340	$ (16,886)	$ 194,060	$ 1,750,067
Net income	—	—	—	—	185,959	185,959
Issuance of common stock for debt conversion	21	1	(7)	—	—	(6)
Exercise of stock options and vesting of stock units	326,192	3	3,704	—	—	3,707
Tax withholding on vesting of restricted stock	(89,972)	(1)	(17,017)	—	—	(17,018)
Stock-based compensation expense	—	—	27,316	—	—	27,316
Impact of the adoption of ASU 2020-06	—	—	(39,070)	—	17,253	(21,817)
Translation adjustment	—	—	—	(17,508)	—	(17,508)
Balance at December 31, 2022	55,557,698	$ 556	$ 1,547,266	$ (34,394)	$ 397,272	$ 1,910,700

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

REPLIGEN CORPORATION
CONSOLIDATED STATEMENTS OF CASH FLOWS
(Amounts in thousands)

	For the Years Ended December 31,		
	2022	2021	2020
Cash flows from operating activities:			
Net income	$ 185,959	$ 128,291	$ 59,926
Adjustments to reconcile net income to net cash provided by operating activities:			
Inventory step-up charges	—	2,130	734
Depreciation and amortization	50,985	38,447	27,067
Amortization of debt discount and issuance costs	1,815	11,530	10,970
Stock-based compensation expense	27,316	27,500	17,007
Contingent consideration expense	(28,729)	5,865	—
Deferred income taxes, net	(1,352)	6,517	(3,992)
Other	(100)	864	267
Changes in operating assets and liabilities, excluding impact of acquisitions:			
Accounts receivable	(3,596)	(46,523)	(20,892)
Inventories	(57,204)	(89,781)	(29,994)
Prepaid expenses and other assets	2,396	(10,192)	(4,870)
Operating lease right of use assets	(24,549)	(4,315)	3,583
Other assets	(231)	430	175
Accounts payable	(8,197)	19,523	2,462
Accrued expenses	(2,019)	23,196	1,037
Operating lease liability	28,623	6,958	(1,964)
Long-term liabilities	966	(1,424)	1,109
Total cash provided by operating activities	172,083	119,016	62,625
Cash flows from investing activities:			
Purchase of marketable securities held to maturity	(100,000)	—	—
Additions to capitalized software costs	(3,512)	(4,187)	(3,889)
Acquisitions, net of cash acquired	—	(149,893)	(175,041)
Purchases of property, plant and equipment	(84,834)	(67,089)	(22,455)
Purchase of intellectual property	(45,000)	—	—
Other investing activities	110	—	—
Total cash used in investing activities	(233,236)	(221,169)	(201,385)
Cash flows from financing activities:			
Proceeds from issuance of common stock, net of issuance costs	—	—	297,775
Proceeds from exercise of stock options	3,707	3,879	8,151
Repayment of Convertible Senior Notes	(26)	(21)	—
Payment of tax withholding obligation on vesting of restricted stock	(17,018)	(2,897)	(10)
Total cash (used in) provided by financing activities	(13,337)	961	305,916
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(5,866)	(12,286)	12,729
Net (decrease) increase in cash, cash equivalents and restricted cash	(80,356)	(113,478)	179,885
Cash, cash equivalents and restricted cash, beginning of period	603,814	717,292	537,407
Cash and cash equivalents, end of period	$ 523,458	$ 603,814	$ 717,292
Supplemental disclosure of cash flow information:			
Income taxes paid	$ 34,365	$ 16,515	$ 10,279
Interest paid	$ 1,033	$ 1,066	$ 1,066
Supplemental disclosure of non-cash investing and financing activities:			
Assets acquired under operating leases	$ 29,126	$ 85,312	$ 3,349
Fair value of 271,096 shares of common stock issued for acquisition of Avitide, Inc.	$ —	$ 82,968	$ —
Fair value of earnouts related to the acquisition of Avitide, Inc.	$ —	$ 94,238	$ —
Fair value of 372,990 shares of common stock issued for acquisition of ARTeSYN Biosolutions Holdings Ireland Limited	$ —	$ —	$ 69,422

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

1. Organization and Nature of Business

Repligen Corporation (NASDAQ:RGEN) is a global life sciences company that develops and commercializes highly innovative bioprocessing technologies and systems that increase efficiencies and flexibility in the process of manufacturing biological drugs. The Company's franchises include filtration, chromatography, process analytics and proteins. See Part I, Item 1. *"Business - Our Products",* of this report for additional information related to the Company's products. The Company's bioprocessing products are sold to major life sciences companies, biopharmaceutical development companies and contract manufacturing organizations worldwide. The Company operates under one reportable segment. The Company's chief operating decision maker ("CODM") reviews financial information presented on a consolidated basis for purposes of allocating resources and evaluating financial performance. See Note 2, *"Summary of Significant Accounting Policies – Segment Reporting,"* for more information on the Company's segment.

A majority of our 18 manufacturing sites are located in the United States (California, Massachusetts, New Hampshire, New Jersey, New York and Texas). Outside the United States, we have manufacturing sites in Estonia, France, Germany, Ireland, the Netherlands and Sweden.

The Company is subject to a number of risks typically associated with companies in the biotechnology industry. These risks principally include the Company's dependence on key customers, development by the Company or its competitors of new technological innovations, dependence on key personnel, protection of proprietary technology, compliance with the U.S. Food and Drug Association and other governmental regulations and approval requirements, as well as the ability to grow the Company's business and obtain adequate funding to finance this growth.

2. Summary of Significant Accounting Policies

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States 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 periods.

Significant estimates and assumptions by management affect the Company's revenue recognition for multiple element arrangements, allowance for credit losses, the net realizable value of inventory, valuations and purchase price allocations related to business combinations, expected future cash flows including growth rates, discount rates, terminal values and other assumptions and estimates used to evaluate the recoverability of long-lived assets, contingent consideration, estimated fair values of intangible assets and goodwill, amortization methods and periods, warranty reserves, certain accrued expenses, stock-based compensation, tax reserves and recoverability of the Company's net deferred tax assets and related valuation allowance.

Although the Company regularly assesses these estimates, actual results could differ materially from these estimates. Changes in estimates are recorded in the period in which they become known. The Company bases its estimates on historical experience and various other assumptions that it believes to be reasonable under the circumstances.

Basis of Presentation

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"), ARTeSYN Biosolutions Holdings Ireland Ltd., ARTeSYN Biosolutions Ireland Limited and its subsidiaries ("ARTeSYN"), Polymem S.A. ("Polymem"), Avitide, LLC ("Avitide"), Newton T&M Corp ("NTM"), Bio-Flex Solutions, LLC ("BioFlex"), Repligen Singapore Pte. Ltd. and Repligen UK Limited. All significant intercompany accounts and transactions have been eliminated in consolidation. Certain prior year balances have changed to reflect current year presentation.

Foreign Currency

The Company translates the assets and liabilities of its foreign subsidiary at rates in effect at the end of the reporting period. Revenues and expenses are translated at average rates in effect during the reporting period. Translation adjustments, including adjustments related to the Company's various intercompany loans. Any intercompany loans with foreign subsidiaries are remeasured at each period end and included in accumulated other comprehensive loss on the consolidated balance sheets.

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 sciences and biopharmaceutical industries. Under Accounting Standard Codification No. ("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. Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring products or services to a customer ("transaction price"). To the extent the transaction price includes variable consideration, the Company estimates the amount of variable consideration that should be included in the transaction price utilizing the expected value method or the most likely amount method, depending on the facts and circumstances relative to the contract. Variable consideration is included in the transaction price if, in the Company's judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. Estimates of variable consideration and determination of whether to include estimated amounts in the transaction price are based largely on an assessment of the Company's anticipated performance and all information (historical, current and forecasted) that is reasonably available. Sales, value add, and other taxes collected on behalf of third parties are excluded from revenue.

When determining the transaction price of a contract, an adjustment is made if payment from a customer occurs either significantly before or significantly after performance, resulting in a significant financing component. Applying the practical expedient in paragraph 606-10-32-18, the Company does not assess whether a significant financing component exists if the period between when the Company performs its obligations under the contract and when the customer pays is one year or less. None of the Company's contracts contained a significant financing component as of December 31, 2022.

Contracts with customers may contain multiple performance obligations. For such arrangements, the transaction price is allocated to each performance obligation based on the estimated relative standalone selling prices of the promised products or services underlying each performance obligation. The Company determines standalone selling prices based on the price at which the performance obligation is sold separately. If the standalone selling price is not observable through past transactions, the Company estimates the standalone selling price taking into account available information such as market conditions and internally approved pricing guidelines related to the performance obligations.

The Company recognizes product revenue under the terms of each customer agreement upon transfer of control to the customer, which occurs at a point in time. Shipping and handling fees are recorded as a component of product revenue, with the associated costs recorded as a component of cost of product revenue.

Risks and Uncertainties

The Company evaluates its operations periodically to determine if any risks and uncertainties exist that could impact its operations in the near term. The Company does not believe that there are any significant risks that have not already been disclosed in the consolidated financial statements. A loss of certain suppliers could temporarily disrupt operations, although alternate sources of supply exist for these items. The Company has mitigated these risks by working closely with key suppliers, identifying alternate sources and developing contingency plans.

Cash, Cash Equivalents and Restricted Cash

Cash and cash equivalents include cash on hand and on deposit. Highly liquid investments in money market mutual funds with an original maturity of three months or less are classified as cash equivalents. All cash equivalents are carried at cost, which

approximates fair value. Restricted cash represents cash that is restricted as to withdrawal or usage. There was no restriction on the Company's cash balance as of December 31, 2022 and 2021.

The Company's cash, cash equivalents and restricted cash total as presented in the Company's consolidated statements of cash flows for the years ended December 31, 2022, 2021 and 2020 was $523.5 million, $603.8 million and $717.3 million, respectively. The beginning cash, cash equivalents and restricted cash balance of $537.4 million on the consolidated statement of cash flows for the year ended December 31, 2020 includes $9.0 million in restricted cash, which represented cash held and due to employees based on their continued employment with the Company one year after the acquisition of C Technologies in 2019. The amount was subsequently paid to employees during 2020.

Investment Securities

We classify our investment securities in one of three categories: held to maturity, trading, or available for sale. Our investment portfolio at December 31, 2022 consists of an investment in U.S. treasury bills classified as held to maturity which is included in the Company's consolidated balance sheets under marketable securities held to maturity. Securities that we have the positive intent and ability to hold to maturity are classified as held to maturity and stated at amortized cost in the consolidated balance sheet. Management determines the appropriate classification of securities at the time of purchase based upon management's intent with regards to such investment and reevaluates such designation as of each balance sheet date. The Company's investment policy requires that it only invest in high rated securities and limit its exposure to any single-user. Currently, all investment securities are held-to-maturity and are carried at amortized cost on the Company's consolidated balance sheet as of December 31, 2022, as marketable securities held to maturity. There were no realized or unrealized gains or losses on investments recorded as of December 31, 2022, 2021 and 2020.

The Company classifies marketable securities as short-term when they have remaining contractual maturities of one year or less from the balance sheet date. The Company periodically assesses its marketable securities for impairment or credit losses.

Fair Value Measurement

In determining the fair value of its assets and liabilities, the Company uses various valuation approaches. 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.

Allowance for credit losses

We establish an allowance for credit losses through a review of several factors, including historical collection experience, current aging status of the customer accounts, and current financial condition of our customers. Losses are charged against the allowance when the customer accounts are determined to be uncollectible.

Inventories

Inventories relate to the Company's bioprocessing business. The Company values inventory at cost or, if lower, net realizable value, using the first-in, first-out method. The Company reviews its inventories at least quarterly and records a provision for excess and obsolete inventory based on its estimates of expected sales volume, production capacity and expiration dates of raw materials, work-in-process and finished products. The Company writes down inventory that has become obsolete, inventory that has a cost basis in excess of its expected net realizable value, and inventory in excess of expected requirements to cost of product revenue. Manufacturing of bioprocessing finished goods is done to order and tested for quality specifications prior to shipment.

A change in the estimated timing or amount of demand for the Company's products could result in additional provisions for excess inventory quantities on hand. Any significant unanticipated changes in demand or unexpected quality failures could have a significant impact on the value of inventory and reported operating results. During all periods presented in the accompanying consolidated financial statements, there have been no material adjustments related to a revised estimate of inventory valuations.

Work-in-process and finished products inventories consist of material, labor, outside processing costs and manufacturing overhead.

Lease Accounting

The Company adopted Accounting Standards Update No. ("ASU") 2016-02, *"Leases (Topic 842)"* ("ASC 842") as of January 1, 2019. Under ASC 842, the Company determines whether the arrangement contains a lease at the inception of an arrangement. If a lease is identified in an arrangement, the Company recognizes a right-of-use asset and liability on its consolidated balance sheet and determines whether the lease should be classified as a finance or operating lease. The Company does not recognize assets or liabilities for leases with lease terms of less than 12 months.

A lease qualifies as a finance lease if any of the following criteria are met at the inception of the lease: (i) there is a transfer of ownership of the leased asset to the Company by the end of the lease term, (ii) the Company holds an option to purchase the leased asset that it is reasonably certain to exercise, (iii) the lease term is for a major part of the remaining economic life of the leased asset, (iv) the present value of the sum of lease payments equals or exceeds substantially all of the fair value of the leased asset, or (v) the nature of the leased asset is specialized to the point that it is expected to provide the lessor no alternative use at the end of the lease term. All other leases are recorded as operating leases.

Finance and operating lease assets and liabilities are recognized at the lease commencement date based on the present value of the lease payments over the lease term using the discount rate implicit in the lease. If the rate implicit is not readily determinable, the Company utilizes its incremental borrowing rate at the lease commencement date. Operating lease assets are further adjusted for prepaid or accrued lease payments. Operating lease payments are expensed using the straight-line method as an operating expense over the lease term. Finance lease assets are amortized to depreciation expense using the straight-line method over the shorter of the useful life of the related asset or the lease term. Finance lease payments are bifurcated into (i) a portion that is recorded as imputed interest expense and (ii) a portion that reduces the finance liability associated with the lease.

The Company does not separate lease and non-lease components when determining which lease payments to include in the calculation of its lease assets and liabilities. Variable lease payments are expensed as incurred. If a lease includes an option to extend or terminate the lease, the Company reflects the option in the lease term if it is reasonably certain it will exercise the option.

Finance leases are recorded in property, plant and equipment, net, other current liabilities and long-term finance lease liabilities and operating leases are recorded in operating lease right of use assets, operating lease liability and operating lease liability, long-term on the Company's consolidated balance sheet.

Certain of the Company's operating leases where the Company is the lessee provide for minimum annual payments that increase over the life of the lease. Some of these leases include obligations to pay for other services, such as operations and maintenance. For leases of property, the Company accounts for these other services as a component of the lease. The aggregate minimum annual payments are expensed on the straight-line basis beginning when the Company takes possession of the property and extending over the term of the related lease, including renewal options when the exercise of the option is reasonably certain as an economic penalty may be incurred if the option is not exercised. The Company also accounts in its straight-line computation for the effect of any "rental holidays."

Operating lease assets represent the Company's right to use an underlying asset for the lease term and lease liabilities represent the Company's obligation to make lease payments arising from the lease. Operating lease assets and liabilities are recognized at the lease commencement date based on the estimated present value of the fixed lease payments, reduced by landlord incentives using a discount rate based on similarly secured borrowings available to the Company. Most of the leases do not provide implicit interest rates and therefore the Company determines the discount rate based on its incremental borrowing rate. The incremental borrowing rate for the Company's leases is determined based on lease term and currency in which the lease payments are made.

Accrued Liabilities

The Company estimates accrued liabilities by identifying services performed on the Company's behalf, estimating the level of service performed and determining the associated cost incurred for such service as of each balance sheet date. For example, the Company would accrue for professional and consulting fees incurred with law firms, audit and accounting service providers and other third-party consultants. These expenses are determined by either requesting those service providers to estimate unbilled services at each reporting date for services incurred or tracking costs incurred by service providers under fixed fee arrangements.

The Company has processes in place to estimate the appropriate amounts to record for accrued liabilities, which principally involve the applicable personnel reviewing the services provided. In the event that the Company does not identify certain costs that have begun to be incurred or the Company under or over-estimates the level of services performed or the costs of such services, the reported expenses for that period may be too low or too high. The date on which certain services commence, the level of services performed on or before a given date, and the cost of such services often require the exercise of judgment. The Company makes these judgments based upon the facts and circumstances known at the date of the financial statements.

Income Taxes

Deferred taxes are determined based on the difference between the financial statement and tax basis of assets and liabilities using enacted tax rates in effect in the years in which the differences are expected to reverse. Valuation allowances are provided, if, based upon the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized. The Company accounts for uncertain tax positions using a "more-likely-than-not" threshold for recognizing and resolving uncertain tax positions. The evaluation of uncertain tax positions is based on factors including, but not limited to, changes in tax law, the measurement of tax positions taken or expected to be taken in tax returns, the effective settlement of matters subject to audit, new audit activity and changes in facts or circumstances related to a tax position. The Company evaluates this tax position on a quarterly basis. The Company also accrues for potential interest and penalties related to unrecognized tax benefits in income tax expense. The Company is subject to a territorial tax system under the Tax Cuts and Jobs Act enacted in December 2017, in which the Company is required to provide for tax on Global Intangible Low-Taxed Income ("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.

Property, Plant & Equipment

Property, plant & equipment is recorded at cost less allowances for depreciation. Depreciation is calculated using the straight-line method over the estimated useful life of the asset as follows:

Classification	Estimated Useful Life
Buildings	Thirty years
Leasehold improvements	Shorter of the term of the lease or estimated useful life
Equipment	Three to twelve years
Furniture, fixtures and office equipment	Three to eight years
Computer hardware and software	Three to seven years or estimated useful life

Upon disposal of property, plant & equipment, the cost of the asset and the accumulated depreciation are removed from the accounts and the resulting gain or loss is reflected in our results of operations. Fully depreciated assets are not removed from the accounts until they are physically disposed of.

Certain systems development costs related to the purchase, development and installation of computer software developed or obtained for internal use are capitalized and depreciated over the estimated useful life of the related project. Costs incurred prior to the development stage, as well as maintenance, training costs, and general and administrative expenses are expensed as incurred.

Earnings Per Share

The Company reports earnings per share ("EPS") in accordance with ASC 260, *"Earnings Per Share,"* which establishes standards for computing and presenting EPS. Basic EPS is computed by dividing net income available to common shareholders by the weighted average number of common shares outstanding during the period. Diluted EPS is computed by dividing net income available to common shareholders by the weighted-average number of common shares and dilutive common share equivalents outstanding during the period. Potential common share equivalents consist of restricted stock awards (including performance stock units) and the incremental common shares issuable upon the exercise of stock options and warrants. Under the treasury stock method, unexercised “in-the-money” stock options 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.

A reconciliation of basic and diluted weighted average share outstanding is as follows:

	For the Years Ended December 31,		
	2022	2021	2020
	(Amounts in thousands, except per share data)		
Numerator:			
Net income	$ 185,959	$ 128,291	$ 59,926
Effect of dilutive securities:			
Charges associated with convertible debt instruments, net of tax	387	—	—
Numerator for diluted earnings per share - net income available to common stockholders after the effect of dilutive securities	$ 186,346	$ 128,291	$ 59,926
Denominator:			
Weighted average shares used in computing net income per share - basic	55,460	55,015	52,554
Effect of dilutive shares:			
Options and stock units	608	915	971
Convertible senior notes	1,360	1,253	367
Contingent consideration	11	—	—
Dilutive effect of unvested performance stock units	16	81	—
Dilutive potential common shares	1,995	2,249	1,338
Denominator for diluted earnings per share - adjusted weighted average shares used in computing net income per share - diluted	57,455	57,264	53,892
Earnings per share:			
Basic	$ 3.35	$ 2.33	$ 1.14
Diluted	$ 3.24	$ 2.24	$ 1.11

For the years ended December 31, 2022, 2021 and 2020, 177,318 shares, 68,968 shares and 98,048 shares, respectively, of the Company's common stock were excluded from the calculation of diluted earnings per share because they would have had an anti-dilutive effect for years presented.

In July 2019, the Company issued $287.5 million aggregate principal amount of our 0.375% Convertible Senior Notes due 2024 (the "2019 Notes"). As provided by the terms of the indenture underlying the 2019 Notes, prior to March 4, 2022, conversion of the 2019 Notes could have been settled in cash, shares of the Company's common stock or a combination thereof, at the Company's election. On March 4, 2022, we entered into the Second Supplemental Indenture for the 2019 Notes, which irrevocably elected to settle the conversion of the 2019 Notes using a combination of cash and shares of the Company's common stock, settling the par value of the 2019 Notes in cash and any excess conversion premium in shares.

As provided by the terms of the Second Supplemental Indenture underlying the 2019 Notes, the Company irrevocably elected to settle the conversion obligation for the 2019 Notes in a combination of cash and shares of the Company's common stock. This means the Company will settle the par value of the 2019 Notes in cash and any excess conversion premium in shares. As mentioned in Note 13, *"Convertible Senior Notes,"* the Company adopted ASU 2020-06 effective January 1, 2022. Under ASU 2020-06, the Company is required to reflect the dilutive effect of the convertible securities by application of the "if-converted" method, which means the denominator of the EPS calculation would include the total number of shares assuming the 2019 Notes had been fully converted at the beginning of the period. Prior to March 4, 2022, the Company had the choice to settle the conversion of the 2019 Notes in cash, stock or a combination of the two. Therefore, from January 1, 2022 (the date the Company adopted ASU 2020-06) to March 4, 2022, the Company included 3,474,429 shares in the denominator of the EPS calculation, applying the if converted method. Subsequent to March 4, 2022, after the Second Supplemental Indenture became effective, the Company irrevocably elected to settle the conversion obligation for the 2019 Notes in a combination of cash and shares of the Company's common stock, and from March 5, 2022 forward, only the excess premium will be settled with shares. Under the if-converted method of calculating dilutive shares, the Company was also required to exclude amortization of debt issuance costs and interest charges applicable to the convertible debt from the numerator of the dilutive EPS calculation for the period from January 1, 2022 to March 4, 2022, as if the interest on convertible debt was never recognized for that period. For the year ended December 31, 2022, the Company excluded

interest charges of $0.4 million (net of tax) from the numerator and included 1,359,957 shares in the calculation of diluted earnings as the dilutive effect of the conversion premium.

Prior to the adoption of ASU 2020-06, the Company applied the provisions of ASC 260-10-45-44, to determine the diluted weighted average shares outstanding as it related to the conversion spread on its convertible notes. Accordingly, the par value of the 2019 Notes was not included in the calculation of diluted EPS, but the dilutive effect of the conversion premium was considered in the calculation of diluted EPS using the treasury stock method. The dilutive impact of the 2019 Notes was based on the difference between the Company's current period average stock price and the conversion price of the convertible notes, provided there is a premium. Pursuant to this accounting standard, there was no dilution from the accreted principal of the 2019 Notes. For the years ended December 31, 2021 and 2020, the dilutive effect of the conversion premium included in the calculation of diluted earnings was 1,253,168 shares and 366,534 shares, respectively.

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 product revenues by product line:

	For the Years Ended December 31,		
	2022	2021[1]	2020[2]
	(Amounts in thousands)		
Filtration products	$ 495,930	$ 403,505	$ 174,851
Chromatography products[3]	131,680	91,037	70,677
Process analytics products	53,512	48,019	33,346
Proteins products[3]	114,320	123,707	83,317
Other	5,741	4,051	3,945
Total product revenue	$ 801,183	$ 670,319	$ 366,136

(1) 2021 revenue for filtration products includes revenue related to Polymem from July 1, 2021, as well as BioFlex and NTM from December 16, 2021 through December 31, 2021. 2021 revenue for proteins products includes revenue related to Avitide from September 20, 2021 through December 31, 2021.

(2) 2020 revenue for filtration products includes revenue related to EMT from July 13, 2020, NMS from October 20, 2020, and ARTeSYN from December 3, 2020 through December 31, 2020.

(3) Revised 2020 revenue in the table above reflects a shift in product revenue from chromatography products to proteins products of approximately $3 million. These changes are consistent with the current year presentation of product revenue.

Revenue from filtration products includes the XCell ATF® systems and consumables as well as the KrosFlo® and SIUS® filtration products. Revenue from chromatography products includes the OPUS® chromatography pre-packed columns ("PPC"), chromatography resins and ELISA test kits. Revenue from process analytics products includes the SoloVPE®, FlowVPE® and FlowVPX® devices. Revenue from protein products includes the Protein A affinity ligands and cell culture growth factors. Other revenue primarily consists of revenue from the sale of operating room products to hospitals as well as freight revenue.

The following table represents the Company's total revenue by our country of domicile (the United States) and other countries where our major subsidiaries are domiciled for the periods presented (based on the location of the customer):

	For the Years Ended December 31,		
	2022	2021	2020
Revenue by customers' geographic locations:			
North America	43%	41%	48%
Europe	37%	40%	38%
APAC/Other	20%	19%	14%
Total revenue	100%	100%	100%

The following table represents the Company's total assets by our country of domicile (the United States) and other countries where our major subsidiaries are domiciled for the periods presented:

	December 31,	
	2022	2021
	(Amounts in thousands)	
Total assets by geographic locations:		
North America	$ 2,209,244	$ 2,082,721
Europe	287,543	243,076
APAC	27,871	32,557
Total assets by geographic location	$ 2,524,658	$ 2,358,354

The following table represents the Company's long-lived assets by our country of domicile (the United States) and other countries where our major subsidiaries are domiciled for the periods presented:

	December 31,	
	2022	2021
	(Amounts in thousands)	
Long-lived assets by geographic locations:		
North America	$ 275,151	$ 198,436
Europe	38,541	27,168
APAC	2,819	1,534
Total long-lived assets by geographic location	$ 316,511	$ 227,138

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, limit its credit exposure to any one issuer (with the exception of U.S. treasury obligations) and type of instrument is limited. At December 31, 2022, 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.

There was no revenue from customers that represented 10% or more of the Company's total revenue for the year ended December 31, 2022. Revenue from Pfizer Inc. accounted for 10% of total revenue for the year ended December 31, 2021, and MilliporeSigma accounted for 11% of total revenues in the year ended December 31, 2020.

Significant accounts receivable balances representing 10% or more of the Company's total trade accounts receivable balances at December 31, 2022 and 2021 is as follows:

	December 31, 2022	December 31, 2021
Purolite (an Ecolab Inc. company)	13%	N/A
Pfizer Inc.	N/A	14%

Business Combinations, Goodwill and Intangible Assets

Business Combinations

Total consideration transferred for acquisitions is allocated to the tangible and intangible assets acquired and liabilities assumed, if any, based on their fair values at the dates of acquisition. This purchase price allocation process requires management to make significant estimates and assumptions with respect to intangible assets and deferred revenue. The fair value of identifiable intangible assets is based on detailed valuations that use information and assumptions determined by management. Any excess of purchase price over the fair value of the net tangible and intangible assets acquired is allocated to goodwill. While the Company uses its best estimates and assumptions to accurately value assets acquired and liabilities assumed at the acquisition date as well as any contingent consideration, where applicable, the Company's estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which may be up to one year from the acquisition date, the Company records adjustments to the assets acquired and liabilities assumed with the corresponding offset to goodwill. Upon conclusion of the measurement period or final determination of the values of assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments are recorded to the Company's consolidated statements of comprehensive income. Any excess of the fair value of the net tangible and intangible assets acquired over the purchase price is recognized in the consolidated statements of comprehensive income. The fair value of contingent consideration includes estimates and judgments made by management regarding the probability that future contingent payments will be made and the extent of royalties to be earned in excess of the defined minimum royalties. Management updates these estimates and the related fair value of contingent consideration at each reporting period. These changes in the fair value of contingent consideration are recorded to contingent consideration expense in our consolidated statements of comprehensive income. For the years ended December 31, 2022 and 2021, we recorded ($28.7) million and $5.9 million, respectively, of contingent consideration expense related to the change in estimated contingent consideration obligation related to the acquisition of Avitide (the "Avitide Acquisition").

The Company uses the income approach to determine the fair value of certain identifiable intangible assets including customer relationships and developed technology. This approach determines fair value by estimating after-tax cash flows attributable to these assets over their respective useful lives and then discounting these after-tax cash flows back to a present value. The Company bases its assumptions on estimates of future cash flows, expected growth rates, expected trends in technology, etc. Discount rates used to arrive at a present value as of the date of acquisition are based on the time value of money and certain industry-specific risk factors. The Company believes the estimated purchased customer relationships, developed technologies, trademark/tradename, patents, non-compete agreements and in-process research and development ("R&D") amounts so determined represent the fair value at the date of acquisition, and do not exceed the amount a third-party would pay for such assets.

Goodwill

Goodwill is not amortized and is tested for impairment at least annually at the reporting unit level. The Company operates as one reporting unit as of the goodwill impairment measurement date of December 31, 2022. During the qualitative assessment of the Company's one reporting unit during the 2022 goodwill impairment testing, it was determined that it was not more likely than not that its fair value was less than its carrying amount. As such, a quantitative impairment assessment was not required as of December 31, 2022. If an event occurs or circumstances change that would more likely than not reduce the fair value of its reporting unit below its carrying value, the Company will evaluate its goodwill for impairment between annual tests. There was no impairment to goodwill and therefore no impairment charge recorded for the years ended December 31, 2022, 2021 and 2020.

Intangible Assets

Intangible assets with a definite life are amortized over their useful lives using the straight-line method and the amortization expense is recorded within cost of product revenue, research and development and selling, general and administrative expense in the consolidated statements of comprehensive income. Intangible assets and their related useful lives are reviewed at least annually to determine if any adverse conditions existed 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 the Company's products or changes in the size of the market for the Company's products. If impairment indicators are present, the Company determines whether the underlying intangible asset is recoverable through estimated future undiscounted cash flows. If the asset is not found to be recoverable, it is written down to the estimated fair value of the asset based on the sum of the future discounted cash flows expected to result from the use and disposition 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 definite-lived intangible assets are recoverable at December 31, 2022. Indefinite-lived intangible assets are reviewed for impairment at least annually. There has been no impairment of our intangible assets for the periods presented.

Stock Based Compensation

The Company measures stock-based compensation cost at the grant date based on the estimated fair value of the award and recognizes it as an expense over the employee's requisite service period on a straight-line basis. The Company records the expense for share-based awards subject to performance-based milestone vesting over the remaining service period when management determines that achievement of the milestone is probable. Management evaluates whether the achievement of a performance-based milestone is probable as of the reporting date. The Company has no awards that are subject to market conditions. The Company recognizes stock-based compensation expense based upon options that are ultimately expected to vest, and accordingly, such compensation expense has been adjusted by an amount of estimated forfeitures.

The Company uses the Black-Scholes option pricing model to calculate the fair value of share-based awards on the grant date. The following assumptions are used in calculating the fair value of share-based awards:

Expected term – The expected term of options granted represents the period of time for which the options are expected to be outstanding. For purposes of estimating the expected term, the Company has aggregated all individual option awards into one group as the Company does not expect substantial differences in exercise behavior among its employees.

Expected volatility – The expected volatility is a measure of the amount by which the Company's stock price is expected to fluctuate during the expected term of options granted. The Company determines the expected volatility based primarily upon the historical volatility of the Company's common stock over a period commensurate with the option's expected term.

Risk-free interest rate – The risk-free interest rate is the implied yield available on U.S. treasury zero-coupon issues with a remaining term equal to the option's expected term on the grant date.

Expected dividend yield – The Company has never declared or paid any cash dividends on any of its capital stock and does not expect to do so in the foreseeable future. Accordingly, the Company uses an expected dividend yield of zero to calculate the grant-date fair value of a stock option.

Estimated forfeiture rates – The Company has applied, based on an analysis of its historical forfeitures, annual forfeiture rates of 8% for awards granted to non-executive level employees, 3% for awards granted to executive level employees and 0% for awards granted to non-employee members of the Board of Directors to all unvested stock options as of December 31, 2022. The Company reevaluates this analysis periodically and adjusts these estimated forfeiture rates as necessary. Ultimately, the Company will only recognize an expense for those shares that vest.

Advertising Costs

The Company expenses advertising costs as they are incurred. Advertising expense for the years ended December 31, 2022, 2021 and 2020 was $0.6 million, $0.6 million and $0.3 million, respectively.

Recent Accounting Standards Updates

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

Recently Issued Accounting Standard Updates – Adopted During the Fiscal Year

Effective January 1, 2022, the Company adopted ASU 2020-06, "*Debt - Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging - Contracts in Entity's Own Equity (Subtopic 815-40)*" using the modified retrospective method of adoption. ASU 2020-06 simplifies the accounting for convertible debt instruments and convertible preferred stock by reducing the number of accounting models and the number of embedded conversion features that could be recognized separately from the primary contract. Consequently, a convertible instrument is now accounted for as a single liability measured at its amortized cost as long as no other features of such convertible instrument require bifurcation and recognition as derivatives. By removing those separation models, the interest rate of convertible debt instruments will typically be closer to the coupon interest rate when applying the guidance in Topic 835, *"Interest."* The Company now accounts for its 0.375% convertible senior notes due July 15, 2024 (the "2019 Notes") as a single liability measured at amortized cost. As a result, the adoption of ASU 2020-06 had a material impact on the Company's consolidated financial statements, resulting in adjustments of $39.1 million, $17.3 million and $27.6 million to the opening balances of additional paid-in capital, retained earnings and Convertible Senior Notes, net, respectively, on the Company's consolidated balance sheet as of January 1, 2022. Additionally, due to the adoption of ASU 2020-06, the Company reversed the remaining balance of the deferred tax liability of $6.4 million, which was initially recorded in connection with the 2019 Notes. See Note 13, *"Convertible Senior Notes,"* for more information, including our modified disclosures as required by ASU 2020-06 upon adoption.

3. Fair Value Measurements

Cash, Cash Equivalents and Marketable Securities Held to Maturity

The following table summarizes the Company's cash, cash equivalents and marketable securities held to maturity as of December 31, 2022:

	As of December 31, 2022			
	Amortized Costs	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
	(Amounts in thousands)			
Cash and cash equivalents:				
Cash and money market funds	$ 523,458	$ —	$ —	$ 523,458
Total cash and cash equivalents	523,458	—	—	523,458
Marketable securities held to maturity:				
U.S. treasury bills - short-term	100,299	24	—	100,323
Total cash, cash equivalents and marketable securities	$ 623,757	$ 24	$ —	$ 623,781

During the fourth quarter of 2022, the Company purchased $100.0 million of 6-month U.S. treasury bills with the positive intent and ability to hold them until maturity. Therefore, the Company classified this investment as held to maturity and stated it at amortized cost on the consolidated balance sheet. There is no comparable investment as of December 31, 2021.

The amortized cost and fair value of the Company's held to maturity securities by contractual maturity at December 31, 2022 are summarized below. There is no comparable investment as of December 31, 2021:

	December 31, 2022	
	Amortized Costs	Estimated Fair Value
Maturity of one year or less	$ 100,299	$ 100,323
Total	$ 100,299	$ 100,323

Fair Value Measured on a Recurring Basis

Financial assets and financial liabilities measured at fair value on a recurring basis consist of the following as of December 31, 2022 and 2021:

	As of December 31, 2022			
	Level 1	Level 2	Level 3	Total
Assets:				
Money market accounts	$ 343,929	$ —	$ —	$ 343,929
Liabilities:				
Short-term contingent consideration	$ —	$ —	$ 13,950	$ 13,950
Long-term contingent consideration	$ —	$ —	$ 51,559	$ 51,559

	As of December 31, 2021			
	Level 1	Level 2	Level 3	Total
Assets:				
Money market accounts	$ 460,936	$ —	$ —	$ 460,936
Liabilities:				
Long-term contingent consideration	$ —	$ —	$ 94,238	$ 94,238

Contingent Consideration – Earnout

On September 20, 2021, the Company completed the Avitide Acquisition. Avitide is a privately-held affinity ligand discovery and development company headquartered in Lebanon, New Hampshire. The transaction consisted of upfront payments of $150.0 million and up to an additional $125.0 million (undiscounted) in contingent consideration earnout payments made equally in cash and the Company's common stock over a three-year performance period beginning January 1, 2022 and ending December 31, 2024. See Note 4, *"Acquisitions"* below for additional information.

During 2022, a change in market inputs and a shift in revenue and volume projections, due to the expected timing of achievement over the three-year performance period, resulted in a material change in amounts reported as of December 31, 2022. A reconciliation of the change in fair value of contingent consideration – earnout is included in the following table (amounts in thousands):

Balance at December 31, 2021	$ 94,238
Decrease in fair value of contingent consideration earnouts	(28,729)
Balance at December 31, 2022	$ 65,509

The recurring Level 3 fair value measurement of our contingent consideration – earnout that we expect to be required to settle, include the following significant unobservable inputs:

Contingent Consideration Earnout	Fair Value as of December 31, 2022	Valuation Technique	Unobservable Input	Range	Weighted Average[1]
Commercialization-based payments	$ 28,969	Monte Carlo Simulation	Probability of Success	100%	100%
			Earnout Discount Rate	5.4%-6.1%	5.7%
Revenue and Volume-based payments	$ 36,540	Monte Carlo Simulation	Volatility	20.8%	20.8%
			Revenue & Volume Discount Rate	5.4%	5.4%
			Earnout Discount Rate	5.4%-6.1%	5.7%

(1) Unobservable inputs were weighted by the relative fair value of the contingent consideration liability.

The Company estimates the fair value of the contingent consideration earnouts using a Monte Carlo simulation. Changes in the projected performance of the acquired business could result in a higher or lower contingent consideration obligation in the future.

Fair Value Measured on a Nonrecurring Basis

During 2022, there were no re-measurements to fair value of financial assets and liabilities that are measured at fair value on a nonrecurring basis.

Convertible Senior Notes

In July 2019, the Company issued $287.5 million aggregate principal amount of 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. At December 31, 2022, the carrying value of the 2019 Notes was $284.6 million, net of unamortized debt issuance costs and the fair value of the 2019 Notes was $452.0 million. At December 31, 2021, prior to the adoption of ASU 2020-06, the carrying value of the 2019 Notes was $255.3 million, net of unamortized discount and unamortized issuance costs, and the fair value of the 2019 Notes was $678.5 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 December 31, 2022 and 2021. The 2019 Notes are discussed in more detail in Note 13, *"Convertible Senior Notes,"* to these consolidated financial statements.

4. Acquisitions

2021 Acquisitions

BioFlex Solutions LLC and Newton T&M Corp.

On November 29, 2021, the Company entered into an Equity Purchase Agreement with Bioflex, NTM and each of Ralph Meola and Jason Nisler, to acquire 100% of the outstanding securities of Bioflex and NTM (collectively, the "NTM Acquisition"). The transaction closed on December 16, 2021.

NTM, which is headquartered in Newton, New Jersey, is the parent company of BioFlex and focuses on manufacturing of products, while BioFlex, also headquartered in Newton, New Jersey, commercializes branded products to biotech customers. The NTM Acquisition complements and expands our filtration offering paths as the industry migrates to single-use flow paths solutions for monoclonal antibody ("mAb"), vaccine and cell and gene therapy ("C&GT") applications, with a focus on single-use fluid management components, including single-use clamps, adapters, end caps and hose assemblies. The NTM Acquisition streamlines and increases control over many components in our single-use supply chain which ultimately should drive reduced lead-times for Repligen customers in the coming years.

Consideration Transferred

The NTM Acquisition was accounted for as a purchase of businesses under ASC 805, *"Business Combinations"* and the Company engaged a third-party valuation firm to assist with the valuation of the business acquired. Under the terms of the Equity Purchase Agreement, all outstanding shares of capital stock of BioFlex were acquired for consideration with a value totaling $31.6 million, which includes $3.0 million deposited into an escrow against which the Company may make claims for indemnification.

Under the acquisition method of accounting, the assets acquired and liabilities assumed of BioFlex were recorded as of the acquisition date, at their respective fair values, and consolidated with those of the Company. The fair value of the net assets acquired is $4.6 million, the fair value of the intangible assets acquired is $17.2 million, and the residual goodwill is $9.8 million. Acquisition-related costs are not included as a component of consideration transferred but are expensed in the periods in which costs are incurred. The Company incurred $3.0 million of transaction and integration costs associated with the NTM Acquisition from the date of acquisition to December 31, 2022, with $2.7 million of transaction and integration costs incurred in 2022 and $0.3 million incurred in 2021. The transaction and integration costs are included in operating expenses in the consolidated statements of comprehensive income for the periods ended December 31, 2022 and 2021.

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 final valuation. The Company has made appropriate adjustments to the purchase price allocation during the measurement period, which ended December 16, 2022.

The components and estimated allocation of the purchase price consist of the following (amounts in thousands):

Cash and cash equivalents	$	2,870
Accounts receivable		1,408
Inventory		741
Prepaid expenses and other current assets		126
Property and equipment		34
Operating lease right of use asset		1,034
Customer relationships		13,240
Developed technology		3,540
Trademark and tradename		310
Non-competition agreements		60
Goodwill		9,834
Long term deferred tax asset		81
Accounts payable		(224)
Accrued liabilities		(450)
Operating lease liability		(1,030)
Operating lease liability, long-term		(3)
Fair value of net assets acquired	$	31,571

During 2022, the Company recorded net working capital adjustments of approximately $0.3 million related to pre-acquisition liabilities, which are included in goodwill and accrued liabilities in the table above.

Acquired Goodwill

The goodwill of $9.8 million represents future economic benefits expected to arise from anticipated synergies from the integration of BioFlex and NTM into the Company. These synergies include certain operating efficiencies and strategic benefits projected to be achieved as a result of the NTM Acquisition. Substantially all of the goodwill recorded is expected to be deductible for income tax purposes.

Intangible Assets

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

	Useful life	Fair Value (Amounts in thousands)	
Customer relationships	10 years	$	13,240
Developed technology	11 years		3,540
Trademark and tradename	15 years		310
Non-competition agreements	3 years		60
		$	17,150

Avitide, Inc.

On September 16, 2021, the Company entered into an Agreement and Plan of Merger and Reorganization ("Avitide Merger Agreement") with Avalon Merger Sub, Inc., a Delaware corporation and a wholly owned direct subsidiary of the Company, Avalon Merger Sub LLC, a Delaware limited liability company and a wholly owned direct subsidiary of the Company, Avitide, a Delaware

corporation, and Shareholder Representative Services LLC, a Colorado limited liability company, solely in its capacity as the representative, agent and attorney-in-fact of Avitide's securityholders to purchase Avitide. The transaction closed on September 20, 2021, and on the terms set forth in the Avitide Merger Agreement.

Avitide, which is headquartered in Lebanon, New Hampshire, offers diverse libraries and leading technology in affinity ligand discovery and development resulting in best-in-class ligand discovery and development lead-times. The acquisition gives the Company a new platform for affinity resin development, including C&GT, and advances and expands the Company's proteins and chromatography franchises to address the unique purification needs of gene therapies and other emerging modalities.

Consideration Transferred

The Avitide Acquisition was accounted for as a purchase of a business under ASC 805, *"Business Combinations"* and the Company engaged a third-party valuation firm to assist with the valuation of the business acquired. Under the terms of the Avitide Merger Agreement, all outstanding shares of capital stock of Avitide were cancelled and converted into the right to receive merger consideration with a value totaling up to $275.0 million, which consisted of upfront payments in aggregate of $150.0 million ($149.4 million, net of cash acquired) and up to an additional $125.0 million (undiscounted) in contingent consideration earnout payments if certain performance targets are achieved. Total consideration paid also included $0.8 million deposited into an escrow account against which the Company may make claims for indemnification. The Avitide Acquisition was funded through payment of $75.0 million in cash, the issuance of 271,096 unregistered shares of the Company's common stock totaling $83.0 million and contingent consideration with fair value of approximately $88.4 million.

Under the acquisition method of accounting, the assets acquired and liabilities assumed of Avitide were recorded as of the acquisition date, at their respective fair values, and consolidated with those of the Company. The fair value of the net assets acquired is $2.1 million, fair value of the intangible assets acquired is $46.7 million, and the residual goodwill is $197.5 million. The Company has incurred $5.6 million of transaction and integration costs associated with the Avitide Acquisition from the date of acquisition to December 31, 2022, with $3.0 million of transaction and integration costs incurred in 2022 and $2.6 million in 2021. The transaction costs are included in operating expenses in the consolidated statements of comprehensive income for the periods ended December 31, 2022 and 2021. During 2022 and 2021, due to the change in market inputs and a shift in revenue and volume projections, due to the expected timing of achievement over the three-year performance period, the Company recorded contingent consideration adjustments of ($28.7) million and $5.9 million to the Company's consolidated statement of comprehensive income in 2022 and 2021, respectively. See Note 3, *"Fair Value Measurements"* for additional information.

The preparation of the valuation 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 the Company believes to be reasonable. However, actual results may differ from these estimates.

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

Cash consideration	$	74,962
Equity consideration		82,968
Contingent consideration - earnout		88,373
Fair value of net assets acquired	$	246,303

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 final valuation of Avitide. The Company has made appropriate adjustments to the purchase price allocation during the measurement period, which ended on September 20, 2022.

The components and estimated allocation of the purchase price consist of the following (amounts in thousands):

Cash and cash equivalents	$	572
Accounts receivable		228
Inventory		332
Prepaid expenses and other current assets		114
Property and equipment		1,862
Operating lease right of use asset		3,648
Customer relationships		24,580
Developed technology		20,650
Trademark and tradename		1,210
Non-competition agreements		210
Goodwill		197,476
Long term deferred tax asset		1,525
Accounts payable		(215)
Accrued liabilities		(2,183)
Operating lease liability		(698)
Operating lease liability, long-term		(2,950)
Other liabilities		(58)
Fair value of net assets acquired	$	246,303

Acquired Goodwill

The goodwill of $197.5 million represents future economic benefits expected to arise from anticipated synergies from the integration of Avitide. These synergies include certain cost savings, operating efficiencies and other strategic benefits projected to be achieved as a result of the Avitide Acquisition. Substantially all of the goodwill recorded is expected to be nondeductible for income tax purposes. During 2022, the Company recorded adjustments to goodwill of $1.8 million related to a change in estimated tax benefits associated with the net operating loss carryforward filed on the Avitide pre-acquisition tax return. The offset of these adjustments is included in long term deferred tax asset in the table above.

Intangible Assets

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

	Useful life		Fair Value (Amounts in thousands)
Customer relationships	13 years	$	24,580
Developed technology	15 years		20,650
Trademark and tradename	18 years		1,210
Non-competition agreements	3 years		210
		$	46,650

Polymem S.A.

On June 22, 2021, the Company entered into a Stock Purchase Agreement with Polymem, a company organized under the laws of France, and Jean-Michel Espenan and Franc Saux, acting together jointly and severally as the representatives of the sellers pursuant to which Repligen acquired all of the outstanding common stock of Polymem for $47.0 million in cash. The transaction closed on July 1, 2021 (the "Polymem Acquisition.").

Polymem, which is headquartered in, Toulouse, France, is a manufacturer of hollow fiber ("HF") membranes, membrane modules and systems for industrial and bioprocessing applications. Polymem products will complement and expand the Company's portfolio of HF systems and consumables. The acquisition substantially increases Repligen's membrane and module manufacturing

capacity and establishes a world-class center of excellence in Europe to address the accelerating global demand for these innovative products.

Consideration Transferred

The Company accounted for the Polymem Acquisition as a purchase of a business under ASC 805 and the Company engaged a third-party valuation firm to assist with the valuation of the business acquired. Payment for the transaction was denominated in Euros but is reflected here in U.S. dollars for presentation purposes based on an exchange rate of 0.8437 as of July 1, 2021, the date of acquisition. Total consideration paid was $47.0 million, which included $4.3 million deposited into an escrow account against which the Company may make claims for indemnification.

Under the acquisition method of accounting, the assets acquired and liabilities assumed of Polymem were recorded as of the acquisition date, at their respective fair values, and consolidated with those of the Company. The fair value of the net assets acquired is $2.2 million, the fair value of the intangible assets acquired is $9.1 million, and the residual goodwill is $35.7 million. Acquisition-related costs are not included as a component of consideration transferred but are expensed in the periods in which costs are incurred. The Company incurred $8.2 million of transaction and integration costs associated with the Polymem Acquisition from the date of acquisition to December 31, 2022, with $5.1 million incurred in 2022 and $3.1 million incurred from the date of acquisition to December 31, 2021. The transaction costs are included in operating expenses in the consolidated statements of comprehensive income for the periods ended December 31, 2022 and 2021.

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 final valuation of Polymem. The Company has made appropriate adjustments to the purchase price allocation during the measurement period, which ended on July 1, 2022.

The components and final allocation of the purchase price consist of the following (amounts in thousands):

Cash and cash equivalents	$	353
Net working capital (excluding cash and inventory step-up)		414
Inventory step-up		543
Operating lease right of use assets		1,424
Property and equipment		3,145
Other assets		41
Developed technology		8,274
Trademark and tradenames		510
Non-compete agreements		312
Goodwill		35,680
Operating lease liability		(1,253)
Long term deferred tax liability		(2,327)
Other long-term liabilities		(143)
Fair value of net assets acquired	**$**	**46,973**

Acquired Goodwill

The goodwill of $35.7 million represents future economic benefits expected to arise from anticipated synergies from the integration of Polymem. These synergies include certain operating efficiencies and strategic benefits projected to be achieved as a result of the Polymem Acquisition. Substantially all of the goodwill recorded is expected to be nondeductible for income tax purposes.

Intangible Assets

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

	Useful life	Fair Value (Amounts in thousands)
Developed technology	13 years	$ 8,274
Trademark and tradename	14 years	510
Non-competition agreements	5 years	312
		$ 9,096

2020 Acquisitions

ARTeSYN Biosolutions Holdings Ireland Limited

On October 27, 2020, the Company entered into an Equity and Asset Purchase Agreement with ARTeSYN, a company organized under the laws of Ireland, Third Creek Holdings, LLC, a Nevada limited liability company, Alphinity, LLC, a Nevada limited liability company ("Alphinity", and together with Third Creek Holdings, LLC the "Sellers"), and Michael Gagne, solely in his capacity as the representative of the Sellers, pursuant to which the Company acquired (i) all of the outstanding equity securities of ARTeSYN and (ii) certain assets from Alphinity related to the business of ARTeSYN (collectively, the "ARTeSYN Acquisition") for approximately $200 million, comprised of approximately $130 million in cash to the Sellers and approximately $70 million in Repligen common stock to Third Creek. The transaction closed on December 3, 2020.

ARTeSYN is headquartered in Waterford, Ireland and conducts its operations in Ireland, the United States and Estonia. Its suite of single-use solutions has been created with the goal of enabling "abundance in medicine" by allowing 10x greater efficiency in biologics manufacturing. The ARTeSYN team has created a number of solutions targeting the single-use space from single-use valves with fully disposable valve liners, XO® skeletal supports, a hybrid small parts offering for de-bottlenecking traditional facilities, and fully automated SU process systems that have quickly become leading solutions in the bioprocessing industry. In addition to its single-use solutions, ARTeSYN also engages in the manufacture of large-scale systems to be used for biologics manufacturing. ARTeSYN has established downstream processing leadership with a suite of state of the art single-use systems for chromatography, filtration, continuous manufacturing and media/buffer prep workflows. In addition, the Company has integrated unique flow path assemblies utilizing the Company's silicone extrusion and molding technology, to deliver highly differentiated, low hold-up volume systems that minimize product loss during processing. The ARTeSYN portfolio expands on the market success of the Company's HF systems and complements its chromatography and tangential flow filtration ("TFF") product lines.

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 and integration costs associated with the ARTeSYN Acquisition from the date of acquisition to December 31, 2020, and an additional $4.7 million of transaction and integration costs during 2021. The transaction costs are included in operating expenses in the consolidated statements of comprehensive income for the period ended December 31, 2021.

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. We have made appropriate adjustments to the purchase price allocation during the measurement period, which ended on December 3, 2021.

During 2021, the Company recorded net working capital adjustments of $0.1 million related to settlement of pre-acquisition liabilities, which offset goodwill in the table below.

The components and estimated allocation of the purchase price consists of the following amounts (amounts in thousands):

Cash and cash equivalents	$	2,982
Accounts receivable		4,811
Inventory		8,592
Prepaid expenses and other current assets		5,561
Property and equipment		1,836
Operating lease right of use asset		1,611
Other noncurrent assets		26
Customer relationships		38,400
Developed technology		27,060
Trademark and tradename		1,630
Non-competition agreements		300
Goodwill		128,598
Accounts payable		(2,251)
Accrued liabilities		(8,706)
Deferred revenue		(3,583)
Deferred tax liabilities, net		(1,240)
Notes payable		(24)
Operating lease liability		(417)
Operating lease liability, long-term		(1,193)
Fair value of net assets acquired	**$**	**203,993**

Acquired Goodwill

The goodwill of $128.6 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.

Non-Metallic Solutions, Inc.

On October 15, 2020, the Company entered into a Stock Purchase Agreement with Non-Metallic Solutions, Inc. ("NMS"), a Massachusetts corporation, and each of William Malloneé and Derek Masser, the legal and beneficial owners of NMS, to purchase NMS, which transaction subsequently closed on October 20, 2020 (the “NMS Acquisition”).

NMS, headquartered in Auburn, Massachusetts, is a manufacturer of fabricated plastics, custom containers, and related assemblies and components used in the manufacturing of biologic drugs. The acquisition of NMS allows Repligen to expand its line of single-use systems and associated integrated flow path assemblies and streamline the supply chain for current products, providing more flexibility to scale and expand the Company's single-use and systems portfolios.

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. We have made appropriate adjustments to the purchase price allocation during the measurement period, which ended on October 20, 2021.

The components and allocation of the purchase price consist of the following (amounts in thousands):

Cash and cash equivalents	$	1,163
Accounts receivable		415
Inventory		334
Prepaid expenses and other current assets		13
Property and equipment		73
Operating lease right of use asset		194
Customer relationships		6,370
Developed technology		1,810
Trademark and tradename		190
Non-competition agreements		90
Goodwill		6,713
Deferred tax assets		24
Accounts payable		(96)
Accrued liabilities		(999)
Operating lease liability		(136)
Operating lease liability, long-term		(59)
Fair value of net assets acquired	**$**	**16,099**

Acquired Goodwill

The goodwill of $6.7 million represents future economic benefits expected to arise from anticipated synergies from the integration of NMS. These synergies include certain cost savings, operating efficiencies and other strategic benefits projected to be achieved as a result of the NMS Acquisition. Substantially all of the goodwill recorded is expected to be deductible for income tax purposes.

The Company has included the operating results of our 2021 acquisitions of Polymem, Avitide and NTM and the 2020 acquisitions of ARTeSYN, NMS and EMT in its consolidated statements of comprehensive income since their respective acquisition dates. The Company does not consider these acquisitions to be material to its consolidated statements of comprehensive income and therefore has not included pro forma results.

Effective July 11, 2021, EMT was absorbed into the Company by way of "short-form" merger pursuant to New York and Delaware law, which did not require a vote of the Company's shareholders.

5. Leases

The Company is a lessee under leases of manufacturing facilities, office spaces, machinery, certain office equipment and vehicles. A majority of the Company's leases are operating leases with remaining lease terms between one month and 14 years. Finance leases are immaterial to the Company's consolidated financial statements. The Company determines if an arrangement qualifies as a lease and what type of lease it is at inception. The Company elected the package of practical expedients permitted under the transition guidance within the new lease standard, which among other things, allowed it to continue to account for existing leases based on the historical lease classification. The Company also elected the practical expedients to combine lease and non-lease components and to exclude right of use assets and lease liabilities for leases with an initial term of 12 months or less from the balance sheet.

Some of the lease agreements the Company enters into include Company options to either extend and/or early terminate the lease, the costs of which are included in the Company's operating lease liabilities to the extent that such options are reasonably certain of being exercised. Leases with renewal options allow the Company to extend the lease term typically between 1 and 5 years per option, some of its leases have multiple options to extend. When determining if a renewal option is reasonably certain of being exercised, the Company considers several economic factors, including but not limited to, the significance of leasehold improvements incurred on the property, whether the asset is difficult to replace, underlying contractual obligations, or specific characteristics unique to that particular lease that would make it reasonably certain that the Company would exercise such options.

As of December 31, 2022 and 2021, operating lease right of use assets were $125.0 million and $101.6 million, respectively and operating lease liabilities were $138.3 million and $110.8 million, respectively. The Company signed the Sixth Amendment of Lease for our headquarters in Waltham, Massachusetts in September 2021 to expand the facility by 74,108 square feet. The facility expanded by 21,244 square feet immediately. The remaining 52,864 square feet commenced in June 2022. As a result of this and the expansion of facilities in Bridgewater, New Jersey and Clifton Park, New York, the operating right of use asset and operating lease liability balances increased by a total of $23.5 million in 2022, net of the normal amortization of existing leases. The maturities of the Company's operating lease liabilities as of December 31, 2022 are as follows (amounts in thousands):

As of December 31, 2022	Amount
2023	$ 19,936
2024	21,651
2025	21,566
2026	21,367
2027	20,194
2028 and thereafter	78,312
Total future minimum lease payments	183,026
Less lease incentives	(14,822)
Less amount of lease payment representing interest	(29,858)
Total operating lease liabilities	$ 138,346

Total operating lease liabilities included on the Company's consolidated balance sheet are as follows (amounts in thousands):

	December 31,	
	2022	2021
Operating lease liability	$ 6,957	$ 8,303
Operating lease liability, long-term	131,389	102,492
Minimum operating lease payments	$ 138,346	$ 110,795

Lease expense for these leases is recognized on a straight-line basis over the lease term, with variable lease payments recognized in the period those payments are incurred. For the year ended December 31, 2022 and 2021, total lease cost is comprised of the following:

	For the Years Ended December 31,	
Lease Cost	2022	2021
	(Amounts in thousands)	
Operating lease cost	$ 17,833	$ 9,838
Variable operating lease cost	11,317	7,118
Lease cost	$ 29,150	$ 16,956

The following information represents supplemental disclosure for the consolidated statements of cash flows related to operating leases (amounts in thousands):

	For the Years Ended December 31,	
	2022	2021
Operating lease cost	$ (13,757)	$ (8,863)

Most of the leases do not provide implicit interest rates and therefore the Company determines the discount rate based on its incremental borrowing rate. The incremental borrowing rate for the Company's leases is determined based on lease term and currency in which the lease payments are made.

The weighted average remaining lease term and the weighted average discount rate used to measure the Company's operating lease liabilities as of December 31, 2022, were:

Weighted average remaining lease term (years)	8.60
Weighted average discount rate	4.08%

6. Revenue Recognition

The Company generates 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

Revenue for the years ended December 31, 2022, 2021 and 2020 was as follows:

	For the Years Ended December 31,		
	2022	2021	2020
	(Amounts in thousands)		
Product revenue	$ 801,183	$ 670,319	$ 366,136
Royalty and other income	353	215	124
Total revenue	$ 801,536	$ 670,534	$ 366,260

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 a few customers; therefore, economic factors specific to these 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 2, *"Summary of Significant Accounting Policies – Segment Reporting,"* above.

There was no revenue from customers that represented 10% or more of the Company's total revenue for the year ended December 31, 2022. Revenue from Pfizer Inc. was $68.3 million, or 10%, of the Company's total revenue for the year ended December 31, 2021 and MilliporeSigma accounted for $39.5 million, or 11% of total revenues in the year ended December 31, 2020.

Filtration Products

The Company's filtration products generate revenue through the sale of KrosFlo hollow fiber ("HF") TFF systems, TangenX® flat sheet ("FS") cassettes, Spectrum® HF filters, membranes and modules, XCell ATF systems and related consumables. Supporting our systems, we also sell ProConnex® Flow Path assemblies and custom silicone-based, single-use flow path assemblies and components from Polymem, BioFlex, NMS and ARTeSYN, four acquisitions completed in 2021 and 2020.

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 is 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 FS cassettes (SIUS, SIUS Gamma® and 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 FS cassettes is 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., tubing sets, 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 tubing set(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.

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 are designed to be disposable following a production campaign. Each OPUS column is delivered pre-packaged with the customer's choice of chromatography resin, which is either provided by the Company for the customer or customer supplied. 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.

Process Analytics Products

The process analytics franchise generates revenue primarily through the sale of the SoloVPE, FlowVPE and FlowVPX slope spectroscopy systems, consumables and service. 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. Process analytics product revenue is generally recognized at a point in time upon transfer of control to the customer.

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 for 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.

On September 20, 2021, the Company completed the Avitide Acquisition and added its diverse libraries and leading technology in affinity ligand discovery and development to its proteins franchise. The acquisition gives the Company a new platform for affinity resin development, including C&GT, and advances and expands the Company's proteins and chromatography franchises to address the unique purification needs of gene therapies and other emerging modalities.

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 represent 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 revenue from contracts with customers as of December 31, 2022 (amounts in thousands):

	December 31, 2022	December 31, 2021
Balances from contracts with customers only:		
Accounts receivable	$ 116,247	$ 117,420
Deferred revenue (included in accrued liabilities and other noncurrent liabilities in the consolidated balance sheets)	$ 19,631	$ 14,797
Revenue recognized during periods presented relating to:		
The beginning deferred revenue balance	$ 13,390	$ 13,708

The timing of revenue recognition, billings and cash collections results in the accounts receivable and deferred revenue balances on the Company's consolidated balance sheets.

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 in our consolidated statement of comprehensive income. 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.

7. Credit Losses

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 December 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 receivable. 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 the Company's 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 a 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 the Company's consolidated balance sheet as of December 31, 2022 was $116.2 million, net of $1.4 million of allowances. The following table provides a roll-forward of the allowance for credit losses in 2022 that is deducted from the amortized cost basis of accounts receivable to present the net amount expected to be collected (amounts in thousands):

	For the Years Ended December 31,	
	2022	2021
Balance of allowance for credit losses, beginning of period	$ (1,417)	$ (762)
Current period change for write-offs	126	173
Current period change for expected credit losses	(74)	(828)
Balance of allowance for credit losses, end of period	$ (1,365)	$ (1,417)

8. 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 changes in the carrying value of goodwill for the years ended December 31, 2022 and 2021 (amounts in thousands):

Balance as of December 31, 2020	$	618,305
Measurement period adjustment - NMS		(71)
Measurement period adjustment - ARTeSYN		(60)
Acquisition of Polymem		35,680
Acquisition of Avitide		199,245
Acquisition of NTM		10,180
Cumulative translation adjustment		(2,917)
Balance as of December 31, 2021	$	860,362
Measurement period adjustment - BioFlex		(346)
Measurement period adjustment - Avitide		(1,768)
Cumulative translation adjustment		(2,735)
Balance as of December 31, 2022	$	855,513

During each of the fourth quarters of 2022, 2021 and 2020, the Company completed its annual impairment assessments and concluded that goodwill was not impaired in any of those years.

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 in the Company's consolidated statements of comprehensive income. Intangible assets and their related useful lives are reviewed at least annually to determine if any adverse conditions existed 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 the Company's products or changes in the size of the market for the Company's products. If impairment indicators are present, the Company determines whether the underlying intangible asset is recoverable through estimated future undiscounted cash flows. If the asset is not found to be recoverable, it is written down to the estimated fair value of the asset based on the sum of the future discounted cash flows expected to result from the use and disposition 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 definite-lived intangible assets are recoverable at December 31, 2022.

Indefinite-lived intangible assets are tested 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 December 31, 2022:

	December 31, 2022			
	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in years)
	(Amounts in thousands)			
Finite-lived intangible assets:				
Technology - developed[(1)]	$ 190,463	$ (30,992)	$ 159,471	16
Patents	240	(240)	—	8
Customer relationships	252,934	(66,559)	186,375	15
Trademarks	7,682	(1,319)	6,363	19
Other intangibles	2,811	(2,044)	767	4
Total finite-lived intangible assets	454,130	(101,154)	352,976	16
Indefinite-lived intangible asset:				
Trademarks	700	—	700	—
Total intangible assets	$ 454,830	$ (101,154)	$ 353,676	

(1) Includes an upfront payment paid to DRS Daylight Solutions, Inc. ("Daylight") in September 2022 to exclusively license and commercialization rights to use certain technology and intellectual property which Daylight owns. The expected useful life of this technology is 15 years, which is the term of the exclusive License Agreement ("Daylight Agreement") and the period the Company expects to be able to utilize the license and which the technology will contribute directly to cash flows. See Note 12, *"Commitments and Contingencies"* for more information on this transaction.

Intangible assets consisted of the following at December 31, 2021:

	December 31, 2021			
	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in years)
	(Amounts in thousands)			
Finite-lived intangible assets:				
Technology - developed	$ 146,097	$ (21,553)	$ 124,544	17
Patents	240	(240)	—	8
Customer relationships	254,699	(50,719)	203,980	15
Trademarks	7,699	(877)	6,822	19
Other intangibles	2,839	(1,611)	1,228	4
Total finite-lived intangible assets	411,574	(75,000)	336,574	16
Indefinite-lived intangible asset:				
Trademarks	700	—	700	—
Total intangible assets	$ 412,274	$ (75,000)	$ 337,274	

Amortization expense for finite-lived intangible assets was $27.1 million, $22.1 million and $16.1 million for the years ended December 31, 2022, 2021 and 2020, respectively. As of December 31, 2022, the Company expects to record the following amortization expense (amounts in thousands):

For the Years Ended December 31,	Estimated Amortization Expense
2023	$ 29,286
2024	28,699
2025	28,361
2026	28,333
2027	28,305
2028 and thereafter	209,992
Total	$ 352,976

9. Consolidated Balance Sheet Detail

Inventories, net

Inventories, net consists of the following:

	December 31,	
	2022	2021
	(Amounts in thousands)	
Raw materials	$ 149,438	$ 123,321
Work-in-process	6,183	8,119
Finished products	82,656	53,054
Total inventories, net	$ 238,277	$ 184,494

Prepaid Expenses and Other Current Assets

Prepaid expenses and other current assets consist of the following:

	December 31,	
	2022	2021
	(Amounts in thousands)	
Equipment maintenance and services	$ 7,135	$ 10,857
Prepaid income taxes	519	3,970
Prepaid insurance	1,909	2,713
Other	10,274	8,409
Total prepaid expenses and other current assets	$ 19,837	$ 25,949

Property, Plant and Equipment

Property, plant and equipment consist of the following:

	December 31,	
	2022	2021
	(Amounts in thousands)	
Land	$ 1,003	$ 1,023
Buildings	1,599	764
Leasehold improvements	115,672	52,505
Equipment	94,613	70,983
Furniture, fixtures and office equipment	8,307	9,137
Computer hardware and software	29,813	22,380
Construction in progress	31,553	38,446
Other	420	443
Total property, plant and equipment	282,980	195,681
Less - Accumulated depreciation	(92,307)	(70,717)
Total property, plant and equipment, net	$ 190,673	$ 124,964

Depreciation expense totaled $23.9 million, $16.4 million and $10.9 million in the fiscal years ended December 31, 2022, 2021 and 2020, respectively.

Accrued Liabilities

Accrued liabilities consist of the following:

	December 31,	
	2022	2021
	(Amounts in thousands)	
Employee compensation	$ 33,522	$ 42,147
Deferred revenue	19,283	14,675
Income taxes payable	2,459	4,984
Other	15,856	13,692
Total accrued liabilities	$ 71,120	$ 75,498

10. Income Taxes

The components of income before income taxes are as follows:

	For the Years Ended December 31,		
	2022	2021	2020
	(Amounts in thousands)		
Domestic	$ 153,446	$ 81,984	$ 27,545
Foreign	65,694	71,559	31,672
Income before income taxes	$ 219,140	$ 153,543	$ 59,217

The components of the income tax provision are as follows:

	For the Years Ended December 31,		
	2022	2021	2020
	(Amounts in thousands)		
Components of the income tax provision (benefit):			
Current	$ 34,800	$ 20,166	$ 5,193
Deferred	(1,619)	5,086	(5,902)
Total	$ 33,181	$ 25,252	$ (709)
Jurisdictional components of the income tax provision (benefit):			
Federal	$ 17,662	$ 8,321	$ (4,741)
State	1,381	1,251	(3,011)
Foreign	14,138	15,680	7,043
Total	$ 33,181	$ 25,252	$ (709)

At December 31, 2022, the Company had federal net operating loss carryforwards of $42.9 million, state net operating loss carryforwards of $0.8 million, and foreign net operating loss carryforwards of $4.9 million. Federal net operating loss carryforwards of $7.3 million will expire at various dates through 2037. The state net operating loss carryforwards will expire at various dates through 2041, while the foreign net operating loss carryforwards do not expire. The other $35.6 million of federal net operating loss carryforwards have unlimited carryforward periods. At December 31, 2022, the Company had state business tax credits carryforwards of $3.8 million available to reduce future domestic income taxes. The business tax credit carryforwards will expire at various dates through 2042. 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 shareholders.

The components of deferred income taxes are as follows:

	December 31,	
	2022	2021
	(Amounts in thousands)	
Deferred tax assets:		
Stock-based compensation expense	$ 5,323	$ 5,144
Operating leases	31,564	26,264
Capitalized research and development	9,102	—
Inventory	5,983	3,082
Net operating loss carryforwards	9,808	10,841
Business tax credit carryforwards	2,639	1,834
Other	4,440	3,504
Total deferred tax assets	68,859	50,669
Less: valuation allowance	(19)	(718)
Net deferred tax assets	68,840	49,951
Deferred tax liabilities:		
Fixed assets	(18,965)	(7,779)
Acquired intangible assets	(43,549)	(43,227)
Operating lease right of use assets	(28,486)	(24,114)
Conversion option on convertible notes	—	(6,408)
Total deferred tax liabilities	(91,000)	(81,528)
Total net deferred tax liabilities	$ (22,160)	$ (31,577)

The net change in the total valuation allowance for the year ended December 31, 2022 and 2021 was a decrease of approximately $0.7 million and a decrease of $9,000, respectively.

The reconciliation of the federal statutory rate to the effective income tax rate for the years ended December 31, 2022, 2021 and 2020 is as follows:

	For the Years Ended December 31, 2022					
	2022		2021		2020	
	Amount	%	Amount	%	Amount	%
	(Amounts in thousands, except percentages)					
Income before income taxes	$ 219,140		$ 153,543		$ 59,217	
Expected tax at statutory rate	46,020	21.0%	32,247	21.0%	12,436	21.0%
Adjustments due to:						
Difference between U.S. and foreign tax	1,024	0.5%	530	0.3%	618	1.0%
State income and franchise tax	3,509	1.6%	1,462	1.0%	133	0.2%
Business tax credits	(5,139)	(2.3%)	(2,239)	(1.5%)	(4,660)	(7.9%)
Stock-based compensation expense	(5,638)	(2.6%)	(9,049)	(5.9%)	(9,243)	(15.6%)
U.S. taxation of foreign earnings	83	0.0%	30	0.0%	51	0.1%
Foreign-derived intangible income	(5,042)	(2.3%)	(2,547)	(1.7%)	—	0.0%
Executive compensation	5,441	2.5%	3,397	2.2%	1,401	2.4%
Contingent consideration	(6,033)	(2.8%)	1,232	0.8%	—	0.0%
Change in U.S. and foreign tax rates	2	0.0%	32	0.0%	(2,650)	(4.5%)
Uncertain tax provisions	234	0.1%	(443)	(0.3%)	(168)	(0.3%)
Change in valuation allowance	(688)	(0.3%)	(48)	(0.0%)	(12)	(0.0%)
Other	(592)	(0.3%)	648	0.4%	1,385	2.3%
Income tax provision	$ 33,181	15.1%	$ 25,252	16.4%	$ (709)	(1.2%)

The Company's tax returns are subject to examination by federal, state and foreign tax authorities. The Company's two major tax jurisdictions are subject to examination for the following periods:

Jurisdiction	Fiscal Years Subject to Examination
United States - federal and state	2018-2022
Sweden	2017-2022

The following is a tabular reconciliation of the total amounts of unrecognized tax benefits:

	For the Years Ended December 31, 2022	
	2022	2021
	(Amounts in thousands)	
Balance of gross unrecognized tax benefits, beginning of period	$ 2,786	$ 3,200
Gross amounts of increases in unrecognized tax benefits as a result of tax positions taken in the current period	146	133
Gross amounts of increases and (decreases) in unrecognized tax benefits as a result of tax positions taken in the prior period	64	(500)
Gross amounts of decreases due to release	—	(47)
Balance of gross unrecognized tax benefits, end of period	$ 2,996	$ 2,786

Included in the balance of unrecognized tax benefits as of December 31, 2022, are $3.0 million of tax benefits that, if recognized, would affect the effective tax rate. The Company classifies interest and penalties related to income taxes as components of its income tax provision. In 2022, a net expense of approximately $24,000 was recorded to the income tax provision related to interest and penalties while in 2021 and 2020, net (benefit)/expenses of approximately ($29,000) and $17,000, respectively, were recorded. The amount of interest and penalties recorded in the accompanying consolidated balance sheets was approximately $52,000 and $29,000 as of December 31, 2022 and 2021, respectively. The Company does not anticipate the amount of unrecognized tax benefits to change over the next twelve months.

On August 16, 2022, the United States enacted the Inflation Reduction Act of 2022 ("IRA"), which, among other things, implements a 15% alternative minimum tax on global adjusted financial statement income of certain large corporations, a 1% excise tax on net stock repurchases and several tax incentives to promote clean energy and will become effective beginning in 2023. The Company evaluated the provisions of the IRA and no provision had, or will have a material effect on our consolidated financial position or results of operations as of December 31, 2022.

As of December 31, 2022, the Company has accumulated undistributed earnings generated by its foreign subsidiaries of approximately $148.2 million. Because $5.7 million of such earnings have previously been subject to the one-time transition tax on foreign earnings required by the Tax Cuts and Jobs Act enacted in December 2017, any additional taxes due with respect to such earnings or the excess of the amount for financial reporting over the tax basis of our foreign investments would generally be limited to foreign and state taxes. At December 31, 2022, the Company has not provided for taxes on outside basis differences of its foreign subsidiaries as it is not practicable and the Company has the ability and intent to indefinitely reinvest the undistributed earnings of its foreign subsidiaries, and there are no needs for such earnings in the United States that would contradict its plan to indefinitely reinvest.

11. Stockholders' Equity

Public Offerings of Common Stock

On December 8, 2020, the Company completed a public offering in which 1,725,000 shares of its common stock, including the underwriters' exercise in full of an option to purchase an additional 225,000 shares, were sold to the public at a price of $181.00 per share (the "December Stock Offering"). The net proceeds of the December Stock Offering, after deducting underwriting discounts and commissions and other estimated offering expenses payable by the Company, were approximately $297.8 million.

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 "July Stock Offering"). The net proceeds of the July 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, including the underwriters' full exercise 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 "May Stock Offering"). The total proceeds received by the Company from the May Stock 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 the Company's 2018 Annual Meeting of Stockholders held on May 16, 2018, the Company's shareholders approved the 2018 Stock Option and Incentive Plan (the "2018 Plan"). Under the 2018 Plan the number of shares of the Company's common stock that are reserved and available for issuance shall be 2,778,000 plus the number of shares of common stock available for issuance under the Company's Amended and Restated 2012 Stock Option and Incentive Plan (the "2012 Plan"). The shares of common stock underlying any awards under the 2018 Plan, 2012 Plan and the Second Amended and Restated 2001 Repligen Corporation Stock Plan (the "2001 Plan," and together with the 2018 Plan and 2012 Plan, 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 December 31, 2022, 1,904,702 shares were available for future grants under the 2018 Plan.

Stock-Based Compensation

The Company recorded stock-based compensation expense of $27.3 million, $27.5 million and $17.0 million for the years ended December 31, 2022, 2021 and 2020, 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:

	For the Years Ended December 31,		
	2022	2021	2020
	(Amounts in thousands)		
Cost of product revenue	$ 2,525	$ 2,021	$ 1,929
Research and development	2,622	2,856	1,534
Selling, general and administrative	22,169	22,623	13,544
Total stock-based compensation	$ 27,316	$ 27,500	$ 17,007

The 2018 Plan allows for the granting of incentive and nonqualified options to purchase shares of common stock, restricted stock and other equity awards. Except for the grant to the Company's Chief Executive Officer ("CEO") in 2018 mentioned below, 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 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 CEO which consisted of both stock options and restricted stock units 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 December 31, 2022, options to purchase 609,965 shares and 531,034 stock units were outstanding under the Plans.

Stock Options

The Company uses the Black-Scholes option pricing model to calculate the fair value of stock option awards on the grant date, and measures stock-based compensation costs of stock options 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. 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.

The fair value of stock option awards granted during the years ended December 31, 2022, 2021 and 2020 were calculated using the following estimated assumptions:

	For the Years Ended December 31,		
	2022	2021	2020
Expected term (in years)	5.5-6.5	5.5-6.5	5.5-6.5
Expected volatility (range)	41.44-43.96%	44.57-45.27%	45.14-50.87%
Risk-free interest rate	1.86-4.07%	0.77-1.07%	0.34-1.15%
Expected dividend yield	0%	0%	0%

Information regarding option activity for the year ended December 31, 2022, 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, 2021	625,107	$ 54.15		
Granted	87,838	$ 190.90		
Exercised	(86,980)	$ 42.62		
Forfeited/expired/cancelled	(16,000)	$ 196.79		
Options outstanding at December 31, 2022	609,965	$ 71.74		
Options exercisable at December 31, 2022	317,218	$ 47.93		
Vested and expected to vest at December 31, 2022[1]	594,350	$ 71.30	5.85	$ 61,155

(1) Represents the number of vested options as of December 31, 2022 plus the number of unvested options expected to vest as of December 31, 2022, based on the unvested outstanding options at December 31, 2022 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 December 31, 2022, the last business day of 2022, of $169.31 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 December 31, 2022. The aggregate intrinsic value of stock options exercised during the years ended December 31, 2022, 2021 and 2020 was $14.1 million, $20.3 million and $36.6 million, respectively.

The weighted average grant date fair value of options granted during the years ended December 31, 2022, 2021 and 2020 was $87.40, $88.01 and $53.06, respectively. The total fair value of stock options that vested during the years ended December 31, 2022, 2021 and 2020 was $3.1 million, $3.0 million and $2.8 million, respectively.

Stock Units

The fair value of stock units is calculated using the closing price of the Company's common stock on the date of grant. The Company recognizes expense on awards with service-based vesting over the employee's requisite service period on a straight-line basis. Prior to 2020, the Company issued performance stock units to certain employees which are tied to the achievement of certain Company financial goal metrics and the passage of time. Since 2020, the Company has implemented formal programs that issue performance stock units to certain employees set to vest upon the achievement of individual goals and financial goals of the Company, as well as the passage of time. The Company recognizes expense on performance-based awards over the vesting period based on the probability that the performance metrics will be achieved. Information regarding stock unit activity, which includes activity for restricted stock units and performance stock units, for the year ended December 31, 2022 under the Plans is summarized below:

	Shares	Weighted Average Grant Date Fair Value
Unvested at December 31, 2021	606,685	$ 115.11
Awarded	194,633	$ 191.61
Vested	(208,531)	$ 98.90
Forfeited/cancelled	(61,753)	$ 161.05
Unvested at December 31, 2022	531,034	$ 142.57
Vested and expected to vest at December 31, 2022[(1)]	505,611	$ 138.17

(1) Represents the number of vested stock units as of December 31, 2022, plus the number of unvested stock units expected to vest as of December 31, 2022, based on the unvested outstanding stock units at December 31, 2022 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 of stock units vested during the years ended December 31, 2022, 2021 and 2020 was $43.9 million, $46.5 million and $28.3 million, respectively. The total fair value of stock units that vested during the years ended December 31, 2022, 2021 and 2020 was $22.7 million, $13.9 million and $10.85 million, respectively.

As of December 31, 2022, there was $63.9 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 3.01 years. The Company expects 2,071,467 unvested options and stock units to vest over the next five years.

12. Commitments and Contingencies

License Agreement

On September 19, 2022, the Company entered into the Daylight Agreement with Daylight, giving the Company exclusive license and commercialization rights to use certain technology and intellectual property subject to conditions set forth in the Daylight

Agreement. The Company agreed to pay Daylight (i) an initial, one-time, non-refundable, non-creditable upfront cash payment and (ii) certain quarterly royalty payments.

Pursuant to the Daylight Agreement, the Company obtains the exclusive, non-transferrable, right and license to use specifically in the field of bioprocessing, the Daylight intellectual property called Culpeo® QCL-IR Liquid Analyzer ("Culpeo"), which is a compact, intelligent spectrometer that uses the power of quantum cascade lasers ("QCLs") to analyze and identify chemicals. Under the Daylight Agreement, the Company assumes responsibility for the commercialization and sale of Culpeo, in addition to the ability to incorporate the intellectual property into optimized products over the term of the Daylight Agreement. Daylight will continue to sell the products in the specified fields of Aerospace and Defense.

Collaboration 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 that 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, 2022, 2021 and 2020.

In June 2018, the Company secured an agreement with Navigo Proteins GmbH ("Navigo") for the exclusive co-development of multiple affinity ligands for which Repligen holds commercialization rights. The Company is manufacturing and supplying the first of these ligands, NGL-Impact®, exclusively to Purolite, an Ecolab Inc. company ("Purolite"), who is pairing the Company's high-performance ligand with Purolite's agarose jetting base bead technology used in their Jetted A50 Protein A resin product. The Company also signed a long-term supply agreement with Purolite for NGL-Impact and other potential additional affinity ligands that may advance from the Company's Navigo collaboration. In September 2020, the Company and Navigo successfully completed co-development of an affinity ligand targeting the SARS-CoV-2 spike protein, to be utilized in the purification of vaccines for the COVID-19 pandemic, including emerging variants of the SARS-CoV-2 coronavirus. The Company has proceeded with scaling up and manufacturing this ligand and the development and validation of the related affinity chromatography resin, which is marketed by the Company. In September 2021, the Company and Navigo successfully completed co-development of a novel affinity ligand that addresses aggregation issues associated with pH sensitive antibodies and Fc-fusion proteins. The Company is manufacturing and supplying this ligand, NGL-Impact® HipH, to Purolite. The Navigo and Purolite agreements are supportive of the Company's strategy to secure and reinforce the Company's proteins business. The Company made payments to Navigo of $2.6 million, $2.3 million and $0.9 million in the years ended December 31, 2022, 2021 and 2020, respectively, in connection with this program, which are recorded to research and development expenses in the Company's consolidated statements of comprehensive income.

Purchase Orders, Supply Agreements and Other Contractual Obligations

In the normal course of business, the Company has entered into purchase orders and other agreements with manufacturers, distributors and others. Outstanding obligations at December 31, 2022 of $72.1 million are expected to be completed within one year.

Legal Proceedings

From time to time, in the normal course of its operations, the Company is subject to litigation matters and claims relating to employee relations, business practices and patent infringement. Litigation can be expensive and disruptive to normal business operations. Moreover, the results of complex legal proceedings are difficult to predict, and the Company's view of these matters may change in the future as the litigation and events related thereto unfold. The Company expenses legal fees as incurred. The Company records a provision for contingent losses when it is both probable that a liability has been incurred and the amount of the loss can be reasonably estimated. An unfavorable outcome to any legal matter, if material, could have an adverse effect on the Company's operations or its financial results.

13. Convertible Senior Notes

The carrying value of the Company's convertible senior notes is as follows:

	December 31, 2022	December 31, 2021
	(Amounts in thousands)	
0.375% Convertible Senior Notes due 2024:		
Principal amount	$ 287,470	$ 287,489
Unamortized debt discount	—	(28,220)
Unamortized debt issuance costs	(2,855)	(4,011)
Net carrying amount	$ 284,615	$ 255,258

0.375% Convertible Senior Notes due 2024

On July 19, 2019, the Company issued $287.5 million aggregate principal amount of the 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.

During the fourth quarter of 2022, the closing price of the Company's common stock exceeded 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. As a result, the 2019 Notes are convertible at the option of the holders of the 2019 Notes during the first quarter of 2023, the quarter immediately following the quarter when the conditions are met, as stated in the terms of the 2019 Notes. Expecting to continue meeting these terms, the Company will continue to classify the carrying value of the 2019 Notes as a current liability on the Company's consolidated balance sheet as of December 31, 2022. These conditions have been met since the third quarter of 2020. As a result, as of the date of this filing, the Company has received requests to convert $30,000 aggregate principal amount of the 2019 Notes all of which have settled. The conversions resulted in the issuance of a nominal number of shares of the Company's common stock to the note holders.

Prior to the adoption of ASU 2020-06, the Company accounted for the 2019 Notes as a liability and equity component where the carrying value of the liability component was valued based on a similar debt instrument. In accounting for the issuance of the 2019 Notes, the Company separated the 2019 Notes into liability and equity components. The carrying value of the liability component was calculated as the present value of its cash flows using a discount rate of 4.5% based on comparative convertible transactions for similar companies. The carrying value of the equity component representing the conversion option was determined by deducting the fair value of the liability component from the par value of the 2019 Notes as a whole. The excess of the principal

amount of the liability component over its carrying value amount, referred to as the debt discount, was amortized to interest expense on our consolidated statements of comprehensive income over the five-year term of the 2019 Notes. The equity component was not re-measured as long as it continued to meet the conditions for equity classification. The equity component related to the 2019 Notes recorded at issuance was $52.1 million, which was recorded in additional paid-in capital on the Company's consolidated balance sheets.

In accounting for the transaction costs related to the issuance of the 2019 Notes, the Company allocated the total costs incurred to the liability and equity components of the 2019 Notes 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 amortized to interest expense using the effective interest method over the five-year 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 the Company's consolidated balance sheets. Additionally, the Company recorded a net deferred tax liability of $11.4 million.

Effective January 1, 2022, the Company adopted ASU 2020-06. After adoption, the Company now accounts for the 2019 Notes as a single liability measured at amortized cost. As the equity component is no longer required to be split into a separate component, the Company recorded a net adjustment for the initial $50.4 million that was allocated to additional paid-in capital and $22.9 million of life-to-date interest expense recorded as amortization of debt discount. Additionally, the net deferred tax liability recorded for the 2019 Notes was reversed. The principal amount of the liability over its carrying amount is amortized to interest expense over the five-year term of the 2019 Notes. Since the 2019 Notes are classified as a single liability, there is no debt discount required to be amortized in 2022.

Interest expense recognized on the 2019 Notes in 2022 was $1.1 million and $1.8 million for the contractual coupon interest and the amortization of the debt issuance costs, respectively. The effective interest rate on the 2019 Notes is 1.01%, which included the interest on the 2019 Notes, amortization of the debt discount and debt issuance costs. As of December 31, 2022, the carrying value of the 2019 Notes was $284.6 million and the fair value of the principal was $452.0 million. The fair value of the 2019 Notes was determined based on the most recent trade activity of the 2019 Notes as of December 31, 2022.

The 2019 Notes agreement contains customary terms and events of default. If an event of default (other than certain events of bankruptcy, insolvency or reorganization involving the Company) occurs and is continuing, the holders of at least 25% in aggregate principal amount of the outstanding 2019 Notes may declare 100% of the principal of, and any accrued and unpaid interest on, all of the 2019 Notes to be due and payable. Upon the occurrence of certain events of bankruptcy, insolvency or reorganization involving the Company, 100% of the principal of and accrued and unpaid interest, if any, on all of the 2019 Notes will become due and payable automatically. Notwithstanding the foregoing, the 2019 Notes provide that, to the extent the Company elects and for up to 270 days, the sole remedy for an event of default relating to certain failures by the Company to comply with certain reporting covenants consist exclusively of the right to receive additional interest on the 2019 Notes. The Company is not aware of any events of default, current events or market conditions that would allow holders to call or convert the 2019 Notes as of December 31, 2022.

14. Accumulated Other Comprehensive Income (Loss)

Changes in accumulated other comprehensive income (loss) consisted of the following for the years ended December 31, 2022 and 2021 (amounts in thousands):

	Foreign Currency Translation Adjustment
Balance at December 31, 2020	$ 2,085
Other comprehensive loss	(18,971)
Balance at December 31, 2021	(16,886)
Other comprehensive loss	(17,508)
Balance at December 31, 2022	$ (34,394)

15. Employee Benefit Plans

In the United States, the Repligen Corporation 401(k) Savings and Retirement Plan (the "401(k) Plan") is a qualified defined contribution plan in accordance with Section 401(k) of the Internal Revenue Code. All U.S. employees over the age of 21 are eligible to make pre-tax contributions up to a specified percentage of their compensation. Under the 401(k) Plan, the Company may, but is not obligated to match a portion of the employees' contributions up to a defined maximum. The match is calculated on a calendar year basis. The Company matched $2.7 million, $1.8 million and $1.4 million in the years ended December 31, 2022, 2021 and 2020, respectively.

In Sweden, the Company contributes to a government-mandated occupational pension plan that is a qualified defined contribution plan. All employees in Sweden are eligible for this pension plan. The Company pays premiums to a third-party occupational pension specialist who administers the pension plan. These premiums are based on various factors including each employee's age, salary, employment history and selected benefits in the pension plan. When an employee terminates or retires, these premium payments cease for that employee and the Company has no further pension-related obligations for that employee. The Company contributed $1.1 million, $1.0 million and $0.6 million, respectively to the defined contribution plan for the years ended December 31, 2022, 2021 and 2020.

16. Related Party Transactions

Certain facilities leased by Spectrum are owned by the Roy Eddleman Living Trust (the "Trust"). As of December 31, 2022, the Trust owned greater than 5% of the Company's outstanding shares. Therefore, the Company considers the Trust to be a related party. The lease amounts paid to the Trust prior to the public offering were negotiated in connection with the acquisition of Spectrum. The Company incurred rent expense related to these leases totaling $0.7 million for the years ended December 31, 2022, 2021 and 2020.

Exhibit 21.1

SUBSIDIARIES OF THE REGISTRANT

Subsidiary Name	Subsidiary Jurisdiction
Repligen Sweden AB	Sweden
Repligen GmbH	Germany
Repligen Singapore Pte. Ltd.	Singapore
Repligen Europe B.V.	Netherlands
Repligen (Shanghai) Biotechnology Co. Ltd.	China
Repligen Japan LLC	Japan
Repligen India Private Limited	India
Repligen Korea Co., Ltd.	South Korea
ARTeSYN Biosolutions Holdings Ireland Ltd.	Ireland
ARTeSYN Biosolutions Ireland Limited	Ireland
Repligen Estonia OÜ	Estonia
Repligen Ireland Limited	Ireland
ARTeSYN Biosolutions USA, LLC	United States
Spectrum Life Sciences, LLC	United States
C Technologies, Inc.	United States
Polymem S.A.	France
Avitide LLC	United States
Newton T&M Corp.	United States
Bio-Flex Solutions, L.L.C.	United States
Repligen UK Limited	United Kingdom

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in the following Registration Statements:

(1) Registration Statements (Form S-8 No. 333-224978) pertaining to the 2018 Stock Option and Incentive Plan of Repligen Corporation,
(2) Registration Statements (Form S-8 No. 333-196456) pertaining to the Repligen Corporation Amended and Restated 2012 Stock Option and Incentive Plan, and
(3) Registration Statements (Form S-8 No. 333-157168) pertaining to the Second Amended and Restated 2001 Repligen Corporation Stock Plan;

of our reports dated February 22, 2023 with respect to the consolidated financial statements of Repligen Corporation and the effectiveness of internal control over financial reporting of Repligen Corporation, included in this Annual Report (Form 10-K) of Repligen Corporation for the year ended December 31, 2022.

/s/ Ernst & Young LLP

Boston, Massachusetts
February 22, 2023

Exhibit 31.1

CERTIFICATION

I, Tony Hunt, certify that:

1. I have reviewed this Annual Report on Form 10-K 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: February 22, 2023

/S/ TONY J. HUNT

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

Exhibit 31.2

CERTIFICATION

I, Jon K. Snodgres, certify that:

1. I have reviewed this Annual Report on Form 10-K 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: February 22, 2023

/S/ JON K. SNODGRES

Jon K. 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 Annual Report of Repligen Corporation (the "Company") on Form 10-K for the period ending December 31, 2022 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.

This certification is being provided pursuant to 18 U.S.C. 1350 and is not to be deemed a part of the Report, nor is it to be deemed to be "filed" for any purpose whatsoever.

Date: February 22, 2023

By: /S/ TONY J. HUNT
Tony J. Hunt
Chief Executive Officer and President
(Principal executive officer)

Date: February 22, 2023

By: /S/ JON K. SNODGRES
Jon K. Snodgres
Chief Financial Officer
(Principal financial officer)

Board of Directors

Karen A. Dawes
Chairperson
President, Knowledgeable Decisions, LLC

Nicolas M. Barthelemy
Former President and Chief Executive Officer, bioTheranostics

Carrie Eglinton Manner
President and Chief Executive Officer, OraSure Technologies, Inc.

Tony J. Hunt
President and Chief Executive Officer, Repligen Corporation

Konstantin Konstantinov, Ph.D.
Chief Technology Officer, Codiak BioSciences

Martin D. Madaus, D.V.M., Ph.D.
Senior Operating Executive, The Carlyle Group

Rohin Mhatre, Ph.D.
Senior Vice President, Product and Technology Development, Biogen Inc.

Glenn P. Muir
Former Chief Financial Officer and Executive Vice President, Hologic, Inc.

Investor Information

Copies of our annual reports on Form 10-K, proxy statements, quarterly reports on Form 10-Q and current reports on Form 8-K are available to shareholders upon request without charge.

Please visit our website at www.repligen.com or direct requests to:

Repligen Corporation
41 Seyon Street, Building #1, Suite 100
Waltham, MA 02453
ATTN: Investor Relations
Phone: 781.250.0111
investors@repligen.com

Executive Management

Executive Officers:

Tony J. Hunt
President and Chief Executive Officer

Jon K. Snodgres
Chief Financial Officer

James R. Bylund
Chief Operating Officer

Christine Gebski
Senior Vice President, Filtration and Chromatography

Ralf Kuriyel
Senior Vice President, Research & Development

Senior Management:

Gautam Choudhary
Senior Vice President, Systems and Automation

Kimberly A. Cornwell
General Counsel

Leslie Galvin
Global Head of Human Resources

Jaime M. Humara
Senior Vice President, Marketing

Kola Otitoju
Senior Vice President, Strategy and Business Development

Keith Lee Robinson
Chief Information Officer

Mark Salerno
Vice President and Global Head of Analytics

Stephen Tingley
Vice President, Head of Fluid Management

Neil Whitfield
Vice President, Global Sales

Market for Repligen Stock

NASDAQ Global Select Market: RGEN

Transfer Agent and Registrar

American Stock Transfer & Trust Company, LLC
6201 15th Avenue
Brooklyn, NY 11219
Phone: 800.937.5449
Teletypewriter for the hearing impaired: 866.703.9077
help@astfinancial.com

The Transfer Agent is responsible for handling shareholder questions regarding lost certificates, address changes and change of ownership or name in which shares are held.

Outside Corporate Counsel

Goodwin Procter LLP
100 Northern Avenue
Boston, MA 02210

Independent Accountants

Ernst & Young LLP
200 Clarendon Street
Boston, MA 02116

Virtual Annual Meeting

The Annual Meeting of Shareholders will be held on Thursday, May 18, 2023, 8:00 a.m. ET

Location
Our 2023 Annual Meeting will be held online (only) at http://www.virtualshareholdermeeting.com/RGEN2023

You can vote your shares if you were a shareholder of record at the close of business on March 20, 2023 (the "Record Date").

REPLIGEN CORPORATION

41 Seyon Street, Building 1, Suite 100, Waltham, MA 02453

phone 781.250.0111 | toll-free 800.622.2259 | fax 781.250.0115

www.repligen.com

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