UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, DC 20549

FORM 10-K

(Mark One)

☑ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the year ended December 31, 2022

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the transition period from to

Commission File Number 001-36362

BioLife Solutions, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**94-3076866**
(State or other jurisdiction of incorporation or organization)	*(IRS Employer Identification No.)*

3303 Monte Villa Parkway, Suite 310, Bothell, Washington, 98021
(Address of registrant's principal executive offices, Zip Code)

(425) 402-1400
(Telephone number, including area code)

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

Title of each class	Trading symbol	Name of exchange on which registered
BioLife Solutions, Inc. Common Stock	BLFS	NASDAQ Capital Market

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

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

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

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

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (S232.405 of this chapter) during the preceding 12 months (or for such shorter period that the Registrant was required to submit such said files). Yes ☑ No ☐

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

Large accelerated filer ☐ Accelerated filer ☑ Non-accelerated filer ☐ Smaller reporting company ☐ Emerging Growth Company ☐

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

Indicate by check mark whether the registrant 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 ☑

As of the registrant’s most recently completed second fiscal quarter, the aggregate market value of common equity (based on closing price on June 30, 2022 of $13.81 per share) held by non-affiliates was approximately $472,940,782.

As of March 21, 2023, 43,211,955 shares of the registrant’s common stock were outstanding.

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FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K ("Form 10-K" or "Annual Report") contains forward-looking statements which are made pursuant to the safe harbor provisions of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). The forward-looking statements in this Form 10-K do not constitute guarantees of future performance and actual results could differ materially from those contained in the forward-looking statements. These statements are based on current expectations of future events. Such statements include, but are not limited to, statements about our products, including our newly acquired products, customers, regulatory approvals, the potential utility of and market for our products and services, our ability to implement our business strategy and anticipated business and operations, in particular following our acquisitions in recent years, future financial and operational performance, our anticipated future growth strategy, including the acquisition of other synergistic cell and gene therapy manufacturing tools and services or technologies or other companies or technologies, capital requirements, intellectual property, suppliers, joint venture partners, future financial and operating results, the impact of the COVID-19 pandemic, plans, objectives, expectations and intentions, revenues, costs and expenses, interest rates, outcome of contingencies, business strategies, regulatory filings and requirements, the estimated potential size of markets, capital requirements, the terms of any capital financing agreements and other statements that are not historical facts. You can find many of these statements by looking for words like "believes", "expects", "anticipates", "estimates", "may", "should", "will", "could", "plan", "intend", or similar expressions in this Form 10-K. We intend that such forward-looking statements be subject to the safe harbors created thereby.

These forward-looking statements are based on the current beliefs and expectations of our management and are subject to significant risks and uncertainties. If underlying assumptions prove inaccurate or unknown risks or uncertainties materialize, actual results may differ materially from current expectations and projections. Factors that might cause such a difference include those discussed under "Risk Factors", as well as those discussed elsewhere in the Form 10-K.

You are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date of this Form 10-K or, in the case of documents referred to or incorporated by reference, the date of those documents.

All subsequent written or oral forward-looking statements attributable to us or any person acting on our behalf are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. We do not undertake any obligation to release publicly any revisions to these forward-looking statements to reflect events or circumstances after the date of this Form 10-K or to reflect the occurrence of unanticipated events, except as may be required under applicable U.S. securities law. If we do update one or more forward-looking statements, no inference should be drawn that we will make additional updates with respect to those or other forward-looking statements.

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

PART I

ITEM 1. BUSINESS

The following discussion of our business contains forward-looking statements that involve risks and uncertainties (see the section entitled "Forward-Looking Statements" herein). Our actual results could differ materially from those anticipated in these forward-looking statements as a result of certain factors, including those factors set forth under "Risk Factors" and elsewhere in this Form 10-K.

Overview

We are a life sciences company that develops, manufactures, and markets bioproduction tools and services which are designed to improve quality and de-risk biologic manufacturing, storage, distribution, and transportation in the cell and gene therapy ("CGT") industry and broader biopharma markets. Our products are used in basic and applied research and commercial manufacturing of biologic-based therapies. Customers use our products to maintain the health and function of biologic material during sourcing, manufacturing, storage, and distribution.

We currently operate as one bioproduction tools and services business which supports several steps in the biologic material manufacturing and delivery process. We have a diversified portfolio of tools and services that focuses on biopreservation, cell processing, frozen biologic storage products and services, cold-chain transportation, and thawing of biologic materials. We have in-house expertise in cryobiology and continue to capitalize on opportunities to maximize the value of our product platform for our extensive customer base through both organic growth innovations and acquisitions.

Our products

Our bioproduction tools and services are comprised of three revenue lines that contain seven main offerings:

- Cell processing
  - Biopreservation media
  - Human platelet lysate media ("hPL"), cryogenic vials, and automated cell-processing fill machines
- Freezers and thaw systems
  - Ultra-low temperature freezers
  - Cryogenic freezers and accessories
  - Automated thawing devices
- Storage and cold chain services
  - Biological and pharmaceutical material storage
  - Cloud connected "smart" shipping containers

Cell processing

Biopreservation media

Our proprietary biopreservation media products, HypoThermosol® FRS and CryoStor®, are formulated to mitigate preservation-induced, delayed-onset cell damage and death, which result when cells and tissues are subjected to reduced temperatures. Our technology can provide our CGT customers with significant shelf-life extension of biologic source material and final cell products and can also greatly improve post-preservation cell and tissue viability and function. Our biopreservation media are serum-free, protein-free, fully defined, and manufactured under current Good Manufacturing Practices (cGMP). We strive to source wherever possible, the highest available grade, multi-compendium raw materials. We estimate our cell processing products have been incorporated in nearly 700 customer clinical applications, including numerous chimeric antigen receptor (CAR) T cell and other cell types.

Stability (i.e. shelf-life) and functional recovery are crucial aspects of academic research and clinical practice in the biopreservation of biologic-based source material, intermediate derivatives, and isolated/derived/expanded cellular products and therapies. Limited stability is especially critical in the CGT field, where harvested cells and tissues will lose viability over time, if not maintained appropriately at normothermic body temperature (37ºC) or stored in a hypothermic state in an effective preservation medium. Chilling (hypothermia) is used to reduce metabolism and delay degradation of harvested cells and tissues. However, subjecting biologic material to hypothermic environments induces damaging molecular stress and structural changes. Although cooling successfully reduces metabolism (i.e., lowers demand for energy), various levels of cellular damage and death occur when using suboptimal methods. Traditional biopreservation media range from simple "balanced salt" (electrolyte) formulations to complex mixtures of electrolytes, energy substrates such as sugars, osmotic buffering agents and antibiotics. The limited stability, which results from the use of these traditional biopreservation media formulations, is a significant shortcoming that our optimized proprietary products address with great success.

Our scientific research activities over the last 20+ years enabled a detailed understanding of the molecular basis for the hypothermic and cryogenic (low-temperature induced) damage/destruction of cells through apoptosis and necrosis. This research led directly to the development of our HypoThermosol FRS and CryoStor technologies. Our proprietary biopreservation media products are specifically formulated to:

- Minimize cell and tissue swelling
- Reduce free radical levels upon formation
- Maintain appropriate low temperature ionic balances
- Provide regenerative, high-energy substrates to stimulate recovery upon warming
- Avoid the creation of an acidic state (acidosis)
- Inhibit the onset of apoptosis and necrosis

A key feature of our biopreservation media products is their “fully-defined” profile. All of our cGMP products are serum-free, protein-free and are formulated and filled using aseptic processing. We strive to use USP/Multicompendial grade or the highest quality available synthetic components. All of these features benefit prospective customers by facilitating the qualification process required to incorporate our products into their regulatory filings.

Competing biopreservation media products are often formulated with simple isotonic media cocktails, animal serum, potentially a single sugar or human protein. A key differentiator of our proprietary HypoThermosol FRS and CryoStor formulation is the engineered optimization of the key ionic component concentrations for low temperature environments, as opposed to normothermic body temperature around 37°C, as found in culture media or saline-based isotonic formulas. Competing cryopreservation freeze media is often comprised of a single permeating cryoprotectant such as dimethyl sulfoxide (“DMSO”). Our CryoStor formulations incorporate multiple permeating and non-permeating cryoprotectant agents which allow for multiple mechanisms of protection and reduces the dependence on a single cryoprotectant. We believe that our products offer significant advantages over in-house formulations, or commercial “generic” preservation media, including, time savings, improved quality of components, more rigorous quality control release testing, cost effectiveness, and improved preservation efficacy.

The results of independent testing demonstrate that our biopreservation media products significantly extend shelf-life and improve cell and tissue post-thaw viability and function. Our products have demonstrated improved biopreservation outcomes, including greatly extended shelf-life and post-thaw viability, across a broad array of cell and tissue types.

We estimate that annual revenue from each customer commercial application in which our products are used could range from $500,000 to $2.0 million, if such application is approved and our customer commences large scale commercial manufacturing of the biologic-based therapy.

Human platelet lysate media, cryogenic vials and automated cell-processing fill machines

In September 2021, we acquired Sexton Biotechnologies, Inc. (“Sexton”), a producer of bioproduction tools. Sexton's bioproduction tools portfolio includes human platelet lysates for cell expansion, which reduces risk and improves downstream performance over fetal bovine serum, human serum, and other chemically defined media, CellSeal® closed system vials that are purpose-built rigid containers used in CGT that can be filled manually or with high throughput systems, and automated cell processing machines that bring multiple processes traditionally performed by manual techniques under a higher level of control to protect therapies from loss or contamination.

For our Sexton vials and media, we estimate that annual revenue from each customer commercial application in which these products are used could also range from $500,000 to $2.0 million, if such application is approved and our customer commences large scale commercial manufacturing of the biologic-based therapy.

Freezers and thaw systems

Ultra-low temperature freezers

In May 2021, we acquired Global Cooling, Inc. (“Global Cooling”), a manufacturer of class defining ultra-low temperature freezers. Global Cooling carries a portfolio of freezers that range in size from portable units to stationary upright freezers to accommodate a wide variety of use cases. Users can configure these freezers to achieve temperatures between -20°C and -86°C. The portfolio was designed to be environmentally friendly and energy efficient, using as little as 2.8 kWh/day at temperatures of -80°C. The freezers do not use compressor-based or cascade refrigeration systems. Instead, they use patented free-piston Stirling engine technology that uses fewer moving parts.

Cryogenic freezers and accessories

Our line of cryogenic freezers offer leading design and manufacture of state-of-the-art liquid nitrogen laboratory freezers, cryogenic equipment and accessories. Our Isothermal LN2 freezers are constructed with a patented system which stores liquid nitrogen in a jacketed space in the walls of the freezer. This dry storage method eliminates liquid nitrogen contact with stored specimens, reduces the risk of cross-contamination, and provides increased user safety in a laboratory setting. To accommodate customer requirements, we offer customizable features including wide bodied and extended height models. Our high-capacity controlled rate freezers ("HCFR") are designed for large volume storage with customizable freezing programs and the ability to monitor conditions in real time.

To accompany the offerings of cryogenic freezer equipment, we supply equipment for storing critically important biological materials. This storage equipment includes upright freezer racks, chest freezer racks, liquid nitrogen freezer racks, canisters/cassettes and frames as well as laboratory boxes and dividers. Due to our onsite design and manufacturing capability, racks and canisters can be customized to address customers' varying requirements.

Automated thawing devices

The ThawSTAR® line includes automated vial and cryobag thawing products that control the heat and timing of the thawing process of biologic material. Our customizable, automated, water-free thawing products use algorithmic programmed heating plates to consistently bring biologic material from a frozen state to a liquid state in a controlled and consistent manner. This helps reduce damage during the temperature transition. The ThawSTAR products can also reduce risk of contamination versus using a traditional water bath.

Storage and cold chain services

Biological and pharmaceutical storage

In October 2020, we acquired SciSafe Holdings, Inc. ("SciSafe"), a premier provider of biological and pharmaceutical storage. In addition to providing storage services, SciSafe provides cold chain logistics that ensures materials are kept at target temperatures from the moment that the materials leave the customer's premises to their ultimate return. State-of-the-art monitoring systems employed by SciSafe allow for customers to monitor the storage temperatures of their materials throughout the entire logistics chain.

We operate six storage facilities in the USA and one facility in the Netherlands.

Cloud connected "smart" shipping containers

We are a leading developer and supplier of next generation cold chain management tools for cell and gene therapies. Our cloud-connected shipping containers and evo.is cloud app allows biologic products to be traced and tracked in real time. Our evo platform consists of rentable cloud-connected shippers that include technologies enabling tracking software to provide real-time information on geolocation, payload temperature, ambient temperature, tilt of shipper, humidity, altitude, and real-time alerts when a shipper has been opened. Our internally developed evo.is software allows customers to customize alert notifications both in data measurements and user requirements. The evo Dry Vapor Shipper ("DVS") is specifically marketed for use with cell and gene therapies. The evo DVS has an improved form factor and ergonomics over the traditional dewar, including extended thermal performance, reduced liquid nitrogen recharge time, improved payload extractors, and ability to maintain temperature for longer periods if tilted on its side.

We utilize couriers who already have established logistic channels and distribution centers. Our strategy greatly reduces the cash need to build out specialized facilities around the world. Our partnerships with several white glove couriers allow us to scale our sales and marketing effort by leveraging their salesforce. Our courier partnerships market our evo platform to their existing cell and gene therapy customers as a cost effective and innovative solution. We also market directly to our existing and prospective customers who can utilize the evo platform through our courier partnerships.

Our market opportunity

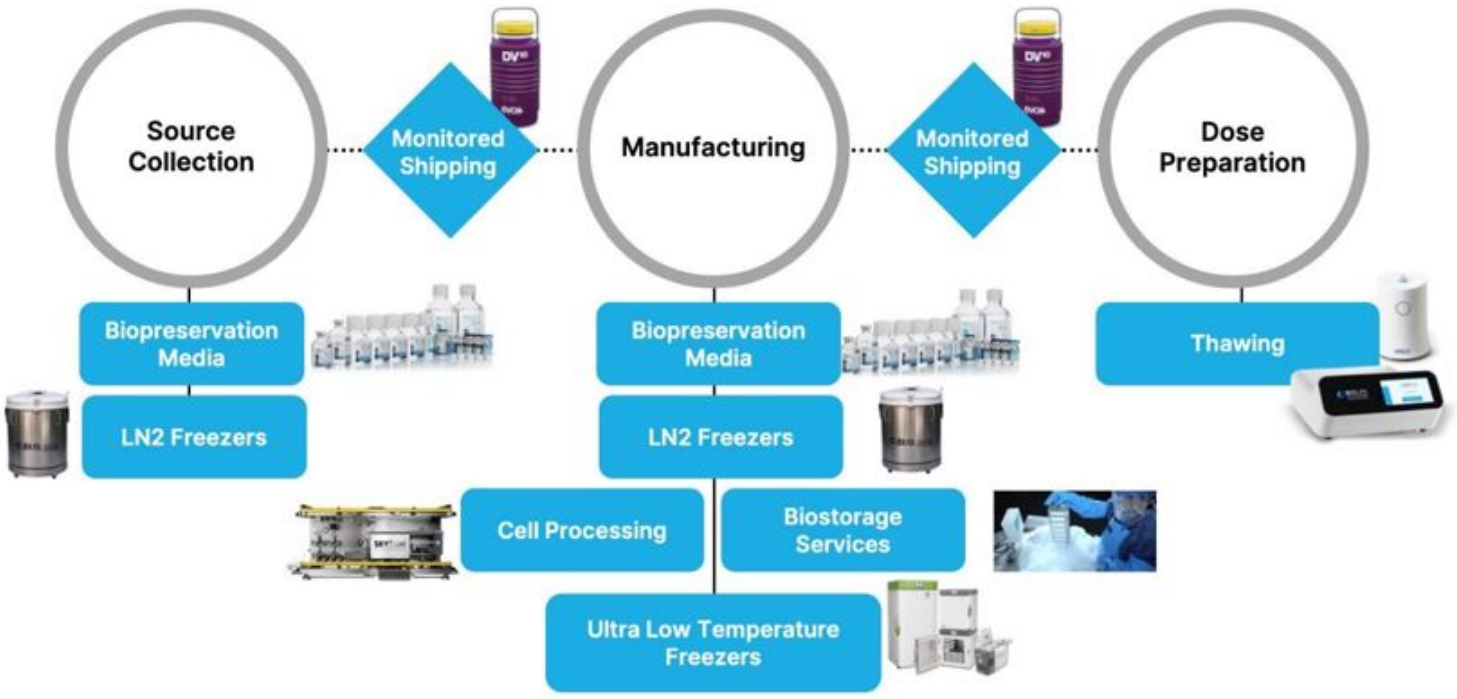
The CGT market has been rapidly expanding, treating diseases once thought incurable. According to the Alliance for Regenerative Medicine ("ARM"), "2023 State of the Industry Report" there were over 2,220 ongoing clinical trials utilizing regenerative medicine at the end of Q4 2022, with an 11% growth in CGT development companies throughout 2022. ARM also reported there were over $12.6 billion in total global financings in the regenerative market raised in 2022. The FDA predicts up to fourteen cell and gene therapy regulatory decisions to be made during 2023.

These technologies change the way physicians treat patients. The manufacturing, distribution and the delivery process is significantly different from many other types of medicines and therapies. We believe we are well positioned to address many of the manufacturing difficulties in the process of producing cell and gene therapies.

The bioproduction process

Our various products and services currently integrate into several steps in our customers' bioproduction workflow process for cell and gene therapies. See the diagram below for an illustration of this process and our product roles. We now offer products that integrate into the critical steps of preservation, thawing, fixed storage, and transportable storage under controlled conditions.

Complementary products portfolio
Expanding Participation in Customers' Workflow



Our strategy

We are focused on the development, production, and commercialization of differentiated, best-in-class products and services that facilitate the manufacturing, delivery, and storage of cell and gene therapies and biologic materials. Our products are designed to increase our customers' product yield and we are committed to supporting our customers with strong customer service and applications expertise.

We leverage our numerous relationships with the leading cell and gene therapy companies that use our expanded product portfolio of bioproduction tools and services to cross-sell our other parts of the portfolio. Over the last several years, we have built a strong reputation as a trusted supplier of critical tools used in cell and gene therapy manufacturing and the broader biopharma market. We believe that our relationships and reputation could enable us to drive incremental revenue growth through the sale of additional products to a captive customer base. Our products are designed to increase our customers' product yield and functionality, and we are committed to supporting our customers with strong customer service and expertise in the clinical applications of our products.

Business Operations

Research and development

Our research and development activities are focused on evaluating new, potentially disruptive technologies, which may be applicable throughout the cell and gene therapy manufacturing workflow. We routinely assess and analyze the strengths and weaknesses of competitive products and are typically engaged in business development discussions on an ongoing basis. We strive to continue to introduce differentiated and high-quality products that address specific difficulties in manufacturing, delivery and storage of biologic material.

Sales and marketing

We market and sell our products through direct sales and third-party distribution. We have significantly expanded our global commercial organization from 18 team members in 2020 to 58 team members as of December 31, 2022.

We have experienced field-based sales employees who market our growing product portfolio on a direct basis. Over time, we have expanded our sales team and anticipate adding additional sales personnel. Our technical applications engineers and customer care support teams have extensive experience with the products and services that we offer.

Our products are also marketed and distributed by STEMCELL Technologies, MilliporeSigma, VWR, part of Avantor, Thermo Fisher and several other regional distributors under non-exclusive agreements. In 2022, 2021, and 2020, sales to third-party distributors accounted for 50%, 46%, and 45% of our revenue, respectively.

During the years ended December 31, 2022 and 2021, we derived approximately 18% and 17% of our revenue from the same customer, respectively. During the year ended December 31, 2020, we derived approximately 13% of our revenue from a different customer.

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

	Year Ended December 31,		
Revenue by customers' geographic locations	**2022**	**2021**	**2020**
United States	72%	78%	73%
Canada	17%	7%	13%
Europe, Middle East, Africa (EMEA)	7%	14%	12%
Other	4%	1%	2%
Total revenue	100%	100%	100%

Manufacturing

Cell processing – We maintain and operate two independent cGMP clean room production suites for manufacturing sterile biopreservation media products in Bothell, Washington. Our quality management system ("QMS") in Bothell is certified to the ISO 13485:2016 standard. Our QMS takes guidance from applicable sections of 21 CFR Part 820 – Quality System Regulation for Good Manufacturing Practice of medical devices, 21 CFR Parts 210 and 211 – cGMP for Finished Pharmaceuticals, FDA Guidance – Sterile Drug Products, Volume 4, EU Guidelines Annex 1 – Manufacture of Sterile Medicinal Products, ISO 13408 – Aseptic Processing of Healthcare Products, and ISO 14644 – Clean Rooms and Associated Controlled Environments.

We also maintain and operate one cGMP clean room production suite for manufacturing hPL media in Indianapolis, Indiana. Our quality management system ("QMS") in Indianapolis is certified to the ISO 9001:2015 standard. Our QMS takes guidance from applicable sections of 21 CFR Part 820 – Quality System Regulation for Good Manufacturing Practice of medical devices, 21 CFR Parts 210 and 211 – cGMP for Finished Pharmaceuticals, Volume 4, EU Guidelines Annex 2 – Manufacture of Biological active substances and Medicinal Products for Human Use and ISO 14644 – Clean Rooms and Associated Controlled Environments.

We seek to manage single-source supplier risk by regularly assessing the quality and capacity of our suppliers, implementing supply and quality agreements where appropriate and actively managing lead times and inventory levels of sourced components. Pursuant to our supply agreements, we are required to notify customers of any changes to our raw materials. For certain components in which we do not have a secondary supplier, we estimate that it would take up to six months to find and qualify a second source. Order quantities and lead times for externally sourced components are based on our forecasts, which are derived from historical demand and anticipated future demand. Lead times for components may vary depending on the size of the order, specific supplier requirements and current market demand for the materials and parts. Due to COVID-19, we have seen increased lead times for certain raw materials, particularly personal protective equipment used in our clean rooms and certain form factors of bottles and vials used in our finished products. To date, we have not experienced significant difficulties in obtaining raw materials for the manufacture of our biopreservation media products.

Freezers and thaw systems – Ultra-low temperature ("ULT") freezers are produced in our facilities in Athens, Ohio and Bruce Township, Michigan and by a contract manufacturing organization ("CMO") based in Ohio. We believe this CMO has the skills, experience and capacity needed to meet our quality standards and demand expectations for the product line. We estimate that it would take up to six months to find and qualify an alternative CMO. As of December 31, 2022, we were transitioning manufacturing operations for this product line to in-house production and anticipate completion within the year ended December 31, 2023. To date, we have not experienced significant difficulties in obtaining our ULT freezer products from our CMO. During the year ended December 31, 2021, we experienced difficulties in obtaining sheet metal and electrical components incorporating semiconductor chips for the manufacture of our ULT freezer products. During the year ended December 31, 2022, supply chain bottlenecks were mitigated through the diversification of suppliers, resulting in improved pricing from the year ended December 31, 2021. We were still experiencing constraints in supply for semiconductor chips as of December 31, 2022. Though our costs to obtain semiconductor components normalized throughout the year, we were still experiencing constraints in obtaining electrical component parts. These constraints are expected to improve through diversification of our semiconductor supply chain partnerships.

The majority of our isothermal LN2 freezers and related accessories are manufactured in our facility in Bruce Township, Michigan. We are reliant on certain critical suppliers for some components. Due to COVID-19, we have seen increased lead times for certain raw materials and components from our suppliers as well as increased costs on certain raw materials. To date, we have not experienced significant difficulties in obtaining raw materials for the manufacture of our LN2 freezers freezer and related accessories.

Our ThawSTAR automated, water-free thawing products are produced by a CMO based in the United States. We believe this CMO has the skills, experience and capacity needed to meet our quality standards and demand expectations for the product line. Due to COVID-19, we have seen increased lead times from our CMO due to increased lead times from our CMO's suppliers. We estimate that it would take up to six months to find and qualify an alternative CMO. To date, we have not experienced significant difficulties in obtaining our automated thaw products from our CMO.

Storage and cold chain services – Production of our evo cold chain management hardware products is performed by external CMOs and by personnel in our Albuquerque, New Mexico facility. During the year-ended December 31, 2022, we began to transition our operations from the Albuquerque, New Mexico facility to our facility in Bruce Township, Michigan. We anticipate this to be completed in the first quarter of 2023. Our QMS is certified to the ISO 9001:2015 standard. Due to COVID-19 and other market-wide supply chain constraints, we have seen increased lead times for certain raw materials and components from our suppliers, causing additional increased lead times for the manufacture of our evo cold chain products.

We practice continuous improvement 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.

SciSafe operates six cGMP compliant storage facilities in the United States and one state-of-the-art facility in the Netherlands, which is registered with the European Regulatory body in Netherlands (IGJ) for Good Distribution of Active Pharmaceutical Ingredients. One facility in the United States is certified to the ISO 20387:2018 standard and all facilities, both in the United States and the Netherlands, are certified to the ISO 9001:2015 standard. We rely on outside suppliers for the build out of our cold-storage chambers and stand-alone freezers. Due to COVID-19, we have experienced increased lead times in acquiring external stand-alone freezers, which we use to store customers' biologic materials.

Product regulatory status

Our products are not subject to any specific United States Food and Drug Administration ("FDA") or other international marketing regulations for drugs, devices, or biologics. We are not required to sponsor formal prospective, controlled clinical trials in order to establish safety and efficacy. However, to support our current and prospective clinical customers, we manufacture and release our products in compliance with cGMP and other relevant quality standards.

To assist customers with their regulatory applications, we maintain Type II Master Files at the FDA for CryoStor, HypoThermosol FRS, BloodStor 27, Stemulate, nLiven PR, T-Liven PR, CellSeal Closed System Cryogenic Vials, and our Cell Thawing Media products, which provide the FDA with information regarding our manufacturing facility and process, our quality system, stability and safety, and any additional testing that has been performed. Customers engaged in clinical and commercial applications may notify the FDA of their intention to use our products in their product development and manufacturing process by requesting a cross-reference to our master files.

A group of isothermal, standard, and carousel LN2 freezers in our freezers and thaw systems product line is currently regulated as Class 2 medical devices in the EU.

Intellectual property

The following table lists our granted and pending patents. We have also obtained certain trademarks and tradenames for our products to distinguish our genuine products from our competitors' products and we maintain certain details about our processes, products, and strategies as trade secrets. While we believe that the protection of patents and trademarks is important to our business, we also rely on a combination of trade secrets, nondisclosure and confidentiality agreements, scientific expertise and continuing technological innovation to maintain our competitive position. Despite these precautions, it may be possible for unauthorized third parties to copy certain aspects of our products and/or to obtain and use information that we regard as proprietary (see "Item 1A. Risk Factors" of this Annual Report for additional details). The laws of some foreign countries in which we may sell our products do not protect our proprietary rights to the same extent as do the laws of the United States.

	Issued Patents	Patents Applied For	Registered Trademarks
Cell processing	58	9	37
Freezers and thaw systems	85	66	24
Storage and cold chain services	11	24	9
Total	**154**	**99**	**70**

Competition

Our bioproduction products and services 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.

Human capital

We view our employees and our culture as key to our success. As of December 31, 2022, we had 466 full time employees and 1 part-time employee. Our employees are not covered by any collective bargaining agreement. We consider relations with our employees to be good.

Since the beginning of the COVID-19 pandemic, the health and safety of our employees has remained a priority. We have implemented and will continue to implement initiatives safeguarding our employees from the transmission of COVID-19 in accordance with federal, state, and local regulations. We have taken a variety of measures to ensure the availability and functioning of our critical infrastructure to promote the safety and security of our employees and to support the communities in which we operate. These measures have included the increase of our raw materials, manufacturing safety stock inventory for our biopreservation media, expansion of availability for our biological and pharmaceutical storage, requiring remote working arrangements for employees who are not integral to physically making and shipping our products or who do not need specialized equipment to perform their work, restricting on-site visits by non-employees, implementing social distancing protocols, and investing in personal protective equipment. As we continue to monitor the recommendations of public health authorities, we have encouraged positions not essential to being on-site to work to continue working under our flexible work arrangement.

Corporate history

We were incorporated in Delaware in 1987 under the name Trans Time Medical Products, Inc. In 2002, the Company, then known as Cryomedical Sciences, Inc. was engaged in manufacturing and marketing cryosurgical products. The entity was merged with our wholly owned subsidiary, BioLife Solutions, Inc., which was engaged as a developer and marketer of biopreservation media products for cells and tissues. Following the merger, we changed our name to BioLife Solutions, Inc.

Principal offices; available information

Our principal executive offices are located at 3303 Monte Villa Parkway, Suite 310, Bothell, Washington 98021 and the telephone number is (425) 402-1400. We maintain a website at www.biolifesolutions.com. The information contained on or accessible through our website is not part of this Annual Report on Form 10-K and is not incorporated in any manner into this Annual Report. Our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to reports filed or furnished pursuant to Sections 13(a) and 15(d) of the Securities Exchange Act of 1934 (the "Exchange Act"), are available free of charge on our website as soon as reasonably practicable after we electronically file such reports with, or furnish those reports to, the Securities and Exchange Commission (the "SEC"). The SEC also maintains an Internet site that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC at http://www.sec.gov.

ITEM 1A. RISK FACTORS

Investing in our common stock involves a high degree of risk. You should carefully consider the risks and uncertainties described below, together with all of the other information contained in this Annual Report, before deciding to invest in our common stock. If any of the following risks materialize, our business, financial condition, results of operation and prospects will likely be materially and adversely affected. In that event, the market price of our common stock could decline and you could lose all or part of your investment.

Risks related to our financial condition

Despite our increasingly diversified customer base, we have historically depended on a limited number of customers and products in a limited number of market sectors; if we lose any of these large customers or if there are problems in those market sectors, our net product revenue and operating results could decline significantly.

During the years ended December 31, 2022 and 2021, we derived approximately 18% and 17% of our revenue from the same customer, respectively. During the year ended December 31, 2020, we derived approximately 13% of our revenue from a different customer. No other customer accounted for more than 10% of revenue in the years ended December 31, 2022, 2021 and 2020. In the years ended December 31, 2022, 2021, and 2020, we derived approximately 36%, 33%, and 60% of our revenue from CryoStor products, respectively. Additionally, during the years ended December 31, 2022 and 2021, we derived approximately 22% of our revenues in both years from our 780XLE freezers. Our principal customers may vary from period to period and such customers may not continue to purchase products from us at current levels or at all. Further, 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 customer ordering patterns could lead to significant reductions in net product revenue which could harm our business. Because our revenue and operating results are difficult to predict, we believe that period-to-period comparisons of our results of operations are not 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, supply chain issues 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 research and development, sales and marketing and general and administrative expenses are not significantly affected by variations in revenue. Further, our cost of product revenue is dependent on product mix. If our quarterly operating results fail to meet investor expectations, the price of our common stock may decline.

We expect our operating results to fluctuate significantly from period to period.

Following our recent acquisitions, we have increased our fixed costs and now sell products having higher costs of product revenue than our biopreservation media products. We expect that the result of these acquisitions will make it more difficult to predict our revenue and operating results from period-to-period and that, as a result, comparisons of our results of operations are not currently and will not be for the foreseeable future a good indicator of our future performance. For example, if revenue declines in a quarter, whether due to a delay in recognizing expected revenue, adverse economic conditions, supply chain issues or otherwise, our results of operations in such period will be harmed because many of our expenses are now relatively fixed. In particular, a large portion of our manufacturing costs, research and development expenses, sales and marketing expenses and general and administrative expenses are not significantly affected by variations in revenue. Further, a shift in product revenue concentration away from our CryoStor products and towards other developing products with higher costs of product revenue will adversely affect our operating margin. If our quarterly operating results fail to meet investor expectations, the price of our common stock may decline.

Risks related to our acquisition strategy

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 in recent years, we recorded a significant amount of intangible assets, including developed technology, in-process research and development, and customer relationships relating to the acquired product lines, and goodwill. Under generally accepted accounting principles in the United States, we must assess, at least annually and potentially more frequently, whether the value of indefinite-lived intangible assets and goodwill have been impaired. Intangible assets and goodwill are assessed for impairment in the event of an impairment indicator, as was the case in Q2 and Q4 of 2022 when a combination of three events (a significant decline in our market capitalization, the abandonment of an in-process research and development project within the asset group acquired in the acquisition of Global Cooling and our revised forecasts for net income and net cash flows to be generated by that asset group) constituted an interim triggering event as of June 30, 2022 and led to further decline as of the annual impairment testing date of October 1, 2022 that required further analysis with respect to, and resulted in, impairment charges to goodwill, indefinite-lived intangibles, and definite-lived intangibles. Any future 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.

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 have made and may continue to make selected acquisitions of complementary products and/or businesses. 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, such as the underperformance of products acquired from Global Cooling;
- negative near-term impacts on financial results after an acquisition, including acquisition-related earnings charges, such as the negative cash flows resulting from our acquisition of Global Cooling;
- 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 (which in the case of certain of our prior acquisitions were significant);
- 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;
- diversion of management's attention and company resources from existing operations of the business;
- inconsistencies in standards, controls, procedures, and policies;
- the impairment of intangible assets as a result of technological advancements, or worse-than-expected performance of acquired companies;
- assumption of, or exposure to, historical liabilities of the acquired business, including unknown contingent or similar liabilities, including product liability, 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, research and development, 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.

The integration of our acquisitions may result in significant accounting charges that adversely affect the announced results of our Company.

The financial results of our Company may be adversely affected by cash expenses and non-cash accounting charges incurred in connection with our recent acquisitions. In addition to the anticipated cash charges, costs associated with the amortization of intangible assets are expected. The price of our common stock could decline to the extent our financial results are materially affected by the foregoing charges or if the foregoing charges are larger than anticipated.

Our recent acquisitions may result in unexpected consequences to our business and results of operations.

Although we believe that our acquired product lines will generally be subject to risks similar to those to which we are subject to in our existing operations, we may not have discovered all risks applicable to these businesses during the due diligence process. Some of these risks could produce unexpected and unwanted consequences for us. Undiscovered risks may result in us incurring financial liabilities, which could be material and have a negative impact on our business operations.

We may engage in future acquisitions or other strategic transactions which may require us to seek additional financing or financial commitments, increase our expenses and/or present significant distractions to our management.

We continue to actively evaluate opportunities and consider other strategic transactions to grow our portfolio of bioproduction tools and services for the cell and gene therapy and broader biopharma markets. In the event we engage in an acquisition or strategic transaction, including by making an investment in another company, we may need to acquire additional financing. Obtaining financing through the issuance or sale of additional equity and/or debt securities, if possible, may not be at favorable terms and may result in additional dilution to our current stockholders. Additionally, any such transaction may require us to incur non-recurring or other charges, may increase our near and long-term expenditures and may pose significant integration challenges or disrupt our management or business, which could adversely affect our operations and financial results. For example, an acquisition or strategic transaction may entail numerous operational and financial risks, including the risks outlined above and additionally:

- exposure to unknown financial or product liabilities;
- disruption of our business and diversion of our management's time and attention in order to negotiate and close on such transaction or develop acquired products or technologies;
- higher than expected acquisition and integration costs;
- write-downs of assets or goodwill or impairment charges;
- increased amortization expenses;
- difficulty and cost in combining the operations and personnel of any acquired businesses with our operations and personnel;
- impairment of relationships with key suppliers or customers of any acquired businesses due to changes in management and ownership; and
- inability to retain key employees of any acquired businesses.

Accordingly, although there can be no assurance that we will undertake or successfully complete any transactions of the nature described above, any transactions that we do complete could have a material adverse effect on our business, results of operations, financial condition, and prospects.

Risks related to our business and operations

Healthcare reform measures could adversely affect our business.

The efforts of governmental and third-party payors to contain or reduce the costs of healthcare 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 healthcare system in ways that could affect our ability to sell our products profitably. Efforts by governments and other third-party payors to contain or reduce the costs of healthcare through various means may limit our commercial opportunities and adversely affect our operating results and result in a decrease in the price of our common stock or limit our ability to raise capital.

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 products to our customers. 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. 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.

We face significant competition.

The life sciences industry is highly competitive. We anticipate that we will continue to face increased competition as existing companies may choose to develop new or improved products and as new companies could enter the market with new technologies, any of which could compete with our product or even render our products obsolete. Many of our competitors are significantly larger than us and have greater financial, technical, research, marketing, sales, distribution and other resources than us. There can be no assurance that our competitors will not succeed in developing or marketing technologies and products that are more effective or commercially attractive than any that are being developed or marketed by us, or that such competitors will not succeed in obtaining regulatory approval, or introducing or commercializing any such products, prior to us. Such developments could have a material adverse effect on our business, financial condition and results of operations. Also, even if we can compete successfully, there can be no assurance that we can continue do so in a profitable manner.

We are dependent on outside suppliers for all our manufacturing supplies.

We rely on outside suppliers for all our manufacturing supplies, parts and components. There can be no assurance that, in the future, our current or alternative sources for manufacturing supplies will be able to meet all our demands on a timely basis. Unavailability of necessary components could require us to re-engineer our products to accommodate available substitutions, which could increase costs to us and/or have a material adverse effect on manufacturing schedules, products performance and market acceptance. In addition, an uncorrected defect or supplier’s variation in a component or raw material, either unknown to us or incompatible with our manufacturing process, could harm our ability to manufacture products. We might not be able to find a sufficient alternative supplier in a reasonable amount of time, or on commercially reasonable terms, if at all. If we fail to obtain a supplier for the components of our products, our operations could be disrupted.

During year ended December 31, 2021, we experienced difficulties in obtaining sheet metal and electrical components incorporating semiconductor chips for the manufacture of our ULT freezer products. During the year ended December 31, 2022, supply chain bottlenecks were mitigated through the diversification of suppliers, resulting in improved pricing from the year ended December 31, 2021. We were still experiencing constraints in supply for semiconductor chips as of December 31, 2022. Though our costs to obtain semiconductor components normalized throughout the year, we were still experiencing constraints in obtaining electrical component parts. These constraints are expected to improve through diversification of our semiconductor supply chain partnerships. We have sufficient supply for electrical component parts within our operations for the foreseeable future.

Our success will depend on our ability to attract and retain key personnel.

In order to execute our business plan, we must attract, retain and motivate highly qualified managerial, scientific, manufacturing, and sales personnel. If we fail to attract and retain skilled scientific and sales personnel, our sales efforts will be hindered. Our future success depends to a significant degree upon the continued services of key scientific and technical personnel. If we do not attract and retain qualified personnel, we will not be able to achieve our growth objectives.

Difficulties in manufacturing could have an adverse effect upon our expenses and our product revenues.

We currently manufacture all of our biopreservation media products, freezer products and related components. We currently outsource the manufacturing of certain thaw products, certain cold chain products, two ULT freezer models, and components of our LN2 freezers. The manufacturing of our products is difficult and complex. To support our current and prospective clinical customers, we comply with and intend to continue to comply with cGMP in the manufacture of our products. Our ability to adequately manufacture and supply our products in a timely matter is dependent on the uninterrupted and efficient operation of our facilities and those of third parties producing raw materials and supplies upon which we rely in our manufacturing. The manufacture of our products may be impacted by:

- availability or contamination of raw materials and components used in the manufacturing process, particularly those for which we have no other source or supplier;
- the ongoing capacity of our facilities;
- our ability to comply with new regulatory requirements, including our ability to comply with cGMP;
- inclement weather and natural disasters;
- changes in forecasts of future demand for product components;
- potential facility contamination by microorganisms or viruses;
- updating of manufacturing specifications;
- product quality success rates and yields; and
- global viruses and pandemics, including COVID-19.

If efficient manufacture and supply of our products is interrupted, we may experience delayed shipments or supply constraints. If we are at any time unable to provide an uninterrupted supply of our products to customers, our customers may be unable to supply their end-products incorporating our products to their patients and other customers, which could materially and adversely affect our product revenue and results of operations.

While we are not currently subject to FDA or other regulatory approvals on substantially all of our products, if we become subject to regulatory requirements, the manufacture and sale of our products may be delayed or prevented, or we may become subject to increased expenses.

None of our products are subject to FDA. In particular, we are not required to sponsor formal prospective, controlled clinical-trials to establish safety and efficacy. A group of isothermal, standard, and carousel LN2 freezers in our freezers and thaw systems product line is currently regulated as Class 2 medical devices in the EU. Additionally, we comply with cGMP requirements. This is done solely to support our current and prospective clinical customers. However, there can be no assurance that we will not be required to obtain approval from the FDA, or foreign regulatory authorities, as applicable, prior to marketing any of our products in the future. Any such requirements could delay or prevent the sale of our products or may subject us to additional expenses.

Our business may be subject to product liability claims or product recalls, which could be expensive and could result in a diversion of management's attention.

Our business exposes us to potential product liability risks that are inherent in designing, manufacturing, and marketing our products. In particular, we are a supplier of bioproduction tools to the cell and gene therapy industry. Our products are used in basic and applied research, and commercial manufacturing of biologic-based therapies. Customers use our products to maintain the health and function of biologic material during sourcing, manufacturing, storage, and distribution of cells and tissues, and component failures, manufacturing flaws, design defects or inadequate disclosure of product-related risks with respect to these or other products we manufacture or sell could result in an unsafe condition or injury. As a result, we face an inherent risk of damage to our reputation if one or more of our products are, or are alleged to be, defective. We may be exposed to risks from product liability and warranty claims in the event that our products actually or allegedly fail to perform as expected or the use of our products results, or is alleged to result, in bodily injury and/or property damage. The outcome of litigation, particularly any class-action lawsuits, is difficult to quantify. Plaintiffs often seek recovery of very large or indeterminate amounts, including punitive damages. The magnitude of the potential losses relating to these lawsuits may remain unknown for substantial periods of time and the cost to defend against any such litigation may be significant. Accordingly, we could experience product liability losses in the future and incur significant costs to defend these claims.

In addition, if any of our products are, or are alleged to be, defective, we may voluntarily participate, or be required by applicable regulators, to participate in a recall of that product if the defect or the alleged defect relates to safety. In the event of a recall, we may experience lost sales and be exposed to individual or class-action litigation claims and reputational risk. Product liability, warranty and recall costs may have a material adverse effect on our business, financial condition and results of operations.

Insurance coverage is increasingly difficult to obtain or maintain.

While we currently maintain product liability insurance, directors' and officers' liability insurance, general liability insurance, and other types of insurance, first- and third-party insurance is increasingly more costly and narrower in scope, and we may be required to assume more risk in the future. If we are subject to third-party claims or suffer a loss or damage in excess of our insurance coverage, we may be required to share that risk in excess of our insurance limits. Furthermore, any first- or third-party claims made on our insurance policies may impact our future ability to obtain or maintain product liability insurance coverage at reasonable costs, if at all.

We are and may become the subject of various claims, litigation or investigations which could have a material adverse effect on our business, financial condition, results of operations or price of our common stock.

We are and may become subject to various claims (including "whistleblower" complaints), litigation or investigations, including commercial disputes and employee claims, and from time to time may be involved in governmental or regulatory investigations or similar matters. Any claims asserted against us or our management, regardless of merit or eventual outcome, could harm our reputation and have an adverse impact on our relationship with our clients, distribution partners and other third-parties and could lead to additional related claims. Furthermore, there is no guarantee that we will be successful in defending ourselves in pending or future litigation or similar matters under various laws. Any judgments or settlements in any pending litigation or future claims, litigation or investigation could have a material adverse effect on our business, financial condition, results of operations and price of our common stock.

Risks related to our intellectual property and cyber security

Expiration of our patents may subject us to increased competition and reduce our opportunity to generate product revenue.

The patents for our products have varying expiration dates and, when these patents expire, we may be subject to increased competition and we may not be able to recover our development costs. In some of the larger economic territories, such as the United States and Europe, patent term extension/restoration may be available. We cannot, however, be certain that an extension will be granted or, if granted, what the applicable time or the scope of patent protection afforded during any extended period will be. If we are unable to obtain patent term extension/restoration or some other exclusivity, we could be subject to increased competition and our opportunity to establish or maintain product revenue could be substantially reduced or eliminated. Furthermore, we may not have sufficient time to recover our development costs prior to the expiration of our U.S. and non-U.S. patents.

Our proprietary rights may not adequately protect our technologies and products.

Our commercial success will depend on our ability to obtain patents and/or regulatory exclusivity and maintain adequate protection for our technologies and products in the United States and other countries. We will be able to protect our proprietary rights from unauthorized use by third-parties only to the extent that our proprietary technologies and products are covered by valid and enforceable patents or are effectively maintained as trade secrets.

We intend to apply for additional patents covering both our technologies and products, as we deem appropriate. We may, however, fail to apply for patents on important technologies or products in a timely fashion, if at all. Our existing patents and any future patents we obtain may not be sufficiently broad to prevent others from practicing our technologies or from developing competing products and technologies. In addition, the patent positions of life science industry companies are highly uncertain and involve complex legal and factual questions for which important legal principles remain unresolved. As a result, the validity and enforceability of our patents cannot be predicted with certainty. In addition, we cannot guarantee that:

- we were the first to make the inventions covered by each of our issued patents and pending patent applications;
- we were the first to file patent applications for these inventions;
- others will not independently develop similar or alternative technologies or duplicate any of our technologies;
- any of our pending patent applications will result in issued patents;
- any of our patents will be valid or enforceable;
- any patents issued to us will provide us with any competitive advantages, or will not be challenged by third parties; and
- we will develop additional proprietary technologies that are patentable, or the patents of others will not have an adverse effect on our business.

The actual protection afforded by a patent varies on a product-by-product basis, from country to country and depends on many factors, including the type of patent, the scope of its coverage, the availability of regulatory related extensions, the availability of legal remedies in a particular country and the validity and enforceability of the patents. Our ability to maintain and solidify our proprietary position for our products will depend on our success in obtaining effective claims and enforcing those claims once granted. Our issued patents and those that may be issued in the future, or those licensed to us, may be challenged, invalidated, unenforceable or circumvented, and the rights granted under any issued patents may not provide us with proprietary protection or competitive advantages against competitors with similar products. We also rely on trade secrets to protect some of our technology, especially where it is believed that patent protection is inappropriate or unobtainable. However, trade secrets are difficult to maintain. While we use reasonable efforts to protect our trade secrets, our employees, consultants, contractors, or scientific and other advisors may unintentionally or willfully disclose our proprietary information to competitors. Enforcement of claims that a third party has illegally obtained and is using trade secrets is expensive, time consuming and uncertain. In addition, non-U.S. courts are sometimes less willing than U.S. courts to protect trade secrets. If our competitors independently develop equivalent knowledge, methods, and know-how, we would not be able to assert our trade secrets against them and our business could be harmed.

We may not be able to protect our intellectual property rights throughout the world.

Filing, prosecuting, and defending patents on all our products in every jurisdiction would be prohibitively expensive. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products. These products may compete with our products and may not be covered by any patent claims or other intellectual property rights.

The laws of some non-U.S. countries do not protect intellectual property rights to the same extent as the laws of the United States, and many companies have encountered significant problems in protecting and defending such rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property protection, particularly those relating to biotechnology, which could make it difficult for us to stop the infringement of our patents. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial cost and divert our efforts and attention from other aspects of our business.

If we fail to protect our intellectual property rights, our competitors may take advantage of our ideas and compete directly against us.

Our success will depend to a significant degree on our ability to secure and protect intellectual property rights and enforce patent and trademark protections relating to our technology. While we believe that the protection of patents and trademarks is important to our business, we also rely on a combination of copyright, trade secret, nondisclosure and confidentiality agreements, know-how and continuing technological innovation to maintain our competitive position. From time to time, litigation may be advisable to protect our intellectual property position. However, these legal means afford only limited protection and may not adequately protect our rights or permit us to gain or keep any competitive advantage. Any litigation in this regard could be costly, and it is possible that we will not have sufficient resources to fully pursue litigation or to protect our intellectual property rights. This could result in the rejection or invalidation of our existing and future patents. Any adverse outcome in litigation relating to the validity of our patents, or any failure to pursue litigation or otherwise to protect our patent position, could materially harm our business and financial condition. In addition, confidentiality agreements with our employees, consultants, customers, and key vendors may not prevent the unauthorized disclosure or use of our technology. It is possible that these agreements will be breached or that they will not be enforceable in every instance, and that we will not have adequate remedies for any such breach. Enforcement of these agreements may be costly and time consuming. Furthermore, the laws of foreign countries may not protect our intellectual property rights to the same extent as the laws of the United States.

We may incur substantial costs as a result of litigation or other proceedings relating to patent and other intellectual property rights and we may be unable to protect our rights to, or use of, our technology.

If we choose to go to court to stop someone else from using the inventions claimed in our patents or our licensed patents, that individual or company has the right to ask the court to rule that these patents are invalid and/or should not be enforced against that third party. These lawsuits are expensive and would consume time and other resources even if we were successful in stopping the infringement of these patents. In addition, there is a risk that the court will decide that these patents are invalid or unenforceable and that we do not have the right to stop the other party from using the inventions. There is also the risk that, even if the validity or enforceability of these patents is upheld, the court will refuse to stop the other party on the grounds that such other party's activities do not infringe our rights.

If we wish to use the technology claimed in issued and unexpired patents owned by others, we will need to obtain a license from the owner, enter into litigation to challenge the validity or enforceability of the patents or incur the risk of litigation in the event that the owner asserts that we infringed its patents. The failure to obtain a license to technology or the failure to challenge an issued patent that we may require to discover, develop or commercialize our products may have a material adverse effect on us.

If a third party asserts that we infringed its patents or other proprietary rights, we could face a number of risks that could seriously harm our results of operations, financial condition and competitive position, including:

- patent infringement and other intellectual property claims, which would be costly and time consuming to defend, whether or not the claims have merit, and which could delay a product and divert management's attention from our business;
- substantial damages for past infringement, which we may have to pay if a court determines that our product or technologies infringe a competitor's patent or other proprietary rights;
- a court prohibiting us from selling or licensing our technologies unless the third party licenses its patents or other proprietary rights to us on commercially reasonable terms, which it is not required to do; and
- if a license is available from a third party, we may have to pay substantial royalties or lump-sum payments or grant cross licenses to our patents or other proprietary rights to obtain that license.

The biotechnology industry has produced a proliferation of patents, and it is not always clear to industry participants, including us, which patents cover various types of products or methods of use. The coverage of patents is subject to interpretation by the courts, and the interpretation is not always uniform. If we are sued for patent infringement, we would need to demonstrate that our products or methods of use either do not infringe the patent claims of the relevant patent, and/or that the patent claims are invalid, and/or that the patent is unenforceable, and we may not be able to do this. Proving invalidity, in particular, is difficult since it requires a showing of clear and convincing evidence to overcome the presumption of validity enjoyed by issued patents.

U.S. patent laws as well as the laws of some foreign jurisdictions provide for provisional rights in published patent applications beginning on the date of publication, including the right to obtain reasonable royalties, if a patent subsequently issues and certain other conditions are met.

Because some patent applications in the United States may be maintained in secrecy until the patents are issued, because patent applications in the United States and many foreign jurisdictions are typically not published until 18 months after filing, and because publications in the scientific literature often lag behind actual discoveries, we cannot be certain that others have not filed patent applications for technology covered by our issued patents or our pending applications, or that we were the first to invent the technology.

Patent applications filed by third parties that cover technology similar to ours may have priority over our patent applications and could further require us to obtain rights to issued patents covering such technologies. If another party files a U.S. patent application on an invention similar to ours, we may elect to participate in or be drawn into an interference proceeding declared by the U.S. Patent and Trademark Office to determine priority of invention in the United States. The costs of these proceedings could be substantial, and it is possible that such efforts would be unsuccessful, resulting in a loss of our U.S. patent position with respect to such inventions. Some of our competitors may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. In addition, any uncertainties resulting from the initiation and continuation of any litigation could have a material adverse effect on our ability to raise the funds necessary to continue our operations. We cannot predict whether third parties will assert these claims against us, or whether those claims will harm our business. If we are forced to defend against these claims, whether they are with or without any merit and whether they are resolved in favor of or against us, we may face costly litigation and diversion of management's attention and resources. As a result of these disputes, we may have to develop costly non-infringing technology, or enter into licensing agreements. These agreements, if necessary, may be unavailable on terms acceptable to us, if at all, which could seriously harm our business or financial condition.

Our inability to protect our systems and data from continually evolving cybersecurity risks or other technological risks, including as a result of breaches of our associated third parties, could affect our ability to conduct our business.

In conducting our business, we process, transmit and store sensitive business information and personal information about our customers, vendors, and other parties. This information may include account access credentials, credit and debit card numbers, bank account numbers, social security numbers, driver's license numbers, names and addresses and other types of sensitive business or personal information. Some of this information is also processed and stored by our third-party service providers to whom we outsource certain functions and other agents, including our customers, which we refer to collectively as our associated third parties.

We are a regular target of malicious third-party attempts, some of which have been successful, to identify and exploit system vulnerabilities, and/or penetrate or bypass our security measures, in order to gain unauthorized access to our networks and systems or those of our associated third parties. Such access has led and could lead in the future to the compromise of sensitive, business, personal or confidential information or instructions to transfer funds by us or customers to unauthorized recipients. In the third quarter during the year ended December 31, 2022, we experienced an immaterial security breach that successfully redirected payments from BioLife customers to unauthorized bank accounts. As a result, we proactively employ multiple methods at different layers of our systems to defend our systems against intrusion and attack and to protect the data we collect. These measures have been breached in the past and we cannot be certain that they will be successful and sufficient to counter current and emerging technology threats that are designed to breach our systems in order to gain access to confidential information.

Our computer systems and our associated third parties' computer systems have been, and could be in the future, subject to breach, and our data protection measures may not prevent unauthorized access. The techniques used to obtain unauthorized access, disable or degrade service, or sabotage systems change frequently and are often difficult to detect. Threats to our systems and our associated third parties' systems can derive and have derived from human error, fraud or malice on the part of employees or third parties, or may result from accidental technological failure. Computer viruses and other malware can be distributed and has and could in the future infiltrate our systems or those of our associated third parties. In addition, denial of service or other attacks could be launched against us for a variety of purposes, including to interfere with our services or create a diversion for other malicious activities. Our defensive measures in the past, have not, and in the future, may not, prevent downtime, unauthorized access, or use of sensitive data. Further, while we select our third-party service providers carefully, and we seek to ensure that our customers adequately protect their systems and data, we do not control their actions and are not able to oversee their processes. Any problems experienced by our associated third parties, including those resulting from breakdowns or other disruptions in the services provided by such parties or cyber-attacks and security breaches, could adversely affect our ability to conduct our business and our financial condition.

We could also be subject to liability for claims relating to misuse of personal information, such as violation of data privacy laws. We cannot provide assurance that the contractual requirements related to security and privacy that we impose on our service providers who have access to customer data will be followed or will be adequate to prevent the unauthorized use or disclosure of data. Any failure to adequately enforce or provide these protective measures could result in liability, protracted and costly litigation, governmental intervention, and fines.

Risks related to our common stock

Our stock price and volume may be volatile, and purchasers of our securities could incur substantial losses.

Our common stock, traded on the NASDAQ Capital Market, may be volatile and has experienced price and volume fluctuations. For example, in the year ended December 31, 2022, the highest intra-day sale price of our common stock on NASDAQ was $38.01 per share and the lowest intra-day sale price of our common stock on NASDAQ was $10.40 per share. Our highest trading day volume was 3,276,000 shares traded and the lowest trading day volume was 138,800 shares traded. We may continue to incur substantial increases or decreases in our stock price and volume in the foreseeable future.

Our stock price and trading volume and the market prices and trading volume of many publicly traded companies, including emerging companies in the life sciences industry, have been, and can be expected to be, highly volatile. The future market price and trading volume of our common stock could be significantly impacted by numerous factors, including, but not limited to:

- Future sales of our common stock or other fundraising events;
- Sales of our common stock by existing shareholders;
- Changes in our capital structure, including stock splits or reverse stock splits;
- Announcements of technological innovations for new commercial products by our present or potential competitors;
- Developments concerning proprietary rights;
- Adverse results in our field or with clinical tests of our products in customer applications;
- Adverse litigation;
- Unfavorable legislation or regulatory decisions;
- Public concerns regarding our products;
- Variations in quarterly operating results;
- General trends in the health care industry;
- Global viruses, epidemics, and pandemics, including COVID-19
- Other factors outside of our control, including significant market fluctuations.

A significant percentage of our outstanding common stock is held by one stockholder, and this stockholder therefore has significant influence on us and our corporate actions.

As of December 31, 2022, based on our review of public filings and the Company's records, one of our existing stockholders, Casdin Capital, LLC ("Casdin"), owned 7,566,292 shares of our common stock, representing 18% of the issued and outstanding shares of common stock. Accordingly, this stockholder has had, and will continue to have, significant influence in determining the outcome of any corporate transaction or other matter submitted to our stockholders for approval, including mergers, consolidations and the sale of all or substantially all our assets, election of directors and other significant corporate actions. In addition, without the consent of this stockholder where a stockholder vote may be necessary, we could be prevented from entering into transactions that could be beneficial to us.

Any future sales of our securities in the public markets or any future securities issuances in connection with our acquisition strategy may cause the trading price of our common stock to decline and could impair our ability to raise capital through future equity offerings.

Sales of a substantial number of shares of our common stock or other securities in the public markets, or the perception that these sales may occur, could cause the market price of our common stock or other securities to decline and could materially impair our ability to raise capital through the sale of additional securities. If we issue additional securities in a public offering or a private placement, such sales or any resales of such securities could further adversely affect the market price of our common stock. The sale of a large number of shares of our common stock or other securities also might make it more difficult for us to sell equity or equity-related securities in the future at a time and at the prices that we deem appropriate.

We do not anticipate declaring any cash dividends on our common stock.

We have never declared or paid cash dividends on our common stock and do not plan to pay any cash dividends in the near future. Our current policy is to retain all funds and earnings for use in the operation and expansion of our business.

Risks related to accounting matters

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, 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 and could require us to restate our prior financial statements and issue a non-reliance statement regarding our prior financial disclosures.

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% 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.

If we are unable to develop an effective system of internal controls, we may not be able to accurately and timely report financial results or prevent fraud. If we identify additional material weaknesses in our internal control over financial reporting or are unable to rectify the material weaknesses that we have identified, our ability to meet our reporting obligations and the trading price of our stock could be negatively affected.

As described in Item 9A — Controls and Procedures and elsewhere in this Form 10-K, Management identified material weaknesses in our internal control over financial reporting for the fiscal years ended December 31, 2022 and 2021.

In the course of making our assessment of the effectiveness of internal control over financial reporting as of December 31, 2022, we identified several material weaknesses. Material weaknesses were identified in relation to (i) inappropriately designed entity-level controls impacting the control environment, risk assessment, and monitoring activities to prevent or detect material misstatements to the consolidated financial statements attributed to an insufficient number of qualified resources and inadequate oversight and accountability over the performance of controls, ineffective identification and assessment or risks impacting internal control over financial reporting, and ineffective monitoring controls; (ii) information system logical access within certain key financial systems; (iii) accounting policies and procedures and related controls over certain financial statement areas; (iv) inadequate risk assessment, accounting policies, procedures, and related controls performed over the recognition and measurement of indirect tax liabilities. Because material weaknesses in internal control exist, the Company's internal controls may not prevent, or detect and correct a material misstatement in its financial statements or disclosures.

In the course of making our assessment of the effectiveness of internal control over financial reporting as of December 31, 2021, we identified several material weaknesses. Material weaknesses were identified in relation to (i) inappropriately designed entity-level controls impacting the control environment, risk assessment, and monitoring activities to prevent or detect material misstatements to the consolidated financial statements attributed to an insufficient number of qualified resources and inadequate oversight and accountability over the performance of controls, ineffective identification and assessment or risks impacting internal control over financial reporting, and ineffective monitoring controls; (ii) information system logical access within certain key financial systems; (iii) accounting policies and procedures and related controls over complex financial statement areas; (iv) accounting policies, procedures, and related controls over assets held for lease; (v) accounting policies, procedures, and related controls over the preparation and review of projected financial information used in determining the valuation of acquired intangible assets and contingent consideration in business combinations as well as the quantitative impairment analysis of indefinite-lived intangible assets; and (vi) policies, procedures, and related controls over the presentation and disclosure of amounts presented in the consolidated financial statements in accordance with the applicable financial reporting requirements. Because material weaknesses in internal control exist, the Company's internal controls may not prevent, or detect and correct a material misstatement in its financial statements or disclosures.

The aforementioned material weaknesses did not result in any identified material misstatements to our financial statements, and there were only immaterial changes to previously released financial results.

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. 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.

While we are in the process of addressing our material weaknesses as disclosed herein, elements of our remediation plan can only be accomplished over time and we can offer no assurance that these initiatives will ultimately have the intended effects. Any failure to maintain such internal controls could adversely impact our ability to report our financial results on a timely and accurate basis. If our financial statements are not accurate, investors may not have a complete understanding of our operations or may lose confidence in our reported financial information. Likewise, if our financial statements are not filed on a timely basis as required by the SEC and the NASDAQ Stock Market, we could face severe consequences from those authorities. In either case, it could result in a material adverse effect on our business or have a negative effect on the trading price of our common stock. Further, if we fail to remedy these deficiencies (or any other future deficiencies) or maintain the adequacy of our internal controls, we could be subject to regulatory scrutiny, civil or criminal penalties or shareholder litigation. We can give no assurance that the measures we have taken and plan to take in the future will remediate the material weaknesses identified or that any additional material weaknesses or restatements of our financial statements will not arise in the future due to a failure to implement and maintain adequate internal control over financial reporting or circumvention of those controls.

Further, in the future, 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 Stock Market or other regulatory authorities.

Risks related to COVID-19 and other disruptive events

Our financial condition and results of operations may be adversely affected by the COVID-19 pandemic.

We continue to closely monitor the impact of the COVID-19 global pandemic on all aspects of our business and geographies, including how it has and will impact our customers, team members, suppliers, vendors, business partners and distribution channels. The COVID-19 global pandemic has created significant volatility, uncertainty, and economic disruption, which may continue to affect our business operations and may materially and adversely affect our results of operations, cash flows and financial position.

We are currently following the recommendations of local health authorities to minimize exposure risk for our team members and visitors. While we have implemented specific business continuity plans to reduce the impact of COVID-19 and believe that we have sufficient inventory to meet forecasted demand for the next six to nine months, there is no guarantee that our continuity plan will be successful or that our inventory will meet forecasted or actual demand.

During year ended December 31, 2021, we experienced difficulties in obtaining sheet metal and electrical components incorporating semiconductor chips for the manufacture of our ULT freezer products. During the year ended December 31, 2022, supply chain bottlenecks were mitigated through the diversification of suppliers, resulting in improved pricing from the year ended December 31, 2021. We were still experiencing constraints in supply for semiconductor chips as of December 31, 2022. Though our costs to obtain semiconductor components normalized throughout the year, we were still experiencing constraints in obtaining electrical component parts. These constraints are expected to improve through diversification of our semiconductor supply chain partnerships. We have sufficient supply for electrical component parts within our operations for the foreseeable future.

Additional disruptions may occur for our customers or suppliers that may materially affect our ability to obtain supplies or other components for our products, produce our products or deliver inventory in a timely manner. This would result in lost product revenue, additional costs, or penalties, or damage our reputation. Similarly, COVID-19 could impact our customers and/or suppliers as a result of a health epidemic or other outbreak occurring in other locations which could reduce their demand for our products or their ability to deliver needed supplies for the production of our products.

We cannot predict at this time the full extent to which the COVID-19 pandemic will impact our business, results, and financial condition, which will depend on many factors that are not known at this time, as the situation is unprecedented and continues to evolve. These include, among others, the extent of harm to public health, including the duration of the pandemic, any potential subsequent waves of COVID-19 infection, the emergence of new variants of COVID-19, some of which may be more transmissible or virulent than the initial strain, and the availability and distribution of effective vaccines and medical treatments, further disruption to the manufacturing of and demand for our products, our ability to effectively manage inventory levels and adjust our production schedules to align with demand, impairments and other charges, the impact of the global business and economic environment on liquidity and the availability of capital, the costs incurred to keep our employees safe while maintaining continued operations, and our ability to effectively motivate and retain the necessary workforce. We are staying in close communication with our manufacturing facilities, employees, customers, and suppliers, and acting to mitigate the impact of this dynamic and evolving situation through a variety of measures, which may not be successful and are subject to the factors described above, many of which are uncertain or outside of our control. Even after the COVID-19 pandemic has subsided, we may continue to experience impacts to our business as a result of its global economic impact.

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, whether in the United States or abroad, may have a strong negative impact on the global economy, 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. 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.

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
Bothell, WA	45,522	Corporate headquarters, manufacturing, research and development, marketing, and administrative offices	July 2031
Woodinville, WA	13,578	Warehouse	January 2030
Menlo Park, CA	3,460	Research and development, and administrative offices	December 2023
Albuquerque, NM	9,932	Manufacturing, research and development, and administrative offices	January 2023
Bruce Township, MI	106,998	Manufacturing, research and development, and administrative offices	Month to Month
Athens, OH	50,000	Manufacturing, research and development, and administrative offices	March 2028
Nelsonville, OH	24,114	Warehouse	May 2023
Columbus, OH	1,807	Administrative offices	January 2025
Indianapolis, IN	11,415	Manufacturing, research and development, and administrative offices	September 2024
United States	12,500	Biological and pharmaceutical specimen storage	January 2027
United States	26,600	Biological and pharmaceutical specimen storage	March 2024
United States	16,153	Biological and pharmaceutical specimen storage	June 2024
United States	16,800	Biological and pharmaceutical specimen storage	February 2026
United States	26,800	Biological and pharmaceutical specimen storage	November 2031
Netherlands	47,533	Biological and pharmaceutical specimen storage	March 2026

We consider the facilities to be in a condition suitable for their current uses. Because of anticipated growth in the business and due to the increasing requirements of customers or regulatory agencies, we may need to acquire additional space or upgrade and enhance existing space. We believe that adequate facilities will be available upon the conclusion of our leases.

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 Capital Market exchange under the ticker symbol "BLFS."

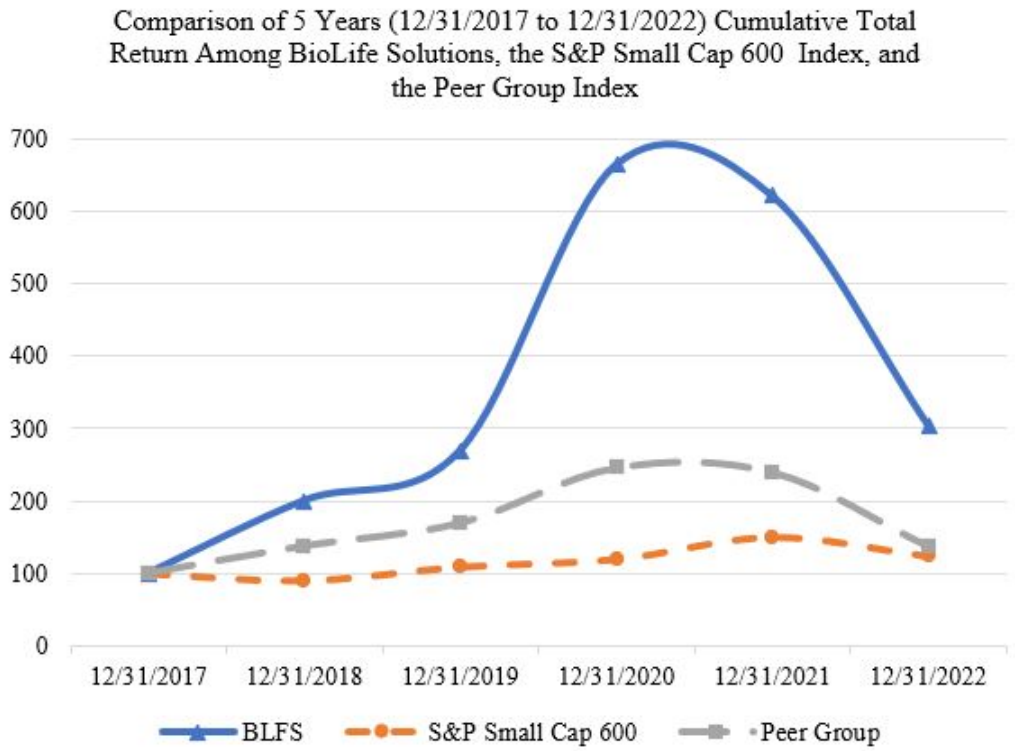
Stockholders and dividends

As of March 21, 2023, there were approximately 202 holders of record of our common stock. We have never paid cash dividends on our common stock and do not anticipate that any cash dividends will be paid 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 and will depend on our financial condition, results of operations, capital requirements and other factors our Board of Directors deems relevant.

See Item 12 for information regarding securities authorized for issuance under our equity compensation plans.

Performance graph

The following graph shows the cumulative total stockholder return on our common stock with the cumulative total return of the S&P Small Cap 600 Index and our peer group, assuming an initial investment of $100 on December 31, 2017 and the reinvestment of all dividends.



Issuer repurchases of equity securities

Not applicable.

ITEM 6. RESERVED

Reserved.

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

This Form 10-K contains "forward-looking statements". These forward-looking statements involve a number of risks and uncertainties. We caution readers that any forward-looking statement is not a guarantee of future performance and that actual results could differ materially from those contained in the forward-looking statement. These statements are based on current expectations of future events. Such statements include, but are not limited to, statements about our products, including our newly acquired products, customers, regulatory approvals, the potential utility of and market for our products and services, our ability to implement our business strategy and anticipated business and operations, in particular following our acquisitions in recent years, future financial and operational performance, our anticipated future growth strategy, including the acquisition of synergistic cell and gene therapy manufacturing tools and services or technologies, or other companies or technologies, capital requirements, intellectual property, suppliers, joint venture partners, future financial and operating results, the impact of the COVID-19 pandemic, plans, objectives, expectations and intentions, revenues, costs and expenses, interest rates, outcome of contingencies, business strategies, regulatory filings and requirements, the estimated potential size of markets, capital requirements, the terms of any capital financing agreements and other statements that are not historical facts. You can find many of these statements by looking for words like "believes", "expects", "anticipates", "estimates", "may", "should", "will", "could", "plan", "intend", or similar expressions in this Form 10-K. We intend that such forward-looking statements be subject to the safe harbors created thereby.

These forward-looking statements are based on the current beliefs and expectations of our management and are subject to significant risks and uncertainties. If underlying assumptions prove inaccurate or unknown risks or uncertainties materialize, actual results may differ materially from current expectations and projections. Factors that might cause such a difference include those discussed under "Risk Factors", as well as those discussed elsewhere in the Form 10-K.

You are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date of this Form 10-K or, in the case of documents referred to or incorporated by reference, the date of those documents.

All subsequent written or oral forward-looking statements attributable to us or any person acting on our behalf are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. We do not undertake any obligation to release publicly any revisions to these forward-looking statements to reflect events or circumstances after the date of this Form 10-K or to reflect the occurrence of unanticipated events, except as may be required under applicable U.S. securities law. If we do update one or more forward-looking statements, no inference should be drawn that we will make additional updates with respect to those or other forward-looking statements.

We are a life sciences company that develops and commercializes innovative technologies used in the manufacture, storage and transportation of biological materials and provides storage solutions for biological and pharmaceutical materials.

We develop, manufacture, and market bioproduction tools and services to the cell and gene therapy ("CGT") industry and broader biopharma market, which are designed to improve quality and de-risk biologic manufacturing, storage, and distribution. Our products are used in basic and applied research and commercial manufacturing of biologic-based therapies. Customers use our products to maintain the health and function of biologic material during sourcing, manufacturing, storage, and distribution.

Our current portfolio of bioproduction tools and services are comprised of three revenue lines that contain seven main offerings: (i) cell processing (including biopreservation media for the preservation of cells and tissues, human platelet lysate media for the supplementation of cell expansion, cryogenic vials and automated fill machines that provide high-quality, efficient, and precise mixes of solutions), (ii) freezers and thaw systems (including a full line of mechanical ultra-low temperature ("ULT"), isothermal, and liquid nitrogen freezers and accessories, automated thaw devices which provide controlled, consistent thawing of frozen biologics in vials and cryobags), and (iii) storage and storage services (including biological and pharmaceutical storage services, and "smart", cloud connected devices for transporting biologic payloads).

We currently operate as one bioproduction tools and services business which supports several steps in the biologic material manufacturing and delivery process. We have a diversified portfolio of tools and services that focus on biopreservation, cell processing, frozen biologic storage products and services, cold-chain transportation, and thawing of biologic materials. We have in-house expertise in cryobiology and continue to capitalize on opportunities to maximize the value of our product platform for our extensive customer base through both organic growth innovations and acquisitions.

The consolidated financial statements as of December 31, 2021 and for the years ended December 31, 2021 and 2020 have been corrected to correct immaterial prior period errors as discussed in Note 2, *Correction of immaterial errors* to our consolidated financial statements included in this Annual Report on Form 10-K. Accordingly, Management's Discussion and Analysis reflects the impact of those corrections.

Sexton Biotechnologies, Inc. acquisition

On August 9, 2021, BioLife entered into an Agreement and Plan of Merger (the "Sexton Merger Agreement") with BLFS Merger Sub, Inc., a Delaware corporation ("Sexton Merger Sub"), Fortis Advisors LLC, in its capacity as the representative of the stockholders of Sexton (the "Sexton Seller Representative") and Sexton Biotechnologies, Inc., a Delaware corporation.

On September 1, 2021, the Company completed the merger of Sexton Merger Sub with and into Sexton and Sexton became a wholly owned subsidiary of the Company (the "Sexton Merger"). As consideration for the Sexton Merger (the "Sexton Merger Consideration"), holders of common stock, preferred stock and options of Sexton, other than the Company (collectively, the "Sexton Participating Holders"), are entitled to receive an aggregate of 530,502 newly issued shares of the Company's common stock, subject to certain post-closing adjustments, of which 477,452 shares of Common Stock were issued to the Sexton Participating Holders at the Closing, and 53,050 shares of Common Stock, or approximately 10% of the Merger consideration, were deposited into an escrow account for indemnification and post-closing purchase price adjustment purposes. Prior to the merger, the Company held preferred stock in Sexton, which was accounted for using a measurement alternative that measures the securities at cost minus impairment, if any. The Company accounted for the merger as a step acquisition, which required remeasurement of the Company's existing ownership in Sexton to fair value prior to completing the acquisition method of accounting. Using step acquisition accounting, the Company increased the value of its existing equity interest to its fair value, resulting in the recognition of a non-cash gain of $6.5 million, which was included in the gain on acquisition of Sexton Biotechnologies, Inc. in the Consolidated Statements of Operations in the year ended December 31, 2021. The Company utilized a market-based valuation approach to determine the fair value of the existing equity interest based on the total merger consideration offered and the Company's stock price at acquisition.

The Sexton Merger was accounted for as a purchase of a business under FASB ASC Topic 805, *Business Combinations*. The fair value of the net tangible assets acquired was approximately $4.1 million, the deferred tax liability acquired was approximately $1.5 million, the fair value of the intangible assets acquired was approximately $8.8 million, and the residual goodwill was approximately $28.5 million. The fair value calculations required critical estimates, including, but not limited to, future expected cash flows, revenue and expense projections, discount rates, revenue volatility, and royalty rates.

Global Cooling, Inc. acquisition

On March 19, 2021, the Company entered into an Agreement and Plan of Merger (the "GCI Merger Agreement") with BLFS Merger Subsidiary, Inc., a Delaware corporation ("GCI Merger Sub"), Global Cooling, a Delaware corporation and Albert Vierling and William Baumel, in their capacity as the representatives of the stockholders of GCI (collectively, the "GCI Seller Representative").

On May 3, 2021, pursuant to the GCI Merger Agreement, subject to the terms and conditions set forth therein, the transactions contemplated by the GCI Merger Agreement were consummated (the "GCI Closing"), GCI Merger Sub merged with and into GCI (the "GCI Merger" and, together with other transactions contemplated by the GCI Merger Agreement, the "GCI Transactions"), with GCI continuing as the surviving corporation in the GCI Merger and a wholly owned subsidiary of the Company. In the GCI Merger, all of the issued and outstanding shares of capital stock of GCI immediately prior to the filing of the Certificate of Merger with the Secretary of State of the State of Delaware (other than those properly exercising any applicable dissenter's rights under Delaware law) were converted into the right to receive the GCI Merger Consideration (as defined below). The Company paid the GCI Merger Consideration to the holders of common stock and preferred stock of GCI (collectively, the "GCI Stockholders").

The aggregate merger consideration paid pursuant to the GCI Merger Agreement to the GCI Stockholders was 6,646,870 newly issued shares of common stock, provided, however, that the GCI Merger Consideration otherwise payable to GCI Stockholders is subject to the withholding of the GCI Escrow Shares (as defined below) and is subject to reduction for indemnification obligations. The GCI Merger Consideration allocable to one GCI stockholder was reduced by 10,400 shares to satisfy an outstanding note receivable of $374,000. In accordance with ASC 805, the Company recognized the settlement of pre-existing relationships in the forms of cash deposits, trade receivables, and trade payables, which are included in the consideration transferred. The GCI Merger Consideration is not subject to any purchase price adjustments.

At the GCI Closing, approximately nine percent (9%) of the GCI Merger Consideration (the "Escrow Shares", along with any other dividends, distributions or other income on the GCI Escrow Shares, the "GCI Escrow Property") otherwise issuable to the GCI Stockholders (allocated pro rata among the GCI Stockholders based on the GCI Merger Consideration otherwise issuable to them at the GCI Closing), was deposited into a segregated escrow account in accordance with an escrow agreement entered into in connection with the GCI Transactions (the "GCI Escrow Agreement").

The GCI Escrow Property will be held for a period of up to twenty-four (24) months after the GCI Closing as the sole and exclusive source of payment for any post-GCI Closing indemnification claims (other than fraud claims), unless earlier released in accordance with the terms of the GCI Escrow Agreement.

The GCI Merger was accounted for as a purchase of a business under FASB ASC Topic 805, *Business Combinations*. The fair value of the net tangible assets acquired was $740,000, the deferred tax liability acquired was $24.1 million, the fair value of the intangible assets acquired was $120.5 million, and the residual goodwill was $137.8 million. The fair value calculations for intangible assets required critical estimates, including, but not limited to, future expected cash flows, revenue and expense projections, discount rates, revenue volatility, and royalty rates.

SciSafe Holdings, Inc. acquisition

On September 18, 2020, BioLife entered into a Stock Purchase Agreement, by and among the Company, SciSafe Holdings, Inc., a Delaware corporation, and the stockholders of SciSafe (collectively, the "SciSafe Sellers"), pursuant to which the Company agreed to purchase from the SciSafe Sellers one hundred percent (100%) of the issued and outstanding capital shares or other equity interests of SciSafe (the "SciSafe Acquisition"). The SciSafe Acquisition closed October 1, 2020.

In connection with the SciSafe Acquisition, the Company issued to the SciSafe Sellers 611,683 shares of common stock valued at $29.29 per share and a cash payment of $15 million, with $1.5 million held in escrow to account for adjustments for net working capital and as a security for, and a source of payment of, the Company's indemnity rights. Pending the occurrence of certain events, the Company will issue to the SciSafe Sellers an additional 626,000 shares of common stock, which are issuable to SciSafe Sellers upon SciSafe achieving certain specified revenue targets in each year from 2021 to 2024. The revenue target set for 2022 was met and, therefore, has resulted in 116,973 shares of common stock becoming issuable to the SciSafe Sellers. These shares will be issued during the year ended December 31, 2023.

The SciSafe Acquisition was accounted for as a purchase of a business under FASB ASC Topic 805, *Business Combinations*. The fair value of the contingent consideration was $3.7 million, the fair value of the net tangible assets acquired was $2.8 million, the deferred tax liability was $3.3 million, the fair value of the intangible assets acquired was $12.1 million, and the residual goodwill was $24.9 million. The fair value calculations for intangible assets required critical estimates, including, but not limited to, future expected cash flows, revenue and expense projections, discount rates, revenue volatility, and royalty rates.

Critical accounting policies and estimates

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 any associated risks related to these policies on our business operations are discussed throughout "Management's Discussion and Analysis of Financial Condition," including 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

To determine revenue recognition for contractual arrangements that we determine are within the scope of Financial Accounting Standards Board ("FASB") Topic 606, *Revenue from Contracts with Customers*, we perform the following five steps: (i) identify each contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to our performance obligations in the contract; and (v) recognize revenue when (or as) we satisfy the relevant performance obligation. We only apply the five-step model to contracts when it is probable that we will collect the consideration we are entitled to in exchange for the goods or services we transfer to the customer. 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. Payment terms and conditions vary, although terms generally include a requirement of payment within 30 to 90 days.

The Company primarily recognizes product revenues, service revenues, and rental revenues. Product revenues are generated from the sale of biopreservation media, ThawSTAR, and freezer products. We recognize product revenue, including shipping and handling charges billed to customers, when we transfer control of our products to our customers. Shipping and handling costs are classified as part of cost of product revenue in the Consolidated Statement of Operations. Service revenues are generated from the storage of biological and pharmaceutical materials. We recognize service revenues over time as services are performed or ratably over the contract term. 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. 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 or variable consideration as of and during the years ended December 31, 2022, 2021, and 2020.

The Company also generates revenue from the leasing of our property, plant, and equipment, operating right-of-use assets, and evo cold chain systems to customers pursuant to service contracts or rental arrangements entered into with the customer. Revenue from these arrangements is not within the scope of FASB ASC Topic 606 as it is within the scope of FASB ASC Topic 842, *Leases*. All customers leasing shippers currently do so under month-to-month rental arrangements. We account for these rental transactions as operating leases and record rental revenue on a straight-line basis over the rental term.

Business combinations

Amounts paid for acquisitions are 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 Operations. The fair value of contingent consideration includes estimates and judgments made by management regarding the probability that future contingent payments will be made, the extent of royalties to be earned in excess of the defined minimum royalties, etc. Management updates these estimates and the related fair value of 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 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. Changes in the fair value of contingent consideration are recorded in our Consolidated Statements of Operations. 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, trademarks, tradenames, patents, and in process research and development 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 estimated useful lives using the straight-line method and the amortization expense is recorded within intangible asset amortization in the Consolidated Statements of Operations. If the estimate of a definite-lived 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. Definite-lived intangible assets and their related estimated 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.

Indefinite-lived intangibles are carried at the initially recorded fair value less any recognized impairment. In-process research and development ("IPR&D") is initially capitalized at fair value as an intangible asset with an indefinite life. When the IPR&D project is complete, it is reclassified as a definite-lived intangible asset and is amortized over its estimated useful life. If an IPR&D project is abandoned, a charge would be recorded for the value of the related intangible asset to our Consolidated Statement of Operations in the period it is abandoned. Indefinite-lived intangibles are tested annually for impairment. Impairment assessments are conducted more frequently 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.

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 our goodwill is less than its carrying value. Events that would indicate impairment and trigger an interim impairment assessment include, but are not limited to, current economic and market conditions, including a decline in the Company's market capitalization, a significant adverse change in legal factors, business climate or operational performance of the business, and an adverse action or assessment by a regulator. Goodwill is tested for impairment in the fourth quarter 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 as of the goodwill impairment measurement date in the fourth quarter of 2022.

Warranty guarantees

Our freezer and thaw and certain cell processing products are warranted to provide assurance that the product will function as expected and to ensure customer confidence in design and overall quality. Warranty coverage on our products is generally provided for specified periods of time and on select products' hours of usage, and generally covers parts, labor, and other expenses for non-maintenance repairs. Warranty coverage generally does not cover operator abuse or improper use.

At the time of sale, we recognize expense and record a warranty accrual by product line for estimated costs in connection with forecasted future warranty claims. Our estimate of the cost of future warranty claims is based primarily on the estimated number of products under warranty, historical average costs incurred to service warranty claims, the trend in the historical ratio of warranty claims for each part covered, and the historical length of time between the sale and resulting warranty claim. If applicable, historical claims experience may be adjusted for known product design improvements or for the impact of unusual product quality issues. We periodically assess the adequacy of our warranty accruals based on changes in our estimates and assumptions and record any necessary adjustments if the cost of actual claim experience differs from our estimate and indicates that adjustments to our warranty accrual are necessary. Factors that could have an impact on actual future claims and our warranty accrual include, but are not limited to, items such as performance of new products; product failure rates; factors impacting product usage, such as changes in sales volumes and shifts in product mix; manufacturing quality and product design issues, including significant manufacturing or design defects not discovered until after the product is delivered to customers; higher or lower than expected service and component part costs to satisfactorily address the repair, and, if applicable, changes to the warranty coverage periods. Additionally, from time to time, we also establish warranty accruals for our estimate of the costs necessary to settle major rework campaigns on a product-specific basis during the period in which the circumstances giving rise to the major rework campaign become known and when the costs to satisfactorily address the situation are both probable and estimable. The warranty accrual for the cost of a major rework campaign is primarily based on an estimate of the cost to repair each affected unit and the number of affected units expected to be repaired.

We believe that our analysis of historical warranty claim trends and knowledge of potential manufacturing and/or product design improvements or issues provide sufficient information to establish a reasonable estimate for the cost of future warranty claims at the time of sale and our warranty accruals as of the date of our Consolidated Balance Sheets. We believe that our $8.3 million warranty accrual as of December 31, 2022 is adequate and historically has been adequate; however, due to the inherent uncertainty in the accrual estimation process, including forecasting future warranty claims, costs associated with servicing future warranty claims, and unexpected major rework campaigns that may arise in the future, our actual warranty costs incurred may differ from our warranty accrual estimate. An unexpected increase in warranty claims and/or in the costs associated with servicing those claims would result in an increase in our warranty accruals and a decrease in our net earnings.

Contingent consideration

We estimate the acquisition date fair value of the acquisition-related contingent consideration using various valuation approaches, including option pricing models and Monte Carlo simulations, as well as significant unobservable inputs, reflecting the Company's assessment of the assumptions market participants would use to value these liabilities. The fair value of the contingent consideration is remeasured each reporting period, with any change in the value recorded in our Consolidated Statements of Operations as change in fair value of contingent consideration.

Stock-based compensation

We measure and record compensation expense using the applicable accounting guidance for share-based payments related to stock options, time-based restricted stock, market-based restricted stock awards and performance-based awards granted to our directors and employees. The fair value of market-based restricted stock awards is estimated at the date of grant using the Monte Carlo Simulation model. The Monte Carlo Simulation valuation model incorporates assumptions as to stock price volatility, the expected life of options or awards, a risk-free interest rate and dividend yield. In valuing our market-based stock awards, significant judgment is required in determining the expected volatility of our common stock. Expected volatility for our market-based restricted stock awards is based on the historical volatility of our own stock and the stock of companies within our defined peer group. Further, our expected volatility may change in the future, which could substantially change the grant-date fair value of future awards and, ultimately, the expense we record. The fair value of restricted stock, including performance awards, without a market condition is estimated using the current market price of our common stock on the date of grant.

We expense stock-based compensation for stock options, restricted stock awards, and performance awards over the requisite service period. For awards with only a service condition, we expense stock-based compensation using the straight-line method over the requisite service period for the entire award. For awards with a market condition, we expense over the vesting period regardless of the value that the award recipients will ultimately receive.

Provision for income taxes

The assessment regarding whether a valuation allowance is required considers both positive and negative evidence when determining whether it is more likely than not that deferred tax assets are recoverable. In making this assessment, significant weight is given to evidence that can be objectively verified. In its evaluation, the Company considered its cumulative loss and its forecasted losses in the near-term as significant negative evidence. Based upon a review of the four sources of income identified within ASC 740, *Accounting for Income Taxes*, the Company determined that the Company's recorded deferred tax liabilities as of December 31, 2022 would be a sufficient source of taxable income to realize all of its deferred tax assets except for a portion of its net operating loss carryforwards. As a result, a full valuation allowance on its deferred tax assets was recorded as of December 31, 2022. The Company will continue to assess the realizability of its assets going forward and will adjust the valuation allowance as needed.

The Company determines its uncertain tax positions based on a determination of whether and how much of a tax benefit taken by the Company in its tax filings or positions is more likely than not to be sustained upon examination by the relevant income tax authorities. The Company is generally subject to examination by U.S. federal and local income tax authorities for all tax years in which loss carryforward is available.

The Company applies judgment in the determination of the financial statement recognition and measurement of tax positions taken or expected to be taken in a tax return. As of December 31, 2022, the Company has an unrecognized tax benefit of $610,000 related to tax attributes being carried forward. The Company is generally subject to examination by U.S. federal and local income tax authorities for all tax years in which loss carryforward is available.

As of December 31, 2022, the Company had U.S. federal net operating loss ("NOL") carryforwards of approximately $128.6 million, which is available to reduce future taxable income. Approximately $39.5 million of NOL will expire from 2023 through 2037, and approximately $89.1 million of NOL will be carried forward indefinitely. The NOL carryforwards are subject to an annual limitation in the event of certain cumulative changes in the ownership interest. This limits the amount of tax attributes that can be utilized annually to offset future taxable income or tax liabilities. Subsequent ownership changes may further affect the limitation in future years.

Recent accounting standards update

See Note 1: "*Organization and significant accounting policies – recent accounting pronouncements,*" to our Consolidated Financial Statements included in this report for more information.

Discussions of 2020 results and year-to-year comparisons between 2021 and 2020 that are omitted in this Annual Report on Form 10-K can be found in "Management's Discussion and Analysis of Financial Condition and Results of Operations" in Part II, Item 7 of our Annual Report on Form 10-K for the year ended December 31, 2021, filed with the SEC on March 31, 2022.

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.

Revenue

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

	Year Ended December 31,			2022 vs. 2021		2021 vs. 2020	
(In thousands, except percentages)	**2022**	**2021[1]**	**2020[2]**	**$ Change**	**% Change**	**$ Change**	**% Change**
Product revenue							
Freezer and thaw	$ 66,682	$ 56,620	$ 13,548	$ 10,062	18%	$ 43,072	318%
Cell processing	68,509	44,965	30,946	23,544	52%	14,019	45%
Storage and cold chain services	809	328	46	481	147%	282	613%
Service revenue							
Freezer and thaw	74	-	-	74	-%	-	-%
Storage and cold chain services	15,234	9,817	1,752	5,417	55%	8,065	460%
Rental revenue							
Storage and cold chain services	10,451	7,426	1,795	3,025	41%	5,631	314%
Total revenue	$ 161,759	$ 119,156	$ 48,087	$ 42,603	36%	$ 71,069	148%

(1) 2021 revenue includes product revenue related to Global Cooling from May 3, 2021 through December 31, 2021 and product revenue related to Sexton from September 1, 2021 through December 31, 2021.
(2) 2020 revenue includes service revenue related to SciSafe from October 1, 2020 through December 31, 2020.

Revenue growth in the year ended December 31, 2022, as compared to the year ended December 31, 2021, was driven primarily by organic growth in our cell processing product and storage and cold chain services rental product lines, which grew by 45% and 51%, respectively. During the year ended December 31, 2021, revenues diversified significantly compared to the year ended December 31, 2020. This diversification was primarily driven by the acquisition of Global Cooling and Sexton in May and September of 2021, respectively. Most notably, the Company's freezer and thaw revenues increased by 318% as a result of the acquisition of Global Cooling and growth in LN2 freezer sales in 2021.

Revenue concentrations with one customer increased to 18% in the year ended December 31, 2022 from 17% from the same customer in the year ended December 31, 2021, primarily as a result of increased sales to a prominent international distributor. Revenue concentrations with one customer increased to 17% in the year ended December 31, 2021 from 13% from a different customer in the year ended December 31, 2020, primarily as a result of concentrations of freezer sales to a prominent international distributor.

In the year ended December 31, 2022, revenue increased by $42.6 million, or 36%, from the year ended December 31, 2021. Of this increase, $27.7 million, or 23%, of the increase was driven by organic growth. Of the $27.7 million, $19.4 million is derived from our cell processing product line, $1.6 million from our freezer and thaw product and services product lines, and $6.7 million from our storage and cold chain services product line. The remaining $14.9 million, or 13%, was driven by earning full year revenues from the acquisitions of Global Cooling and Sexton compared to partial revenues earned during the prior year.

Revenue is impacted by the relatively high degree of customer concentration, the timing of orders, the development efforts of our customers or end-users and regulatory approvals for biologics that incorporate our products, which may result in significant quarterly fluctuations. Such fluctuations are expected, but they may not be predictive of future revenue or otherwise indicative of a trend.

Costs and operating expenses

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

	Year Ended December 31,			2022 vs. 2021		2021 vs. 2020	
(In thousands, except percentages)	**2022**	**2021**	**2020**	**$ Change**	**% Change**	**$ Change**	**% Change**
Cost of product, rental, and service revenue	$ 107,937	$ 82,108	$ 20,646	$ 25,829	31 %	$ 61,462	298%
Research and development	14,798	11,821	6,720	2,977	25 %	5,101	76%
Sales and marketing	21,570	14,006	6,413	7,564	54 %	7,593	118%
General and administrative	47,670	33,668	15,273	14,002	42 %	18,395	120%
Intangible asset impairment charges	110,364	-	-	110,364	- %	-	-%
Intangible asset amortization	9,697	8,202	3,033	1,495	18 %	5,169	170%
Acquisition costs	18	1,636	668	(1,618)	(99)%	968	145%
Change in fair value of contingent consideration	(4,754)	2,875	1,575	(7,629)	(265)%	1,300	83%
Total operating expenses	$ 307,300	$ 154,316	$ 54,328	$ 152,984	99%	$ 99,988	184%

Cost of product, rental, and service revenue

In the year ended December 31, 2022, cost of product, rental, and service revenue increased $25.8 million or 31% from the year ended December 31, 2021. This increase was primarily driven by increased sales.

We expect the cost of product, rental, and service revenue to fluctuate in future quarters based on production volumes, product mix, and the impact of any future acquisitions.

Cost of product, rental, and service revenue as a percentage of revenue was 70%, 69%, and 43% for the years ended December 31, 2022, 2021, and 2020, respectively. Cost of product, rental, and service revenue in the years ended December 31, 2022, 2021, and 2020 includes $251,000, $1.1 million, and $411,000, respectively, in inventory step-up expense recorded in the purchase accounting of our Global Cooling, CBS, and AsteroBio Corporation (“Astero”) acquisitions.

The cost of product, rental, and service revenue as a percentage of revenue was relatively consistent between the years ended December 31, 2022 and 2021, at 70% and 69%, respectively. Despite these percentages being relatively consistent, the Company experienced decreases in warranty expenses in the year ended December 31, 2022 that were offset by increases in material and overhead costs driven by increases in personnel expenses, including stock-based compensation expenses, during the year. Additionally, material cost increases derived from our difficulties in obtaining sheet metal and electrical components incorporating semiconductor chips for the manufacture of our ULT freezer products due to the effects of COVID-19 during the year ended December 31, 2021 were mitigated during the current year. Through the diversification of suppliers, we experienced improved pricing from the year ended December 31, 2021. We were still experiencing constraints in supply for semiconductor chips as of December 31, 2022. Though our costs to obtain semiconductor components normalized throughout the year, we were still experiencing constraints in obtaining electrical component parts. These constraints are expected to improve through diversification of our semiconductor supply chain partnerships. We have sufficient supply for electrical component parts within our operations for the foreseeable future.

Research and development expenses

During the years ended December 31, 2022, 2021, and 2020, research and development (“R&D”) expense consisted primarily of personnel-related costs, consulting, and external product development services.

R&D expense increased $3.0 million in the year ended December 31, 2022, or 25%, compared with the year ended December 31, 2021. The increase is primarily due to $2.5 million of increased personnel costs in cash and stock-based compensation expenses from the full year ownership of Global Cooling and Sexton.

We expect sustained R&D expense increases through the year ended December 31, 2023 as we continue to expand, develop, and refine our product lines, particularly in the completion of our GCI vault project.

Sales and marketing expenses

Sales and marketing expense (“S&M”) consisted primarily of personnel-related costs, stock based compensation expense, trade shows, sales commissions, and advertising.

S&M expense increased $7.6 million in the year ended December 31, 2022, or 54%, compared with the year ended December 31, 2021. The increase is primarily due to $5.0 million of increased personnel expenses from cash and stock compensation. The increase was also driven by a $1.5 million increase in advertising and trade show costs from the expansion of our product outreach.

We expect S&M expense to increase as we expand our product line offerings and our presence in the markets in which we participate.

General and administrative expenses

General and administrative ("G&A") expense consists primarily of personnel-related expenses, non-cash stock-based compensation for administrative personnel and members of the board of directors, professional fees, such as accounting and legal, and corporate insurance.

In the year ended December 31, 2022, G&A expenses increased by $14.0 million, or 42%, compared with the year ended December 31, 2021. Of this increase, $7.7 million, or 55%, was driven by increased personnel expenses from cash and stock-based compensation. The remaining costs primarily relate to an increase of $3.2 million in professional services fees and $1.2 million on the losses incurred from asset disposal.

We expect G&A expense to increase as we continue to execute on our growth strategy.

Intangible asset impairment charges

Intangible asset impairment charges consist of the impairments incurred of $69.9 million and $40.5 million during the quarter ended June 30, 2022 and impairment assessment date of October 1, 2022, respectively. These impairment charges impacted both definite and indefinite-lived intangible assets acquired during the acquisition of Global Cooling. See Note 11: *Goodwill and intangible assets* of our accompanying Consolidated Financial Statements for more information on the events and assessment leading to these non-cash impairment charges during the year ended December 31, 2022.

Intangible asset amortization expense

Amortization expense consists of charges related to the amortization of intangible assets associated with the acquisitions of Global Cooling, Custom Biogenic Systems ("CBS"), SciSafe, Sexton, SAVSU Technologies, Inc. ("SAVSU"), and Astero in which we acquired definite-lived intangible assets.

Acquisition costs

Acquisition costs consist of legal, accounting, third-party valuations, and other due diligence costs related to our Global Cooling, SciSafe, and Sexton acquisitions.

Change in fair value of contingent consideration

Change in fair value of contingent consideration consists of changes in estimated fair value of our potential earnouts related to our SciSafe, CBS, and Astero acquisitions.

Other income and expenses

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

	Year Ended December 31,			2022 vs. 2021		2021 vs. 2020	
(In thousands, except percentages)	**2022**	**2021**	**2020**	**$ Change**	**% Change**	**$ Change**	**% Change**
Change in fair value of warrant liability	$ -	$ (121)	$ 3,601	$ 121	(100)%	$ (3,722)	(103)%
Change in fair value of investments	697	-	1,319	697	- %	(1,319)	(100)%
Interest (expense) income, net	(687)	(485)	40	(202)	42 %	(525)	(1,313)%
Other income	704	289	-	415	144 %	289	- %
Gain on acquisition of Sexton	-	6,451	-	(6,451)	(100)%	6,451	- %
Total other income (expense), net	$ 714	$ 6,134	$ 4,960	$ (5,420)	(88)%	$ 1,174	24 %

Change in fair value of warrant liability. Reflects the changes in fair value associated with the periodic "mark-to-market" valuation of certain warrants that were issued in 2014. See Note 1: "*Organization and Significant Accounting Policies*" of our accompanying Consolidated Financial Statements "Certain Warrants which have Features that may Result in Cash Settlement" for more information.

Change in fair value of investments. Reflects fair value adjustments to our investment in iVexSol.

Interest (expense) income, net. Interest expense incurred in the year ended December 31, 2022 related primarily to the loan obtained in September 2022 and two loans that were assumed in the acquisition of Global Cooling. We also earn interest on cash held in our money market account. Increases in interest expenses during the year ended December 31, 2022 can also be attributed to the increases in interest rates set by the United States Federal Reserve, causing the variable interest component on our 2022 term loan to be exposed to increasing interest rates.

Gain on acquisition of Sexton Biotechnologies, Inc. Reflects the non-cash gain associated with our investment in Sexton due to the step-acquisition of the remaining shares of Sexton and subsequent consolidation of Sexton in our financial statements.

Income Tax Benefit

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

	Year Ended December 31,			2022 vs. 2021		2021 vs. 2020	
(In thousands, except percentages)	**2022**	**2021**	**2020**	**$ Change**	**% Change**	**$ Change**	**% Change**
Income tax benefit	$ 5,022	$ 20,118	$ 3,264	$ (15,096)	(75)%	$ 16,854	516%
Effective tax rate	4%	69%	255%				

The income tax benefit recognized in the year ended December 31, 2022 primarily related to losses generated in 2022. Our effective tax rate for 2022 was lower than the U.S. statutory rate of 21% primarily due to the change in our valuation allowance.

The income tax benefit recognized in the year ended December 31, 2021 primarily related to losses generated in 2021 and the recognition of the release of our valuation allowance related to the acquisition of Global Cooling. Our effective tax rate for 2021 was higher than the U.S. statutory rate of 21% primarily due to windfall benefits on stock compensation, 162(m) limitations on executive compensation, and the change in our valuation allowance.

Liquidity and capital resources

We believe our cash, cash equivalents, restricted cash, cash generated from operations, available-for-sale securities, and credit lines will satisfy, for at least the next twelve months from the date of this filing, our liquidity requirements, both globally and domestically, including the following: working capital needs, capital expenditures, contractual obligations, commitments, principal and interest payments on debt, and other liquidity requirements associated with our operations. We have not identified any material liquidity concerns as a result of the COVID-19 pandemic.

On December 31, 2022, we had $64.1 million in cash, cash equivalents, and available-for-sale securities, compared to $69.9 million as of December 31, 2021. The decrease in cash and cash equivalents is primarily due to significant investments made in available-for-sale securities, increased investment in property, plant, and equipment, decrease in working capital related accounts compared to the prior year, offset by the draw of $20 million during Q3 2022 on a term loan.

On September 20, 2022, the Company, and certain of its subsidiaries, entered into a term loan agreement, which provided for up to $50 million in aggregate principal to be drawn. The agreement provides for borrowings of up to $30 million upon closing and options to borrow up to $10 million between closing and June 30, 2023, up to $10 million upon the achievement of certain revenue milestones, and an additional $10 million upon the Company's request subject to fulfilling certain requirements of the lender. The Company borrowed $20 million upon closing. For additional information on terms, see Note 13: *Long-term debt*.

On March 10, 2023, Silicon Valley Bank ("SVB"), the issuer of our term loan, was closed upon the appointment of the Federal Deposit Insurance Corporation ("FDIC") as the receiver of SVB. In addition to the term loan, we have deposit accounts held at SVB captured within our cash, cash equivalents, and available-for-sale securities. However, as of March 13, 2023, all deposit amounts, regardless of amount in excess of FDIC-insured limits, were guaranteed to customers, mitigating any liquidity constraints.

On May 22, 2020, the Company closed on a share purchase agreement with Casdin Capital LLC, a current stockholder of the Company, pursuant to which Casdin invested $20.0 million in the Company at $10.50 per share.

On July 7, 2020, the Company closed its public offering of 5,951,250 shares of common stock at the public offering price of $14.50 per share, which includes the shares purchased pursuant to the exercise in full of the underwriters' option to purchase up to an additional 776,250 shares of its common stock. The net proceeds from the public offering to BioLife, after deducting underwriting discounts and commissions and estimated underwriter offering expenses of $6.1 million, were approximately $80.2 million.

On October 1, 2020, we acquired SciSafe for $15.0 million in cash, 611,683 shares of common stock, and up to 626,000 additional shares of common stock as contingent consideration. As of December 31, 2022 and 2021, 116,973 shares and 64,130 shares were earned, respectively. These shares will be issued during the year ended December 31, 2023.

Cash flows

	Year Ended December 31,			2022 vs. 2021
(In thousands)	**2022**	**2021**	**$ Change**	**% Change**
Operating activities	$ (8,488)	$ (4,593)	$ (3,895)	85%
Investing activities	(58,117)	(13,192)	(44,925)	341%
Financing activities	16,316	(2,778)	19,094	(687)%
Net (decrease) increase in cash and cash equivalents	$ (50,289)	$ (20,563)	$ (29,726)	145 %

Operating activities

In the year ended December 31, 2022, our operating activities used cash of $8.5 million reflecting net loss of $139.8 million and non-cash charges totaling $146.2 million primarily related to impairment of intangible assets, depreciation, amortization, changes in fair value of contingent consideration, deferred income tax benefit, stock-based compensation, and non-cash lease charges. An increase in accrued expenses and current liabilities of $5.7 million was primarily driven by a $3.7 million non-income tax liability estimated for sales taxes owed and approximately $1.8 million increase in accrued compensation for increased headcount compared to the prior year. The increase in accrued expenses and current liabilities was offset by a $6.9 million reduction in warranty liability and $1.6 million reduction in accounts payable.

In the year ended December 31, 2021, our operating activities used cash of $4.6 million reflecting net loss of $8.9 million and non-cash charges totaling $6.6 million primarily related to depreciation, amortization, changes in the fair value of investments, changes in fair value of contingent consideration, deferred income tax benefit, stock-based compensation, and non-cash lease charges. An increase in accounts receivable of $10.1 million was primarily driven by the 148% year-to-date increase in revenues. The remaining cash provided by operating activities resulted from favorable changes in various other working capital accounts.

Investing activities

Our investing activities used $58.1 million of cash in the year ended December 31, 2022. We invested $44.6 million in available-for-sale securities in addition to continued investment in capital expenditures and purchases of assets held for rent, using an additional $13.9 million.

Our investing activities used $13.2 million of cash in the year ended December 31, 2021. We acquired $1.6 million in cash in the acquisitions of Global Cooling and Sexton. Capital expenditures and purchases of assets held for rent used $14.8 million as we continue to invest in our manufacturing and storage facilities.

Financing activities

In the year ended December 31, 2022, cash provided by financing activities was $16.3 million. The increase in cash provided by financing activities compared to the prior year is primarily due to drawing $20 million on a term loan obtained on September 20, 2022, offset by payments on outstanding debt of $1.7 million and payments on financed insurance premiums of $1.4 million.

In the year ended December 31, 2021, cash used by financing activities was $2.8 million. We used $4.2 million to pay off the line of credit assumed in the acquisition of Global Cooling. Other significant cash flows include $1.6 million provided by lenders to finance equipment for our continued expansion, $1.4 million provided by the exercise of stock options, and $1.0 million used to pay financed insurance premiums.

Contractual obligations

Our cash flows from operations are dependent on a number of factors, including fluctuations in our operating results, accounts receivable collections, inventory management, and the timing of tax and other payments. As a result, the impact of contractual obligations on our liquidity and capital resources in future periods should be analyzed in conjunction with such factors. Despite these uncertainties, we believe that our balances of cash, cash equivalents, available-for-sale securities, and restricted cash in addition to our cash flows from operations are adequate to meet our liquidity requirements in the next 12 months.

The following summarizes certain of our contractual obligations as of December 31, 2022 and the effect such obligations are expected to have on our cash flows in the next fiscal year:

Long-term debt, including interest

These amounts represent expected cash payments, including principal and interest. Debt obligations are described in Note 13 of the Consolidated Financial Statements. As of December 31, 2022, our total obligations were $25.6 million, of which $1.8 million was short-term.

Lease obligations

We have various operating and financing lease agreements for office space, warehouses, manufacturing, research equipment, machinery, and production locations as well as vehicles and other equipment. Lease obligations are described in Note 6 of the Consolidated Financial Statements. As of December 31, 2022, our total obligations were $18.1 million, of which $3.0 million was short-term.

Purchase obligations

Purchase obligations are defined as agreements to purchase goods or services that are enforceable and legally binding and that specify all significant terms, including fixed or minimum quantities to be purchased, fixed, minimum or variable pricing provisions and the approximate timing of the transactions. As of December 31, 2022, our total obligations were $507,000, of which $304,000 was short-term.

Purchase orders or contracts for the purchase of supplies and other goods and services are not included in the discussion above. We are not able to determine the aggregate amount of such purchase orders that represent contractual obligations, as purchase orders may represent authorizations to purchase rather than binding agreements. Our purchase orders are based on our current procurement or developmental needs and fulfilled by our vendors within short time horizons.

Capital requirements

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

- the expansion of our cell and gene therapy tools and services business
- the ability to sustain product revenue and profits of our cell and gene therapy products and services;
- The degree to which we implement additional automated production equipment throughout our facilities;
- our ability to acquire additional cell and gene therapy products and services;
- the scope of and progress made in our research and development activities; and
- the success of any proposed financing efforts.

Absent acquisitions of additional products, product candidates, or intellectual property, we believe our current cash balances are adequate to meet our cash needs for at least the next 12 months as of the date of this filing. We expect operating expenses in the year ending December 31, 2023 to increase as we continue to expand our CGT tools business. We expect to incur continued spending related to the research and development of new technology, expansion of our existing product lines, and expansion of our commercial capabilities for the foreseeable future, with an increased emphasis on the development of new products during the year ended December 31, 2023. Our future capital requirements may include, but are not limited to, purchases of property, plant and equipment, the acquisition of additional cell and gene therapy products and technologies to complement our existing manufacturing capabilities, and continued investment in our intellectual property portfolio.

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

Impacts of COVID-19

Our domestic and international operations have been and continue to be affected by the ongoing global pandemic of COVID-19 and the resulting volatility and uncertainty it has caused in the U.S. and international markets.

During year ended December 31, 2021, we experienced difficulties in obtaining sheet metal and electrical components incorporating semiconductor chips for the manufacture of our ULT freezer products due to the effects of COVID-19. These supply chain disruptions decreased the Company’s profitability as a result of increased supplier pricing and production stoppages. During the year ended December 31, 2022, supply chain bottlenecks were mitigated through the diversification of suppliers, resulting in improved pricing from the year ended December 31, 2021. We were still experiencing constraints in supply for semiconductor chips as of December 31, 2022. Though our costs to obtain semiconductor components normalized throughout the year, we were still experiencing constraints in obtaining electrical component parts. These constraints are expected to improve through diversification of our semiconductor supply chain partnerships. We have sufficient supply for electrical component parts within our operations for the foreseeable future.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Foreign currency exchange risk

The Company operates internationally, and thus is subject to potentially adverse movements in foreign currency exchange rates. Approximately 2% of the Company's consolidated net sales in the year ended December 31, 2022 were made in euros. The Company is exposed to market risk primarily from foreign exchange rate fluctuations of the euro as compared to the U.S. dollar as the financial position and operating results of the Company's foreign operations are translated into U.S. dollars for consolidation.

Month-end exchange rates between the euro and the U.S. dollar, which have not been weighted for actual sales volume in the applicable months in the periods, were as follows:

	Year Ended December 31,		
	2022	2021	2020
High	$ 1.15	$ 1.24	$ 1.23
Low	$ 0.95	$ 1.12	$ 1.06
Average	$ 1.05	$ 1.18	$ 1.14

The Company's exposure to foreign exchange rate fluctuations also arises from trade receivables and intercompany payables denominated in one currency in the financial statements, but receivable or payable in another currency.

The Company does not enter into foreign currency forward contracts to reduce its exposure to foreign currency rate changes on forecasted intercompany sales transactions or on intercompany foreign currency denominated balance sheet positions. Foreign currency transaction gains and losses are included in "Other income (expense)" in the Consolidated Statements of Operations. The effect of translating net assets of foreign subsidiaries into U.S. dollars are recorded on the Consolidated Balance Sheet as part of "Accumulated other comprehensive loss, net of taxes".

The effects of a hypothetical 10% appreciation in the U.S. dollar from December 31, 2022 levels against the euro are as follows (in thousands):

Decrease in translation of 2022 earnings into U.S. dollars	$ 85
Decrease in translation of net assets of foreign subsidiaries	$ 107

Interest rate risk

Our exposure to market risk for changes in interest rates relates primarily to our investments in available-for-sale securities and our long-term debt. We invest our excess cash in investment grade short to intermediate-term fixed income securities. These securities may have their fair market value adversely affected due to a rise in interest rates, and we may suffer losses if forced to sell securities that have declined in market value due to changes in interest rates. Our long-term debt primarily bears interest at a fixed rate, with a variable component subject to an interest rate ceiling. Fluctuations in interest rates therefore do not materially impact our consolidated financial statements from long-term debt. For additional information about our available-for-sale securities and long-term debt, see Notes 4 and 13 to the consolidated financial statements in Part II, Item 8 of this Annual Report.

ITEM 8. CONSOLIDATED FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Shareholders and Board of Directors
BioLife Solutions, Inc.
Bothell, Washington

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheet of BioLife Solutions, Inc. and subsidiaries (the "Company") as of December 31, 2022, the related consolidated statements of operations, comprehensive (loss) income, shareholders' equity, and cash flows for the year ended December 31, 2022, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2022, and the results of its operations and its cash flows for the year then ended, in conformity with accounting principles generally accepted in the United States of America.

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 the 2013 Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"), and our report dated March 31, 2023 expressed an adverse opinion.

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 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 the financial statements are free of material misstatement, whether due to error or fraud. Our audit 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 included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audit 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 audit provides a reasonable basis for our opinion.

Critical audit matters

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

Global Cooling, Inc. Intangible Asset Impairment

As described further in Note 11 to the consolidated financial statements, the Company has intangible assets that were acquired in the Global Cooling, Inc. ("GCI") purchase. Definite-lived intangible assets and their related estimated 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. Indefinite-lived intangibles are tested annually for impairment. 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. We identified the quantitative fair value assessment of the GCI intangible assets as a critical audit matter.

The principal considerations for our determination that the impairment assessment of the GCI intangible assets is a critical audit matter are that the impairment assessment requires the Company to utilize subjective assumptions to estimate the discounted cash flows attributable to the GCI intangible assets, such as revenue growth rates, forecasted expenses, royalty rates, and discount rates. The estimation process required a high degree of auditor judgement and an increased extent of effort.

Our audit procedures related to the GCI intangibles included the following, among others.

- We reviewed revenue growth rates and forecasted expenses prepared by management that were utilized in the model through: (i) evaluating historical performance of GCI and (ii) assessing financial projections against market trends, industry metrics and peer-group/guideline companies.
- We utilized a valuation specialist to assess the appropriateness of the model utilized and underlying assumptions including royalty rates and discount rates.

Consolidated Financial Statements - Impact of Internal Control over Financial Reporting

As described in Management's Report on Internal Control Over Financial Reporting, material weaknesses were identified as of December 31, 2022. The prevention, detection, and correction of material misstatements of the consolidated financial statements, is dependent, in part, on management (i) designing and maintaining an effective control environment, including maintaining sufficient resources within the accounting and financial reporting department to review complex financial reporting transactions; and updating and distributing accounting policies and procedures across the organization (ii) designing and implementing effective information and communication process to identify and assess the source of and controls necessary to ensure the reliability of information used in financial reporting and that communicates relevant information about roles and responsibilities for internal control over financial reporting and (iii) designing and implementing effective process-level control activities and general information technology controls related to financial reporting processes. We identified the impact on our audit of the material weaknesses related to the control environment, information and communication, and control activities ("material weaknesses"), as further described in Management's Report, as a critical audit matter.

The principal consideration for our determination that the impact on our audit of the material weaknesses is a critical audit matter is that especially challenging auditor judgment was required in designing audit procedures and evaluating audit evidence due to the ineffective system of internal control over financial reporting, which affects substantially all consolidated financial statement account balances and disclosures.

Our audit procedures related to the material weaknesses included the following, among others.

- We determined the nature and extent of audit procedures that are responsive to the identified material weaknesses and evaluated the evidence obtained from the procedures performed.
- We lowered the threshold used for investigating differences noted for recorded amounts.
- We selected larger sample sizes for tests of details.
- We substantively tested the accuracy and completeness of system-generated reports used in the audit and more extensively tested these reports.
- We increased the extent of supervision over the execution of audit procedures.

/s/ GRANT THORNTON LLP

We have served as the Company's auditor since 2022.

Bellevue, Washington

March 31, 2023

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Shareholders and Board of Directors
BioLife Solutions, Inc.
Bothell, Washington

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheet of BioLife Solutions, Inc. (the "Company") as of December 31, 2021, and the related consolidated statements of operations, comprehensive (loss) income, shareholders' equity, and cash flows for each of the two years in the period ended December 31, 2021, 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, 2021, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2021**,** in conformity with accounting principles generally accepted in the United States of America.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's consolidated financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) ("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 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 consolidated 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 consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated 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 consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ BDO USA, LLP

We served as the Company's auditor from 2019 to 2022.

Seattle, Washington

March 31, 2022

BioLife Solutions, Inc.
Consolidated Balance Sheets

(In thousands, except per share and share data)	December 31, 2022	December 31, 2021
Assets		
Current assets:		
Cash and cash equivalents	$ 19,442	$ 69,860
Restricted cash	31	10
Available-for-sale securities, current portion	43,260	-
Accounts receivable, trade, net of allowance for doubtful accounts of $739 and $275 as of December 31, 2022 and December 31, 2021, respectively	33,936	23,217
Inventories	34,904	28,345
Prepaid expenses and other current assets	6,879	4,656
Total current assets	138,452	126,088
Assets held for rent, net	9,064	9,809
Property and equipment, net	23,638	17,657
Operating lease right-of-use assets, net	15,292	18,705
Financing lease right-of-use assets, net	272	440
Long-term deposits and other assets	281	325
Available-for-sale securities, long term	1,332	-
Equity Investments	5,069	4,372
Intangible assets, net	32,088	152,149
Goodwill	224,741	224,741
Total assets	$ 450,229	$ 554,286
Liabilities and Shareholders' Equity		
Current liabilities:		
Accounts payable	$ 15,367	$ 14,945
Accrued expenses and other current liabilities	9,782	6,870
Sales taxes payable	4,151	2,591
Warranty liability	8,312	9,398
Lease liabilities, operating, current portion	2,860	2,758
Lease liabilities, financing, current portion	158	149
Debt, current portion	1,814	862
Contingent consideration, current portion	2,138	5,127
Total current liabilities	44,582	42,700
Contingent consideration, long-term	2,318	4,900
Lease liabilities, operating, long-term	14,962	16,466
Lease liabilities, financing, long-term	126	291
Debt, long-term	23,793	6,353
Deferred tax liabilities	250	5,487
Other long-term liabilities	10	42
Total liabilities	86,041	76,239
Commitments and Contingencies (Note 12)		
Shareholders' equity:		
Preferred stock, $0.001 par value; 1,000,000 shares authorized, Series A, 4,250 shares designated, and 0 shares issued and outstanding as of December 31, 2022 and December 31, 2021	-	-
Common stock, $0.001 par value; 150,000,000 shares authorized, 42,832,231 and 41,817,503 shares issued and outstanding as of December 31, 2022 and December 31, 2021, respectively	43	42
Additional paid-in capital	611,739	585,397
Accumulated other comprehensive loss, net of taxes	(679)	(282)
Accumulated deficit	(246,915)	(107,110)
Total shareholders' equity	364,188	478,047
Total liabilities and shareholders' equity	$ 450,229	$ 554,286

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements

BioLife Solutions, Inc.
Consolidated Statements of Operations

(In thousands, except per share and share data)	Years Ended December 31		
	2022	2021	2020
Product revenue	$ 136,000	$ 101,913	$ 44,540
Service revenue	15,308	9,817	1,752
Rental revenue	10,451	7,426	1,795
Total product, service, and rental revenue	161,759	119,156	48,087
Costs and operating expenses:			
Cost of product revenue (exclusive of intangible assets amortization)	88,519	69,676	18,058
Cost of service revenue (exclusive of intangible assets amortization)	12,360	5,381	1,367
Cost of rental revenue (exclusive of intangible assets amortization)	7,058	7,051	1,221
Research and development	14,798	11,821	6,720
Sales and marketing	21,570	14,006	6,413
General and administrative	47,670	33,668	15,273
Intangible asset impairment charges	110,364	-	-
Intangible asset amortization	9,697	8,202	3,033
Acquisition costs	18	1,636	668
Change in fair value of contingent consideration	(4,754)	2,875	1,575
Total operating expenses	307,300	154,316	54,328
Operating loss	(145,541)	(35,160)	(6,241)
Other income (expense):			
Change in fair value of warrant liability	-	(121)	3,601
Change in fair value of investments	697	-	1,319
Interest (expense) income, net	(687)	(485)	40
Other income	704	289	-
Gain on acquisition of Sexton Biotechnologies, Inc.	-	6,451	-
Total other income, net	714	6,134	4,960
Loss before income tax benefit	(144,827)	(29,026)	(1,281)
Income tax benefit	5,022	20,118	3,264
Net (loss) income	$ (139,805)	$ (8,908)	$ 1,983
Net (loss) income attributable to common shareholders:			
Basic	$ (139,805)	$ (8,908)	$ 1,822
Diluted	(139,805)	(8,908)	(1,632)
(Loss) earnings attributable to common shareholders:			
Basic	$ (3.29)	$ (0.23)	$ 0.07
Diluted	$ (3.29)	$ (0.23)	$ (0.06)
Weighted average shares used to compute (loss) earnings per share attributable to common shareholders:			
Basic and Diluted	42,481,027	38,503,944	27,306,258

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements

BioLife Solutions, Inc.
Consolidated Statements of Comprehensive (Loss) Income

(In thousands)	Years Ended December 31		
	2022	2021	2020
Net (loss) income	$ (139,805)	$ (8,908)	$ 1,983
Other comprehensive loss - foreign currency translation adjustment, net of tax	(347)	(282)	-
Unrealized loss on available-for-sale securities, net of tax	(50)	-	-
Comprehensive (loss) income	$ (140,202)	$ (9,190)	$ 1,983

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements

BioLife Solutions, Inc.
Consolidated Statements of Shareholders' Equity

(In thousands, except share data)	Series A Preferred Stock Shares	Series A Preferred Stock Amount	Common Stock Shares	Common Stock Amount	Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit	Total Shareholders' Equity
Balance, December 31, 2019	-	$ -	20,825,452	$ 21	$ 143,485	$ -	$ (100,185)	$ 43,321
Stock issued as 2019 bonus payout	-	-	-	-	314	-	-	314
Stock-based compensation	-	-	-	-	5,981	-	-	5,981
Sale of common stock, net of costs	-	-	7,856,012	8	100,113	-	-	100,121
Common stock issued for services	-	-	3,175	-	60	-	-	60
Shares issued in acquisitions	-	-	611,683	-	17,916	-	-	17,916
Stock option exercises	-	-	777,496	1	1,471	-	-	1,472
Stock issued – on vested RSAs	-	-	208,858	-	-	-	-	-
Cashless exercises of 3,871,405 warrants	-	-	2,747,970	3	33,108	-	-	33,111
Warrant exercises	-	-	8,500	-	150	-	-	150
Net Income	-	-	-	-	-	-	1,983	1,983
Balance, December 31, 2020	-	-	33,039,146	33	302,598	-	(98,202)	204,429
Stock issued as consideration in GCI acquisition	-	-	6,636,470	7	232,734	-	-	232,741
Stock issued as consideration in Sexton acquisition	-	-	530,502	-	31,977	-	-	31,977
Fees incurred for registration filings	-	-	-	-	(186)	-	-	(186)
Stock-based compensation	-	-	-	-	13,956	-	-	13,956
Stock option exercises	-	-	869,065	1	1,417	-	-	1,418
Cashless exercise of 79,100 warrants	-	-	70,030	-	2,901	-	-	2,901
Stock issued – on vested RSAs	-	-	672,290	1	-	-	-	1
Foreign currency translation	-	-	-	-	-	(282)	-	(282)
Net loss	-	-	-	-	-	-	(8,908)	(8,908)
Balance, December 31, 2021	-	-	41,817,503	42	585,397	(282)	(107,110)	478,047
Stock issued as consideration for SciSafe earnout	-	-	64,130	-	817	-	-	817
Fees incurred for registration filings	-	-	-	-	(131)	-	-	(131)
Stock-based compensation	-	-	-	-	25,334	-	-	25,334
Stock option exercises	-	-	161,646	-	323	-	-	323
Stock issued – on vested RSAs	-	-	788,952	1	(1)	-	-	-
Other comprehensive loss	-	-	-	-	-	(397)	-	(397)
Net loss	-	-	-	-	-	-	(139,805)	(139,805)
Balance, December 31, 2022	-	$ -	42,832,231	$ 43	$ 611,739	$ (679)	$ (246,915)	$ 364,188

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements

BioLife Solutions, Inc.
Consolidated Statements of Cash Flows

(In thousands)	Year Ended December 31, 2022	2021	2020
Cash flows from operating activities			
Net (loss) income	$ (139,805)	$ (8,908)	$ 1,983
Adjustments to reconcile net (loss) income to net cash (used in) provided by operating activities			
Impairment of intangible assets	110,364	-	-
Depreciation	6,775	4,663	2,035
Amortization of intangible assets	9,697	8,202	3,033
Amortization of loan costs	18	121	-
Stock-based compensation	25,334	13,956	5,981
Non-cash lease expense	3,486	2,053	737
Deferred income tax benefit	(5,238)	(20,127)	(3,297)
Change in fair value of contingent consideration	(4,754)	2,875	1,575
Change in fair value of warrant liability	-	121	(3,601)
Change in fair value of investments	(697)	-	(1,319)
Accretion of investments	(447)	-	-
Gain on acquisition of Sexton Biotechnologies, Inc.	-	(6,451)	-
Stock issued for services	-	-	60
Loss on disposal of assets held for rent, net	773	609	365
Loss on disposal of property and equipment, net	745	482	-
Forgiveness of loans payable	-	(284)	-
Other	166	353	190
Change in operating assets and liabilities, net of effects of acquisitions			
Accounts receivable, trade, net	(10,753)	(10,132)	(1,786)
Inventories	(6,559)	114	(629)
Prepaid expenses and other current assets	26	2,663	(50)
Accounts payable	414	2,018	(171)
Accrued expenses and other current liabilities	1,787	(3,936)	780
Sales taxes payable	1,526	1,412	759
Warranty liability	(1,086)	5,833	-
Other	(260)	(230)	-
Net cash used in operating activities	(8,488)	(4,593)	6,645
Cash flows from investing activities			
Payments related to the acquisition of SciSafe, net of cash acquired	-	-	(14,947)
Cash acquired in acquisition of Global Cooling, Inc. and Sexton Biotechnologies, Inc.	-	1,559	-
Investment in iVexSol preferred stock	-	-	(1,000)
Investment in PanTHERA Cryosolutions	-	-	(995)
Purchases of property and equipment	(10,385)	(8,385)	(1,961)
Deposits on property and equipment	-	-	(2,672)
Purchases of assets held for rent	(3,536)	(6,371)	(2,813)
Deposits on assets held for rent	-	-	(362)
Proceeds from sale of marketable securities	420	-	-
Maturities of marketable securities	8,500	-	-
Investment in available-for-sale securities	(53,116)	-	-
Proceeds from sale of equipment	-	5	35
Net cash used in investing activities	(58,117)	(13,192)	(24,715)
Cash flows from financing activities			
Proceeds from Paycheck Protection Program ("PPP") Loan	-	-	2,175
Payoff of PPP Loan	-	-	(2,175)
Proceeds from term loan	20,000	-	-
Payments on term loan	(1,666)	-	-
Proceeds from equipment loans	-	1,550	984
Payments on equipment loans	(498)	(214)	-
Payments of contingent consideration	-	-	(483)
Proceeds from sale of common stock, net of $6.2 million of costs in 2020	-	-	100,121
Fees paid related to issuance of common stock	(131)	(145)	-
Proceeds from line of credit	-	27,306	-
Payments on line of credit	-	(31,536)	-
Proceeds from exercise of common stock options	323	1,418	1,472
Proceeds from exercise of warrants	-	-	40
Payments on financed insurance premium	(1,375)	(1,033)	-
Other	(337)	(124)	(56)
Net cash provided by (used in) financing activities	16,316	(2,778)	102,078
Net decrease in cash, cash equivalents, and restricted cash	(50,289)	(20,563)	84,008

Cash, cash equivalents, and restricted cash – beginning of period	69,870	90,456	6,448
Effects of currency translation on cash, cash equivalents, and restricted cash	(108)	(23)	-
Cash, cash equivalents, and restricted cash – end of period	$ 19,473	$ 69,870	$ 90,456
Non-cash investing and financing activities			
Cashless exercise of warrants reclassified from warrant liability to common stock	$ -	$ 2,901	$ 33,111
Stock issued as consideration to acquire Global Cooling, Inc. and Sexton Biotechnologies, Inc.	$ -	$ 264,718	$ -
Equipment acquired under operating leases	$ 243	$ 6,875	$ 8,096
Equipment acquired under finance leases	$ -	$ 440	$ -
Purchase of property and equipment not yet paid	$ 478	$ 197	$ -
Unrealized gains and losses on available-for-sale-securities	$ 50	-	-
Reclassification of warrant liabilities to equity upon exercise	$ -	$ -	$ 110
Stock issued as consideration to acquire SciSafe	$ 817	$ -	$ 17,916
Stock issued as bonus consideration	$ -	$ -	$ 314
Cash interest paid	$ 586	$ 452	$ -

The accompanying Notes to Consolidated Financial Statements are an integral part of these consolidated financial statements

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Organization and significant accounting policies

Business

BioLife Solutions, Inc. (“BioLife”, “us”, “we”, “our”, or the “Company”) is a developer, manufacturer, and supplier of a portfolio of bioproduction tools and services including proprietary biopreservation media, automated thawing devices, cloud-connected shipping containers, ultra-low temperature mechanical freezers, cryogenic and controlled rate freezers, and biological and pharmaceutical materials storage. Our CryoStor freeze media and HypoThermosol hypothermic storage media are optimized to preserve cells in the regenerative medicine market. These novel biopreservation media products are serum-free and protein-free, fully defined, and are formulated to reduce preservation-induced cell damage and death. Our Sexton cell processing product line includes human platelet lysates (“hPL”) for cell expansion, reducing risk and improving downstream performance over fetal bovine serum, human serum, and other chemically defined media, CellSeal cryogenic vials that are purpose-built rigid containers used in cell and gene therapy (“CGT”) that can be filled manually or with high throughput systems, and automated cell processing machines that bring multiple processes traditionally performed by manual techniques under a higher level of control to protect therapies from loss or contamination. Our ThawSTAR product line is comprised of a family of automated thawing devices for frozen cell and gene therapies packaged in cryovials and cryobags. These products help administer temperature-sensitive biologic therapies to patients by standardizing the thawing process and reducing the risks of contamination and overheating, which are inherent with the use of traditional water baths. Our cryogenic freezer technology provides for controlled rate freezing and cryogenic storage of biologic materials. Our ultra-low temperature mechanical freezers allow biological materials and vaccines to be stored at temperatures which range from negative 20℃ to negative 86℃. Our evo® shipping containers provide cloud-connected passive storage and transport containers for temperature-sensitive biologics and pharmaceuticals. Our biological and pharmaceutical materials storage services provide facilities that allow for real-time tracking of biologic materials and vaccines that can be stored at a wide range of temperatures.

Use of estimates

The preparation of financial statements in conformity with generally accepted accounting principles in the United States (“U.S. GAAP”) requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities as of the date of the financial statements and reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates.

Significant estimates and assumptions by management affect the Company’s allowance for doubtful accounts, the net realizable value of inventory, fair value of warrant liability, sales tax liabilities, valuation of market based awards, valuations and purchase price allocations related to investments and 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, estimated fair values of intangible assets and goodwill, amortization methods and periods, warranty reserves, certain accrued expenses, share-based compensation, contingent consideration from business combinations, and the provision for income taxes.

The Company regularly assesses these estimates; however, 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, SAVSU Technologies, Inc. (“SAVSU”), Arctic Solutions, Inc. doing business as CBS, SciSafe (acquired on October 1, 2020), Global Cooling, Inc. doing business as Stirling Ultracold (“Global Cooling” or “GCI” acquired on May 3, 2021), and Sexton Biotechnologies, Inc. (“Sexton” acquired on September 1, 2021). All intercompany accounts and transactions have been eliminated in consolidation.

All long-lived assets are maintained in the United States of America and the Netherlands.

Foreign currency translation

The Company translates balance sheet and income statement items into U.S. dollars. For the Company's subsidiaries that operate in a local currency functional environment, all assets and liabilities are translated into U.S. dollars using current exchange rates at the balance sheet date; revenue and expenses are translated using quarterly exchange rates which approximate to average exchange rates in effect during each period. Resulting translation adjustments are reported as a separate component of accumulated other comprehensive (loss) income in shareholders' equity.

Segment reporting

The Company views its operations and makes decisions regarding how to allocate resources and manages its business as one reportable segment and one reporting unit. The Company's Chief Executive Officer, who is the chief operating decision maker, reviews financial information on an aggregate basis for purposes of allocating and evaluating financial performance.

Revenue recognition

To determine revenue recognition for contractual arrangements that we determine are within the scope of Financial Accounting Standards Board ("FASB") Topic 606, *Revenue from Contracts with Customers*, we perform the following five steps: (i) identify each contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to our performance obligations in the contract; and (v) recognize revenue when (or as) we satisfy the relevant performance obligation. We only apply the five-step model to contracts when it is probable that we will collect the consideration we are entitled to in exchange for the goods or services we transfer to the customer. 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. Payment terms and conditions vary, although terms generally include a requirement of payment within 30 to 90 days. During the year ended December 31, 2022, the Company recognized approximately $511,000 of revenue that was included in the deferred revenue balance at the beginning of the year.

The Company primarily recognizes product revenues, service revenues, and rental revenues. Product revenues are generated from the sale of biopreservation media, ThawSTAR, and freezer products. We recognize product revenue, including shipping and handling charges billed to customers, at a point in time when we transfer control of our products to our customers, which is upon shipment for substantially all transactions. Shipping and handling costs are classified as part of cost of product revenue in the Consolidated Statement of Operations. Service revenues are generated from the storage of biological and pharmaceutical materials. We recognize service revenues over time as services are performed or ratably over the contract term. 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. 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 and during the year ended December 31, 2022.

The Company also generates revenue from the leasing of our property, plant, and equipment, operating right-of-use assets, and evo cold chain systems to customers pursuant to service contracts or rental arrangements entered into with the customer. Revenue from these arrangements is not within the scope of FASB ASC Topic 606 as it is within the scope of FASB ASC Topic 842, *Lease*s. All customers leasing shippers currently do so under month-to-month rental arrangements. We account for these rental transactions as operating leases and record rental revenue on a straight-line basis over the rental term.

The Company enters into various customer service agreements (collectively, "Service Contracts") with customers to provide biological and pharmaceutical storage services. In certain of these Service Contracts, the property, plant, and equipment or operating right-of-use assets used to store a customer's product are used only for the benefit of one customer. This is primarily driven by the customer's desire to ensure that sufficient storage capacity is available in a specific geographic location for a set period of time. These agreements may include extension and termination clauses. These Service Contracts do not allow for customers to purchase the underlying assets.

The Company has assessed its Service Contracts and concluded that certain of the contracts for the storage of customer products met the criteria to be considered a leasing arrangement ("Embedded Leases"), with the Company as the lessor. The specific Service Contracts that met the criteria were those that provided a single customer with the ability to substantially direct the use of the Company's property, plant, and equipment or operating right-of-use assets.

Under ASC 842, consistent with the previous guidance, the Company recognizes operating right-of-use asset embedded lessor arrangements on its Consolidated Balance Sheets in Operating right-of-use assets.

None of the Embedded Leases identified by the Company qualify as a sales-type or direct finance lease. None of the operating leases for which the Company is the lessor include options for the lessee to purchase the underlying asset at the end of the lease term or residual value guarantees, nor are any such operating leases with related parties.

Embedded Leases may contain both lease and non-lease components. We have elected to utilize the practical expedient to account for lease and non-lease components together as a single combined lease component as the timing and pattern of transfer are the same for the non-lease components and associated lease component and, the lease component, if accounted for separately, would be classified as an operating lease. Non-lease components of the Company's rental arrangements include reimbursements of lessor costs.

Total bioproduction tools and services revenue for the years ended December 31, 2022, 2021, and 2020 were comprised of the following:

	Year Ended December 31,		
(In thousands, except percentages)	**2022**	**2021[1]**	**2020[2]**
Product revenue			
Freezer and thaw	$ 66,682	$ 56,620	$ 13,548
Cell processing	68,509	44,965	30,946
Storage and cold chain services	809	328	46
Service revenue			
Freezer and thaw	74	-	-
Storage and cold chain services	15,234	9,817	1,752
Rental revenue			
Storage and cold chain services	10,451	7,426	1,795
Total revenue	$ 161,759	$ 119,156	$ 48,087

(1) 2021 revenue includes product revenue related to Global Cooling from May 3, 2021 through December 31, 2021 and product revenue related to Sexton from September 1, 2021 through December 31, 2021.
(2) 2020 revenue includes service revenue related to SciSafe from October 1, 2020 through December 31, 2020.

The following table includes estimated rental revenue expected to be recognized in the future related to embedded leases as well as estimated service revenue expected to be recognized in the future related to performance obligations that are unsatisfied or partially unsatisfied as of the end of the reporting periods. The Company elected not to disclose the value of the remaining unsatisfied performance obligation with a duration of one year or less as permitted by the practical expedient in ASU 2014-09, *Revenue from Contracts with Customers*. The estimated revenue in the following table does not include contracts with the original durations of one year or less, amounts of variable consideration attributable to royalties, or contract renewals that are unexercised as of December 31, 2022.

The balances in the table below are partially based on judgments involved in estimating future orders from customers subject to the exercise of material rights pursuant to respective contracts:

(In thousands)	**2023**	**2024**	**Total**
Rental revenue	$ 3,735	$ 900	$ 4,635
Service revenue	$ 200	$ 10	$ 210

Risks and uncertainties

COVID-19 pandemic

Our domestic and international operations have been and continue to be affected by the ongoing global pandemic of a novel strain of coronavirus ("COVID-19") and the resulting volatility and uncertainty it has caused in the U.S. and international markets.

During year ended December 31, 2021, we experienced difficulties in obtaining sheet metal and electrical components incorporating semiconductor chips for the manufacture of our ULT freezer products due to the effects of COVID-19. These supply chain disruptions decreased the Company's profitability as a result of increased supplier pricing and production stoppages. During the year ended December 31, 2022, supply chain bottlenecks were mitigated through the diversification of suppliers, resulting in improved pricing from the year ended December 31, 2021. We were still experiencing constraints in supply for semiconductor chips as of December 31, 2022. Though our costs to obtain semiconductor components normalized throughout the year, we were still experiencing constraints in obtaining electrical component parts. These constraints are expected to improve through diversification of our semiconductor supply chain partnerships. We have sufficient supply for electrical component parts within our operations for the foreseeable future.

We cannot be assured that a continued or prolonged global pandemic will not have other negative impacts on our manufacturing and shipping processes or our product costs. The extent to which the COVID-19 pandemic affects 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 the ongoing pandemic, and current or future domestic and international actions to contain and treat COVID-19.

The Company reviews capital and amortizing intangible assets (long-lived assets) for impairment on an annual basis or whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. The Company determined that the economic uncertainty caused by the COVID-19 pandemic was a trigger for an impairment review in the quarter ended June 30, 2020 of certain long-lived assets based on the expected near-term weakness in ThawSTAR and freezer revenue resulting from the impact of COVID-19.

As a result of the Company's outlook for revenue from the ThawSTAR and freezer product lines, estimated undiscounted cash flow projections were developed to determine if any impairment of the related intangible assets was warranted. After conducting such review, the Company determined that there was no impairment of the remaining long-lived assets as of June 30, 2020. Given the inherent uncertainties of the COVID-19 pandemic and the estimates used in these cash flow projections, changes based on facts and circumstances in future quarters could give rise to impairment.

The Company revised the revenue projections for the ThawSTAR and freezer product lines in the second quarter ended June 30, 2020 to determine the impact on the fair value of the contingent consideration related to the existing earnout provisions. Based on results of the year ended December 31, 2020 related to these two product lines, we made further adjustments to our revenue projections. After reviewing the impact of the updated revenue projections on estimated undiscounted cash flow projections, the Company determined that there was no impairment of the remaining long-lived assets as of December 31, 2020. The Company reduced the fair value of the combined contingent consideration liability from $388,000 at June 30, 2020, to $221,000 as of December 31, 2020 due to updated revenue projections, the time value of money, and actual results for the year ended December 31, 2020.

The Company may also experience other negative impacts of the COVID-19 outbreak such as the lack of availability of the Company's key personnel, additional temporary closures of the Company's office or the facilities of the Company's business partners, customers, third-party service providers or other vendors, the inability to travel to market and sell our products, and the interruption of the Company's supply chain, distribution channels, liquidity and capital or financial markets.

Any disruption and volatility in the global capital markets as a result of the pandemic may increase the Company's cost of capital and adversely affect the Company's ability to access financing when and on terms that the Company desires. In addition, a potential recession resulting from the spread of COVID-19 could materially affect the Company's business, especially if a recession results in higher unemployment causing potential patients to not have access to health insurance.

The ultimate extent to which the COVID-19 pandemic and its repercussions impact the Company's business will depend on future developments, which continue to be uncertain. However, the foregoing and other continued disruptions to the Company's business as a result of COVID-19 could result in a material adverse effect on the Company's business, results of operations, financial condition and cash flows.

On April 20, 2020, the Company received $2,175,320 from the Paycheck Protection Program ("PPP") in accordance with the CARES Act eligibility requirements initially established. After subsequent changes to the eligibility requirements of the PPP for publicly traded companies, the Company repaid the loan in full on April 29, 2020.

Earnings per share

The Company considers its unexercised warrants and unvested restricted shares, which contain non-forfeitable rights to dividends, participating securities, and includes such participating securities in its computation of earnings per share pursuant to the two-class method. Basic earnings per share for the two classes of stock (common stock and warrants) is calculated by dividing net income by the weighted average number of shares of common stock and warrants outstanding during the reporting period. Diluted earnings per share is calculated using the weighted average number of shares of common stock plus the potentially dilutive effect of common equivalent shares outstanding determined under both the two-class method and the treasury stock method, whichever is more dilutive. In periods when we have a net loss, common stock equivalents are excluded from our calculation of earnings per share as their inclusion would have an antidilutive effect.

The following table presents computations of basic and diluted earnings per share under the two-class method:

	Year Ended December 31,		
(In thousands, except share and earnings per share data)	**2022**	**2021**	**2020**
Basic earnings (loss) per common share			
Numerator:			
Net (loss) income	$ (139,805)	$ (8,908)	$ 1,983
Amount attributable to unvested restricted shares	-	-	(100)
Amount attributable to warrants outstanding	-	-	(61)
Net (loss) income allocated to common shareholders	(139,805)	(8,908)	1,822
Denominator:			
Weighted-average common shares issued and outstanding	42,481,027	38,503,944	27,306,258
Basic (loss) earnings per common share	$ (3.29)	$ (0.23)	$ 0.07
Diluted earnings (loss) per common share			
Numerator:			
Net (loss) income	$ (139,805)	$ (8,908)	$ 1,983
Amount attributable to warrants	-	-	(14)
Less: gain related to change in fair value of warrants	-	-	(3,601)
Net loss allocated to common shareholders	(139,805)	(8,908)	(1,632)
Denominator:			
Weighted-average common shares issued and outstanding	42,481,027	38,503,944	27,306,258
Diluted loss per common share	$ (3.29)	$ (0.23)	$ (0.06)

The following table sets forth the number of shares excluded from the computation of diluted loss per share, as their inclusion would have been anti-dilutive:

	Year Ended December 31,	
	2021	**2020**
Stock options and restricted stock awards	1,637,745	2,131,794
Warrants	18,204	1,499,953
Total	1,655,949	3,631,747

Cash, cash equivalents, and restricted cash

Cash equivalents consist primarily of interest-bearing money market accounts. We consider all highly liquid debt instruments purchased with an initial maturity of three months or less to be cash equivalents. We maintain cash balances that may exceed federally insured limits. We do not believe that this results in any significant credit risk.

Restricted cash consists entirely of amounts that will be recovered from escrow in relation to the acquisition of SciSafe. The restricted cash is short term in nature, as the Company anticipates to receive the funds within one year of the balance sheet date.

The following is a summary of 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 and 2021.

(In thousands)	**2022**	**2021**
Cash and cash equivalents	$ 19,442	$ 69,860
Restricted cash	31	10
Total cash, cash equivalents, and restricted cash	$ 19,473	$ 69,870

Available-for-sale securities

Available-for-sale securities consist of U.S. government securities, corporate debt securities, and other debt securities. Management classifies investments at the time of purchase and reevaluates such classification at each balance sheet date. Investments with maturities beyond one year may be classified as short-term based on their liquid nature and because such marketable securities represent the investment of cash that is available for current operations. Available-for-sale securities are reported at fair value based on quoted market prices and other observable market data. Unrealized gains and losses are reported as a component of other comprehensive (loss) income, net of any related tax effect. Realized gains and losses and other-than-temporary impairments on investments are included in other income.

Inventories

Inventories relate to the Company's cell and gene therapy products. The Company values biopreservation media inventory at cost or, if lower, net realizable value, using the specific identification method. All other inventory is valued 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 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 revenue volume to cost of product revenue. The Company bases its estimates on expected product revenue volume, production capacity and expiration dates of raw materials, work in process, and finished products. 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 testing costs and manufacturing overhead.

Accounts receivable

Accounts receivable consist of short-term amounts due from our customers (generally 30 to 90 days) and are stated at the amount we expect to collect. We establish an allowance for doubtful accounts based on our assessment of the collectability of specific customer accounts.

Accounts receivable are stated at principal amount, do not bear interest, and are generally unsecured. We provide an allowance for doubtful accounts based on an evaluation of the collectability of customer account balances. Accounts considered uncollectible are charged against the established allowance.

Equity investments

We periodically invest in securities of private companies to promote business and strategic objectives. These investments are measured and recorded as follows:

Non-marketable equity securities are equity securities without a readily determinable fair value. As of December 31, 2022, these investments are comprised of $4.1 million in Series A-1 and A-2 Preferred Stock in iVexSol, Inc. ("iVexSol") and $995,000 in Series E Preferred Stock in PanTHERA CryoSolutions, Inc. ("PanTHERA"). As of December 31, 2021, these investments are comprised of $3.4 million in Series A-1 and A-2 Preferred Stock in iVexSol, Inc. ("iVexSol") and $995,000 in Series E Preferred Stock in PanTHERA CryoSolutions, Inc. ("PanTHERA").

As of December 31, 2022, Sexton is consolidated in the Consolidated Financial Statements as a result of the step-acquisition completed September 1, 2021. As of December 31, 2020, the Sexton investment was measured and recorded using a measurement alternative for equity investments that do not have a readily determinable fair value that measures the securities at cost minus impairment, if any, plus or minus changes resulting from observable process changes in orderly transactions for identical or similar investments of the same issuer. The Company made an irrevocable election to record this convertible note in its entirety at fair value utilizing the fair value option available under U.S. GAAP. The Company believed that carrying this investment at fair value better portrayed the economic substance of the investment. Under the fair value option, gains and losses on the convertible note were included in unrealized gains/(losses) on investments within net earnings each applicable reporting period. Gains related to the increase in fair value of this convertible note were $697,000, zero, and $1.3 million for the years ended December 31, 2022, 2021, and 2020, respectively. The fair value of the note on the date of investment was determined to be equal to its principal amount. Interest income related to this note was recorded separately from other changes in its fair value within interest income each period. In November of 2020, the Company elected to convert the note into Series A-1 Preferred Stock and invest an additional $1.0 million in Series A-2 Preferred Stock in iVexSol. The Preferred Stock investments in iVexSol are carried at cost minus impairment, if any, plus or minus changes resulting from observable process changes in orderly transactions for identical or similar investments of the same issuer.

In November of 2020, the Company invested $995,000 in Class E Preferred Shares in PanTHERA CryoSolutions, Inc. In conjunction with this investment, the Company executed a development and license agreement with PanTHERA under which the Company will make milestone development payments up to $2.0 million in the event that certain milestones are met in exchange for exclusive, perpetual, worldwide marketing and distribution rights to the technology for use in cell and gene therapy applications. In June of 2021, PanTHERA satisfied the first milestone and the Company paid $200,000 in accordance with the agreement. The Preferred Stock investments in PanTHERA are carried at cost minus impairment, if any, plus or minus changes resulting from observable process changes in orderly transactions for identical or similar investments of the same issuer.

As of December 31, 2022, management believes there are no indications of impairment or changes in fair value for the investments in iVexSol or PanTHERA.

Property and equipment

Property and equipment are stated at cost and are depreciated using the straight-line method over estimated useful lives of three to ten years. Leasehold improvements are amortized using the straight-line method over the shorter of the estimated useful lives of the assets or the remaining lease term of the respective assets. Gains or losses on disposals of property and equipment are recorded within income from operations. Costs of repairs and maintenance are included as part of operating expenses unless they are incurred in relation to major improvements to existing property and equipment, at which time they are capitalized.

Property and equipment are reviewed for impairment whenever events or changes in circumstances indicate that their net book value may not be recoverable. Carrying values are reviewed for recoverability at the asset grouping level to determine if the facts and circumstances suggest that a potential impairment may have occurred. If the sum of the expected future cash flows (undiscounted and before interest) from the use of the assets is less than the net book value of the asset, an impairment could exist and the amount of the impairment loss, if any, will generally be measured as the difference between the net book value of the assets and their estimated fair values. There were no impairment losses recognized during the years ended December 31, 2022, 2021, and 2020.

Assets held for rent

Assets held for rent are carried at cost less accumulated depreciation. These assets consist of dedicated storage space, evo shippers and related components in production shippers complete and ready to be deployed and placed in service upon a customer order, shippers in the process of being assembled, and components available to build shippers. Assets utilized to provide dedicated storage space are depreciated over their applicable useful lives once placed in service. Shippers are depreciated over a useful life of three years when in use by customers.

Our customers rent assets per a rental agreement. Each agreement provides for fixed monthly rent. Rental revenue and fees are recognized over the rental term on a straight-line basis. We retain the ownership of the assets rented. At the end of the rental agreement, the customer returns the asset to the Company.

Assets held for rent are reviewed for impairment whenever events or changes in circumstances indicate that their net book value may not be recoverable. Carrying values are reviewed for recoverability at the asset grouping level to determine if the facts and circumstances suggest that a potential impairment may have occurred. If the sum of the expected future cash flows (undiscounted and before interest) from the use of the assets is less than the net book value of the asset, an impairment could exist and the amount of the impairment loss, if any, will generally be measured as the difference between the net book value of the assets and their estimated fair values. There were no impairment losses recognized during the years ended December 31, 2022, 2021, and 2020.

Lease accounting

We determine if an arrangement is a lease at inception. Where an arrangement is a lease, we determine if it is an operating lease or a financing lease. At lease commencement, we record a lease liability and corresponding right-of-use (“ROU”) asset. Lease liabilities represent the present value of our future lease payments over the expected lease term which includes options to extend or terminate the lease when it is reasonably certain those options will be exercised. The present value of our lease liability is determined using our incremental collateralized borrowing rate at lease inception. ROU assets represent our right to control the use of the leased asset during the lease and are recognized in an amount equal to the lease liability for leases with an initial term greater than 12 months. Over the lease term we use the effective interest rate method to account for the lease liability as lease payments are made and the ROU asset is amortized in a manner that results in straight-line expense recognition.

We elected to apply the practical expedient for short-term leases and accordingly do not apply lease recognition requirements for short-term leases with a duration less than twelve months. Instead, we recognize payments related to these arrangements in the Consolidated Statement of Operations as lease costs on a straight-line basis over the lease term.

Warranty

Our standard warranty terms typically extend between one year and seven years from the date of delivery. We accrue for standard warranty costs based on historical trends in warranty charges. The accrual is reviewed regularly and periodically adjusted to reflect changes in warranty cost over the period.

Income taxes

We account for income taxes using an asset and liability method which generally requires recognition of deferred tax assets and liabilities for the expected future tax effects of events that have been included in the financial statements or tax returns. Under this method, deferred tax assets and liabilities are recognized for the future tax effects of differences between tax bases of assets and liabilities, and financial reporting amounts, based upon enacted tax laws and statutory rates applicable to the periods in which the differences are expected to affect taxable income. We evaluate the likelihood of realization of deferred tax assets and provide an allowance where, in management's opinion, it is more likely than not that the asset will not be realized. Our policy for interest and penalties is to recognize interest and penalties as a component of the provision for income taxes in the Consolidated Statement of Operations.

We determine any uncertain tax positions based on a determination of whether and how much of a tax benefit taken in the Company's tax filings or positions is more likely than not to be sustained upon examination by the relevant income tax authorities.

Judgment is applied in the determination of the financial statement recognition and measurement of tax positions taken or expected to be taken in a tax return. As of December 31, 2022, the Company has an unrecognized tax benefit of $610,000 related to tax attributes being carried forward. The Company is generally subject to examination by U.S. federal and local income tax authorities for all tax years in which loss carryforward is available.

Advertising

Advertising costs are expensed as incurred and totaled $768,000, $552,000, and $167,000 for the years ended December 31, 2022, 2021, and 2020, respectively.

Concentrations of risk

During the years ended December 31, 2022 and 2021, we derived approximately 18% and 17% of our revenue from the same customer, respectively. During the year ended December 31, 2020, we derived approximately 13% of our revenue from a different customer. No other customers accounted for more than 10% of revenues. Revenue from foreign customers is denominated in United States dollars or euros.

	Year Ended December 31,		
Revenue by major product	**2022**	**2021**	**2020**
CryoStor	36%	33%	60%
780XLE Freezer	22%	22%	-%

In the years ended December 31, 2022, 2021, and 2020, no suppliers accounted for more than 10% of purchases.

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

	Year Ended December 31,		
Revenue by customers' geographic locations	**2022**	**2021**	**2020**
United States	72%	78%	73%
Canada	17%	7%	13%
Europe, Middle East, Africa (EMEA)	7%	14%	12%
Other	4%	1%	2%
Total revenue	100%	100%	100%

The following table represents the Company's long-lived assets by geographic area as of December 31:

(In thousands)	**2022**	**2021**
United States	$ 42,829	$ 40,708
Netherlands	5,437	5,903
Total	$ 48,266	$ 46,611

As of December 31, 2022, two customers accounted for 26% of gross accounts receivable. As of December 31, 2021, two customers accounted for 32% of gross accounts receivable. No other customers accounted for more than 10% of our gross accounts receivable.

As of December 31, 2022, one supplier accounted for 23% of accounts payable. As of December 31, 2021, a different supplier accounted for 10% of accounts payable. No other suppliers accounted for more than 10% of our accounts payable.

Research and development

Research and development costs are expensed as incurred.

Stock-based compensation

We measure and record compensation expense using the applicable accounting guidance for share-based payments related to stock options, time-based restricted stock, market-based restricted stock awards and performance-based restricted stock awards granted to our directors and employees. The fair value of stock options, including performance awards, without a market-based condition is determined by using the Black-Scholes option-pricing model. The fair value of restricted stock awards with a market condition is estimated at the date of grant using the Monte Carlo Simulation model. The Black-Scholes and Monte Carlo Simulation valuation models incorporate assumptions as to stock price volatility, the expected life of options or awards, a risk-free interest rate and dividend yield. The fair value of restricted stock, including performance awards, without a market condition is estimated using the current market price of our common stock on the date of grant.

We expense stock-based compensation for stock options, restricted stock awards, and performance awards over the requisite service period. For awards with only a service condition, we expense stock-based compensation using the straight-line method over the requisite service period for the entire award. For awards with a market condition, we expense the grant date fair value over the vesting period regardless of the value that the award recipients ultimately receive.

We have, from time to time, modified the terms of restricted stock awards awarded to employees. We account for the incremental increase in the fair value over the original award on the date of the modification as an expense for vested awards or over the remaining service (vesting) period for unvested awards. The incremental compensation cost is the excess of the fair value of the modified award on the date of modification over the fair value of the original award immediately before the modification.

Business combinations, goodwill, and intangible assets

Business combinations

The Company accounts for business acquisitions using the acquisition method as required by FASB ASC Topic 805, *Business Combinations*.

The Company's identifiable assets acquired and liabilities, including identified intangible assets, assumed in a business combination are recorded at their acquisition date fair values. The valuation requires management to make significant estimates and assumptions, especially with respect to long-lived and intangible assets. Critical estimates in valuing intangible assets include, but are not limited to:

- future expected cash flows, including revenue and expense projections;
- discount rates to determine the present value of recognized assets and liabilities and;
- revenue volatility to determine contingent consideration using option pricing models

Goodwill is calculated as the excess of the acquisition price over the fair value of net assets acquired, including the amount assigned to identifiable intangible assets. Acquisition-related costs, including advisory, legal, accounting, valuation, and other costs, are expensed in the periods in which these costs are incurred. The results of operations of an acquired business are included in the consolidated financial statements beginning at the acquisition date.

The Company estimates the acquisition date fair value of the acquisition-related contingent consideration using various valuation approaches, including option pricing models, as well as significant unobservable inputs, reflecting the Company's assessment of the assumptions market participants would use to value these liabilities. The fair value of the contingent consideration is remeasured each reporting period.

During the measurement period, which may be up to one year from the acquisition date, any refinements made to the fair value of the assets acquired, liabilities assumed, or contingent consideration are recorded in the period in which the adjustments are recognized. Upon the conclusion of the measurement period or final determination of the fair value of the assets acquired, liabilities assumed, or contingent consideration, whichever comes first, any subsequent adjustments are recognized in the Consolidated Statements of Operations.

Goodwill

Goodwill represents the excess of the purchase price over the net amount of identifiable assets acquired and liabilities assumed in a business combination measured at fair value. Goodwill is not amortized but is tested for impairment at least annually. The Company reviews goodwill for impairment annually in the fourth quarter and whenever events or changes in circumstances indicate that the fair value of a reporting unit may be less than its carrying amount (a triggering event). The Company first assesses qualitative factors to determine whether it is more likely than not that the fair value of its reporting unit is less than its carrying amount as a basis for determining whether it is necessary to perform the quantitative goodwill impairment test described in FASB ASC Topic 350, *Intangibles – Goodwill and Other*. The more likely than not threshold is defined as having a likelihood of more than 50 percent. If, after assessing the totality of events or circumstances, the Company determines that it is not more likely than not that the fair value of a reporting unit is less than its carrying amount, then performing the quantitative goodwill impairment test is unnecessary and goodwill is considered to be unimpaired. However, if based on the qualitative assessment the Company concludes that it is more likely than not that the fair value of a reporting unit is less than its carrying amount, the Company will proceed with performing the quantitative goodwill impairment test. In performing the quantitative goodwill impairment test, the Company determines the fair value of its reporting unit and compares it to its carrying value. If the fair value of the reporting unit exceeds the carrying value of the net assets assigned to that unit, goodwill is not impaired. If the carrying value of the reporting unit exceeds its fair value, the Company records an impairment loss equal to the difference. The Company operates as one reporting unit as of the goodwill impairment measurement date in the fourth quarter of 2022. As of the testing date and the period after that date through the issuance date of our financial statements, the Company has observed no indicators of potential goodwill impairment at any point during the period based on its qualitative assessment.

Intangible assets

Intangible assets with a definite life are amortized over their estimated useful lives using the straight-line method and the amortization expense is recorded within intangible asset amortization in the Consolidated Statements of Operations. If the estimate of a definite-lived 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. Definite-lived intangible assets and their related estimated 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. As of June 30, 2022 and October 1, 2022, the Company determined that adverse conditions existed that indicated impairment of certain definite life intangible assets. Refer to Note 11 of the Consolidated Financial Statements for further details.

Indefinite-lived intangibles are carried at the initially recorded fair value less any recognized impairment. In-process research and development ("IPR&D") is initially capitalized at fair value as an intangible asset with an indefinite life. When the IPR&D project is complete, it is reclassified as a definite-lived intangible asset and is amortized over its estimated useful life. If an IPR&D project is abandoned, a charge would be recorded for the value of the related intangible asset to our Consolidated Statement of Operations in the period it is abandoned. Indefinite-lived intangibles are tested annually for impairment. Impairment assessments are conducted more frequently 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. During the second quarter of 2022, the Company identified interim triggering events that required further analysis with respect to potential impairment of the IPR&D assets acquired during 2021. After performing quantitative impairment tests as of June 30, 2022 and October 1, 2022, the Company determined that the IPR&D assets were impaired. Refer to Note 11 of the Consolidated Financial Statements for further details.

Certain warrants which have features that may result in cash settlement

Warrants that include cash settlement features are recorded as liabilities at their estimated fair value at the date of issuance and are remeasured at fair value each reporting period with the increase or decrease in fair value recorded in the Consolidated Statements of Operations. The warrants are measured at estimated fair value using the Black Scholes valuation model, which is based, in part, upon inputs for which there is little or no observable market data, requiring the Company to develop its own assumptions. Inherent in this model are assumptions related to expected stock-price volatility, expected life, risk-free interest rate and dividend yield. We estimate the volatility of our common stock at the date of issuance, and at each subsequent reporting period, based on historical volatility that matches the contractual remaining life of the warrants. The risk-free interest rate is based on the U.S. Treasury zero-coupon yield curve on the grant date for a maturity similar to the expected remaining life of the warrants. The expected life of the warrants is assumed to be equivalent to their remaining contractual term. The dividend rate is based on our historical rate, which we anticipate to remain at zero. The assumptions used in calculating the estimated fair value of the warrants represent our best estimates. However, these estimates involve inherent uncertainties and the application of management judgment. As a result, if factors change and different assumptions are used, the warrant liability and the change in estimated fair value could be materially different. As of December 31, 2022, no warrants were outstanding.

Recent accounting pronouncements

In June 2022, the Financial Accounting Standards Board (“FASB”) issued Accounting Standards Update (“ASU”) No. 2022-03, *Fair Value Measurements (Topic 820): Fair Value Measurement of Equity Securities Subject to Contractual Sales Restrictions* (“ASC Topic 820”). The FASB issued ASU 2022-03 to (1) clarify the guidance in Topic 820, Fair Value Measurement, when measuring the fair value of an equity security subject to contractual restrictions that prohibit the sale of an equity security, (2) to amend a related illustrative example, and (3) to introduce new disclosure requirements for equity related securities subject to contractual sale restrictions that are measured at fair value in accordance with Topic 820. ASU 2022-03 clarifies that a contractual restriction on the sale of an equity security is not considered part of the unit of account of the equity security and, therefore, is not considered in measuring fair value. The guidance is effective for fiscal years beginning after December 15, 2023, and interim periods within those fiscal years with early adoption permitted. We are evaluating when to adopt the amendments in ASU 2022-03. We do not expect a material impact as a result of adopting this amendment.

In March 2022, the FASB issued ASU No. 2022-02 *Financial Instruments-Credit Losses (Topic 326): Troubled Debt Restructurings and Vintage Disclosures*. ASU 2022-02 eliminates the accounting guidance for troubled debt restructurings and requires disclosure of current-period gross write-offs by year of loan origination. Additionally, ASU 2022-02 updates the accounting for credit losses under ASC 326 and adds enhanced disclosures with respect to loan refinancings and restructurings in the form of principal forgiveness, interest rate concessions, other-than-insignificant payment delays, or term extensions when the borrower is experiencing financial difficulties. ASU 2022-02 is effective for fiscal years beginning after December 15, 2022 and early adoption is permitted. The Company adopted this guidance and it did not have a material impact on the Company’s financial position, results of operation, or cash flows.

In November 2021, the Financial Accounting Standards Board (“FASB”) issued Accounting Standards Update (“ASU”) No. 2021-10, *Government Assistance (Topic 832): Disclosures by Business Entities about Government Assistance*, to increase the transparency of government assistance including the disclosure of the types of assistance an entity receives, an entity’s method of accounting for government assistance, and the effect of the assistance on an entity’s financial statements. The guidance in this update will be effective for fiscal years beginning after December 15, 2023, with early application of the amendments allowed. The amendments are to be applied prospectively to all transactions within the scope of the amendments that are reflected in financial statements at the date of initial application and new transactions that are entered into after the date of initial application or, retrospectively to those transactions. The Company is currently evaluating the impact of this standard on its consolidated financial statements.

In October 2021, the FASB issued ASU No. 2021-08, *Business Combinations (Topic 805): Accounting for Contract Assets and Contract Liabilities from Contracts with Customers*. This update amends guidance to require that an entity (acquirer) recognize and measure contract assets and contract liabilities acquired in a business combination in accordance with *Revenue from Contracts with Customers (Topic 606)*. At the acquisition date, an acquirer should account for the related revenue contracts in accordance with Topic 606 as if it had originated the contracts. ASU 2021-08 is effective for fiscal years beginning after December 15, 2022, including interim periods within those fiscal years. Early adoption of the amendments is permitted including adoption in an interim period. The Company adopted this guidance and it did not have a material impact on the Company’s financial position, results of operation, or cash flows.

In March 2020, the FASB issued ASU No. 2020-04, *Reference Rate Reform (Topic 848): Facilitation of the Effects of Reference Rate Reform on Financial Reporting*. ASU 2020-04 provides optional expedient and exceptions for applying generally accepted accounting principles to contracts, hedging relationships, and other transactions affected by reference rate reform if certain criteria are met. In response to the concerns about structural risks of interbank offered rates and, particularly, the risk of cessation of the London Interbank Offered Rate (“LIBOR”), regulators in several jurisdictions around the world have undertaken reference rate reform initiatives to identify alternative reference rates that are more observable or transaction-based and less susceptible to manipulation. The ASU provides companies with optional guidance to ease the potential accounting burden associated with transitioning away from reference rates that are expected to be discontinued. In January 2021, the FASB issued ASU 2021-01, *Reference Rate Reform—Scope*, which clarified the scope and application of the original guidance. In December 2022, the FASB issued ASU 2022-06, *Reference Rate Reform—Deferral of the Sunset Date of Topic 848*. This update extends the sunset provision of ASU 2020-04 to December 31, 2024. The Company has not yet adopted this ASU and is evaluating the effect of adopting this new accounting guidance.

In June 2016, the FASB issued ASU No. 2016-13, *Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments*. ASU 2016-13 requires companies to measure credit losses utilizing a methodology that reflects expected credit losses and requires a consideration of a broader range of reasonable and supportable information to inform credit loss estimates. For companies that qualified as Smaller Reporting Companies as defined by the SEC as of November 19, 2019, ASU 2016-13 is effective for fiscal years beginning after December 15, 2023, including interim periods within those fiscal years. The Company is evaluating the impact of the guidance on its financial statements.

2. Correction of immaterial errors

During the fourth quarter of 2022, we determined that an error existed in our previously issued consolidated financial statements. Specifically, we identified we had established nexus in several jurisdictions beginning in the year ended December 31, 2019 in which we were not collecting and remitting sales taxes appropriately. The error was evaluated under the U.S. Securities and Exchange Commission's ("SEC's") guidance on evaluating the materiality of prior period misstatements to the Company’s financial statements. We evaluated the error and concluded that it was not material to the previously issued consolidated financial statements. Although the error was not material to any period, we corrected the accompanying historical consolidated financial statements for the years ended December 31, 2021 and 2020 to reflect the sales tax liability and associated expenses owed within each period for comparative purposes.

The following tables represent the adjustments to our Consolidated Statements of Operations and Consolidated Statements of Cash Flows for the years ended December 31, 2021 and 2020, as well as adjustments to our Consolidated Balance Sheet as of December 31, 2021 in accordance with ASC 250. The adjustments to our Consolidated Statements of Comprehensive (Loss) Income and Consolidated Statements of Shareholders' Equity were limited to the net income (loss) adjustments outlined below.

The effect of the adjustments to our Consolidated Balance Sheet as of December 31, 2021 was as follows (in thousands):

	December 31, 2021		
	As reported	Adjustment	As corrected
Prepaid expenses and other current assets	$ 4,427	$ 229	$ 4,656
Total current assets	125,859	229	126,088
Total assets	554,057	229	554,286
Accrued expenses and other current liabilities(1)	7,142	(272)	6,870
Sales taxes payable	-	2,591	2,591
Total current liabilities	40,381	2,319	42,700
Total liabilities	73,920	2,319	76,239
Accumulated deficit(2)	(105,020)	(2,090)	(107,110)
Total shareholders' equity	480,137	(2,090)	478,047
Total liabilities and shareholders' equity	554,057	229	554,286

(1) In the prior year Consolidated Balance Sheet as of the year ended December 31, 2021, accrued sales taxes in the amount of $272,000 were recorded within the Accrued expenses and other current liabilities line item on the consolidated balance sheets. These were reclassified to Sales tax payable in the current year.

(2) The impact of the error on Accumulated deficit in our Consolidated Balance Sheet as of the year ended December 31, 2019 was negative $133,000, adjusting the ending balance to be $100.2 million when previously reported as $100.1 million.

The effect of the adjustments to our Consolidated Statements of Operations for the years ended December 31, 2021 and 2020 were as follows (in thousands, except per share data):

	Years Ended December 31, 2021 and 2020		
2021	As reported	Adjustment	As corrected
General and administrative	$ 32,448	$ 1,220	$ 33,668
Total operating expenses	153,096	1,220	154,316
Operating loss	(33,940)	(1,220)	(35,160)
Interest expense	(432)	(53)	(485)
Total other income, net	6,187	(53)	6,134
Loss before income tax benefit	(27,753)	(1,273)	(29,026)
Net loss(1)	(7,635)	(1,273)	(8,908)
Net loss per basic share	(0.20)	(0.03)	(0.23)
Net loss per diluted share	(0.20)	(0.03)	(0.23)
2020			
General and administrative	14,607	666	15,273
Total operating expenses	53,662	666	54,328
Operating loss	(5,575)	(666)	(6,241)
Interest income	58	(18)	40
Total other income, net	4,978	(18)	4,960
Loss before income tax benefit	(597)	(684)	(1,281)
Net income(1)	2,667	(684)	1,983
Net income attributable to common shareholders - Basic	2,450	(628)	1,822
Net loss attributable to common shareholders - Diluted	(954)	(678)	(1,632)
Net income per basic share	0.09	(0.02)	0.07
Net loss per diluted share	(0.03)	(0.03)	(0.06)

(1) The Consolidated Statements of Comprehensive (Loss) Income for the years ended December 31, 2021 and 2020 were adjusted by the impact to net (loss) income noted here. Comprehensive loss for the year ended December 31, 2021 is now reported at $9.2 million, reflecting an adjustment of $1.3 million, and was previously reported as $7.9 million. Comprehensive income for the year ended December 31, 2020 is now reported at $1.9 million, reflecting an adjustment of negative $684,000, and was previously reported as $2.7 million.

The effect of the adjustments to our Consolidated Statements of Cash Flows for the years ended December 31, 2021 and 2020 were as follows (in thousands):

	Years Ended December 31, 2021 and 2020		
2021	**As reported**	**Adjustment**	**As corrected**
Net loss	$ (7,635)	$ (1,273)	$ (8,908)
Prepaid expenses and other current assets	2,802	(139)	2,663
Sales taxes payable	-	1,412	1,412
2020			
Net income	2,667	(684)	1,983
Prepaid expenses and other current assets	25	(75)	(50)
Sales taxes payable	-	759	759

All accompanying footnotes reflect corrected balances presented in the tables above.

3. Fair value measurement

In accordance with FASB ASC Topic 820, *Fair Value Measurements and Disclosures*, ("ASC Topic 820"), the Company measures its financial instruments at fair value on a recurring basis. The carrying values of certain of our financial instruments including cash and cash equivalents, accounts receivable, accounts payable, and accrued liabilities approximate fair value because of their short maturities. The carrying value of our marketable debt securities, which are accounted for as available-for-sale, are classified within either Level 1 or Level 2 in the fair value hierarchy because we use quoted market prices or alternative pricing sources and models utilizing market observable inputs to determine their fair value. The carrying values of our long-term debt, which is classified within Level 2 in the fair value hierarchy, approximates fair value as our borrowings with lenders are at interest rates that approximate market rates for comparable loans. The fair values of investments and contingent consideration classified as Level 3 were derived from management assumptions (see Note 1: *Organization and Significant Accounting Policies*.). The Company also measures certain assets and liabilities at fair value on a non-recurring basis when applying acquisition accounting. ASC Topic 820 clarifies that fair value is an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability. As a basis for considering such assumptions, ASC Topic 820 establishes a three-tier value fair hierarchy, which prioritizes the inputs used in measuring fair value as follows:

Level 1 – Observable inputs that reflect quoted prices (unadjusted) in active markets for identical assets or liabilities.

Level 2 – Observable inputs other than quoted prices included in Level 1 for similar assets or liabilities, quoted prices in markets that are not active or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the related assets or liabilities.

Level 3 – Unobservable data points for the asset or liability, and include situations where there is little, if any, market activity for the asset or liability.

For the investment in iVexSol convertible debt that was converted to Series A-1 preferred stock in November 2020, the significant Level 3 inputs were the expected term of the instrument, the underlying creditworthiness of iVexSol and the valuation of various embedded features in the note, which were based on future financings of iVexSol. We considered a range of probability-weighted financing or payoff settlements between 5% and 50% with outcomes occurring over a range of 1 to 2 years. The estimated market interest rate of approximately 8.0% was based on an average of indexes of below investment grade debt. The market rate was calibrated to the rate implied in the original issuance in September 2019 and adjusted for changes in market rates quarterly.

The fair value of the SciSafe contingent consideration liability was initially valued based on unobservable inputs using a Monte Carlo simulation. These inputs included the estimated amount and timing of projected future revenue, a discount rate of 4.5%, a risk-free rate of approximately 0.20%, asset volatility of 60%, and revenue volatility of 15%. Significant changes in any of those inputs in isolation would result in significant changes in fair value measurement. Generally, changes used in the assumptions for projected future revenue and revenue volatility would be accompanied by a directionally similar change in the fair value measurement. Conversely, changes in the discount rate would be accompanied by a directionally opposite change in the related fair value measurement. However, due to the contingent consideration having a maximum payout amount, changes in these assumptions would not affect the fair value of the contingent consideration if they vary beyond certain amounts. At the acquisition date, the contingent consideration was determined to have a fair value of $3.7 million. Subsequent to the acquisition date, the contingent consideration liability was re-measured to fair value with changes recorded in the change in fair value of contingent consideration in the Consolidated Statements of Operations. During the most recent re-measurement of the contingent consideration liability as of December 31, 2022, the Company used a discount rate of 12.8%, a risk-free rate of approximately 4.1%, asset volatility of 68%, and revenue volatility of 30%. This contingent consideration liability is included in the Consolidated Balance Sheets as of December 31, 2022 and 2021 in the amounts of $4.3 million and $9.9 million, respectively. The changes in fair value of contingent consideration of $5.6 million and $3.0 million associated with this liability are included within the Change in Fair Value of Contingent Consideration in the Consolidated Statements of Operations for the years ended December 31, 2022 and 2021, respectively.

For the warrant liability, the significant Level 3 inputs included the contractual remaining term of the warrants and the volatility of the Company's common stock. For the estimated term of the warrants, we used the actual terms of the warrants, which expired March 25, 2021. For the volatility of the Company's stock as of December 31, 2020, we used historical volatility for the remaining term of each warrant. These amounts ranged from 56.8% to 84.6%. We did not make any adjustments to the historical volatility. Certain assumptions used in estimating the fair value of the warrants are uncertain by nature. On March 25, 2021, the expiration date of all remaining warrants, all remaining warrants were exercised via a "cashless" exercise and the warrant liability was revalued to its intrinsic value, as the Company's stock price was observable as of that date.

There were no remeasurements to fair value during the year ended December 31, 2022 of financial assets and liabilities that are not measured at fair value on a recurring basis.

The following tables set forth the Company's financial assets and liabilities measured at fair value on a recurring basis as of December 31, 2022 and 2021, based on the three-tier fair value hierarchy:

(In thousands)

As of December 31, 2022	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents:				
Money market accounts	$ 11,416	$ -	$ -	$ 11,416
Available-for-sale securities:				
U.S. government securities	15,051	-	-	15,051
Corporate debt securities	-	26,047	-	26,047
Other debt securities	-	3,494	-	3,494
Total	26,467	29,541	-	56,008
Liabilities:				
Contingent consideration - business combinations	-	-	4,456	4,456
Debt	-	25,607	-	25,607
Total	$ -	$ 25,607	$ 4,456	$ 30,063

As of December 31, 2021	Level 1	Level 2	Level 3	Total
Assets:				
Money market accounts	$ 63,873	$ -	$ -	$ 63,873
Total	63,873	-	-	63,873
Liabilities:				
Contingent consideration - business combinations	-	-	10,027	10,027
Total	$ -	$ -	$ 10,027	$ 10,027

There have been no transfers of assets or liabilities between the fair value measurement levels.

The following table presents the changes in fair value of contingent consideration liabilities which are measured using Level 3 inputs for the years ended December 31, 2022, 2021, and 2020:

	Year Ended December 31,		
(In thousands)	**2022**	**2021**	**2020**
Beginning balance as of December 31, 2021, 2020, and 2019	$ 10,027	$ 7,152	1,914
Additions	-	-	3,663
Change in fair value recognized in net (loss) income	(4,754)	2,875	1,575
Payment of contingent consideration earned	(817)	-	-
Ending balance	$ 4,456	$ 10,027	$ 7,152

The following table presents the changes in fair value of warrant liabilities which are measured using Level 3 inputs for the years ended December 31, 2021 and 2020:

(In thousands)	2021	2020
Beginning balance as of December 31, 2020 and 2019	$ 2,780	39,602
Exercised warrants	(2,901)	(33,221)
Change in fair value recognized in net (loss) income	121	(3,601)
Ending balance	$ -	$ 2,780

There was no warrant liability activity during the year ended December 31, 2022.

4. Investments

Available-for-sale securities

The Company's portfolio of available-for-sale marketable securities consists of the following:

	December 31, 2022			
	Amortized	Gross unrealized		Estimated
(In thousands)	Cost	Gains	Losses	Fair Value
Available-for-sale securities, current portion				
U.S. government securities	$ 15,087	$ 1	$ 37	$ 15,051
Corporate debt securities	26,057	6	16	26,047
Other debt securities	2,169	-	7	2,162
Total short-term	43,313	7	60	43,260
Available-for-sale securities, long-term				
Other debt securities	1,329	3	-	1,332
Total marketable securities	$ 44,642	$ 10	$ 60	$ 44,592

(In thousands)	Amortized Cost	Estimated Fair Value
Due in one year or less	$ 43,313	$ 43,260
Due after one year through five years	1,329	1,332
Total	$ 44,642	$ 44,592

There were no outstanding available-for-sale marketable securities as of December 31, 2021.

Equity investments

The Company periodically invests in non-marketable equity securities of private companies without a readily determinable fair value to promote business and strategic objectives. These securities included Series A-1 and A-2 Preferred Stock in iVexSol, Inc. with a fair value of $4.1 million and $3.4 million as of December 31, 2022 and December 31, 2021, respectively, and Series E Preferred Stock in PanTHERA CryoSolutions, Inc. with a fair value of $995,000 as of December 31, 2022 and December 31, 2021.

5. Inventories

Inventories consist of the following as of December 31, 2022 and 2021:

(In thousands)	2022	2021
Raw materials	$ 20,950	$ 17,252
Work in progress	5,680	5,015
Finished goods	8,274	6,078
Total	$ 34,904	$ 28,345

6. Leases

We have various operating lease agreements for office space, warehouses, manufacturing, and production locations as well as vehicles and other equipment. Our real estate leases have remaining lease terms of one to eight years. We exclude options that are not reasonably certain to be exercised from our lease terms, ranging from one to five years. Our lease payments consist primarily of fixed rental payments for the right to use the underlying leased assets over the lease terms. For certain leases, we receive incentives from our landlords, such as rent abatements, which effectively reduce the total lease payments owed for these leases. Vehicle and other equipment operating leases have terms between one and five years.

Our financing leases relate to research equipment, machinery, and other equipment.

The table below presents certain information related to the weighted average discount rate and weighted average remaining lease term for the Company's leases as of December 31, 2022 and 2021:

	2022	2021
Weighted average discount rate - operating leases	4.2%	3.8%
Weighted average discount rate - finance leases	6.1%	6.1%
Weighted average remaining lease term in years - operating leases	7.2	7.8
Weighted average remaining lease term in years - finance leases	2.0	3.0

The components of lease expense for the years ended December 31, 2022, 2021, and 2020 were as follows:

	Year Ended December 31,		
(In thousands)	**2022**	**2021**	**2020**
Operating lease costs	$ 3,701	$ 2,817	$ 839
Short-term lease costs	2,141	1,727	277
Total operating lease costs	5,842	4,544	1,116
Variable lease costs	1,104	749	357
Total lease expense	$ 6,946	$ 5,293	$ 1,473

Maturities of our lease liabilities as of December 31, 2022 are as follows:

(In thousands)	**Operating Leases**	**Financing Leases**
2023	$ 3,448	$ 171
2024	3,089	101
2025	2,649	28
2026	2,267	2
2027	2,242	-
Thereafter	6,927	-
Total lease payments	20,622	302
Less: interest	(2,800)	(18)
Total present value of lease liabilities	$ 17,822	$ 284

7. Assets held for rent

Assets held for rent consist of the following as of December 31, 2022 and 2021:

(In thousands)	**2022**	**2021**
Shippers placed in service	$ 7,671	$ 5,645
Fixed assets held for rent	4,686	4,040
Accumulated depreciation	(4,952)	(2,272)
Net	7,405	7,413
Shippers and related components in production	1,659	2,396
Total	$ 9,064	$ 9,809

Shippers and related components in production include shippers complete and ready to be deployed and placed in service upon a customer order, shippers in the process of being assembled, and components available to build shippers. We recognized $3.5 million, $1.9 million, and $671,000 in depreciation expense related to assets held for rent during the years ended December 31, 2022, 2021, and 2020, respectively.

8. Property and equipment

Property and equipment consist of the following as of December 31, 2022 and 2021:

(In thousands)	2022	2021
Property and equipment		
Leasehold improvements	$ 5,249	$ 3,840
Furniture and computer equipment	1,908	1,861
Manufacturing and other equipment	20,557	16,675
Construction in-progress	5,095	2,022
Subtotal	32,809	24,398
Less: Accumulated depreciation	(9,171)	(6,741)
Net property and equipment	$ 23,638	$ 17,657

Depreciation expense for property and equipment was $3.3 million, $2.9 million, and $1.4 million for the years ended December 31, 2022, 2021, and 2020, respectively.

9. Accrued expenses and other current liabilities

Accrued expenses and other current liabilities consist of the following as of December 31, 2022 and 2021:

(In thousands)	2022	2021
Accrued expenses	$ 3,128	$ 1,656
Accrued taxes	975	27
Accrued compensation	5,080	4,351
Deferred revenue, current	548	814
Other	51	22
Total accrued expenses and other current liabilities	$ 9,782	$ 6,870

10. Warranty reserve liability

We reserve estimated exposures on known claims, as well as on a portion of anticipated claims, for product warranty and rework cost, based on historical product liability claims. Claim costs are deducted from the accrual when paid. Factors that could have an impact on the warranty accrual in any given period include the following: changes in manufacturing quality, changes in product costs, changes in product mix and any significant changes in sales volume.

A rollforward of our warranty liability is as follows:

(In thousands)	2022	2021	2020
Beginning balance as of December 31, 2021, 2020, and 2019	$ 9,398	$ 212	$ 191
Warranty reserve acquired in the acquisition of Global Cooling	-	3,353	-
Provision for warranties[(1)]	4,463	10,989	137
Settlements of warranty claims[(1)]	(5,549)	(5,156)	(116)
Ending Balance	8,312	9,398	212

(1) Both the Provision for warranties and Settlements of warranty claims balances include reclassifications of $1.6 million and $1.1 million for the years ended December 31, 2022 and 2021, respectively, to reflect changes in warranty utilization on pre-existing claims.

11. Goodwill and intangible assets

Goodwill

The following table represents the changes in the carrying value of goodwill for the years ended December 31, 2022 and 2021:

(In thousands)	Goodwill
Balance as of December 31, 2020	$ 58,449
Goodwill related to Global Cooling acquisition	137,822
Goodwill related to Sexton acquisition	28,470
Balance as of December 31, 2022 and 2021	224,741

Intangible assets

Intangible assets, net consisted of the following as of December 31, 2022 and 2021:

(In thousands, except weighted average useful life)	December 31, 2022			
Intangible assets:	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in years)
Customer Relationships	$ 11,288	$ (3,993)	$ 7,295	9.3
Tradenames	13,731	(4,323)	9,408	12.8
Technology - acquired	27,892	(12,796)	15,096	4.9
Non-compete agreements	1,187	(898)	289	2.0
Total intangible assets	$ 54,098	$ (22,010)	$ 32,088	8.2

	December 31, 2021			
Intangible assets:	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Weighted Average Useful Life (in years)
Customer Relationships	$ 17,516	$ (1,776)	$ 15,740	10.3
Tradenames	35,574	(2,306)	33,268	13.8
Technology - acquired	41,942	(7,789)	34,153	5.9
Non-compete agreements	1,990	(442)	1,548	3.0
In-process research and development[(1)]	67,440	-	67,440	N/A
Total intangible assets	$ 164,462	$ (12,313)	$ 152,149	9.8

(1) In-process R&D represents the fair value of incomplete research and development that has not yet reached technological feasibility. Per discussion below, this balance has been written off as a result of the impairment analyses performed during the second and fourth quarters of the year ended December 31, 2022.

Impairment expense for both finite and indefinite-lived intangible assets was $110.4 million, zero, and zero for the years ended December 31, 2022, 2021, and 2020, respectively. Amortization expense for finite-lived intangible assets was $9.7 million, $8.2 million, and $3.0 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:

(In thousands)	
For the Years Ending December 31,	Estimated Amortization Expense
2023	$ 5,431
2024	4,606
2025	4,434
2026	4,136
2027	3,382
Thereafter	10,099
Total	$ 32,088

Impairment testing as of June 30, 2022

In the six months ended June 30, 2022, the Company experienced a significant decline in its market capitalization. In July 2022, the Company abandoned an in-process research and development project within the asset group acquired in the acquisition of Global Cooling and revised its forecasts for net income and net cash flows to be generated by that asset group. The Company determined that these three events constituted interim triggering events that required further analysis with respect to potential impairment to goodwill, indefinite-lived intangibles, and definite-lived intangibles. The Company performed an interim quantitative impairment test as of the June 30, 2022 balance sheet date.

To assess any potential impairment of goodwill, the Company compared the carrying value of its single reporting unit against its market capitalization, noting that the market capitalization exceeded the carrying value. As such, goodwill was not impaired as of June 30, 2022.

The abandonment of the aforementioned in-process research and development project resulted in an $8.0 million non-cash impairment charge during the three months ended June 30, 2022 in the line item *Intangible asset impairment charges* in the Company's Consolidated Statements of Operations, which represents the entirety of the asset’s carrying value.

In order to determine the fair value of our in-process research and development intangible assets not related to the abandoned project, the Company utilized an average of a discounted cash flow analysis and comparable public company analysis. The key assumptions associated with determining the estimated fair value include projected future revenue growth rates, earnings before interest, taxes, depreciation and amortization ("EBITDA") margins, the terminal growth rate, and the discount rate. As a result of the changes in these assumptions, we recognized a $50.9 million non-cash impairment charge during the three months ended June 30, 2022 in the line item *Intangible asset impairment charges* in the Company's Consolidated Statements of Operations, which represents the difference between the estimated fair value of the Company’s in-process research and development intangible assets and their carrying value.

In order to determine the fair value of the acquired technology, customer relationships, tradename, and non-compete definite-lived intangible assets, the Company utilized the excess earnings approach, distributor method, relief from royalty method, and with and without approach, respectively. The key assumptions associated with determining the estimated fair value include (i) the amount and timing of projected future cash flows (including revenue and expenses), (ii) the discount rate selected to measure the risks inherent in the future cash flows, (iii) the assessment of the asset’s life cycle, and (iv) the competitive trends impacting the asset. As a result of the analysis, we recognized non-cash impairment charges of $3.5 million, $1.5 million, $5.9 million, and $4,000 during the period ended June 30, 2022 for the acquired technology, customer relationships, tradename, and non-compete definite-lived intangible assets, respectively, in the line item *Intangible asset impairment charges* in the Company's Consolidated Statements of Operations, which represents the difference between the estimated fair value of the Company’s definite-lived intangible assets and their carrying values.

Impairment Testing as of October 1, 2022

The Company annually performs an impairment assessment as of October 1. To assess any potential impairment of goodwill, the Company compared the carrying value of its single reporting unit against its market capitalization, noting that the market capitalization exceeded the carrying value. As such, goodwill was not impaired as of October 1, 2022.

In order to determine the fair value of our indefinite-lived intangible assets acquired from Global Cooling, which included an in-process research and development project, the Company utilized a discounted cash flow analysis. The key assumptions associated with determining the estimated fair value include projected future revenue growth rates, earnings before interest, taxes, depreciation and amortization ("EBITDA") margins, the terminal growth rate, and the discount rate. As a result of the changes in these assumptions, we recognized a $8.5 million non-cash impairment charge during the year-ended December 31, 2022 in the line item *Intangible asset impairment charges* in the Company's Consolidated Statements of Operations, which represents full impairment of the carrying value of the Company’s in-process research and development intangible asset as of October 1, 2022.

In order to determine the fair value of the acquired technology, customer relationships, tradename, and non-compete definite-lived intangible assets acquired from Global Cooling, the Company utilized the excess earnings approach, distributor method, relief from royalty method, and with and without approach, respectively. The key assumptions associated with determining the estimated fair value include (i) the amount and timing of projected future cash flows (including revenue and expenses), (ii) the discount rate selected to measure the risks inherent in the future cash flows, (iii) the assessment of the asset’s life cycle, and (iv) the competitive trends impacting the asset. These assumptions differed from those incorporated into the forecasts during impairment testing as of June 30, 2022 in through the areas of (i) estimated market growth, (ii) estimated market share capture, (iii) product profitability, and (iv) development costs. As a result of the analysis, we recognized non-cash impairment charges of $10.5 million, $4.7 million, $15.9 million, and $800,000 during the fourth quarter of the year ended December 31, 2022 for the acquired technology, customer relationships, tradename, and non-compete definite-lived intangible assets, respectively, in the line item *Intangible asset impairment charges* in the Company's Consolidated Statements of Operations, which represents the difference between the estimated fair value of the Company’s definite-lived intangible assets and their carrying values. The carrying value of the acquired technology, customer relationships, tradename, and non-compete definite-lived intangible assets were $38.4 million, $16.0 million, $29.6 million, and $2.0 million respectively prior to the impairment charges.

Fair value determinations require considerable judgment and are sensitive to changes in underlying assumptions, estimates and market factors. Estimating the fair value of the Company's reporting unit, indefinite-lived intangible assets, and definite-lived intangible assets requires us to make assumptions and estimates regarding our future plans, as well as industry, economic, and regulatory conditions. These assumptions and estimates include projected future revenue growth rates, EBITDA margins, terminal growth rates, discount rates, royalty rates and other market factors. If current expectations of future growth rates, margins and cash flows are not met, or if market factors outside of our control change significantly, then our reporting unit, indefinite-lived intangible assets, and definite-lived intangible assets might become impaired in the future, negatively impacting our operating results and financial position. As the carrying amounts of the Company's indefinite-lived and definite-lived intangible assets were impaired as of June 30, 2022 and October 1, 2022 and written down to fair value, those amounts are more susceptible to an impairment risk if there are unfavorable changes in assumptions and estimates.

12. Commitments and contingencies

Employment agreements

We have employment agreements with certain key employees. None of these employment agreements is for a definitive period, but rather each will continue indefinitely until terminated in accordance with its terms. The agreements provide for a base annual salary, payable in monthly (or shorter) installments. Under certain conditions and for certain of these officers, we may be required to pay additional amounts upon terminating the officer or upon the officer resigning for good reason.

Litigation

From time to time, the Company is subject to various legal proceedings that arise in the ordinary course of business, none of which are currently material to the Company's business. The Company's industry is characterized by frequent claims and litigation, including claims regarding intellectual property. As a result, the Company may be subject to various legal proceedings from time to time. The results of any future litigation cannot be predicted with certainty, and regardless of the outcome, litigation can have an adverse impact on the Company because of defense and settlement costs, diversion of management resources and other factors. Management is not aware of any pending or threatened litigation.

Indemnification

As permitted under Delaware law and in accordance with the Company's bylaws, the Company is required to indemnify its officers and directors for certain errors and occurrences while the officer or director is or was serving in such capacity. The Company is also party to indemnification agreements with its directors. The Company believes the fair value of the indemnification rights and agreements is minimal. Accordingly, the Company has not recorded any liabilities for these indemnification rights and agreements as of December 31, 2022.

Non-income related taxes

Companies are required to collect and remit sales tax from certain customers if the company is determined to have nexus in a particular state. Upon the determination of nexus, which varies by state, companies are additionally required to maintain detailed record of specific product and customer information within each jurisdiction in which it has established nexus to appropriately determine their sales tax liability, requiring technical knowledge of each jurisdiction's tax case law. During the year ended December 31, 2022, the Company determined that a sales tax liability related to the periods of 2019 through 2022 is probable and determined the estimated liability to be approximately $3.7 million. Outside of the analysis performed to determine the sales tax liability related to the periods of 2019 through 2022, we assessed approximately $306,000 of sales taxes owed during the normal course of business. Due to the variety of jurisdictions in which this estimated liability relates to and our ongoing assessment of sales taxes owed, we cannot predict when final liabilities will be satisfied. We will reevaluate the estimated liability and timing of satisfaction each reporting period.

13. Line of credit and long-term debt

Line of credit

In May 2021, the Company acquired Global Cooling and assumed a line of credit which bore interest at a floating rate equal to the 3-month LIBOR rate plus 5.50%. The maximum allowed on the line of credit was $5.0 million. The line was secured by substantially all assets of Global Cooling. In October 2021, the Company paid off the entirety of the outstanding balance on the line of credit and all related interest.

Long-term debt

In May 2021, the Company assumed three term notes in the acquisition of Global Cooling. At the time of acquisition, these notes carried aggregate outstanding principal balances of $4.4 million. These term notes bore interest at a floating rate equal to the 3-month LIBOR rate plus 6.50%. The term notes included financial covenants tied to the performance of Global Cooling.

In October 2021, the Company entered into amended and restated term notes for all three term notes assumed in the acquisition of Global Cooling. Pursuant to the loan agreements, one lender provided two term notes in the amounts of $1.4 million and $1.4 million. A separate lender provided one term note in the amount of $1.8 million. All three term notes bear interest at a fixed rate of 4%, were interest-only with one balloon principal payment at maturity, and could be pre-paid without penalty at any time. As of September 20, 2022, the Company fully extinguished one of the three term notes. All financial covenants included in the original agreements previously in effect were removed by the amended loan agreements.

On September 20, 2022, the Company, and certain of its subsidiaries, entered into a term loan agreement, which provided for up to $50 million in aggregate principal to be drawn. The term loan matures on June 1, 2026. The agreement provides for borrowings of up to $30 million upon closing and options to borrow up to $10 million between closing and June 30, 2023, up to $10 million upon the achievement of certain revenue milestones, and an additional $10 million upon the Company's request subject to fulfilling certain requirements of the lender. The Company borrowed $20 million upon closing. Payments on the borrowing are interest-only through June 2024, with additional criteria allowing for interest-only payments to continue through June 2025. Tranches borrowed under the term loan agreement bear interest at the Wall Street Journal prime rate plus 0.5%. The interest rate is subject to a ceiling that restricts the interest rate for each tranche from exceeding 1.0% above the overall rate applicable to each tranche at their respective funding dates. The term loan agreement contains customary representations and warranties as well as customary affirmative and negative covenants. As of the date of this filing, the Company is in compliance with the covenants set forth in the 2022 term loan 3 agreement. In the event that borrowings under 2022 term loan 3 exceed $20 million, the Company will become subject to financial covenants.

Long-term debt consisted of the following as of December 31, 2022 and 2021:

			December 31,	
(In thousands)	**Maturity Date**	**Interest Rate**	**2022**	**2021**
2022 term loan 1	(1)	4.0%	$ -	$ 1,750
2022 term loan 2	Various	4.0%	2,896	2,813
2022 term loan 3	Jun-26	6.8%	20,000	-
Insurance premium financing	Apr-23	5.0%	1,074	373
Freezer equipment loan	Dec-25	5.7%	466	612
Manufacturing equipment loans	Oct-25	5.7%	266	355
Freezer installation loan	Various	6.3%	1,078	1,334
Other loans	Various	Various	6	9
Total debt, excluding unamortized debt issuance costs			25,786	7,246
Less: unamortized debt issuance costs			(179)	(31)
Total debt			25,607	7,215
Less: current portion of debt			(1,814)	(862)
Total long-term debt			$ 23,793	$ 6,353

(1) 2022 term loan 1 carried a maturity date of September 2024 as of the year ended December 31, 2021. As of September 20, 2022, the entirety of the outstanding principal and accrued interest was repaid.

2022 term loan 3 is secured by substantially all assets of BioLife, SAVSU, CBS, SciSafe, Global Cooling and Sexton, other than intellectual property. 2022 term loan 2 is secured by substantially all assets of Global Cooling and is effectively subordinated to the security interest established by the lenders of 2022 term loan 3. Equipment loans are secured by the financed equipment.

As of December 31, 2022, the scheduled maturities of loans payable for each of the next five years and thereafter were as follows:

(In thousands)	**Amount**
2023	$ 1,881
2024	5,544
2025	10,543
2026	5,221
2027	2,597
Thereafter	-
Total	$ 25,786

14. Warrants

In May 2020, the Company entered into separate warrant exercise agreements with WAVI Holding AG and Taurus4757 GmbH pursuant to which the warrant holders immediately exercised their respective warrants via a "cashless" exercise as agreed to by the Company. As a result of the cashless exercise, the Company issued an aggregate of 2,747,970 shares of Company common stock upon cashless exercise of an aggregate of 3,871,405 warrants.

In March 2021, all remaining outstanding warrants were exercised via a "cashless" exercise. As a result of the cashless exercise, the Company issued an aggregate of 70,030 shares of Company common stock upon cashless exercise of an aggregate of 79,100 warrants.

The following table summarizes warrant activity for the years ended December 31, 2021 and 2020:

	2021		2020	
	Shares	Wtd. Avg. Exercise Price	Shares	Wtd. Avg. Exercise Price
Outstanding at beginning of year	79,100	$ 4.75	3,959,005	$ 4.33
Exercised	(79,100)	4.75	(3,879,905)	4.33
Outstanding and exercisable at end of year	-	$ -	79,100	$ 4.75

There was no warranty activity during the year ended December 31, 2022.

15. Stock-based compensation

Stock compensation plans

Our stock-based compensation programs are long-term retention programs that are intended to attract, retain, and provide incentives for talented employees, officers, and directors, and to align stockholder and employee interests. We have the following stock-based compensation plans and programs:

During 2013, we adopted the 2013 Performance Incentive Plan (the "2013 Plan"), which allows us to grant options or restricted stock awards to all employees, including executive officers, outside consultants and non-employee directors. An aggregate of 3.1 million shares of common stock were initially reserved for issuance under the 2013 Plan. In May 2017, July 2020, June 2021, and June 2022, the shareholders approved an increase in the number of shares available for issuance to 4.1 million shares, 5.0 million shares, 6.5 million shares, and 8.5 million shares, respectively. As of December 31, 2022, there were outstanding options to purchase 456,000 shares of Company common stock and 2.2 million unvested restricted stock awards outstanding under the 2013 Plan.

Issuance of shares

When options and warrants are exercised, it is the Company's policy to issue new shares.

Stock option activity

Service vesting-based stock options

The following is a summary of service vesting-based stock option activity for the year ended December 31, 2022 and 2021, and the status of service vesting-based stock options outstanding as of December 31, 2022 and 2021:

	2022		2021	
	Shares	Wtd. Avg. Exercise Price	Shares	Wtd. Avg. Exercise Price
Outstanding as of beginning of year	624,531	$ 2.13	844,455	$ 2.00
Exercised	(161,646)	2.00	(183,064)	1.61
Forfeited	-	-	(1,146)	5.69
Expired	(6,592)	3.22	(35,714)	1.73
Outstanding at end of year	456,293	$ 2.17	624,531	$ 2.13
Stock options exercisable at year end	456,293	$ 2.17	624,531	$ 2.13

We recognized stock compensation expense related to service-based options of zero, $25,000, and $119,000 during the years ended December 31, 2022, 2021, and 2020. As of December 31, 2022, there was $7.3 million of aggregate intrinsic value of outstanding service vesting-based stock options, including $7.3 million of aggregate intrinsic value of exercisable service vesting-based stock options. Intrinsic value is the total pretax intrinsic value for all "in-the-money" options (i.e., the difference between the Company's closing stock price on the last trading day of the year and the exercise price, multiplied by the number of shares) that would have been received by the option holders had all option holders exercised their options on December 31, 2022. This amount will change based on the fair market value of the Company's stock. Intrinsic value of service vesting-based awards exercised during the years ended December 31, 2022, 2021, and 2020 was $4.1 million, $6.9 million, and $13.1 million, respectively. There were no service based-vesting options granted during the years ended December 31, 2022, 2021, and 2020. The weighted average remaining contractual life of service vesting-based options outstanding and exercisable as of December 31, 2022 is 3 years. There were no unrecognized compensation costs for service vesting-based stock options as of December 31, 2022.

The following table summarizes information about service vesting-based stock options outstanding as of December 31, 2022:

Range of Exercise Prices	Number Outstanding at December 31, 2022	Weighted Average Remaining Contractual Life	Weighted Average Exercise Price
$1.00 - 1.50	2,000	3.85	$ 1.49
$1.51 - 2.00	177,500	3.28	1.90
$2.01 - 2.50	255,938	2.35	2.06
$2.51 - 8.60	20,855	4.92	5.69
	456,293	2.84	$ 2.16

Performance-based stock options

The Company's Board of Directors implemented a Management Performance Bonus Plan for 2017. Based on achieving varying levels of specified revenue for the year ending December 31, 2017, up to 1,000,000 options to purchase shares of the Company's common stock were available for vesting. The options had an exercise price of $1.64 and vested if revenue levels for 2017 were met. If the minimum performance targets were not achieved, no options would have vested. On February 27, 2018, the Company's Board of Directors determined that the specified revenue target had been achieved. Accordingly, 999,997 options to purchase shares of the Company's common stock vested in 2017 and 2018.

The following is a summary of performance-based stock option activity under our stock option plans for the years ended December 31, 2021 and the status of performance-based stock options outstanding as of December 31, 2021:

	2021	
	Shares	Wtd. Avg. Exercise Price
Outstanding as of beginning of year	686,001	$ 1.64
Exercised	(686,001)	1.64
Outstanding at end of year	-	$ 1.64
Stock options exercisable at year end	-	$ -

There was no performance-based stock option grant activity during the year ended December 31, 2022.

No stock compensation expense was recognized during the years ended December 31, 2022, 2021, and 2020 related to performance-based options. The intrinsic value of performance-based awards exercised during the years ending December 31, 2022, 2021, and 2020 was zero, $27.4 million, and $1.3 million, respectively. There were no stock options granted to employees and non-employee directors in the years ending December 31, 2022, 2021, and 2020.

Restricted stock

Service vesting-based restricted stock

The following is a summary of service vesting-based restricted stock activity for the years ended December 31, 2022 and 2021, and the status of unvested service vesting-based restricted stock outstanding as of December 31, 2022 and 2021:

	2022		2021	
	Shares	Wtd. Avg. Grant Date Fair Value	Shares	Wtd. Avg. Grant Date Fair Value
Outstanding as of beginning of year	1,212,783	$ 37.48	930,854	$ 19.31
Granted	1,373,909	25.26	801,484	47.20
Vested	(569,535)	35.51	(378,502)	19.31
Forfeited	(137,942)	40.19	(141,053)	36.95
Non-vested at year end	1,879,215	$ 28.94	1,212,783	$ 37.48

On November 4, 2021, the Board of Directors approved to modify certain restricted stock awards that were awarded to one executive that otherwise would have expired upon the executive's intended retirement in early 2023. The modification accelerated the vesting of the awards to vest equally over four quarters in the year ended December 31, 2022. We recorded incremental stock-based compensation expense of $666,000 in the year ended December 31, 2021 for this stock option modification.

The aggregate fair value of the service vesting-based awards granted during the years ended December 31, 2022, 2021, and 2020 was $34.7 million, $37.8 million, and $15.3 million, respectively. The aggregate fair value of the service vesting-based awards that vested during the years ended December 31, 2022, 2021, and 2020 was $12.6 million, $15.9 million, and $4.5 million, respectively.

During the months of May through August 2022, our board of directors granted 21,566 restricted stock awards in lieu of salary for executive leadership. The awards vested in full on the date of grant, regardless of employment status on that date. All expenses related to these awards were incurred in the year ended December 31, 2022. For all specific grant information related to these awards, refer to the *Equity Incentive Compensation* discussion of Part III within this filing.

We recognized stock compensation expense of $21.0 million, $12.7 million, and $3.0 million related to service vesting-based awards during the years ended December 31, 2022, 2021, and 2020, respectively. As of December 31, 2022, there was $47.0 million in unrecognized compensation costs related to service vesting-based awards. We expect to recognize those costs over 3 years.

Performance-based restricted stock

On March 25, 2020, the Company granted 82,805 shares of performance-based stock to its executives in the form of restricted stock. The shares granted contain a performance condition based on several Company metrics related to 2020 performance. The grant date fair value of this award was $9.18 per share. The fair value of this award was expensed on a straight-line basis over the requisite service period ending on December 31, 2020.

We recognized stock compensation expense of zero, zero, and $760,000 related to performance-based restricted stock awards for the years ended December 31, 2022, 2021, and 2020, respectively. As of December 31, 2022, there were no unrecognized non-cash compensation costs related to performance-based restricted stock awards. Non-cash compensation costs were expensed over the period for which performance was measured.

The aggregate fair value of the performance-based awards granted during the years ended December 31, 2022, 2021, and 2020 was zero, zero, and $760,000, respectively. The aggregate fair value of the performance-based awards that vested during the years ended December 31, 2022, 2021, and 2020 was zero, zero, and $2.3 million, respectively.

Market-based restricted stock

The following is a summary of market-based restricted stock activity under our stock option plan for the years ended December 31, 2022 and 2021 and the status of market-based restricted stock outstanding as of December 31, 2022 and 2021:

	2022		2021	
	Shares	Wtd. Avg. Grant Date Fair Value	Shares	Wtd. Avg. Grant Date Fair Value
Outstanding as of beginning of year	139,756	$ 19.86	224,774	$ 19.20
Granted	349,568	22.66	152,665	32.50
Vested	(218,280)	10.95	(231,268)	26.98
Forfeited	-	-	(6,415)	40.65
Non-vested at year end	271,044	$ 30.64	139,756	$ 19.86

On February 25, 2019 the Company granted 94,247 shares and on April 1, 2019 granted 29,604 shares of market-based stock to its executives in the form of restricted stock. The shares granted contain a market condition based on Total Shareholder Return ("TSR"). The TSR market condition measures the Company's performance against a peer group. On February 8, 2021, the Company determined the TSR attainment was 200% of the targeted shares, resulting in 115,634 shares being granted and 231,268 shares vesting to current employees of the Company based on our total shareholder return during the period beginning on January 1, 2019 through December 31, 2020 as compared to the total shareholder return of 20 of our peers. The fair value of this award was determined at the grant date using a Monte Carlo simulation with the following assumptions: a historical volatility of 69%, 0% dividend yield and a risk-free interest rate of 2.5%. The historical volatility was based on the most recent 2-year period for the Company and correlated with the components of the peer group. The stock price projection for the Company and the components of the peer group assumes a 0% dividend yield. This is mathematically equivalent to reinvesting dividends in the issuing entity over the performance period. The risk-free interest is based on the yield on the U.S. Treasury Strips as of the Measurement Date with a maturity consistent with the 2-year term associated with the market condition of the award. The fair value of this award of $3.1 million was expensed on a straight-line basis over the grant date to the vesting date of December 31, 2020.

On March 25, 2020, the Company granted 109,140 shares of market-based stock to its executives in the form of restricted stock. The shares granted contain a market condition based on TSR. The TSR market condition measures the Company's performance against a peer group. On February 24, 2022, the Company determined the TSR attainment was 200% of the targeted shares, resulting in 109,140 shares being granted and 218,280 shares vesting to current employees of the Company based on our total shareholder return during the period beginning on January 1, 2020 through December 31, 2022 as compared to the total shareholder return of 20 of our peers. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2020 through December 31, 2021 as compared to the total shareholder return of 20 of our peers. The fair value of this award was determined at the grant date using a Monte Carlo simulation with the following assumptions: a historical volatility of 78%, 0% dividend yield and a risk-free interest rate of 0.3%. The historical volatility was based on the most recent 2-year period for the Company and correlated with the components of the peer group. The stock price projection for the Company and the components of the peer group assumes a 0% dividend yield. This is mathematically equivalent to reinvesting dividends in the issuing entity over the performance period. The risk-free interest is based on the yield on the U.S. Treasury Strips as of the Measurement Date with a maturity consistent with the 2-year term associated with the market condition of the award. The fair value of this award of $1.2 million was expensed on a straight-line basis over the grant date to the vesting date of December 31, 2021.

On February 8, 2021, the Company granted 30,616 shares of market-based stock to its executives in the form of restricted stock. The shares granted contain a market condition based on TSR. The TSR market condition measures the Company's performance against a peer group. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2021 through December 31, 2022 as compared to the total shareholder return of 20 of our peers. The fair value of this award was determined using a Monte Carlo simulation with the following assumptions: a historical volatility of 68%, 0% dividend yield, and a risk-free interest rate of 0.1%. The historical volatility was based on the most recent 2-year period for the Company and correlated with the components of the peer group. The stock price projection for the Company and the components of the peer group assumes a 0% dividend yield. This is mathematically equivalent to reinvesting dividends in the issuing entity over the performance period. The risk-free interest rate is based on the yield on the U.S. Treasury Strips as of the Measurement Date with a maturity consistent with the 2-year term associated with the market condition of the award. The fair value of this award of $1.3 million is being expensed on a straight-line basis over the grant date to the vesting date of December 31, 2022.

On May 3, 2021, the Company granted 6,415 shares of market-based stock to one executive in the form of restricted stock. The shares granted contain a market condition based on TSR. The TSR market condition measures the Company's performance against a peer group. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to the recipient based on our total shareholder return during the period beginning on January 1, 2021 through December 31, 2022 as compared to the total shareholder return of 20 of our peers. The fair value of this award was determined using a Monte Carlo simulation with the following assumptions: a historical volatility of 68%, 0% dividend yield, and a risk-free interest rate of 0.2%. The historical volatility was based on the most recent 2-year period for the Company and correlated with the components of the peer group. The stock price projection for the Company and the components of the peer group assumes a 0% dividend yield. This is mathematically equivalent to reinvesting dividends in the issuing entity over the performance period. The risk-free interest rate is based on the yield on the U.S. Treasury Strips as of the Measurement Date with a maturity consistent with the 2-year term associated with the market condition of the award. In November 2021, the executive departed the company and, as a result, forfeited these shares, resulting in no expense being recognized in the year ended December 31, 2021 for this award.

On February 24, 2022, the Company granted 240,428 shares of market-based stock to its executives in the form of restricted stock. The shares granted contain a market condition based on TSR. The TSR market condition measures the Company's performance against a peer group. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2022 through December 31, 2023 as compared to the total shareholder return of 20 of our peers. The fair value of this award was determined using a Monte Carlo simulation with the following assumptions: a historical volatility of 63%, 0% dividend yield, and a risk-free interest rate of 1.5%. The historical volatility was based on the most recent 2-year period for the Company and correlated with the components of the peer group. The stock price projection for the Company and the components of the peer group assumes a 0% dividend yield. This is mathematically equivalent to reinvesting dividends in the issuing entity over the performance period. The risk-free interest rate is based on the yield on the U.S. Treasury Strips as of the Measurement Date with a maturity consistent with the 2-year term associated with the market condition of the award. The fair value of this award of $6.7 million is being expensed on a straight-line basis over the grant date to the vesting date of December 31, 2023.

We recognized stock compensation expense of $4.3 million, $1.4 million, and $2.1 million related to market-based restricted stock awards for the years ended December 31, 2022, 2021, and 2020. As of December 31, 2022, there was $3.3 million in unrecognized non-cash compensation costs related to market-based restricted stock awards expected to vest. We expect to recognize those costs over 1 year.

The aggregate fair value of the market-based awards granted during the years ended December 31, 2022, 2021, and 2020 was $6.7 million, $1.8 million, and $1.2 million, respectively. The aggregate fair value of the market-based awards that vested during the years ended December 31, 2022, 2021, and 2020 was $5.0 million, $10.2 million, and zero, respectively.

Total stock compensation expense

We recorded total stock compensation expense for the years ended December 31, 2022, 2021, and 2020, as follows:

	2022	2021	2020
Research and development costs	$ 3,176	$ 1,906	$ 1,012
Sales and marketing costs	3,649	1,788	852
General and administrative costs	14,066	8,061	3,518
Cost of revenue	4,443	2,201	599
Total	$ 25,334	$ 13,956	$ 5,981

16. Income taxes

The following are the domestic and foreign components of the Company's loss before income taxes:

	Year Ended December 31,		
(In thousands)	**2022**	**2021**	**2020**
Domestic	$ (146,091)	$ (28,590)	$ (1,281)
Foreign	1,264	(436)	-
Total	$ (144,827)	$ (29,026)	$ (1,281)

Income tax benefit consists of the following:

	Year Ended December 31,		
(In thousands)	**2022**	**2021**	**2020**
Current:			
Federal	$ -	$ -	$ -
State	11	-	33
Foreign	205	9	-
Total current tax provision	216	9	33
Deferred:			
Federal	(2,924)	(17,703)	(3,297)
State	(2,314)	(2,424)	-
Foreign	-	-	-
Total deferred tax benefit	(5,238)	(20,127)	(3,297)
Income tax benefit	$ (5,022)	$ (20,118)	$ (3,264)

In the years ended December 31, 2021 and 2020, income tax benefit included excess tax benefits from stock-based compensation of $10.5 million and $3.2 million, respectively. The tax benefit for the year-ended December 31, 2022 did not contain excess tax benefits from stock-based compensation.

In connection with the 2021 Global Cooling acquisition, the Company recognized a deferred tax liability estimated to be $24.1 million. As a result, the Company recorded an income tax benefit of $8.0 million for the release of valuation allowance on our existing U.S. deferred tax assets as a result of the offset of the deferred tax liabilities established for intangible assets from the acquisition. In connection with the 2021 Sexton acquisition, the Company recorded a deferred tax liability estimated to be $1.5 million with an offset to goodwill.

In connection with the 2020 SciSafe acquisition, the Company recognized a deferred tax liability of $3.3 million on acquired intangible assets. As a result, the Company recorded an income tax benefit of $3.3 million for the release of valuation allowance on our existing U.S. deferred tax assets as a result of the offset of deferred tax liabilities established for intangible assets from the acquisition.

A reconciliation of income taxes computed using the U.S. federal statutory rate to that reflected in operations follows:

	Year Ended December 31,		
	2022	2021	2020
Federal statutory tax	21%	21%	21%
State tax, net of federal benefit	3%	7%	20%
Stock compensation	-	36%	251%
Sec. 162(m) limitation on executive compensation	(1%)	(11%)	(16%)
Fair value change in contingent consideration	1%	(2%)	(38%)
Fair value change in warrant liability	-	-	59%
Transaction costs	-	(1%)	(3%)
Gain on stock acquisition	-	5%	-
Tax credits	1%	-	6%
Change in valuation allowance	(21%)	20%	4%
Expired net operating losses	-	(5%)	(47%)
Other	-	(1%)	(2%)
Total	4%	69%	255%

The principal components of the Company's net deferred tax assets are as follows as of December 31, 2022 and 2021:

(In thousands)	2022	2021
Deferred tax assets related to:		
Net operating loss carryforwards	$ 29,102	$ 27,500
Stock-based compensation	3,207	2,066
Accruals and reserves	3,724	3,402
Inventory	425	236
Lease liabilities	3,653	4,198
Tax credit carryforward	1,423	594
Capitalized research and development	2,405	-
Other	445	318
Total deferred tax assets	44,384	38,314
Deferred tax liabilities related to:		
Intangibles	(6,150)	(35,241)
Right-of-use assets	(3,458)	(4,070)
Fair value change in investments	(447)	(294)
Fixed assets	(1,177)	(1,203)
Other	-	-
Total deferred tax liabilities	(11,232)	(40,808)
Net deferred tax (liabilities) assets before valuation allowance	33,152	(2,494)
Less: valuation allowance	(33,402)	(2,993)
Net deferred tax liabilities	$ (250)	$ (5,487)

Realization of deferred tax assets is dependent upon the generation of future taxable income, if any, the timing and amount of which are uncertain. The assessment regarding whether a valuation allowance is required on deferred tax assets considers the evaluation of both positive and negative evidence when concluding whether it is more likely than not that deferred tax assets are realizable. The valuation allowance recorded as of December 31, 2022 and 2021 primarily relates to deferred tax assets for net operating loss carryforwards.

The changes in the valuation allowance for deferred tax assets were as follows:

(In thousands)	2022	2021	2020
Balance at January 1	$ 2,993	$ 8,498	$ 8,706
Deferred tax liabilities assumed through acquisitions	-	(8,498)	(3,297)
Charged to income tax expense	30,409	2,993	3,089
Balance at December 31	$ 33,402	$ 2,993	$ 8,498

As of December 31, 2022, the Company had U.S. federal net operating loss ("NOL") carryforwards of approximately $128.6 million. Approximately $39.5 million of NOL will expire from 2023 through 2037, and approximately $89.1 million of NOL will be carried forward indefinitely. The NOL carryforwards may become subject to an annual limitation in the event of certain cumulative changes in the ownership interest. This limited the amount of tax attributes that can be utilized annually to offset future taxable income or tax liabilities. Subsequent ownership changes may further affect the limitation in future years.

The Tax Cuts and Jobs Act contained a provision which requires the capitalization of Section 174 costs incurred in years beginning on or after January 1, 2022. Section 174 costs are expenditures which represent research and development costs that are incident to the development or improvement of a product, process, formula, invention, computer software, or technique. This provision changes the treatment of Section 174 costs such that the expenditures are no longer allowed as an immediate deduction but rather must be capitalized and amortized. We have included the impact of this provision, which results in a deferred tax asset of approximately $2.4 million as of December 31, 2022.

The Company determines its uncertain tax positions based on a determination of whether and how much of a tax benefit taken by the Company in its tax filings or positions is more likely than not to be sustained upon examination by the relevant income tax authorities.

A reconciliation of the beginning and ending balances of uncertain tax positions in the years ended December 31, 2022 and 2021 is as follows:

(In thousands)	2022	2021
Balance at January 1	$ 255	$ 96
Increase related to prior year tax positions	170	-
Increase related to current year tax positions	185	159
Balance at December 31	$ 610	$ 255

The Company is generally subject to examination by U.S. federal and local income tax authorities for all tax years in which loss carryforward is available, which includes 2003 through 2022.

17. Acquisitions

Sexton acquisition

General terms and effects

On August 9, 2021, BioLife entered into an Agreement and Plan of Merger (the "Sexton Merger Agreement") with BLFS Merger Sub, Inc., a Delaware corporation ("Sexton Merger Sub"), Fortis Advisors LLC, in its capacity as the representative of the stockholders of Sexton (the "Sexton Seller Representative") and Sexton, a Delaware corporation. The acquisition strengthens BioLife's offerings in the cell and gene therapy and broader biopharma markets.

On September 1, 2021, the Company completed the merger of Sexton Merger Sub with and into Sexton and Sexton became a wholly owned subsidiary of the Company (the "Sexton Merger"). As consideration for the Sexton Merger (the "Sexton Merger Consideration"), holders of common stock, preferred stock and options of Sexton, other than the Company (collectively, the "Sexton Participating Holders"), are entitled to receive an aggregate of 530,502 newly issued shares of the Company's common stock, subject to certain post-closing adjustments, of which 477,452 shares of Common Stock were issued to the Sexton Participating Holders at the Closing, and 53,050 shares of Common Stock, or approximately 10% of the Merger consideration, were deposited into an escrow account for indemnification and post-closing purchase price adjustment purposes. Prior to the merger, the Company held preferred stock in Sexton, which was accounted for using a measurement alternative that measures the securities at cost minus impairment, if any, plus or minus changes resulting from observable process changes in orderly transactions for identical or similar investments of the same issuer. The Company accounted for the merger as a step acquisition, which required remeasurement of the Company's existing ownership in Sexton to fair value prior to completing the acquisition method of accounting. Using step acquisition accounting, the Company increased the value of its existing equity interest to its fair value, resulting in the recognition of a non-cash gain of $6.5 million, which was included in the gain on acquisition of Sexton Biotechnologies, Inc. in the Consolidated Statements of Operations for the year ended December 31, 2021. The Company utilized a market-based valuation approach to determine the fair value of the existing equity interest based on the total merger consideration offered and the Company's stock price at acquisition.

Total consideration transferred (in thousands, except number of shares and stock price):

Merger consideration shares		530,502
BioLife stock price (as of September 1, 2021)	$	60.50
Value of issued shares	$	32,095
plus: Fair value of BioLife's existing investment in Sexton	$	7,951
less: Net working capital adjustment	$	(118)
Merger Consideration	$	39,928

Transaction costs related to the acquisition are expensed as incurred and are not included in the calculation of consideration transferred.

Fair value of net assets acquired

Under the acquisition method of accounting, the assets acquired and liabilities assumed from Sexton were calculated as of the merger date, at their respective fair values, and consolidated with those of BioLife. The gross contractual accounts receivable acquired in the acquisition was $509,000. Of the acquired accounts receivable, $17,000 is estimated to be uncollectable. The fair value calculations required critical estimates, including, but not limited to, future expected cash flows, revenue and expense projections, discount rates, revenue volatility, and royalty rates.

The table below represents the fair value of the net assets acquired and liabilities assumed, which were recorded as of the merger date (amounts in thousands).

Cash	$	1,516
Accounts receivable, net		492
Inventory		1,310
Prepaid expenses and other current assets		670
Property, plant and equipment, net		737
Operating lease right-of-use assets, net		470
Developed technology		4,132
Customer relationships		2,276
Tradenames		2,324
Non-compete agreements		90
Goodwill		28,470
Accounts payable		(291)
Lease liabilities, operating		(470)
Deferred tax liability		(1,482)
Other liabilities		(316)
Fair value of net assets acquired	**$**	**39,928**

We recorded a measurement period adjustment in the fourth quarter of the year ended December 31, 2021 of $198,000 to the fair value of goodwill and the deferred tax liability. This adjustment related to the tax attributes of the business combination.

The fair value of Sexton's identifiable intangible assets and useful lives are as follows (amounts in thousands, except years):

		Fair Value	Useful Life (Years)
Developed technology	$	4,132	5 - 9
Customer relationships		2,276	2
Tradenames		2,324	11
Non-compete agreements		90	1
Total identifiable intangible assets	**$**	**8,822**	

Fair value measurement methodologies used to calculate the value of any asset can be broadly classified into one of three approaches, referred to as the cost, market and income approaches. In any fair value measurement analysis, all three approaches must be considered, and the approach or approaches deemed most relevant will then be selected for use in the fair value measurement of that asset. The estimated fair values of developed technology were estimated using a multi-period excess earnings approach. The estimated fair values of customer relationships and non-compete agreements were estimated using a "with and without" approach, comparing projected cash flows under scenarios assuming the customer relationships and non-compete agreements were and were not in place. The estimated fair value of the tradenames is based on the relief from royalty method, which estimates the value of the trade names based on the hypothetical royalty payments that are saved by owning the asset.

Some of the more significant assumptions inherent in the development of intangible asset fair values, from the perspective of a market participant, include, but are not limited to (i) the amount and timing of projected future cash flows (including revenue and expenses), (ii) the discount rate selected to measure the risks inherent in the future cash flows, (iii) the assessment of the asset's life cycle, and (iv) the competitive trends impacting the asset.

Acquired goodwill

The goodwill of $28.5 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. The goodwill recorded is not deductible for income tax purposes.

Global Cooling acquisition

General terms and effects

On March 19, 2021, the Company entered into an Agreement and Plan of Merger (the "GCI Merger Agreement") with BLFS Merger Subsidiary, Inc., a Delaware corporation ("GCI Merger Sub"), Global Cooling, a Delaware corporation and Albert Vierling and William Baumel, in their capacity as the representatives of the stockholders of GCI (collectively, the "GCI Seller Representative"). The acquisition strengthens BioLife's offerings in the cell and gene therapy and broader biopharma markets.

On May 3, 2021, pursuant to the GCI Merger Agreement, subject to the terms and conditions set forth therein, the transactions contemplated by the GCI Merger Agreement were consummated (the "GCI Closing"), GCI Merger Sub merged with and into GCI (the "GCI Merger" and, together with other transactions contemplated by the GCI Merger Agreement, the "GCI Transactions"), with GCI continuing as the surviving corporation in the GCI Merger and a wholly owned subsidiary of the Company. In the GCI Merger, all of the issued and outstanding shares of capital stock of GCI immediately prior to the filing of the Certificate of Merger with the Secretary of State of the State of Delaware (other than those properly exercising any applicable dissenter's rights under Delaware law) were converted into the right to receive the GCI Merger Consideration (as defined below). The Company paid the GCI Merger Consideration to the holders of common stock and preferred stock of GCI (collectively, the "GCI Stockholders").

Merger consideration

The aggregate merger consideration paid pursuant to the GCI Merger Agreement to the GCI Stockholders was 6,646,870 newly issued shares of common stock, provided, however, that the GCI Merger Consideration otherwise payable to GCI Stockholders is subject to the withholding of the GCI Escrow Shares (as defined below) and is subject to reduction for indemnification obligations. The GCI Merger Consideration allocable to one GCI stockholder was reduced by 10,400 shares to satisfy an outstanding note receivable of $374,000. In accordance with ASC 805, the Company recognized the settlement of pre-existing relationships in the forms of cash deposits, trade receivables, and trade payables, which are included in the consideration transferred. The GCI Merger Consideration is not subject to any purchase price adjustments.

Total consideration transferred (in thousands, except number of shares, stock price, and consideration percentage):

BioLife shares outstanding (as of March 19, 2021)		33,401,359
Merger consideration percentage		19.9%
Merger consideration shares		6,646,870
less: Merger consideration shares withheld to satisfy outstanding GCI stockholder obligations to GCI		10,400
Subtotal		6,636,470
BioLife stock price (as of May 3, 2021)	$	35.07
Value of issued shares	$	232,741
plus: Settlement of BioLife prepaid deposits	$	2,152
plus: Net settlement of BioLife accounts receivable	$	16
Merger Consideration	$	234,909

Transaction costs related to the acquisition are expensed as incurred and are not included in the calculation of consideration transferred.

Escrow shares

At the GCI Closing, approximately nine percent (9%) of the GCI Merger Consideration (the "Escrow Shares", along with any other dividends, distributions or other income on the GCI Escrow Shares, the "GCI Escrow Property") otherwise issuable to the GCI Stockholders (allocated pro rata among the GCI Stockholders based on the GCI Merger Consideration otherwise issuable to them at the GCI Closing), was deposited into a segregated escrow account in accordance with an escrow agreement to be entered into in connection with the GCI Transactions (the "GCI Escrow Agreement").

The GCI Escrow Property will be held for a period of up to twenty-four (24) months after the GCI Closing as the sole and exclusive source of payment for any post-GCI Closing indemnification claims (other than fraud claims), unless earlier released in accordance with the terms of the GCI Escrow Agreement.

Fair value of net assets acquired

Under the acquisition method of accounting, the assets acquired and liabilities assumed from Global Cooling were calculated as of the merger date, at their respective fair values, and consolidated with those of BioLife. The gross contractual accounts receivable acquired in the acquisition was $7.1 million. Of the acquired accounts receivable, $53,000 was estimated to be uncollectable. The fair value calculations required critical estimates, including, but not limited to, future expected cash flows, revenue and expense projections, discount rates, revenue volatility, and royalty rates.

The table below represents the fair value of the net assets acquired and liabilities assumed, which were recorded as of the merger date (amounts in thousands).

Cash	$	43
Accounts receivable, net		7,076
Inventory		15,547
Prepaid expenses and other current assets		639
Property, plant and equipment, net		3,512
Operating lease right-of-use assets, net		1,741
Financing lease right-of-use assets, net		114
Long-term deposits and other assets		4
Developed technology		18,140
Customer relationships		7,020
Tradenames		26,640
Non-compete agreements		1,240
In-process research and development		67,440
Goodwill		137,822
Accounts payable		(9,837)
Line of credit		(4,231)
Lease liabilities, operating		(1,880)
Lease liabilities, financing		(114)
Long-term debt		(4,410)
Deferred tax liability		(24,133)
Other liabilities		(7,464)
Fair value of net assets acquired	**$**	**234,909**

We recorded a measurement period adjustment in the fourth quarter of the year ended December 31, 2021 of $607,000 to the fair value of goodwill and the deferred tax liability. This adjustment related to the tax attributes of the business combination.

The fair value of Global Cooling's identifiable intangible assets and useful lives are as follows (amounts in thousands, except years):

		Fair Value	Useful Life (Years)
Developed technology	$	18,140	6
Customer relationships		7,020	12
Tradenames		26,640	15
Non-compete agreements		1,240	4
In-process research and development		67,440	N/A
Total identifiable intangible assets	**$**	**120,480**	

Fair value measurement methodologies used to calculate the value of any asset can be broadly classified into one of three approaches, referred to as the cost, market and income approaches. In any fair value measurement analysis, all three approaches must be considered, and the approach or approaches deemed most relevant will then be selected for use in the fair value measurement of that asset. The fair values of developed technology and in-process research and development were estimated using a multi-period excess earnings approach. The fair values of customer relationships were estimated using the "distributor method". The fair value of the tradenames is based on the relief from royalty method, which estimates the value of the trade names based on the hypothetical royalty payments that are saved by owning the asset. The fair values of non-compete agreements were estimated using a "with and without" approach, comparing projected cash flows under scenarios assuming the non-compete agreements were and were not in place. The fair value of inventory and property, plant and equipment were determined using the "market approach".

Some of the more significant assumptions inherent in the development of intangible asset fair values, from the perspective of a market participant, include, but are not limited to (i) the amount and timing of projected future cash flows (including revenue and expenses), (ii) the discount rate selected to measure the risks inherent in the future cash flows, (iii) the assessment of the asset's life cycle, and (iv) the competitive trends impacting the asset.

Acquired goodwill

The goodwill of $137.8 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. The goodwill recorded is not deductible for income tax purposes.

SciSafe acquisition

On September 18, 2020, BioLife entered into a Stock Purchase Agreement, by and among the Company, SciSafe Holdings, Inc., a Delaware corporation, and the stockholders of SciSafe (collectively, the "SciSafe Sellers") in accordance with the Stock Purchase Agreement, pursuant to which the Company agreed to purchase from the SciSafe Sellers one hundred percent (100%) of the issued and outstanding capital shares or other equity interests of SciSafe (the "SciSafe Acquisition"). The SciSafe Acquisition closed October 1, 2020. The acquisition strengthens BioLife's offerings in the cell and gene therapy and broader biopharma markets.

Consideration transferred

The SciSafe Acquisition was accounted for as a purchase of a business under FASB ASC Topic 805, *Business Combinations*. At the closing of the SciSafe Acquisition, the Company agreed to issue to the SciSafe Sellers 611,683 shares of common stock valued at $29.29 per share and a cash payment of $15 million, with $1.5 million held in escrow to account for adjustments for net working capital and as a security for, and a source of payment of, the Company's indemnity rights. Pending the occurrence of certain events, the Company will issue to the SciSafe Sellers an additional 626,000 shares of common stock, which shall be issuable to SciSafe Sellers upon SciSafe achieving certain specified revenue targets in each year from 2021 to 2024. Under the acquisition method of accounting, the assets acquired and liabilities assumed from SciSafe were recorded as of the acquisition date, at their respective fair values, and consolidated with those of BioLife. The fair value calculations required critical estimates, including, but not limited to, future expected cash flows, revenue and expense projections, discount rates, revenue volatility, and royalty rates.

Total consideration transferred (in thousands):

Cash consideration	$	15,000
Stock consideration		17,916
Contingent consideration		3,663
Working capital adjustment		(53)
Total consideration transferred	**$**	**36,526**

Fair value of net assets acquired

The table below represents the purchase price allocation to the net assets acquired based on their fair values (amounts in thousands).

Cash	$	500
Accounts receivable, net		945
Prepaid expenses and other current assets		31
Property, plant and equipment, net		3,400
Customer relationships		7,420
Tradenames		4,020
Non-compete agreements		660
Goodwill		24,943
Other assets		1,547
Accounts payable		(885)
Deferred tax liability		(3,297)
Other liabilities		(2,758)
Fair value of net assets acquired	**$**	**36,526**

On September 30, 2020, the Company advanced SciSafe $500,000 in cash for working capital purposes. This cash and a payable due to the Company were both assumed in the transaction and are both reflected in the fair value of net assets acquired.

The fair value of SciSafe's identifiable intangible assets and useful lives are as follows (amounts in thousands except years):

	Fair Value	Useful Life (Years)
Customer relationships	$ 7,420	14
Tradenames	4,020	19
Non-compete agreements	660	4
Total identifiable intangible assets	**$ 12,100**	

Fair value measurement methodologies used to calculate the value of any asset can be broadly classified into one of three approaches, referred to as the cost, market and income approaches. In any fair value measurement analysis, all three approaches must be considered, and the approach or approaches deemed most relevant will then be selected for use in the fair value measurement of that asset. The fair values of customer relationships were estimated using a multi-period excess earnings approach. The fair value of the tradenames is based on the relief from royalty method which estimates the value of the trade names based on the hypothetical royalty payments that are saved by owning the asset. The fair values of non-compete agreements were estimated using a "with and without" approach, comparing projected cash flows under scenarios assuming the non-compete agreements were and were not in place. The fair value of property, plant and equipment was determined using the "market approach". The fair value of the milestone contingent consideration was determined using a scenario analysis valuation method which incorporates BioLife's assumptions with respect to the likelihood of achievement of certain revenue milestones, revenue volatility, credit risk, timing of earnout share issuances and a risk-adjusted discount rate to estimate the present value of the expected earnout share issuances.

Some of the more significant assumptions inherent in the development of intangible asset fair values, from the perspective of a market participant, include, but are not limited to (i) the amount and timing of projected future cash flows (including revenue and expenses), (ii) the discount rate selected to measure the risks inherent in the future cash flows, (iii) the assessment of the asset's life cycle, and (iv) the competitive trends impacting the asset.

Indemnification asset

In 2020, the Company recognized a $130,000 liability for a non-income tax contingency related to the acquisition of SciSafe. At the date of acquisition, we recognized an indemnification asset at the same time and on the same basis as the recognized liability, to the extent that collection is reasonably assured, in accordance with ASC 805. When indemnified, subsequent changes in the indemnified item are offset by changes in the indemnification asset. We assess the realizability of the indemnification asset each reporting period. Changes in the principal portion of non-income tax contingencies, as well as changes in any related indemnification asset, are included in operating income. The indemnification asset is included within prepaid expenses and other current assets on the balance sheet.

Acquired goodwill

The goodwill of $24.9 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. The goodwill recorded is not deductible for income tax purposes.

Fair value measurement methodologies used to calculate the value of any asset can be broadly classified into one of three approaches, referred to as the cost, market and income approaches. In any fair value measurement analysis, all three approaches must be considered, and the approach or approaches deemed most relevant will then be selected for use in the fair value measurement of that asset. The fair value of identifiable intangible assets was determined by third-party appraisal primarily using variations of the income approach, which is based on the present value of the future after-tax cash flows attributable to each identifiable intangible asset. The fair value of inventories was determined using both the cost approach and the market approach.

Some of the more significant assumptions inherent in the development of intangible asset fair values, from the perspective of a market participant, include, but are not limited to (i) the amount and timing of projected future cash flows (including revenue and expenses), (ii) the discount rate selected to measure the risks inherent in the future cash flows, (iii) the assessment of the asset's life cycle, and (iv) the competitive trends impacting the asset. Some of the more significant assumptions inherent in valuing the contingent consideration, include, but are not limited to (i) the amount and timing of projected future revenue, (ii) the volatility rate selected to measure the risks inherent in the revenue, and (iii) risk free interest rate.

Revenue, net income, and pro forma presentation

The Company recorded revenue from Sexton of $1.8 million and a net loss of $1.0 million from September 1, 2021, the date of acquisition, to December 31, 2021. The Company recorded revenue from Global Cooling of $39.1 million and a net loss of $19.6 million from May 3, 2021, the date of acquisition, to December 31, 2021. The Company recorded revenue from SciSafe of $1.8 million and a net loss of $416,000 from October 1, 2020, the date of acquisition, to December 31, 2020. The Company has included the operating results of the acquisitions in its Unaudited Condensed Consolidated Statements of Operations since their respective acquisition date.

The following unaudited pro forma financial information presents the combined results of operations of Sexton as if the acquisition had occurred on January 1, 2020 after giving effect to certain pro forma adjustments. These pro forma adjustments include intangible amortization, stock-based compensation expense and salary expense related to a key employee, and the income tax effect of the adjustments made:

(In thousands)	2021 (unaudited)	2020 (unaudited)
Total revenue	$ 122,494	$ 50,856
Net loss	$ (9,860)	$ (1,028)

The following unaudited pro forma financial information presents the combined results of operations of Global Cooling as if the acquisition had occurred on January 1, 2020 after giving effect to certain pro forma adjustments. These pro forma adjustments include intangible amortization, amortization of increased inventory basis, depreciation expense, lease expense, transaction costs, interest expense, stock-based compensation expense and salary expense related to a key employee, and the income tax effect of the adjustments made:

(In thousands)	2021 (unaudited)	2020 (unaudited)
Total revenue	$ 143,732	$ 87,370
Net income (loss)	$ (16,375)	$ 501

The following unaudited pro forma financial information presents the combined results of operations of SciSafe as if the acquisition had occurred on January 1, 2020 after giving effect to certain pro forma adjustments. These pro forma adjustments include intangible amortization, depreciation expense, stock-based compensation expense, and the income tax effect of the adjustments made:

(In thousands)	2020 (unaudited)
Total revenue	$ 52,613
Net income	$ 1,798

18. Employee benefit plan

The Company sponsors 401(k) defined contribution plans for its employees. These plans provide for pre-tax and post-tax contributions for all employees. Employee contributions are voluntary. Employees may contribute up to 100% of their annual compensation to these plans, as limited by an annual maximum amount as determined by the Internal Revenue Service. The Company matches employee contributions in amounts to be determined at the Company's sole discretion. The Company made contributions of $1.0 million, $822,000, and $347,000 to the plans for the years ended December 31, 2022, 2021, and 2020.

19. Subsequent events

The Company has evaluated events subsequent to December 31, 2022 through the date of this filing to assess the need for potential recognition or disclosure. Based upon this evaluation, it was determined that no subsequent events occurred that require recognition or disclosure in the Consolidated Financial Statements.

ITEM9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

(a) Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) as of the end of the period covered by this Form 10-K. Based on that evaluation, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures as of the end of the period covered by this Form 10-K were not effective, due to the material weaknesses in our internal controls over financial reporting described below.

Our management, including our Chief Executive Officer and Chief Financial Officer, does not expect that our disclosure controls and procedures or our internal controls will prevent all error and all fraud. A control system, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within BioLife Solutions have been detected.

(b) Management’s Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rule 13a-15(f) of the Exchange Act). Our management assessed the effectiveness of our internal control over financial reporting as of December 31, 2022. In making this assessment, our management used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”) in Internal Control—Integrated Framework (2013 framework).

Based on our assessment under the framework in Internal Control—Integrated Framework (2013 framework), our management concluded that our internal control over financial reporting was not effective as of December 31, 2022 due to the existence of material weaknesses described below.

A material weakness in internal control is a deficiency in internal control, or combination of control deficiencies, that adversely affects the Company’s ability to initiate, authorize, record, process, or report external financial data reliably in accordance with GAAP such that there is more than a remote likelihood that a material misstatement of the Company’s annual or interim financial statements will not be prevented or detected.

Control Environment, Risk Assessment, and Monitoring Activities

Management did not maintain appropriately designed entity-level controls impacting the control environment, risk assessment procedures, and monitoring activities to prevent or detect material misstatements to the consolidated financial statements in a timely manner. These material weaknesses were attributed to:

- Insufficient number of qualified resources and inadequate oversight and accountability over the performance of controls;
- Ineffective identification and assessment of risks impacting internal control over financial reporting; and,
- Ineffective monitoring controls, as the Company did not effectively evaluate whether the components of internal control were present and functioning.

Control Activities and Information and Communication

Additionally, management did not adequately design and implement effective control activities, including general controls over information technology, and effective policies and procedures, resulting in additional material weaknesses within certain business processes. As a result, the following additional material weaknesses were identified:

- Management did not maintain effective controls over information system logical access within certain key financial systems, including inadequate segregation of duties impacting the revenue and inventory processes at certain of the Company's subsidiaries;

- Management did not establish effective accounting policies and procedures and related controls over certain financial statement areas, including the revenue recognition and procure to pay processes;

- Management did not have adequate risk assessment procedures, or maintain effectively designed and implemented accounting policies, procedures, and related controls, over the recognition and measurement of indirect tax liabilities in the consolidated financial statements in accordance with the applicable financial reporting requirements;

After giving full consideration to these material weaknesses, and the additional analyses and other procedures that we performed to ensure that our consolidated financial statements included in this Annual Report on Form 10-K were prepared in accordance with U.S. GAAP, our management, including our CEO and CFO, has concluded that our consolidated financial statements present fairly, in all material respects, our financial position, results of operations and cash flows for the periods disclosed in conformity with U.S. GAAP.

These control deficiencies create a reasonable possibility that a material misstatement to the consolidated financial statements will not be prevented or detected on a timely basis, and therefore, we concluded that the deficiencies represent material weaknesses in our internal control over financial reporting, and our internal control over financial reporting was not effective as of December 31, 2022.

Management has been actively engaged in developing and implementing remediation plans to address these material weaknesses as described below in section (c).

The Company's independent registered public accounting firm, Grant Thornton, LLP, who audited our internal controls over financial reporting, has issued an adverse opinion on the effectiveness of the Company's internal control over financial reporting as of December 31, 2022, as stated in its report.

(c) Remediation

With respect to the material weaknesses described above, management has identified and begun to implement its remediation plan as listed below to remediate the material weaknesses described in Item 9A and to enhance our overall control environment, risk assessment, control activities, information and communication, and monitoring activities.

Management of the Company and the Board of Directors are committed to maintaining a strong internal control environment and to making further progress in remediating the material weaknesses described in section (b). The following steps either have been planned for implementation or have been implemented in the Company's ongoing efforts to remediate the material weaknesses identified:

- The Company will reassign all system administrator rights to personnel who do not perform key accounting duties;

- The Company plans to continue hiring and retaining additional highly skilled and qualified individuals related to technical accounting and internal control over financial reporting;

- The Company will enhance its control environment, risk assessment, and monitoring activities with the added stability of new hires and the implementation of technology solutions to automate our controls in revenue recognition and procure to pay processes;

- The Company plans to promote accountability of management personnel through the creation of compensation related goals on the design and execution of internal controls;

- The Company will provide enhanced internal control training to finance and accounting personnel, key management roles across the organization, and senior leadership team members to ensure awareness of available resources to aid in the design and execution of internal controls; and

- The Company will continue to make strategic investments over time in available tools to streamline execution and documentation of controls through organization and automation.

As we continue to evaluate and test the remediation plan outlined above, we may also identify additional measures to address the material weaknesses or modify certain of the remediation procedures described above. We also may implement additional changes to our internal control over financial reporting as may be appropriate in the course of remediating the material weaknesses. Management, with the oversight of the Audit Committee, will continue to take steps necessary to remedy the material weaknesses to reinforce the overall design and capability of our control environment.

The material weaknesses will not be considered remediated until management implements the measures described above and management has concluded, through testing, that these controls are operating effectively.

(d) Changes in Internal Control Over Financial Reporting

We made the following material changes in our internal control over financial reporting (as such term is defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) during the fiscal year ended December 31, 2022 to remediate previously reported material weaknesses in our internal control over financial reporting:

- Ongoing implementation of a new ERP system, NetSuite, to streamline and strengthen execution of internal controls.
- Enhanced and implemented new entity-level controls focused on Director and Officer questionnaires to identify related party transactions, Service Organization Control report reviews and quarterly board meeting to review financial results against budget to improve overall control environment, risk assessment, and monitoring activities.
- Implemented enterprise-wide access policy, change management policy, and operations policy to enhance overall General Information Technology Controls over critical applications.
- Implemented controls over asset-held-for-lease manual journal entry review, physical verification of raw materials and finished goods, and rollforward review.
- Implemented controls over intangible impairment in purchase price allocation review and analysis of goodwill and impairment.
- Enhanced controls to identify a complete population of related party transactions and submit them for timely approval to the audit committee and ensure these transactions are properly disclosed in the consolidated financial statements.

Other than the controls implemented to remediate the material weaknesses described above, there have been no changes in our internal control over financial reporting during the fiscal quarter ended December 31, 2022 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

(e) Attestation Report of the Independent Registered Public Accounting Firm

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Opinion on Internal Control over Financial Reporting

We have audited the internal control over financial reporting of BioLife Solutions, Inc. and subsidiaries, (the “Company”) as of December 31, 2022, based on criteria established in the 2013 Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”). In our opinion, because of the effect of the material weaknesses described in the following paragraphs on the achievement of the objectives of the control criteria, the Company has not maintained effective internal control over financial reporting as of December 31, 2022, based on criteria established in the 2013 Internal Control—Integrated Framework issued by COSO.

A material weakness is a deficiency, or combination of control deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the company’s annual or interim financial statements will not be prevented or detected on a timely basis. The following material weaknesses have been identified and included in management’s assessment.

(i) Inappropriately designed entity-level controls impacting the control environment, risk assessment, and monitoring activities to prevent or detect material misstatements to the consolidated financial statements attributed to an insufficient number of qualified resources and inadequate oversight and accountability over the performance of controls, ineffective identification and assessment or risks impacting internal control over financial reporting, and ineffective monitoring controls; (ii) inappropriate information system logical access within certain key financial systems; (iii) ineffective accounting policies and procedures and related controls over certain financial statement areas; (iv) inadequate risk assessment, accounting policies, procedures, and related controls performed over the recognition and measurement of indirect tax liabilities.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (“PCAOB”), the consolidated financial statements of the Company as of and for the year ended December 31, 2022. The material weaknesses identified above were considered in determining the nature, timing, and extent of audit tests applied in our audit of the 2022 consolidated financial statements, and this report does not affect our report dated March 31, 2023, which expressed an unqualified opinion on those financial statements.

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 Management's Annual Report 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.

Other information

We do not express an opinion or any other form of assurance on the remediation plans and actions described in Management's Report.

/s/ GRANT THORNTON LLP

Bellevue, Washington

March 31, 2023

ITEM 9B. OTHER INFORMATION

None.

ITEM 9C. DISCLOSURE REGARDING FOREIGN JURISDICTIONS THAT PREVENT INSPECTIONS

None.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The following table and text set forth the names and ages of our directors and executive officers as of December 31, 2022. The Board is comprised of only one class of directors. Also provided herein are brief descriptions of the business experience of each director and executive officer during the past five years (based on information supplied by them) and an indication of directorships held by each director in other public companies subject to the reporting requirements under the Federal securities laws. During the past ten years, none of our directors or executive officers has been involved in any legal proceedings that are material to an evaluation of the ability or integrity of such person:

Name	Age	Position and Offices With the Company
Michael Rice	59	Chief Executive Officer and Chairman of the Board
Roderick de Greef(1)	61	Chief Operating Officer and President
Troy Wichterman	38	Chief Financial Officer
Aby J. Mathew, Ph.D.	50	Chief Scientific Officer and Executive Vice President
Todd Berard	54	Chief Marketing Officer
Karen Foster	63	Chief Quality Officer
Marcus Schulz	45	Chief Revenue Officer
Sarah Aebersold	47	Vice President, Global Human Resources
Joseph Schick	61	Director
Rachel Ellingson	53	Director
Amy DuRoss	48	Director
Joydeep Goswami	51	Director
Tim Moore	61	Director

(1) As of December 31, 2022, Roderick de Greef served as the Company's Chief Operating Officer and President. On October 3, 2022, Mr. de Greef announced his retirement, with his final day serving as Chief Operating Officer on January 3, 2023. Geraint Phillips succeeded Mr. de Greef as Senior Vice President of Global Operations on January 4, 2023. Mr. de Greef currently serves as a Director for the Company.

Michael Rice has been Chief Executive Officer since August 2006 and Chairman of the Board since July 2021 Previously, Mr. Rice served as a director from August 2006 to July 2021 and Chairman of the Board from August 2007 to November 2013. Mr. Rice has more than 30 years of leadership and entrepreneurial experience in the medical and high-tech industries. He was most recently the senior business development manager for medical and wireless products at AMI Semiconductor, from October 2004 to August 2006. From October 2000 to August 2006, Mr. Rice also served as the director of marketing and business development at Cardiac Science, Inc., a manufacturer of automated external defibrillators. Prior to that, from May 1998 to October 2000, he was the Vice President, Sales and Marketing for TEGRIS Corporation, a privately held network services provider. Mr. Rice also spent 12 years, from May 1986 to May 1998 at Physio Control Corporation in several sales and marketing management roles prior to its acquisition by Medtronic Inc. The Board has determined that Mr. Rice is qualified to serve as a director because of his experience as Chief Executive Officer of the Company and because of his managerial insights.

Roderick de Greef was President and Chief Operating Officer at BioLife from November 2021 until he retired on January 3, 2023 and was appointed to the Board as a director. Previously, Mr. de Greef was appointed Chief Financial Officer from May 2016 to November 2021, and Chief Operating Officer from December 2019 to May 2021. He was appointed interim Chief Financial Officer and interim Secretary in March 2016. Mr. de Greef served as a director of the Company from June 2000 through November 2013, and provided the Company with strategic and financial consulting services from July 2007 through August 2011. Since November 2022, Mr. de Greef has served as a director of the Upper Connecticut Valley Hospital, a non-profit, rural hospital in northern New Hampshire. Since December 2020, Mr. de Greef has served as a director of Sirona Medical Technologies, a cardia electrophysiology company. From February 2019 to January 2021, Mr. de Greef served as a director, chairman of the Audit Committee of the board of directors of Indonesia Energy Corporation Limited, an oil and gas exploration and production company. Mr. de Greef served Pareteum Corporation., a mobile communications company, as a director, chair of the Audit Committee and member of the Nominating and Corporate Governance Committee and Compensation Committee from September 2015 to September 2017, and also from January 2008 to October 2011. From November 2013 to October 2014, Mr. de Greef served as the president and sole director of Cambridge Cardiac Technologies, Inc. a privately held successor to Cambridge Heart, Inc. From November 2008 to October 2013, Mr. de Greef was the chairman of the board of Cambridge Heart, Inc., a manufacturer of non-invasive diagnostic cardiology products. From November 2003 to May 2013, Mr. de Greef served as a director, member of the Audit Committee and chairman of the Compensation Committee of Endologix, Inc. From 2001 to 2006, Mr. de Greef served as Executive Vice President and Chief Financial Officer of NASDAQ listed Cardiac Science, Inc., which in 2004 was ranked as the 4th fastest growing technology company in North America on Deloitte & Touche's Fast 500 listing. Mr. de Greef received his MBA degree from the University of Oregon, and a B.A in Economics and International Relations from San Francisco State University. Mr. de Greef has extensive experience in corporate finance and the business world in general as well as serving as an officer and director of public companies.

Troy Wichterman has been Chief Financial Officer since November 2021. Before his appointment as Chief Financial Officer, Mr. Wichterman served as the Company's Vice President, Finance since November 2019. In that role, Mr. Wichterman oversaw the finance and accounting organization in the areas of integrating acquired businesses, acquisition due diligence and deal structure, SEC reporting, financial planning and analysis, operational finance, and audit compliance. Mr. Wichterman also served as Director of Financial Planning and Analysis from June 2016 to November 2019 and Financial Analyst from February 2015 to June 2016. Prior to joining the company, he was most recently a Senior Financial Analyst, Acquisitions at Ventas, a public healthcare REIT, from January 2013 to September 2014. Prior to Ventas, he was most recently a Senior Portfolio Analyst at Heitman, a private equity REIT, from June 2009 – January 2013 and began his career as an Auditing Associate at PwC in Chicago from 2008 to 2009. Mr. Wichterman is a CPA (inactive) and holds a Bachelor of Business Administration degree and a Master of Accountancy degree from the University of Wisconsin – Madison.

Aby J. Mathew, Ph.D. has been Executive Vice President and Chief Scientific Officer since December 2019. Before his appointment as Executive Vice President and Chief Scientific Officer, Dr. Mathew had served as Chief Technology Officer. Dr. Mathew was part of the founding team of BioLife Solutions, Inc., and has been employed by BioLife since 2000. Dr. Mathew is a co-developer of BioLife's biopreservation media solutions and co-inventor on issued and pending patents related to methods, devices, and formulations for the preservation of cells, tissues, and organs. He holds a Ph.D. in Biological Sciences from Binghamton University and a B.S. in Microbiology from Cornell University. Dr. Mathew has been researching low temperature biopreservation since 1994, and his studies contributed to the development of BioLife's current commercial HypoThermosol and CryoStor product platforms and intellectual property foundation. Dr. Mathew is currently active in, or previously a member of, AABB (formerly the American Association of Blood Banks), BEST (the Biomedical Excellence for Safer Transfusion collaborative), the International Society for Cell and Gene Therapy (ISCT), the Alliance for Regenerative Medicine (ARM), Tissue Engineering & Regenerative Medicine International Society (TERMIS), Society for Cryobiology, International Society for Biological and Environmental Repositories (ISBER), American Society for Cell Biology, and the Society for In Vitro Biology. Dr. Mathew is a member of, the Board of Directors, and Advisory Panel, of the Parent's Guide to Cord Blood Foundation, the Scientific Advisory Board of HemaCare Corporation, the founding Board of Directors of the Cord Blood Association, the Board of Directors of PanTHERA CryoSolutions, Inc., the NIST-AMTech National Cell Manufacturing Consortium, the California Institute for Regenerative Medicine (CIRM) Clinical Advisory Panel, the Business Advisory Board of RoosterBio Inc., and the Scientific Advisory Board of SAVSU Technologies. Dr. Mathew has obtained UCLA Corporate Governance Program Certification.

Todd Berard has been Chief Marketing Officer since December 2019. Before his appointment as Chief Marketing Officer, Mr. Berard had served as Vice President of Marketing since February 2015 and Senior Director of Marketing since July 2014. Previous to BioLife, Mr. Berard served as Director of Marketing at Verathon Medical; a division of Roper Inc., from September 2010 until July 2014, overseeing the global marketing, product development, and product launch strategies for a portfolio of six medical device brands. He also managed all strategic partnerships for product development and helped guide the organization through several key product launches and the corporate acquisition. At Verathon, Mr. Berard oversaw a creative and product management team of 12. Responsibilities included all global marketing initiatives and campaigns, strategy, product portfolio management, and strategic planning. He has over twenty years of experience in life sciences, health care, medical devices, and technology; working for both global leaders and small technology startups, including the University of Washington School of Medicine, DuPont, and Medtronic. He has a Bachelor of Science Degree in Biochemistry from the University of Vermont and an MBA from the University of Washington Foster School of Business.

Karen Foster has been Chief Quality Officer since December 2019. Before her appointment as Chief Quality Officer, Ms. Foster had served as Vice President, Operations since April 2016. From 2003 to early 2016, Ms. Foster was Vice President of Laboratory Operations and Site Leader at ViaCord, LLC, a family cord blood bank, and subsidiary of PerkinElmer Inc. Over a 25-year career, Ms. Foster has managed manufacturing and quality operations in several capacities for companies including ViaCord, Pfizer, Inc. (formerly Pharmacia Corporation) and Amersham Pharmacia Biotech, Inc. (formerly Phamacia Biotech, Inc.). She holds an MBA from the University of Wisconsin-Milwaukee (specialization in Operations Management), an M.S. in Zoology from University of Wisconsin-Milwaukee (specialization in Microbiology) and a B.S. in Biological Sciences from Michigan Technological University.

Marcus Schulz has been Chief Revenue Officer since February 2021. Before his appointment as Chief Revenue Officer, Mr. Schulz has served as the Vice President, Global Sales, since July 2020. Mr. Schulz joined the Company in August 2019 as Vice President of Sales, evo Platform. In that role, Mr. Schulz supported the Company's partnerships with specialty couriers that market the evo cold chain management platform to the regenerative medicine market. Prior to joining the Company, Mr. Schulz served in a variety of strategic business development and executive sales leadership roles with companies including Siemens Healthcare (2000-2009, most recently as Director, Strategic National Accounts), Johnson & Johnson (2010-2012, most recently as Sales Director), Aramark Healthcare Technologies (2012-2013, most recently as Director of Business Development), Abbott Laboratories (2013-2015, most recently as Executive Director, Healthcare Improvement), Belimed, AG (2015-2016, most recently as Executive Director, Strategic Solutions Group) and most recently, GE Healthcare (2016-2019, most recently as General Manager, National Accounts), where he managed a $1 billion annual revenue strategic account.

Sarah Aebersold has been Vice President, Global Human Resources since January 2021. Before her appointment as Vice President, Global Human Resources, Ms. Aebersold has served as the Senior Director, Global Human Resources & Administration since February 2020. In that role, Ms. Aebersold oversaw human resources programs in the areas of employee relations, talent acquisition, benefits, compensation, coaching, training and development, policy, and data management. Prior to joining the Company, Ms. Aebersold served in a variety of human resources roles with companies including MCG Health, a healthcare solutions provider (2016-2020, most recently as Head of Human Resources and Administration), Spacelabs Healthcare, a manufacturer of medical equipment (2014-2016, 2012-2013, most recently as Senior Manager, Human Resources), T-Mobile, a mobile communication company, (2013-2013, most recently as Human Resource Manager), Seattle Children's Hospital, a children's hospital (2009-2012, most recently as Manager, Human Resources Consulting), and ZymoGenetics, Inc., a biotechnology/pharmaceutical company (2004-2009, most recently as Human Resources Manager).

Joseph Schick joined the Board in November 2013 as a director and Chair of the Audit Committee. He has 17 years of experience as a Chief Financial Officer spanning four different mid-sized companies in various industries. Prior to his experience as a Chief Financial Officer, Mr. Schick worked in various roles for seven years at Expedia (NASDAQ: EXPE), including Senior Vice President of Finance. From this background, Mr. Schick has significant experience with SEC reporting, internal controls, strategic planning, and mergers and acquisitions. Mr. Schick started his career with Arthur Andersen and is a CPA who received his B.S. in Accounting from the University of Illinois. He is also on various non-profit boards and completed the Director Certification program at UCLA. The Board has determined that Mr. Schick is qualified to serve as a director because of his financial experience with public companies.

Rachel Ellingson has served as a director and member of the Company's Compensation Committee and Audit Committee since April 2021. Since April 2018, Ms. Ellingson has served as Senior Vice President and Chief Strategy Officer at Zimmer Biomet Holdings, Inc., a medical device company (NYSE: ZBH). As a member of the executive leadership team at ZBH, Ms. Ellingson is responsible for global oversight of strategy, business development and integration. Prior to joining ZBH, Ms. Ellingson served as Vice President, Corporate Strategy and as a member of the executive leadership team at St. Jude Medical, Inc., a medical device company, from 2011 to 2017. Before joining St. Jude Medical, Ms. Ellingson served as Vice President, Business Development and Investor Relations at AGA Medical Corporation, a developer and manufacturer of cardiovascular medical devices. Prior to joining AGA Medical, Ms. Ellingson was an investment banker, most recently as a Managing Director, Healthcare Investment Banking with Bank of America Corporation (NYSE: BAC) and prior to that, was with Cowen & Company (NASDAQ: COWN). Ms. Ellingson holds an MBA in Finance from the University of Connecticut and a Bachelor of Arts degree from the University of Rhode Island. The Board has determined that Ms. Ellingson is qualified to serve as a director because of her experience with strategic leadership and investment banking.

Amy DuRoss has served as a director and member of the Company's Governance and Nominating Committee and as Chair of the Compensation Committee since April 2021. Ms. DuRoss previously served as Chief Executive Officer of Vineti, Inc., a healthcare technology company, from the time that she co-founded Vineti in April 2016 through March 2022. Ms. DuRoss led Vineti and its software as a service platform to the forefront of innovation supporting cell and gene therapy manufacturing, delivery and patient follow up. Before co-founding Vineti, Ms. DuRoss focused on healthcare new business creation for GE Ventures, a venture capital subsidiary of General Electric (NYSE: GE), serving as a Managing Director from May 2013 to May 2017. Prior to GE, Ms. DuRoss was Chief Business Officer at Navigenics, Inc., a genomics company sold to Life Technologies Corporation in 2012. Ms. DuRoss was Co-founder and Executive Director of Proposition 71, California's stem cell research initiative passed in 2004, as well as Chief of Staff at the resulting state grant oversight agency. Ms. DuRoss was named a 2016 Health Innovator Fellow by the Aspen Institute. Ms. DuRoss also serves as a member of the Board of Directors for the ARM Foundation for Cell and Gene Medicine. Ms. DuRoss holds an MBA, Masters degree in English, and Bachelors of Arts degree in English from Stanford University. The Board has determined that Ms. DuRoss is qualified to serve as a director because of her experience founding and growing a successful business in the cell and gene therapy space.

Joydeep Goswami has served as a director and member of the Company's Audit Committee and as chair of the Nominating and Governance Committee since October 2021. Mr. Goswami currently serves as Chief Financial Officer, Chief Strategy and Corporate Development Officer at Illumina, a biotechnology company, since September 2019. As a member of the executive leadership at Illumina, Mr. Goswami is responsible for driving planning, strategic partnerships, and acquisitions. Prior to Illumina, Mr. Goswami served as the President of Thermo Fisher Scientific's Clinical Next-Generation Sequencing (NGS) and Oncology business unit, where he oversaw efforts that drove the adoption of NGS in clinical oncology, research and reproductive health. Mr.Goswami has held senior leadership roles across the pharma/biotech, diagnostics and research tool continuum, previously serving at companies such as Life Technologies and Invitrogen, in addition to Thermo Fisher Scientific. He has led teams across various functions, including sales, marketing, R&D and other support functions. Mr. Goswami served as President, Asia Pacific and Japan while at Thermo Fisher Scientific and created the Stem Cells and Regenerative Medicine Business Unit at Invitrogen. Additionally, he spent five years at McKinsey, where he specialized in strategy for pharmaceutical, medical technology and technology companies. Mr. Goswami holds his MS, PhD in Chemical Engineering, and MBA from MIT and a Bachelor's degree in Chemical Engineering from the Indian Institute of Technology. The Board has determined that Mr. Goswami is qualified to serve as a director because of his experience with strategic leadership and international business operations.

Tim Moore has served as a director and member of the Company's Compensation and Nominating and Governance Committees since September 2022. He has more than three decades of leadership experience in biopharmaceutical manufacturing and operations. Mr. Moore served as COO of Instil Bio through December 2022, a TIL cell therapy company focused on solid tumors. Mr. Moore also served as the President and COO at PACT Pharma from October 2019 through September 2022. Prior to joining PACT, he served as Executive Vice President, Technical Operations at Kite, a Gilead Company, since March of 2016. During this time Mr. Moore was responsible for overseeing the process development, manufacturing, quality and supply chain for the launch of Yescarta®, one of the first CAR T therapies to be developed, manufactured and commercialized, as well as advancement of the Kite pipeline. In addition, Mr. Moore globally expanded the biopharmaceutical operations to serve and support the US, EU, as well as key partners in Asia. Prior to Kite, Mr. Moore served as the Senior Vice President, Head of Global Technical Operations – Biologics of Genentech, Inc. and as a member of the Genentech Executive Committee since 2010. In this role, Mr. Moore oversaw global leadership for more than 7,500 professionals across 10 internal sites and over 37 contract manufacturing organizations, as well as global manufacturing and end-to-end quality supply performance of more than 20 biological product families. Prior to that, Mr. Moore was Genentech's Senior Vice President, Global Supply Chain and Global Engineering from 2007 to 2010. Previously, Mr. Moore served as Vice President, Operations at ZLB Behring (formerly Aventis Behring). He is currently a member of ISPE, PDA and has been a part of the Executive Committee of BioPhorum and serves as a Board member for Cerus. Mr. Moore received a B.S. in Chemical Engineering from Tulsa University and a M.S. in Engineering Management from Northwestern University. The Board has determined that Mr. Moore is qualified to serve as a director because of his extensive experience with leading and executing large scale manufacturing operations in the biopharmaceutical industry.

Except as otherwise provided by law, each director shall hold office until either their successor is elected and qualified, or until he or she sooner dies, resigns, is removed or becomes disqualified. Officers serve at the discretion of the Board.

Board of Directors

Overview

Our Bylaws provide that the size of our Board is to be determined from time to time by resolution of the Board but shall consist of at least three members. As of the date of this filing, our Board consists of seven members. Our Board has determined five of our directors – Messrs. Schick, Goswami, and Moore, and Mss. DuRoss and Ellingson – to be independent under the rules of the NASDAQ Stock Market, after taking into consideration, among other things, those transactions described under "Certain Transactions." Mr. Rice serves as Chairman of the Board and is Chief Executive Officer. The Board does not have a lead director; however, recognizing that the Board is composed almost entirely of outside directors, in addition to the Board's strong committee system (as described more fully below), we believe this leadership structure is appropriate for the Company and allows the Board to maintain effective oversight of management.

At each annual meeting of stockholders, members of our Board are elected to serve until the next annual meeting and until their successors are duly elected and qualified. If the nominees named in this report are elected, the Board will consist of seven persons.

Committees of the Board of Directors

The Board has established an Audit Committee, a Compensation Committee, and a Governance and Nominating Committee. Each committee operates pursuant to a written charter that may be viewed on our website at *http://investors.biolifesolutions.com/corporate-governance*. The inclusion of our web site address in this document does not include or incorporate by reference the information on our web site into this annual filing.

The following table sets forth the current composition of the three standing committees of our Board:

Name[(1)]	Board	Audit	Compensation	Governance and Nominating
Mr. Rice	Chair			
Mr. Schick (financial expert)	X	Chair	X	X
Ms. DuRoss	X		Chair	X
Ms. Ellingson	X	X	X	
Mr. Goswami	X	X		Chair
Mr. Moore	X		X	X

(1) Roderick de Greef joined the Board of Directors as of January 4, 2023. He is serving as only a board member and has no involvement in the three standing committees of the Board.

Audit Committee. Our Audit Committee's role includes the oversight of our financial, accounting and reporting processes; our system of internal accounting and financial controls; and our compliance with related legal, regulatory, and ethical requirements. The Audit Committee oversees the appointment, compensation, engagement, retention, termination and services of our independent registered public accounting firm, including conducting a review of its independence; reviewing and approving the planned scope of our annual audit; overseeing our independent registered public accounting firm's audit work; reviewing and pre-approving any audit and non-audit services that may be performed by our independent registered public accounting firm; reviewing with management and our independent registered public accounting firm the adequacy of our internal financial and disclosure controls; reviewing our critical accounting policies and the application of accounting principles; and monitoring the rotation of partners of our independent registered public accounting firm on our audit engagement team as required by regulation.

In addition, the Audit Committee's role includes meeting to review our annual audited financial statements and quarterly financial statements with management and our independent registered public accounting firm. The Audit Committee has the authority to obtain independent advice and assistance from internal or external legal, accounting and other advisors, at the Company's expense.

The Board has determined that all members of our Audit Committee meet the independence and financial literacy standards of the NASDAQ Stock Market and applicable SEC rules. The Board of Directors has determined that Mr. Schick is an "audit committee financial expert" as defined by the rules of the SEC.

Please see the section entitled "Report of the Audit Committee of the Board of Directors" for further matters related to the Audit Committee.

Compensation Committee. The purpose of the Compensation Committee is to discharge its fiduciary responsibilities relating to the compensation of executive officers, the organizational structure, succession, retention and training policies and review and oversight of benefit programs. Our Compensation Committee is responsible for reviewing the recommendations of our Chief Executive Officer and Chief Financial Officer, making recommendations to the Board regarding the compensation of our executive officers, and ensuring that the total compensation paid to the executive officers is reasonable and competitive, and does not promote excessive risk taking. In making its recommendation to the Board, **t**he Compensation Committee considers the results of the most recent stockholder advisory vote on executive compensation. The Chief Executive Officer may not be present during voting or deliberation on his compensation. The Compensation Committee is also responsible for reviewing and making recommendations to the Board regarding director and committee member compensation. In addition, the Compensation Committee approves and has oversight over our bonus plans for executive officers and/or stock-based compensation plans and oversight of our overall compensation plans and benefit programs, including approval and oversight of grants.

In discharge of its duties related to administration of executive bonus plans, the Compensation Committee may, subject to the terms of each plan, delegate authority to management for the day-to-day non-material administration of such plans. Further, the Compensation Committee may, subject to the terms of each plan, delegate authority to management to make grants to non-executive officers under stock-based compensation plans.

The Compensation Committee has the authority to obtain independent advice and assistance from internal or external legal, accounting and other advisors, at the Company's expense. The Compensation Committee may select, or receive advice from, a compensation consultant, legal counsel or other adviser to the Committee, other than in-house legal counsel, only after taking into consideration the six factors outlined in Rule 10C-1 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). In considering and determining compensation levels, the Compensation Committee reviews independent and externally generated compensation data, in accordance with Rule 10C-1 of the Exchange Act.

The members of the Compensation Committee are independent directors within the meaning of the listing standards of the NASDAQ Stock Market.

***Governance and Nominating Committee*.** Our Governance and Nominating Committee's primary purpose is to evaluate candidates for membership on our Board and make recommendations to our Board regarding candidates; make recommendations with respect to the composition of our Board and its committees; provide guidance to our human resources, legal, and finance departments relating to director orientation programs; recommend corporate governance principles applicable to the Company; manage periodic review, discussion and evaluation of the performance of our Board, its committees and its members and oversee and monitor compliance with our Code of Business Conduct and Ethics. The Governance and Nominating Committee has the authority to obtain independent advice and assistance from internal or external legal, accounting, and other advisors, at the Company's expense.

All members of our Governance and Nominating Committee are independent under the listing standards of the NASDAQ Stock Market.

The Governance and Nominating Committee will consider candidates recommended by stockholders in accordance with the procedures set forth in our Bylaws, and prior to the date it recommends a slate of director nominees to the Board. Pursuant to the Governance and Nominating Committee Charter, there is no difference in the manner in which a nominee recommended by a stockholder or otherwise is evaluated.

In carrying out its function to nominate candidates for election to our Board, the Governance and Nominating Committee considers the Board's mix of skills, experience, character, commitment and diversity, with diversity being broadly construed to mean a variety of opinions, perspectives and backgrounds, such as gender, race and ethnicity differences, as well as other differentiating characteristics, all in the context of the requirements and needs of our Board at that point in time. In reviewing potential candidates, the Committee will also consider all relationships between any proposed nominee and any of our stockholders, competitors, customers, suppliers or other persons with a relationship to the Company. The Governance and Nominating Committee believes that each candidate should be an individual who has demonstrated exceptional ability and judgment, who are willing and able to make a sufficient time commitment to the Company, and who shall be most effective, in conjunction with the other nominees to the Board, in collectively serving the long-term interests of the stockholders.

The Governance and Nominating Committee's methods for identifying candidates for election to our Board include the solicitation of ideas for possible candidates from a number of sources, including from members of our Board, our executive officers, individuals who our executive officers or Board members believe would be aware of candidates who would add value to our Board and through other research. The Governance and Nominating Committee may, from time to time, retain, for a fee, one or more third-party search firms to identify suitable candidates. The Governance and Nominating Committee will consider all candidates identified through the processes described above, and will evaluate each candidate, including incumbents, based on the same criteria.

The Governance and Nominating Committee does not have a formal policy with respect to diversity; however, the Board and the Governance and Nominating Committee believe that it is essential that the Board members represent diverse viewpoints.

Number of Meetings

The Board held a total of ten meetings during 2022. Our Audit Committee held eight meetings in 2022, our Compensation Committee held four meetings in 2022 and our Governance and Nominating Committee did not hold any meetings during 2022. Each incumbent director attended greater than 75% of the total number Board meetings and the total number of Board committee meetings.

Board Member Attendance at Annual Stockholder Meetings

Although we do not have a formal policy regarding director attendance at annual stockholder meetings, directors are encouraged to attend these annual meetings. One of the Company's directors attended the last annual meeting of stockholders held on June 9, 2022.

Codes of Business Conduct and Ethics

We believe in sound corporate governance practices and have always encouraged our employees, including officers and directors to conduct business in an honest and ethical manner. Additionally, it has always been our policy to comply with all applicable laws and provide accurate and timely disclosure.

Accordingly, the Board has adopted a formal written code of ethics for all employees. The Board has adopted an additional corporate code of ethics for its Chief Executive Officer, Chief Financial Officer, and other senior financial officers, which is intended to be a "code of ethics" as defined by applicable SEC rules. The Code of Ethics is publicly available on our website at http://investors.biolifesolutions.com/corporate-governance. The code of ethics is designed to deter wrongdoing and promote honest and ethical conduct and compliance with applicable laws and regulations. These codes also incorporate what we expect from our executives so as to enable us to provide accurate and timely disclosure in our filings with the SEC and other public communications. Any amendments made to the Code of Ethics will be available on our website.

Stockholder Communications with Directors

Stockholders wishing to communicate with the Board or with a particular member or committee of the Board should address communications to the Board, or to an individual member or committee as follows: c/o BioLife Solutions, Inc., Attention: Corporate Secretary, 3303 Monte Villa Parkway, Suite 310, Bothell, Washington 98021. All communications will be relayed to that addressee. From time to time, the Board may change the process through which stockholders communicate with the Board or its members or committees. There were no changes in this process in 2022 or as of the date hereof. Please refer to our website at www.biolifesolutions.com for any future changes in this process. The Board or the particular director or committee of the Board to which a communication is addressed will, if it deems appropriate, promptly refer the matter either to management or to the full Board depending on the nature of the communication.

Board Diversity Matrix

Board Diversity Matrix as of December 31, 2022

Total Number of Directors	6			
	Female	Male	Non-Binary	Did Not Disclose Gender
Part I: Gender Identity				
Directors				
Part II: Demographic Background				
African American or Black				
Alaskan Native or Native American				
Asian		1		
Hispanic or Latinx				
Native Hawaiian or Pacific Islander				
White	2	3		
Two or More Races or Ethnicities				
LGBTQ+				
Did Not Disclose Demographic Background				

ITEM 11. EXECUTIVE COMPENSATION

Compensation Committee report

The Compensation Committee of the Board, which is comprised solely of independent directors within the meaning of applicable rules of NASDAQ, outside directors within the meaning of Section 162(m) of the Internal Revenue Code of 1986, as amended (the “Code”), and non-employee directors within the meaning of Rule 16b-3 under the Exchange Act, is responsible for developing executive compensation policies and advising the Board with respect to such policies and administering the Company’s cash and equity incentive plans. The Compensation Committee sets performance goals and objectives for the CEO and the other executive officers, evaluates their performance with respect to those goals and sets their compensation based upon the evaluation of their performance. In evaluating executive officer pay, the Compensation Committee may retain the services of a compensation consultant and consider recommendations from the CEO with respect to goals and compensation of the other executive officers. The Compensation Committee assesses the information it receives in accordance with its business judgment. The Compensation Committee also periodically reviews non-employee director compensation. All decisions with respect to executive compensation are approved by the Compensation Committee and all decisions with respect to director compensation are recommended by the Compensation Committee to the full Board for approval.

The Compensation Committee of the Company has reviewed and discussed the compensation discussion and analysis required by Item 402(b) of Regulation S-K with management and, based on such review and discussions, the Compensation Committee recommended to the Board that the compensation discussion and analysis be included in this document.

Respectfully submitted by the Compensation Committee:

Amy DuRoss, Chairperson
Joseph Schick
Rachel Ellingson
Timothy Moore

Compensation discussion and analysis

Our compensation discussion and analysis ("CD&A") describes our executive-compensation philosophy and program as reported in the executive compensation tables that follow, which provide information relating primarily to compensation decisions for the following 2022 named executive officers ("NEOs") of the Company:

Name	Position with the Company
Michael Rice	Chief Executive Officer and Chairman of the Board
Roderick de Greef[(1)]	Chief Operating Officer and President
Troy Wichterman	Chief Financial Officer
Aby J. Mathew, Ph.D.	Chief Scientific Officer and Executive Vice President
Karen Foster	Chief Quality Officer

(1) As of December 31, 2022, Roderick de Greef served as the Company's Chief Operating Officer and President. On October 3, 2022, Mr. de Greef announced his retirement, with his final day serving as Chief Operating Officer on January 3, 2023. Geraint Phillips replaced Mr. de Greef as Chief Operating Officer on January 4, 2023. Mr. de Greef currently serves as a Director for the Company. The remaining references of Mr. de Greef as Chief Operating Officer and all compensation earned during 2022 relate to his position as Chief Operating Officer.

2022 year in review

For the fiscal year ended December 31, 2022, we made strong progress toward our long-term goals through a combination of organic growth and success of recent acquisitions. We are keenly focused on achieving our corporate goals, in alignment with our broader purpose to return long-term value to our customers and shareholders. Among our accomplishments in the fiscal year ended December 31, 2022 were the following:

Overall revenue growth and key drivers of revenue growth

- Revenue increased to $161.8 million, an overall gain of 36% year-over-year, compared to revenue of $119.2 million in 2021.
- Revenue growth from organic activities accounted for $29.9 million in 2022, representing 70% of BioLife's year-over-year growth.
- Inorganic revenue growth accounted for $12.7 million in 2022, representing 30% of BioLife's year-over-year growth.

Revenue growth by product line

- Our Cell Processing platform revenue increased $23.5 million, or 52%, over 2021.
- Organic Cell Processing platform revenue increased $19.4 million, or 45%, over 2021.
- Our Freezers & Thaw Systems platform revenue increased $10.1 million, or 18%, over 2021.
- Organic Freezers & Thaw Systems platform revenue increased $1.6 million, or 9%, over 2021.
- Our Storage & Storage Services platform revenue increased $8.9 million, or 51%, over 2021. All growth in the Storage and Storage Services platform was organic.

Creating shareholder value

- We delivered total shareholder return ("TSR") of 203% and 12% over the five-year and three-year periods ending December 31. 2022.

In summary, we met our revenue goal for 2022 and continued to make strong progress toward achieving our long-term goals through a combination of organic growth and success of recent acquisitions. We are keenly focused on achieving our corporate goals, in alignment with our broader purpose to return long-term value to our customers and shareholders. We focused on differentiated products suited to the complexities and pressures of modern biopharmaceutical manufacturing; with single-use and flexible solutions that can help to reduce risk in our customers' manufacturing, storage, and distribution processes.

Compensation philosophy

The Company's compensation philosophy is to provide compensation that will attract and retain high-performing talent in our industry, motivate the Company's executive officers to create long-term, enhanced shareholder value and provide a fair reward for executive effort, and stimulate professional and personal growth. The Company believes that the compensation of its executive officers should align the executive officers' interests with those of the shareholders and focus executive officer behavior to achieve both near-term corporate goals and long-term business and strategies.

It is the responsibility of the Compensation Committee of the Board to administer the Company's compensation programs to ensure that they are competitive with other bioprocessing, life sciences, and biotechnology companies, and to include incentives that are designed to appropriately drive the Company's continued development to create shareholder value. The Compensation Committee reviews and approves all components of the Company's executive officer compensation, including base salaries, annual cash incentive compensation, and equity incentive compensation.

Compensation objectives

The Company's compensation programs for its executive officers are designed to provide the following:

- Salaries and total compensation that are competitive with other bioprocessing, life sciences, and biotechnology companies with which the Company competes for talent, determined by comparing the Company's pay practices with these companies. The committee's objective is to align executive total annual compensation, including salary, cash bonus and long-term equity, at the 50th percentile of the Company's peer group.
- Equity incentive compensation, including market-based equity awards, to ensure that its executive officers are motivated over the long-term to respond to the Company's business challenges and opportunities as owners and not just as employees, thereby aligning the executive officers' interests with those of shareholders.
- Annual cash incentive compensation that motivates the executive officers to lead and manage the business to meet the Company's near-and long-term objectives.

The following features of our compensation programs are designed to protect and promote the interests of our shareholders while aligning executive compensation with performance. Below we summarize practices we follow to incentivize performance and retain leadership, and practices we do not follow because we do not believe they serve the long-term interests of our shareholders:

We Do	We Don't
Pay for Performance: We emphasize market-based compensation that aligns the interests of our shareholders and executive officers through the use of both near-term cash incentive compensation and long-term equity awards subject to both time and market-based vesting.	**Hedge or Pledge:** We do not allow executive officers to engage in hedging or pledging of our securities.
Benchmark: We maintain an industry-specific peer group for annual benchmarking of executive compensation. This benchmarking is a key factor among those used to determine appropriate compensation for our NEOs.	**Re-Pricing:** We do not allow re-pricing of underwater stock options without shareholder approval.
Benefits: We offer market-competitive benefits for executives that are consistent with the benefits we offer all our employees.	**Gross up Payments:** We do not provide tax gross-up payments for our executive officers.
Consult: We consistently engage an independent compensation consultant to advise on compensation levels and practices.	**Guaranteed Bonuses:** We do not provide guaranteed bonuses to our executive officers.
Risk Assessment: We perform an annual compensation risk assessment.	
Double Trigger: We provide each NEO severance benefits that are triggered only upon a termination of employment, including resignation for good reason, following a change-in-control (i.e., double trigger).	

Board and Compensation Committee consideration of shareholder advisory votes on compensation

In evaluating our executive compensation programs for the fiscal year ended December 31, 2022, the Compensation Committee considered the shareholder advisory vote on our executive compensation, (the "say-on-pay vote"), for the fiscal year ended December 31, 2021, which was approved by 74.2% of the votes cast.

The Compensation Committee values and continues to consider shareholder input and feedback, including the results of say-on-pay votes, on our compensation program structure. The Compensation Committee determined that the structure of our executive compensation policies continues to be appropriately aligned to the achievement of Company goals and objectives and the best interests of shareholders. We believe that compensation program enhancements of the past several years, as well as our commitment to improved transparency in our CD&A disclosure, have resulted in a compensation program that best serves our Company, our executives, and our shareholders.

Compensation evaluation process

The Company's executive officer compensation consists of three primary components: base salary, annual cash incentive compensation, and equity incentive compensation. Each of these components is intended to complement the others, and taken together, to satisfy the Company's compensation objectives. The Compensation Committee considers a number of factors in setting compensation for its executive officers, including Company performance, the executive's functional performance, experience and responsibilities, and the compensation of executive officers in similar positions in our peer group of companies.

Role of compensation consultant

In establishing compensation levels for each executive officer, the Compensation Committee has the authority to engage the services of outside experts. In the fiscal year ended December 31, 2022, the Compensation Committee retained FW Cook, an independent compensation consulting firm, to assist management in assessing and reporting to the Compensation Committee the competitiveness and effectiveness of the Company's executive compensation programs. In addition, our finance and human resources departments support management in their work and act in accordance with the direction given to them to administer our compensation programs.

Management has assessed any potential conflicts of interest raised by the work of FW Cook, our compensation consultant, pursuant to SEC rules and has determined that no such conflict of interest exists.

In February 2022, the Compensation Committee held meetings with management to review the reports prepared by FW Cook to:

- Review our compensation objectives
- Review the actual compensation of our executive officers for consistency with our objectives
- Analyze trends in executive compensation
- Assess our variable cash compensation structure, as well as incentive plan components and mechanics, to ensure an appropriate correlation between pay and performance with resulting compensation opportunities that balance returns to the Company and its shareholders
- Assess our equity-based awards programs against our objectives of executive incentive, retention, and alignment with shareholder interests
- Review our peer group and consider appropriate changes related to the realignment of our business
- Benchmark our executive cash compensation and equity-based awards programs, and assess our pay versus performance against our peer group
- Review recommendations for fiscal year 2022 compensation for appropriateness relative to our compensation objectives

Use of peer group to benchmark compensation

In February 2022, FW Cook provided management with an analysis of base salary, target bonus, target total cash, long-term incentive value and design, and target total compensation for executives, and cash and equity compensation for non-employee directors, of comparable companies in the bioprocessing, life sciences, and biotechnology industries. In performing this analysis, FW Cook used a peer group of 20 bioprocessing, life sciences, and biotechnology companies, which was reviewed and approved by management. As necessary, FW Cook, in conjunction with management, revaluates our peer group in light of developments in the market and our industry. As a result of this review, two companies were added to the peer group and two companies were removed from the peer group compared to the prior report. The companies included in the peer group had revenues with a median of $168 million, as compared to the group's median revenue of $127 million in fiscal year 2021, when the evaluation was last completed.

The peer group used in the report presented for consideration of 2022 compensation decisions and approved by the management consisted of the following companies:

Antares Pharma, Inc.(1)	Cerus Corporation	Mesa Laboratories, Inc.
Atrion Corporation	Codexis, Inc.	NanoString Technologies, Inc.
Avid Bioservices, Inc.	Cryoport, Inc.	NEVRO Corporation
Axogen Corporation	Fluidigm Corporation(2)	Silk Road Medical, Inc.
Azenta	Glaukos Corporation	STAAR Surgical Company
Berkely Lights	iRhythm Technologies, Inc.	Veracyte, Inc.
Cardiovascular Systems, Inc	Luminex Corporation(3)	

(1) Antares Pharma, Inc. was acquired by Halozyme (NASDAQ: HALO) as of May 2022.
(2) Fluidigm Corporation rebranded to Standard BioTools, Inc. (NASDAQ: LAB) in April 2022.
(3) Luminex Corporation was acquired by DiaSorin (EuroNext: DSRLF) in July 2021.

The use of peer group compensation data is one of several factors in determining appropriate compensation parameters for base salary, variable cash compensation, and equity-based, long-term incentives. The Compensation Committee's executive compensation decisions are made on a case-by-case basis, and specific benchmark results do not, in and of themselves, determine individual target compensation decisions.

While the Compensation Committee generally targets each NEO's total compensation to be near the 50th percentile of the peer group, it considers a number of additional factors to determine the appropriate level of each NEO's total compensation and each component of compensation, including Company performance and the relevant executive's performance, experience, responsibilities and impact. Due to these other factors, the Compensation Committee may set an NEO's compensation below, at, or above the 50th percentile of the peer group.

Annual review of long-term incentives

The Compensation Committee believes that equity incentives in the form of restricted stock awards, subject to vesting over time or upon achievement of performance or market-based objectives, are effective vehicles to align individual and team performance with the achievement of the Company's strategic and financial goals over time, retain our NEOs, and align the interests of our NEOs with those of our shareholders.

In February 2022, the Compensation Committee granted to the NEOs, service vesting-based restricted stock awards which vest over a four-year period, and market-based restricted stock awards which contain a market condition based on Total Shareholder Return ("TSR"). The TSR market condition measures the Company's performance against a peer group. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2022 through December 31, 2023 as compared to the total shareholder return of our 20 company peer group. The size of these grants is based on target long-term incentive levels for each of the NEOs.

Executive compensation

Base salary

Base salary represents the fixed portion of an executive officer's compensation and is intended to provide compensation for day-to-day performance. The Compensation Committee believes that a competitive base salary is a necessary element of any compensation program that is designed to attract and retain talented and experienced executives. Each executive officer's base salary is initially determined upon hire or promotion based on the executive officer's responsibilities, prior experience, individual compensation history and salary levels of other executives within the Company and similarly situated executives within our peer group. Base salary is typically reviewed annually. The Compensation Committee believes that the base salaries paid to our executive officers during the fiscal year ended December 31, 2022 achieved the Company's compensation objectives. Base salaries for the named executive officers for 2022, 2021 and 2020 are as follows:

Name	2022 Base Salary ($) (1)	2021 Base Salary ($) (1)	2020 Base Salary ($)	Base Salary Increase in 2022 vs 2021 (%)	Base Salary Increase in 2021 vs 2020 (%)
Michael Rice	645,000	641,019	514,712	1	25
Aby J Mathew	419,750	419,750	407,642	-	3
Roderick de Greef	450,000	412,137	390,889	9	5
Troy Wichterman	375,000	249,077	192,308	50	30
Karen Foster	356,500	356,500	345,731	-	3

(1) These base salary increases were based on each named executive officer's performance, qualifications, experience, responsibilities, and FW Cook's survey of the publicly disclosed compensation for similar positions at companies in the peer group.

Annual cash incentive compensation (short-term incentive) plan

In 2022, as in prior years, executives were eligible for bonuses, as approved by the Compensation Committee and the Board, with pre-established goals and weightings, which was designed to reward achievements based upon quantitative & qualitative Company performance (the "Company Objectives"), and to incentivize and reward NEOs for achieving performance goals that drive Company performance, align pay and performance, and support the long-term growth of the Company.

All NEO incentive payouts are calculated based solely on Company Objectives to closely align compensation with the Company's performance. The Compensation Committee determined each NEO's annual cash incentive compensation after the end of fiscal year 2022, which is calculated as a percentage of the executive officer's target annual cash incentive compensation ("Target Award"). The Compensation Committee established each NEOs Target Award at a level that represents a meaningful portion of each NEOs cash compensation. In addition, the Compensation Committee set thresholds, target, and maximum performance goals, and related payout levels, considering annual cash incentive compensation levels for comparable positions within our peer group and our own historical practices. An NEO could earn between 0% and 110% of the NEOs Target Award for achievement of Corporate Objectives, dependent upon the level of achieved performance.

Annual cash incentive compensation (short-term incentive) plan protocol

The Compensation Committee administers the Plan:

1. At the beginning of the fiscal year, the CEO, with assistance from senior management, proposes annual Company Objectives, measurement criteria and weightings, subject to review and approval by the Compensation Committee.
2. At the beginning of the following fiscal year, the CEO and CFO evaluate performance levels and the achievement of these annual Company Objectives, which are subject to review and approval by the Compensation Committee. Specific bonus award recommendations for all participants are submitted by the CEO to the Compensation Committee for review and approval.
3. The Compensation Committee determines the bonus awards for individual participants based on the Target Awards and the Company's performance against the Company Objectives.

Summary of 2022 performance measure and goals

The Compensation Committee may, at its discretion, elect to adjust bonuses or not to pay bonuses at all. A Target Award and the weight assigned to Company Objectives are determined based upon competitive market data derived from our peer group. The final incentive payout is determined based on the achievement of Company Objectives defined for each organizational level and position and the Target Award.

Our Company is focused on driving above-industry level growth through internal innovation, acquisitions, and expansion of applications for our products and services. With our focus on revenue growth, gross margin improvements, and positive adjusted EBITDA, we believe that revenue, gross margin, and Adjusted EBITDA are relevant metrics to reflect success. Revenue was the highest weighted Company Objective, and the remaining weighting was attributed to each of the other Company Objectives as determined by management and approved by the Compensation Committee. We believe these are objectives that our executive team can directly impact, and that drive shareholder value.

For the 2022 Plan, the Compensation Committee set the following Company Objectives and related payout levels:

- **Revenue:** For 2022, the revenue target was set at $163 million (excluding acquired revenue during the year), which if achieved, would result in a payout of 60% of each NEOs Target Award with respect to the revenue metric. If the Company achieved revenues of $166 million, a 10% increase of payout would result and each NEOs Target Award would be paid at 66% with respect to the revenue metric. If achieved performance was below $163 million but at or above $160 million, a 10% reduction of payout would result and each NEOs Target Award would be paid at 54% with respect to the revenue metric. If achieved performance was below $160 million, then no payout would be made to the NEOs with respect to the revenue metric.
- **Adjusted Gross Margin[(1)]**: For 2022, the adjusted gross margin target was set at 37%, which if achieved, would result in a payout of 20% of each NEOs Target Award with respect to the adjusted gross margin metric. If the Company achieved adjusted gross margin of 39%, a 10% increase of payout would result and each NEOs Target Award would be paid at 22% with respect to the adjusted gross margin metric. If achieved performance was below 37% but at or above 35%, a 10% reduction of payout would result and each NEOs Target Award would be paid at 18% with respect to the adjusted gross margin metric. If achieved performance was below 35%, then no payout would be made to the NEOs with respect to the adjusted gross margin metric.
- **Adjusted EBITDA[(1)]**: For 2022, the adjusted EBITDA target was set at 7% of revenues, which if achieved, would result in a payout of 20% of each NEOs Target Award with respect to the adjusted EBITDA metric. If the Company achieved adjusted EBITDA of 9% of revenues, a 10% increase of payout would result and each NEOs Target Award would be paid at 22% with respect to the adjusted EBITDA metric. If achieved performance was below 7% of revenues but at or above 5% of revenues, a 10% reduction of payout would result and each NEOs Target Award would be paid at 18% with respect to the adjusted EBITDA metric. If achieved performance was below 5% of revenues, then no payout would be made to the NEOs with respect to the adjusted EBITDA metric.
- **Complete ULT and Cryostor modules within Netsuite:** In 2022, the objective to complete the modules of two significant entities, ULT and CBS, within Netsuite would result in an additional payout of 5% of each NEOs Target Award, but in no event would an additional payout be achieved if the revenue, Adjusted Gross Margin or Adjusted EBITDA target was met at or above 100% of achievement. If both modules were not completed, then no payout would be made to the NEOs with respect to the Netsuite module completion metric.
- **Complete Transition to new Cryostor tank supplier:** For 2022, a transition of a major tank supplier for Cryostor objective was set to establish a new key supplier relationship in order to mitigate supply chain constraints, which if achieved, would result in a payout 5% of each NEOs Target Award, but in no event would an additional payout be achieved if the revenue, Adjusted Gross Margin or Adjusted EBITDA target was met at or above 100% of achievement. If achieved performance wasn't met, then no payout would be made to the NEOs with respect to the new tank supplier metric.

(1) Adjusted Gross Margin and Adjusted EBITDA are non-GAAP metrics. A reconciliation of these metrics is provided below.

Non-GAAP metric reconciliation tables

Our Target Awards include the calculation of non-GAAP financial measures in which we believe provide useful information for evaluating business performance. When analyzing the Company's operating results, investors should not consider non-GAAP measures as substitutes for the comparable financial measures prepared in accordance with GAAP.

Adjusted gross margin reconciliation

	Years Ended December 31		
	2022	**2021**	**2020**
GAAP total revenues	$ 161,759	$ 119,156	$ 48,087
GAAP cost of revenues	(107,937)	(82,108)	(20,646)
COGS intangible asset amortization	(5,007)	(4,557)	(2,328)
GAAP GROSS PROFIT	$ 48,815	$ 32,491	$ 25,113
GAAP GROSS MARGIN	30.2%	27.3%	52.2%
ADJUSTMENTS TO GROSS PROFIT:			
Inventory step-up	251	1,130	411
Intangible asset amortization	5,007	4,557	2,328
ADJUSTED GROSS PROFIT	$ 54,073	$ 38,178	$ 27,852
ADJUSTED GROSS MARGIN	33.4%	32.0%	57.9%

Adjusted EBITDA reconciliation

	Years Ended December 31		
	2022	**2021**	**2020**
GAAP NET (LOSS) / INCOME	$ (139,805)	$ (8,908)	$ 1,983
ADJUSTMENTS:			
Interest expense/(income), net	687	485	(40)
Income tax benefit	(5,022)	(20,118)	(3,264)
Depreciation	6,834	4,800	2,035
Intangible asset amortization	9,697	8,202	3,033
EBITDA	$ (127,609)	$ (15,539)	$ 3,747
Share-based compensation (non-cash)	25,334	13,974	5,981
Acquisition costs	18	1,636	668
Inventory step-up	251	1,130	411
Loss on Disposal of Assets	683	(145)	182
Change in fair value of contingent consideration	(4,754)	2,875	1,575
Change in fair value of investments	(697)	-	(1,319)
Change in fair value of warrant liability	-	121	(3,601)
Intangible asset impairment charges	110,364	-	-
ADJUSTED EBITDA[(1)]	$ 3,590	$ 4,052	$ 7,644
ADJUSTED EBITDA as a percentage of total revenues	2.2%	3.4%	15.9%

(1) Adjusted EBITDA excluded executive bonuses from GAAP operating expenses to determine target award percentage.

Individual annual cash incentive targets

For the fiscal year ended December 31, 2022, the Company established a Target Award for each NEO Company Objectives, which are set forth below:

Name	**Target Award as % of Salary for the Fiscal Year Ended December 31, 2022 (%)**	**Portion Tied to Company Objectives (%)**
Michael Rice	100	100
Aby J Mathew	45	100
Roderick de Greef	70	100
Troy Wichterman	55	100
Karen Foster	40	100

Achievement of 2022 company objectives

The following table summarizes the achievement of the Company's Objectives for the fiscal year ended December 31, 2022:

Company Objectives for the Fiscal Year Ended December 31, 2022	
Revenue target	Achieved $162 million in total revenue
Adjusted Gross Margin target	Adjusted Gross Margin of 33.4% did not meet target
Adjusted EBITDA target	Adjusted EBITDA of 2.2% of revenues did not meet target
Netsuite module completion target	Did not meet module completion target
New Cryostor supplier target	New tank supplier appointed

The Compensation Committee reviewed our achievement of the Company Objectives and determined that the Company achieved the Company Objectives at 59% of target levels. The Compensation Committee made this determination in consideration of the adjusted consolidated revenue of $161.8 million, adjusted gross margin of 33.4%, adjusted EBITDA, less executive bonus, of 1.0% of revenue, and the qualitative objective that was achieved in 2022.

Annual bonus incentive payments under the plan

The table below shows the annual bonus incentive payments made to our NEOs under the Plan for the fiscal year ended December 31, 2022:

Name	Target Award as % of Salary for the Fiscal Year Ended December 31, 2022 (%)	2022 Company Objectives Results (%)	2022 Bonus Payout ($)	2022 Overall Achievement % of Target Award
Michael Rice	100	59	380,550	59
Aby J Mathew	45	59	111,510	27
Roderick de Greef	70	59	185,850	41
Troy Wichterman	55	59	121,688	32
Karen Foster	40	59	84,252	24

Objectives for the fiscal year ending December 31, 2023

Our annual cash incentive compensation plan for the fiscal year ending December 31, 2023 is generally consistent with the program for the fiscal year ended December 31, 2022. The Compensation Committee, after reviewing assessments provided by management along with market data from FW Cook, determined each NEOs Target Award percentage of salary for the fiscal year 2023. Company Objectives, including revenue, adjusted gross margin, adjusted EBITDA, and weightings were established to determine threshold, target, and maximum performance goals for the 2023 annual bonus.

Equity incentive compensation

The Compensation Committee believes that equity incentives in the form of service vesting-based restricted stock awards and market-based restricted stock awards are effective instruments for long-term compensation. Equity incentives align individual and team performance with the achievement of the Company's strategic and financial goals, long-term value creation, and shareholders' interests. Restricted stock awards are impacted by all stock price changes, so the value to the executive officers is affected by both increases and decreases in stock price from the market price at the date of grant.

For the fiscal year ended December 31, 2022, the Compensation Committee considered a number of factors in determining what, if any, equity incentive compensation to grant to the executive officers, including:

- the performance of the Company during the fiscal year
- the number of shares subject to, and exercise price of, outstanding options held by the executive officers
- the number of restricted stock units held by the executive officers
- the vesting schedule of the unvested equity awards held by the executive officers
- the financial statement impact of any equity award
- the amount and percentage of the total equity on a diluted basis held by the executive officers
- the available shares under the Company's equity incentive plan

The target split of the long-term equity incentive compensation awards made to our NEOs, based upon dollar value, is 50% market-based, and 50% service vesting-based restricted stock awards. We granted our NEOs these equity incentive instruments in 2022, 2021, and 2020 and we anticipate that we will continue to include these grants as part of our long-term incentive compensation program going forward for the reasons noted above.

In February 2022, the Compensation Committee granted the following long-term incentive compensation awards to each of the named executive officers of the Company. These awards are split based upon dollar value between service vesting-based restricted stock awards (50%) and market-based restricted stock awards (50%).

Name	Service-vesting based stock awards (#)	Market-based Stock Units (#)
Michael Rice	70,094	70,094
Aby J Mathew	21,029	21,029
Roderick de Greef	23,365	23,365
Troy Wichterman	23,365	23,365
Karen Foster	16,356	16,356

Service vesting-based equity awards granted in 2022 will vest one-quarter of the shares in one year with the remainder vesting quarterly over three years. Market-based restricted stock awards contain a market condition based on Total Shareholder Return ("TSR"). The TSR market condition measures the Company's performance against a peer group. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2022 through December 31, 2023 as compared to the total shareholder return of our 20 company peer group.

2023 long-term equity incentive compensation

In January 2023, the Compensation Committee granted long-term incentive compensation awards to each of the NEOs of the Company. Consistent with the Company's compensation philosophy and objectives, as described above, these awards are split based upon dollar value between service vesting-based restricted stock (50%) and market-based restricted stock (50%), all of which are subject to similar vesting conditions to comparable service vesting-based and market-based instruments awarded by BioLife as discussed above.

Other compensation

All full-time employees, including the executive officers, are eligible to participate in the health benefits programs, including medical, dental and vision care coverage, disability and life insurance and the Company's 401(k) plan. Under the 401(k) plan, the Company matches 100% of the first 4% of eligible compensation contributed by employees.

Tax and accounting considerations

We have not provided or agreed to provide any of the Company's executive officers or directors with a gross-up or other reimbursement for tax amounts they might pay pursuant to Section 4999 or Section 409A of the Code. Sections 280G and 4999 of the Code provide that executive officers, directors who hold significant shareholder interests and certain other service providers could be subject to significant additional taxes if they receive payments or benefits in connection with a change in control of the Company that exceed certain limits, and that we or our successor could lose a deduction on the amounts subject to the additional tax. Section 409A also imposes additional significant taxes on the individual in the event that an employee, director or service provider receives "deferred compensation" that is not exempt from or does not meet the requirements of Section 409A.

For the Company's financial statements, cash compensation, such as salary and bonus, is expensed and for income tax returns, cash compensation is generally deductible except as set forth below. For equity-based compensation, we expense the fair value of such grants over the requisite service period.

Generally, Section 162(m) of the Code disallows a federal income tax deduction for public corporations of remuneration in excess of $1 million paid for any fiscal year to a "covered employee" of the Company. With respect to taxable years beginning before January 1, 2018, remuneration in excess of $1 million was exempt from this deduction limit if it qualified as "performance-based compensation" within the meaning of Section 162(m). Pursuant to the Tax Cuts and Jobs Act of 2017, effective for taxable years beginning after December 31, 2017, Section 162(m) was amended to: (1) expand the scope of individuals who are "covered employees," including anyone who was a covered employee in any prior taxable year beginning after December 31, 2016, (2) expand the types of companies that are subject to the limitations of Section 162(m), and (3) eliminate the exception for performance-based compensation and commissions. Transition relief provided that any payment made pursuant to a written and binding agreement that was in effect as of November 2, 2017 and not subsequently materially modified, would be subject to the limitations of Section 162(m) as in effect prior to the amendment. Accordingly, compensation paid to our covered employees in excess of $1 million will not be deductible unless it qualifies for the transition relief applicable to certain arrangements in place as of November 2, 2017, as described above. Furthermore, because of the uncertainties as to the application and interpretation of Section 162(m) as revised by the Tax Cuts and Jobs Act of 2017, including the uncertain scope of the transition relief, no assurance can be given that previously granted compensation intended to satisfy the requirements for performance-based compensation will, in fact, qualify for such exception.

The Compensation Committee believes that shareholder interests are best served if the Compensation Committee retains maximum flexibility to design executive compensation programs that meet stated business objectives. For these reasons, the Compensation Committee, while considering tax deductibility as a factor in determining executive compensation, may not limit such compensation to those levels that will be deductible, particularly in light of the expansion of the covered employee group and the elimination of the exception for performance-based compensation.

Compensation risk assessment

The Compensation Committee not only considers and evaluates risks related to the Company's cash and equity-based compensation programs and practices, but also evaluates whether the Company's compensation plans encourage participants to take excessive risks that are reasonably likely to have a material adverse effect on the Company. Consistent with SEC disclosure requirements, the Compensation Committee has worked with management to assess compensation policies and practices for Company employees and has concluded that such policies and practices do not create risks that are reasonably likely to have a material adverse effect on the Company.

Executive compensation tables

Compensation earned

The following table summarizes the compensation earned during the fiscal years ended December 31, 2022, 2021 and 2020 by the Company's principal executive officer, principal financial officer, three other most highly compensated executive officers who were serving as an executive officer as of December 31, 2022 and whose total compensation exceeded $100,000. These individuals are referred to as the Company's NEOs.

Summary compensation table

The following Summary Compensation Table sets forth certain information regarding the compensation, for services rendered in all capacities to us during 2022, 2021 and 2020, of our current principal executive officer, current principal financial officer, and our three other most highly compensated executive officers at the end of 2022 (together, the "named executive officers" or "NEO").

Name and Principal Positions (a)	Year (b)	Salary ($) (c)(1)	Bonus ($) (d)	Stock Awards ($) (e)	All Other Compensation ($) (f)	Total ($) (g)
Michael Rice	2022	645,000	380,550 (2)	3,703,620 (3)	-	4,729,171
Chief Executive Officer and	2021	641,019	603,075 (4)	1,005,813 (5)	-	2,249,908
Chairman of the Board	2020	514,712	-	963,799 (6)	-	1,478,511
Aby J. Mathew	2022	419,750	111,510 (7)	1,155,834 (8)	12,200 (9)	1,699,295
Executive Vice President and	2021	419,750	207,776 (10)	579,568 (11)	11,266 (12)	1,218,361
Chief Scientific Officer	2020	407,642	-	637,388 (13)	11,333 (14)	1,056,363
Roderick de Greef	2022	450,000	185,850 (15)	1,747,823 (16)	-	2,383,673
Chief Operating Officer and	2021	412,137	223,850 (17)	544,603 (18)	-	1,180,590
President	2020	390,889	-	2,663,189 (19)	-	3,054,078
Troy Wichterman	2022	375,000	121,688 (20)	1,245,968 (21)	12,200 (22)	1,754,856
Chief Financial Officer	2021	249,077	30,000 (23)	280,024 (24)	11,463 (25)	570,564
	2020	192,308	40,000 (26)	346,109 (27)	8,892 (28)	587,309
Foster Karen A	2022	356,500	84,252 (29)	891,900 (30)	12,200 (31)	1,344,852
Chief Quality Officer	2021	356,500	156,860 (32)	492,530 (33)	11,518 (34)	1,017,408
	2020	345,731	-	541,347 (35)	-	887,078

(1) Reflects base salary earned in each applicable period.

(2) Cash incentive bonus earned in 2022. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Mr. Rice's cash incentive bonus is 100% of his base salary with additional compensation determined by the Compensation Committee.

(3) Represents fair value of 70,094 service vesting-based restricted stock and 70,094 market-based restricted stock granted on February 24, 2022, and 5,537 service vesting-based restricted stock awards granted in lieu of salary on various dates from May 2022 through August 2022. The service vesting-based restricted stock award granted February 24, 2022 will vest 1/4 of the shares on February 24, 2023 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2022 through December 31, 2023 as compared to the total shareholder return of our 20 company peer group. The service vesting-based restricted awards granted from May 2022 through August 2022 fully vested the date of grant, which can be found in the *Grants of plan-based awards* table below.

(4) Cash incentive bonus earned in 2021. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Mr. Rice's cash incentive bonus is 85% of his base salary with additional compensation determined by the Compensation Committee.

(5) Represents fair value of 7,511 service vesting-based restricted stock and 7,511 market-based restricted stock granted on February 8, 2021, and 8,487 service vesting-based restricted stock granted on April 12, 2021. The service vesting-based restricted stock award granted February 8, 2021 will vest 1/4 of the shares on February 8, 2022 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2021 through December 31, 2022 as compared to the total shareholder return of our 20 company peer group. The service vesting-based restricted award granted April 12, 2021 fully vested October 12, 2021.

(6) Represents fair value of 35,924 service vesting-based restricted stock, 28,868 market-based restricted stock, and 34,641 performance-based restricted stock granted on March 25, 2020. The service vesting-based stock award vested 1/4 of the shares on March 25, 2021 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2020 through December 31, 2021 as compared to the total shareholder return of our 20 company peer group. The performance-based restricted stock vested at 75% of the number of restricted shares granted to each recipient based on achievement of specified performance metrics approved by the Compensation Committee.

(7) Cash incentive bonus earned in 2022. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Mr. Mathews' cash incentive bonus is 45% of his base salary with additional compensation determined by the Compensation Committee.

(8) Represents fair value of 21,029 service vesting-based restricted stock and 21,029 market-based restricted stock granted on February 24, 2022, and 4,514 service vesting-based restricted stock awards granted in lieu of salary on various dates from May 2022 through August 2022. The service vesting-based restricted stock award granted February 24, 2022 will vest 1/4 of the shares on February 24, 2023 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2022 through December 31, 2023 as compared to the total shareholder return of our 20 company peer group. The service vesting-based restricted awards granted from May 2022 through August 2022 fully vested the date of grant, which can be found in the *Grants of plan-based awards* table below.

(9) This amount represents the match paid by the Company on behalf of such individual into the Company 401(k) plan on 100% of the first 4% of eligible compensation contributed by such individual during the fiscal year 2022.

(10) Cash incentive bonus earned in 2021. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Mr. Mathews' cash incentive bonus is 45% of his base salary with additional compensation determined by the Compensation Committee.

(11) Represents fair value of 4,891 service vesting-based restricted stock and 4,891 market-based restricted stock granted on February 8, 2021, and 3,360 service vesting-based restricted stock granted on April 12, 2021. The service vesting-based restricted stock award granted February 8, 2021 will vest 1/4 of the shares on February 8, 2022 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2021 through December 31, 2022 as compared to the total shareholder return of our 20 company peer group. The service vesting-based restricted award granted April 12, 2021 fully vested October 12, 2021.

(12) This amount represents the match paid by the Company on behalf of such individual into the Company 401(k) plan on 100% of the first 4% of eligible compensation contributed by such individual during the fiscal year 2021.

(13) Represents fair value of 28,451 service vesting-based restricted stock, 22,863 market-based restricted stock, and 13,718 performance-based restricted stock granted on March 25, 2020. The service vesting-based stock award vested 1/4 of the shares on March 25, 2021 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2020 through December 31, 2021 as compared to the total shareholder return of our 20 company peer group. The performance-based restricted stock vested at 75% of the number of restricted shares granted to each recipient based on achievement of specified performance metrics approved by the Compensation Committee.

(14) This amount represents the match paid by the Company on behalf of such individual into the Company 401(k) plan on 100% of the first 4% of eligible compensation contributed by such individual during the fiscal year 2020.

(15) Cash incentive bonus earned in 2022. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Mr. de Greef's cash incentive bonus is 70% of his base salary with additional compensation determined by the Compensation Committee.

(16) Represents fair value of 23,365 service vesting-based restricted stock and 23,365 market-based restricted stock granted on February 24, 2022, 12,068 service vesting-based restricted stock awards granted on January 3, 2022, and 5,882 service vesting-based restricted stock awards granted in lieu of salary on various dates from May 2022 through August 2022. The service vesting-based restricted stock award granted February 24, 2022 will vest 1/4 of the shares on February 24, 2023 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2022 through December 31, 2023 as compared to the total shareholder return of our 20 company peer group. The service vesting-based restricted award granted on January 3, 2022 vested 1/4 each quarter end during 2022 and was fully vested on December 31, 2022. The service vesting-based restricted awards granted from May 2022 through August 2022 fully vested the date of grant, which can be found in the *Grants of plan-based awards* table below.

(17) Cash incentive bonus earned in 2021. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Mr. de Greef's cash incentive bonus is 50% of his base salary with additional compensation determined by the Compensation Committee.

(18) Represents fair value of 4,740 service vesting-based restricted stock and 4,740 market-based restricted stock granted on February 8, 2021, and 3,222 service vesting-based restricted stock granted on April 12, 2021. The service vesting-based restricted stock award granted February 8, 2021 vests in 4 quarterly increments beginning on January 1, 2022, provided that Mr. de Greef continues to be employed with BioLife through the vesting dates. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2021 through December 31, 2022 as compared to the total shareholder return of our 20 company peer group. The service vesting-based restricted award granted April 12, 2021 fully vested October 12, 2021.

(19) Represents fair value of 27,282 service vesting-based restricted stock, 21,923 market-based restricted stock, and 13,154 performance-based restricted stock granted on March 25, 2020 and 100,000 service vesting-based restricted stock granted on July 22, 2020. The service vesting-based stock awarded on March 25, 2020 vested 1/4 of the shares on March 25, 2021 with the remainder vesting quarterly over 3 years. The service vesting-based stock awarded on July 22, 2020 vested 1/4 of the shares on July 22, 2021 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2020 through December 31, 2021 as compared to the total shareholder return of our 20 company peer group. The performance-based restricted stock vested at 75% of the number of restricted shares granted to each recipient based on achievement of specified performance metrics approved by the Compensation Committee.

(20) Cash incentive bonus earned in 2022. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Mr. Wichterman's cash incentive bonus is 55% of his base salary with additional compensation determined by the Compensation Committee.

(21) Represents fair value of 23,365 service vesting-based restricted stock and 23,365 market-based restricted stock granted on February 24, 2022, and 2,574 service vesting-based restricted stock awards granted in lieu of salary on various dates from May 2022 through August 2022. The service vesting-based restricted stock award granted February 24, 2022 will vest 1/4 of the shares on February 24, 2023 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2022 through December 31, 2023 as compared to the total shareholder return of our 20 company peer group. The service vesting-based restricted awards granted from May 2022 through August 2022 fully vested the date of grant, which can be found in the *Grants of plan-based awards* table below.

(22) This amount represents the match paid by the Company on behalf of such individual into the Company 401(k) plan on 100% of the first 4% of eligible compensation contributed by such individual during the fiscal year 2022.

(23) Bonus earned and paid in 2021 at the discretion of management prior to Mr. Wichterman being promoted to CFO.

(24) Represents fair value of 5,680 service vesting-based restricted stock granted on August 9, 2021. The service vesting-based stock award will vest 1/4 of the shares on August 9, 2022 with the remainder vesting quarterly over 3 years.

(25) This amount represents the match paid by the Company on behalf of such individual into the Company 401(k) plan on 100% of the first 4% of eligible compensation contributed by such individual during the fiscal year 2021.

(26) Bonus earned in 2020 was paid out in April 2021, plus bonus earned and paid in 2020 at the discretion of management prior to Mr. Wichterman being promoted to CFO.

(27) Represents fair value of 21,299 service vesting-based restricted stock granted on June 19, 2020. The service vesting-based stock award vested 1/4 of the shares on June 19, 2021 with the remainder vesting quarterly over 3 years.

(28) This amount represents the match paid by the Company on behalf of such individual into the Company 401(k) plan on 100% of the first 4% of eligible compensation contributed by such individual during the fiscal year 2020.

(29) Cash incentive bonus earned in 2022. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Ms. Foster's cash incentive bonus is 40% of her base salary with additional compensation determined by the Compensation Committee.

(30) Represents fair value of 16,536 service vesting-based restricted stock and 16,536 market-based restricted stock granted on February 24, 2022. The service vesting-based restricted stock award granted February 24, 2022 will vest 1/4 of the shares on February 24, 2023 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2022 through December 31, 2023 as compared to the total shareholder return of our 20 company peer group.

(31) This amount represents the match paid by the Company on behalf of such individual into the Company 401(k) plan on 100% of the first 4% of eligible compensation contributed by such individual during the fiscal year 2022.

(32) Cash incentive bonus earned in 2021. The cash incentive bonus earned is determined based on achieving Company Objectives set by the Compensation Committee. Ms. Foster's cash incentive bonus is 40% of her base salary with additional compensation determined by the Compensation Committee.

(33) Represents fair value of 4,157 service vesting-based restricted stock and 4,157 market-based restricted stock granted on February 8, 2021. The service vesting-based restricted stock award will vest 1/4 of the shares on February 8, 2022 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2021 through December 31, 2022 as compared to the total shareholder return of our 20 company peer group.

(34) This amount represents the match paid by the Company on behalf of such individual into the Company 401(k) plan on 100% of the first 4% of eligible compensation contributed by such individual during the fiscal year 2021.

(35) Represents fair value of 24,164 time-vested restricted stock, 19,418 market-based restricted stock, and 11,651 performance-based restricted stock granted on March 25, 2020. The time-vested stock award will vest 1/4 of the shares on March 25, 2021 with the remainder vesting quarterly over 3 years. The market-based restricted stock awards will vest as to between 0% and 200% of the number of restricted shares granted to each recipient based on our total shareholder return during the period beginning on January 1, 2020 through December 31, 2021 as compared to the total shareholder return of 20 of our peers. The performance-based restricted stock will vest as to between 0% and 125% of the number of restricted shares granted to each recipient based on certain performance metrics set forth by the Company.

The following table reflects the allocation of base salary, cash incentive compensation, equity incentive compensation, and other compensation earned by the Company's NEOs in the fiscal year 2022 as set forth in the 2022 Summary Compensation Table above.

Name	Long-Term Incentives (%)	Short-Term Incentives (%)	Base Salary (%)	Total Compensation ($)
Michael Rice	78	8	14	4,729,171
Aby J Mathew	68	7	25	1,699,295
Roderick de Greef	73	8	19	2,383,673
Troy Wichterman	71	8	21	1,754,856
Karen Foster	66	7	27	1,344,852

Grants of plan-based awards

The following table sets forth certain information regarding each grant of plan-based awards made to a named executive officer in the last completed fiscal year under any plan, including awards that subsequently have been transferred.

Name (a)	Grant Date (b)	Estimated Future Payouts Under Equity Incentive Plan Awards			All Other Stock Awards: Number of	Grant Date Fair Value of
		Threshold (#) (c)	Target (#) (d)	Maximum (#) (e)	Shares of Stock or Units (#) (e)	Stock Awards ($) (f) (1)
Michael Rice	2/24/2022	—	70,094	140,188	-	1,656,321
Michael Rice	2/24/2022	—	-	-	70,094	1,960,529
Michael Rice	5/23/2022(2)	—	-	-	964	12,397
Michael Rice	6/3/2022(2)	—	-	-	901	12,398
Michael Rice	6/17/2022(2)	—	-	-	899	12,397
Michael Rice	7/1/2022(2)	—	-	-	847	12,400
Michael Rice	7/15/2022(2)	—	-	-	779	12,394
Michael Rice	7/29/2022(2)	—	-	-	643	12,391
Michael Rice	8/12/2022(2)	—	-	-	504	12,393
Aby J. Mathew	2/24/2022	—	21,029	42,058	-	496,915
Aby J. Mathew	2/24/2022	—	-	-	21,029	588,181
Aby J. Mathew	5/23/2022(2)	—	-	-	786	10,108
Aby J. Mathew	6/3/2022(2)	—	-	-	735	10,114
Aby J. Mathew	6/17/2022(2)	—	-	-	733	10,108
Aby J. Mathew	7/1/2022(2)	—	-	-	690	10,102
Aby J. Mathew	7/15/2022(2)	—	-	-	635	10,103
Aby J. Mathew	7/29/2022(2)	—	-	-	524	10,097
Aby J. Mathew	8/12/2022(2)	—	-	-	411	10,106
Roderick de Greef	1/3/2022	—	-	-	12,068	450,016
Roderick de Greef	2/24/2022	—	23,365	46,730	-	552,115
Roderick de Greef	2/24/2022	—	-	-	23,365	653,519
Roderick de Greef	5/23/2022(2)	—	-	-	1,024	13,169
Roderick de Greef	6/3/2022(2)	—	-	-	957	13,168
Roderick de Greef	6/17/2022(2)	—	-	-	955	13,169
Roderick de Greef	7/1/2022(2)	—	-	-	900	13,176
Roderick de Greef	7/15/2022(2)	—	-	-	828	13,173
Roderick de Greef	7/29/2022(2)	—	-	-	683	13,161
Roderick de Greef	8/12/2022(2)	—	-	-	535	13,156
Troy Wichterman	2/24/2022	—	23,365	46,730	-	552,115
Troy Wichterman	2/24/2022	—	-	-	23,365	653,519
Troy Wichterman	5/23/2022(2)	—	-	-	448	5,761
Troy Wichterman	6/3/2022(2)	—	-	-	419	5,765
Troy Wichterman	6/17/2022(2)	—	-	-	418	5,764
Troy Wichterman	7/1/2022(2)	—	-	-	394	5,768
Troy Wichterman	7/15/2022(2)	—	-	-	362	5,759
Troy Wichterman	7/29/2022(2)	—	-	-	299	5,762
Troy Wichterman	8/12/2022(2)	—	-	-	234	5,754
Karen Foster	2/24/2022	—	16,356	32,712	-	386,492
Karen Foster	2/24/2022	—	—	—	16,356	457,477
Karen Foster	5/23/2022(2)	—	—	—	533	6,854
Karen Foster	6/3/2022(2)	—	—	—	498	6,852
Karen Foster	6/17/2022(2)	—	—	—	497	6,854
Karen Foster	7/1/2022(2)	—	—	—	468	6,852
Karen Foster	7/15/2022(2)	—	—	—	430	6,841
Karen Foster	7/29/2022(2)	—	—	—	355	6,841
Karen Foster	8/12/2022(2)	—	—	—	278	6,836

(1) The fair value of the market-based restricted stock awards is estimated at the date of grant using the Monte Carlo Simulation model.
(2) The grants awarded on dates indicated here were made in lieu of salary for each applicable pay period.

There were no Non-Equity Incentive Plan awards in the last completed fiscal year.

Discussion of summary compensation table and grants of plan-based awards table

The Company's executive compensation policies and practices, pursuant to which the compensation set forth in the Summary Compensation Table and the Grants of Plan-Based Awards Table was paid or awarded, are described above under "Compensation Discussion and Analysis." The material terms of employment agreements and arrangements with the Company's named executive officers are described below under the heading "Employment Arrangements."

Outstanding equity awards at December 31, 2022

The following table sets forth certain information regarding the outstanding stock option grants and stock awards held by the NEOs at December 31, 2022. Awards were made under the 2013 Performance Incentive Plan (the "2013 Plan"). For the outstanding stock option grants and stock awards described below, vesting is conditioned on the NEO remaining in service to the Company through such vesting date. Such awards may also be subject to accelerated vesting as described in "Potential Payments Upon Termination or Change in Control."

	OPTION AWARDS				
Name (a)	Number of Securities Underlying Unexercised Options (#) Exercisable (b)	Number of Securities Underlying Unexercised Options (#) Unexercisable (c)	Equity Incentive Plan Awards: Number of Securities Underlying Unexercised Unearned Options (#) (d)	Option Exercise Price ($) (e)	Option Expiration Date (f)
Michael Rice	60,000	—	—	1.90	3/15/2026[1]
Aby J. Mathew	190,000	—	—	2.06	5/4/2025[1]
Troy Wichterman	938	—	—	2.06	5/4/2025[1]
Karen Foster	100,000	—	—	1.90	4/13/2026[1]

(1) This award is fully vested.

		UNVESTED SHARES			
Name (a)	Grant Date (b)	Number of shares or units of stock that have not vested (#) (c)	Market value of shares of units of stock that have not vested(1) ($) (d)	Equity incentive plan awards: Number of unearned shares, units or other rights that have not vested (#) (e)	Equity incentive plan awards: Market or payout value of unearned shares, units or other rights that have not vested ($) (f)
Michael Rice	2/25/2019	2,219 (2)	40,386	-	-
Michael Rice	3/25/2020	11,227 (3)	204,331	-	-
Michael Rice	2/8/2021	4,225 (4)	76,895	7,511 (5)	136,700
Michael Rice	2/24/2022	70,094 (6)	1,275,711	70,094 (7)	1,275,711
Aby J. Mathew	2/25/2019	1,038 (8)	18,892	-	-
Aby J. Mathew	3/25/2020	8,891 (9)	161,816	-	-
Aby J. Mathew	2/8/2021	2,752 (10)	50,086	4,891 (11)	89,016
Aby J. Mathew	2/24/2022	21,029 (12)	382,728	21,029 (13)	382,728
Roderick de Greef	2/8/2021	-	-	4,740 (14)	86,268
Roderick de Greef	2/24/2022	23,365 (15)	425,243	23,365 (16)	425,243
Troy Wichterman	2/25/2019	122 (17)	2,220	-	-
Troy Wichterman	6/19/2020	7,988 (18)	145,382	-	-
Troy Wichterman	8/9/2021	3,195 (19)	58,149	-	-
Troy Wichterman	2/24/2022	23,365 (20)	425,243	23,365 (21)	425,243
Karen Foster	2/25/2019	730 (22)	13,286	-	-
Karen Foster	3/25/2020	7,552 (23)	137,446	-	-
Karen Foster	2/8/2021	2,339 (24)	42,570	4,157 (25)	75,657
Karen Foster	2/24/2022	16,356 (26)	297,679	16,356 (27)	297,679

(1) The dollar amounts shown in columns (d) and (f) are determined by multiplying the number of shares or units shown in column (c) or (e), as applicable, by $18.20, the closing price of BioLife's common stock on December 31, 2022.

(2) 2,219 unvested service vesting-based RSAs subject to this award vested February 25, 2023.

(3) 11,227 service vesting-based RSAs subject to this award are scheduled to vest in 5 equal quarterly increments, provided that Mr. Rice continues to be employed with BioLife through the vesting dates.

(4) 4,225 service vesting-based RSAs subject to this award are scheduled to vest in 8 equal quarterly increments, provided that Mr. Rice continues to be employed with BioLife through the vesting dates.

(5) The target number of 7,511 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return during ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2021 and December 31, 2022.

(6) 70,094 unvested service vesting-based RSAs subject to this award vested ¼ on February 24, 2023 and, thereafter, will vest in 11 equal quarterly increments, provided that Mr. Rice continues to be employed with BioLife through the vesting dates.

(7) The target number of 70,094 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return during ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2022 and December 31, 2023.

(8) 1,038 unvested service vesting-based RSAs subject to this award vested February 25, 2023.

(9) 8,891 unvested service vesting-based RSAs subject to this award are scheduled to vest in 5 equal quarterly increments, provided that Mr. Mathew continues to be employed with BioLife through the vesting dates.

(10) 2,752 unvested service vesting-based RSAs subject to this award are scheduled to vest in 8 equal quarterly increments, provided that Mr. Mathew continues to be employed with BioLife through the vesting dates.

(11) The target number of 4,891 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2021 and December 31, 2022.

(12) 21,029 unvested service vesting-based RSAs subject to this award vested ¼ on February 24, 2023 and, thereafter, will vest in 11 equal quarterly increments, provided that Mr. Mathew continues to be employed with BioLife through the vesting dates.

(13) The target number of 21,029 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return during ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2022 and December 31, 2023.

(14) The target number of 4,740 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2021 and December 31, 2022. According to the compensation agreement provided by the Compensation Committee in relation to Mr. de Greef's retirement, he will be awarded the remaining unvested shares based on the performance period referenced above upon vesting.

(15) 23,365 unvested service vesting-based RSAs subject to this award were vested on an accelerated basis according to Mr. de Greef's compensation agreement provided by the Compensation Committee in relation to his retirement. All shares vested as of January 1, 2023 prior to Mr. de Greef's retirement on January 3, 2023.

(16) The target number of 23,365 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return during ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2022 and December 31, 2023. According to the compensation agreement provided by the Compensation Committee in relation to Mr. de Greef's retirement, he will be awarded the remaining unvested shares based on the performance period referenced above upon vesting.

(17) 122 unvested service vesting-based RSAs subject to this award vested February 25, 2023.

(18) 7,988 unvested service vesting-based RSAs subject to this award will vest in 6 equal quarterly increments, provided that Mr. Wichterman continues to be employed with BioLife through the vesting dates.

(19) 3,195 unvested service vesting-based RSAs subject to this award will vest in 8 equal quarterly increments, provided that Mr. Wichterman continues to be employed with BioLife through the vesting dates.

(20) 23,365 unvested service vesting-based RSAs subject to this award vested ¼ on February 24, 2023 and, thereafter, will vest in 11 equal quarterly increments, provided that Mr. Wichterman continues to be employed with BioLife through the vesting dates.

(21) The target number of 23,365 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return during ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2022 and December 31, 2023.

(22) 730 unvested service vesting-based RSAs subject to this award vested February 25, 2023.

(23) 7,552 unvested service vesting-based RSAs subject to this award are scheduled to vest in 6 equal quarterly increments, provided that Ms. Foster continues to be employed with BioLife through the vesting dates.

(24) 2,339 unvested service vesting-based RSAs subject to this award are scheduled to vest in 8 equal quarterly increments, provided that Ms. Foster continues to be employed with BioLife through the vesting dates.

(25) The target number of 4,157 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return during ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2021 and December 31, 2022.

(26) 16,356 unvested service vesting-based RSAs subject to this award vested ¼ on February 24, 2023 and, thereafter, will vest in 12 equal quarterly increments, provided that Ms. Foster continues to be employed with BioLife through the vesting dates.

(27) The target number of 16,356 market-based RSAs is shown. Between 0% and 200% of the target number of market-based RSAs vest based on our total shareholder return during ("TSR") compared to our 20 company peer group over the relevant two-year performance period between January 1, 2022 and December 31, 2023.

Option exercises and stock vested for the fiscal year ended December 31, 2022

The following Option Exercises and Stock Vested table sets forth certain information regarding each exercise of stock options and each vesting of restricted stock during the last completed year for each of the named executive officers on an aggregated basis.

	Option Awards		Stock Awards	
Name (a)	Number of Shares Acquired on Exercise (#) (b)	Value Realized on Exercise ($) (c)	Number of Shares Acquired on Vesting (#) (d)	Value Realized on Vesting ($) (e)
Michael Rice	106,668	2,679,661	85,586	1,644,752
Aby J. Mathew	37,694	1,102,618	64,592	1,235,926
Roderick de Greef	—	—	156,475	3,476,480
Troy Wichterman	—	—	10,995	217,173
Karen Foster	—	—	53,479	1,025,190

Pension benefits

The Company has no defined benefit plans or other supplemental retirement plans for the NEOs.

Nonqualified deferred compensation

The Company has no nonqualified defined contribution plans or other nonqualified deferred compensation plans for the named executive officers.

Employment agreements

The Company entered into an employment agreement with Michael Rice, Chief Executive Officer, effective December 1, 2020 for a salary of $530,000 per year. With consideration to recommendations of FW Cook, on February 24, 2022, the Compensation Committee approved a salary increase to $645,000. The agreement provides that if Mr. Rice's employment is terminated without "Cause" (other than by reason of death or disability) or if he resigns for "Good Reason," he is entitled to a lump sum payment equal to 12 months' salary, an amount equal to the cost of 12 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest; If Mr. Rice's employment is terminated or Mr. Rice resigns for "Good Reason" upon or within 90 days following a "Change in Control", Mr. Rice is entitled to a lump sum payment equal to 24 months' salary, 100% Target Award of any cash and/or equity incentives for the current year, an amount equal to the cost of 24 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest.

The Company entered into an employment agreement with Aby Mathew, Ph.D., Chief Scientific Officer, effective December 1, 2020 for a salary of $419,800 per year. With consideration to recommendations of FW Cook, on February 24, 2022, the Compensation Committee subsequently approved a salary of $419,750. The agreement provides that if Mr. Mathew's employment is terminated without "Cause" (other than by reason of death or disability) or if he resigns for "Good Reason," he is entitled to a lump sum payment equal to 12 months' salary, an amount equal to the cost of 12 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest; If Mr. Mathew's employment is terminated or Mr. Mathew resigns for "Good Reason" upon or within 90 days following a "Change in Control", Mr. Mathew is entitled to a lump sum payment equal to 12 months' salary, 100% Target Award of any cash and/or equity incentives for the current year, an amount equal to the cost of 12 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest.

The Company entered into an employment agreement with Roderick de Greef, Chief Operating Officer, effective December 1, 2020 for a salary of $402,500 per year. Subsequently, this agreement was superseded by any an amended employment agreement entered into by the Company and Mr. de Greef, effective November 4, 2021 for a salary of $450,000 per year. The agreement provides that if Mr. de Greef's employment is terminated without "Cause" (other than by reason of death or disability) or if he resigns for "Good Reason," he is entitled to a lump sum payment equal to 12 months' salary, an amount equal to the cost of 12 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest; If Mr. de Greef's employment is terminated or Mr. de Greef resigns for "Good Reason" upon or within 90 days following a "Change in Control", Mr. de Greef is entitled to a lump sum payment equal to 18 months' salary, 100% Target Award of any cash and/or equity incentives for the current year, an amount equal to the cost of 18 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest.

The Company entered into an employment agreement with Troy Wichterman, Chief Financial Officer, effective November 4, 2021 for a salary of $325,000 per year. With consideration to recommendations of FW Cook, on February 24, 2022, the Compensation Committee approved a salary increase to $375,000. The agreement provides that if Mr. Wichterman's employment is terminated without "Cause" (other than by reason of death or disability) or if he resigns for "Good Reason," he is entitled to a lump sum payment equal to 9 months' salary, an amount equal to the cost of 9 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest; If Mr. Wichterman's employment is terminated or Mr. Witchterman resigns for "Good Reason" upon or within 90 days following a "Change in Control", Mr. Wichterman is entitled to a lump sum payment equal to 12 months' salary, 100% Target Award of any cash and/or equity incentives for the current year, an amount equal to the cost of 12 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest.

The Company entered into an employment agreement with Karen Foster, Chief Quality Officer, effective December 1, 2020 for the role of Senior Vice President and Chief Quality Officer and a salary of $356,000 per year. The agreement provides that if Ms. Foster's employment is terminated without "Cause" (other than by reason of death or disability) or if she resigns for "Good Reason," she is entitled to a lump sum payment equal to 6 months' salary, an amount equal to the cost of 6 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest; If Ms. Foster's employment is terminated or Ms. Foster resigns for "Good Reason" upon or within 90 days following a "Change in Control", Ms. Foster is entitled to a lump sum payment equal to 12 months' salary, 100% Target Award of any cash and/or equity incentives for the current year, an amount equal to the cost of 12 months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date, plus a tax gross-up amount with respect to such premiums, and unvested stock options, awards, or other equity grants shall immediately fully vest.

For purposes of each of these employment agreements, a "Change in Control" means (i) the consummation of a merger or consolidation of the Company with or into another entity, (ii) the dissolution, liquidation or winding up of the Company or (iii) the sale of all or substantially all of the Company's assets. The foregoing notwithstanding, a merger or consolidation of the Company shall not constitute a "Change in Control" if immediately after such merger or consolidation a majority of the voting power of the capital stock of the continuing or surviving entity, or any direct or indirect parent corporation of such continuing or surviving entity, will be owned by the persons who were the Company's stockholders immediately prior to such merger or consolidation in substantially the same proportions as their ownership of the voting power of the Company's capital stock immediately prior to such merger or consolidation.

Under each employment agreement, "Cause" means the Company's belief that any of the following has occurred: (i) any breach of the employment agreement by the executive officer; (ii) any failure to perform assigned job responsibilities that continues unremedied for a period of 10 days after written notice to the executive officer by the Company; (iii) the executive officer's malfeasance or misconduct in connection with the executive officer's duties under the employment agreement or any act or omission of the executive officer which is materially injurious to the financial condition or business reputation of the Company or any of its subsidiaries or affiliates, (iv) commission of a felony or misdemeanor or failure to contest prosecution for a felony or misdemeanor; (v) the Company's reasonable belief that the executive officer engaged in a violation of any statute, rule or regulation, any of which in the judgment of the Company is harmful to the business or to Company's reputation; (vi) the Company's reasonable belief that the executive officer engaged in unethical practices, dishonesty or disloyalty; or (vii) any reason that would constitute "cause" under the laws the State of Washington.

Under each employment agreement, "Good Reason" for the executive officer to terminate his or her employment means the following: (i) the Company's material breach of the terms of the employment agreement or any other written agreement between the executive officer and Company; (ii) the assignment to the executive officer of any duties that are substantially inconsistent with or materially diminish the executive officer's position prior to execution of the employment agreement; (iii) a material reduction of the executive officer's salary, other than as a result of a general salary reduction affecting substantially all Company employees; (iv) any failure by the Company to obtain the assumption of the employment agreement by any successor or assign of the Company; or (v) a requirement that the executive officer be based at any office or location more than 50 miles from the executive officer's primary work location prior to the effective date of the employment agreement.

Potential payments upon termination or change in control

Employment agreements with executives dictate that, upon a change of control through (i) the consummation of a merger or consolidation of the Company with or into another entity, (ii) the dissolution, liquidation, or winding up of the Company, or (iii) the sale of all or substantially all of the Company's assets whereby the majority of the voting power of the shares of the continuing or surviving entity is owned by persons who were not shareholders of the Company immediately prior to such transaction is not substantially the same in proportions to their ownership of the voting power of the Company's shares immediately prior to the transaction, the Company will pay the executive's salary through the date of termination, twelve months (or 24 months for Mr. Rice) of the executive's salary as severance pay, the total value of all outstanding cash or stock bonus opportunities in the current year, and an amount equivalent to the cost of medical insurance premiums for twelve (or 24) months.

Assuming the NEOs employment was terminated by the Company without cause or the NEOs resigned for good reason and such event took place on December 31, 2022, each of the NEOs would have been entitled to the payments and benefits shown in the table below.

	Payments and Benefits			
Name	Base Salary Continuation ($)	Accelerated Vesting of Equity Awards ($) (1)	Health Insurance Under COBRA ($)	Total ($)
Michael Rice	645,000	4,101,734	17,719	4,764,453
Aby J Mathew	419,750	4,543,266	8,061	4,971,077
Roderick de Greef[2]	450,000	936,754	25,682	1,412,436
Troy Wichterman	375,000	1,073,309	11,991	1,366,550
Karen Foster	178,250	2,684,318	8,859	2,871,427

(1) The dollar amounts shown are based on the intrinsic value of the stock options and restricted stock awards on December 31, 2022 calculated using $18.20, the closing price of BioLife's common stock on December 31, 2022.
(2) Mr. de Greef retired from his position on January 3, 2023.

Assuming the NEO's employment was terminated by the Company or the NEOs resigned for good reason within 90 days following a change in control and such event took place on December 31, 2022, each of the NEOs would have been entitled to the payments and benefits shown in the table below.

	Payments and Benefits				
Name	Base Salary Continuation ($)	2022 Annual Cash Inventive ($)	Accelerated Vesting of Equity Awards ($) (1)	Health Insurance Under COBRA ($)	Total ($)
Michael Rice	1,290,000	380,550	4,101,734	35,438	5,807,722
Aby J Mathew	419,750	111,510	4,543,266	8,061	5,082,587
Roderick de Greef[2]	675,000	185,850	936,754	38,523	1,836,127
Troy Wichterman	375,000	121,688	1,073,309	15,988	1,585,984
Karen Foster	356,500	84,252	2,684,318	17,719	3,142,789

(1) The dollar amounts shown are based on the intrinsic value of the stock options and restricted stock awards on December 31, 2022 calculated using $18.20, the closing price of BioLife's common stock on December 31, 2022.
(2) Mr. de Greef retired from his position on January 3, 2023.

CEO pay ratio

Pursuant to a mandate of the Dodd-Frank Act, the SEC adopted a rule requiring that we annually disclose the ratio of our median employee's total annual compensation to the total annual compensation of our CEO, Michael Rice, who is also our principal executive officer (the "CEO Pay Ratio").

The Company's compensation and benefits philosophy and the overall structure of the compensation and benefit programs are broadly similar across the organization and aim to encourage and reward all employees who contribute to the Company's success. The Company strives to ensure the pay of every employee reflects the level of his or her job impact and responsibilities and is competitive within the Company's peer group. Compensation rates are benchmarked and are generally set to be market-competitive in the country in which the jobs are performed. The Company's ongoing commitment to pay equity is critical to successfully supporting a diverse workforce with opportunities for all employees to grow, develop, and contribute.

We identified the median employee using total salary and wages earned, then subtracting bonuses earned in 2021 but paid in 2022, adding bonuses earned in 2022 but not paid until 2023, adding the fair value of equity awards granted to the employee during 2022, and adding other compensation. Salary and wages were annualized for any employees hired during the most recent fiscal year. A total of 467 US based employees who were employed by the Company on December 31, 2022, the last day of the Company's fiscal year, were included in the determination of this calculation (including all employees, whether employed on a full-time, part-time, seasonal or temporary basis).

As illustrated in the table below, the Company's 2022 CEO Pay Ratio was approximately 47:1.

Michael Rice (CEO) 2022 Compensation	$	4,729,171
Median Employee 2022 Compensation	$	100,315
CEO Pay Ratio		47:1

To determine the median employee, we included all individuals employed as of December 31, 2022. Compensation for the median employee was determined in the same manner as the total compensation reported for Mr. Rice in the "Total" column of the Summary Compensation Table. The pay ratio reported above is a reasonable estimate calculated in a manner consistent with SEC rules, based on the Company's internal records and the methodology described above. The SEC rules for identifying the median compensated employee allow companies to adopt a variety of methodologies, to apply certain exclusions and to make reasonable estimates and assumptions that reflect their employee populations and compensation practices. Accordingly, the pay ratio reported by other peer companies may not be comparable to the pay ratio reported above, as other companies have different employee populations and compensation practices and may use different methodologies, exclusions, estimates and assumptions in calculating their own pay ratios.

Director compensation

Each of our non-employee directors, during the year ended December 31, 2022, were compensated with an annual retainer fee of $50,000. Committee chairpersons were compensated with additional annual retainers as follows:

		Annual Retainer
Audit Committee Chair	$	10,000
Compensation Committee Chair	$	5,000
Governance and Nominating Committee Chair	$	5,000

A total of $200,167 in cash director compensation was recorded during the year ended December 31, 2022, which varied by director depending on when their services began or ended. The following table sets forth information regarding compensation earned by our non-employee directors for the year ended December 31, 2022.

Name (1)	**Annual Cash Retainer ($) (2)**	**Board and Committee Chair Fees ($)**	**Total Cash Compensation ($)**
Amy DuRoss	50,000	5,000	55,000
Rachel Ellingson	50,000	-	50,000
Joydeep Goswami	50,000	5,000	55,000
Tim Moore[3]	16,667	-	16,667
Joseph Schick	50,000	10,000	60,000

(1) Michael Rice did not receive compensation for his services as Board Chairman.
(2) Due to the timing of member resignations and appointments, the annual cash retainers vary depending on the respective period of time each director served.
(3) Mr. Moore joined the board as a Director and member of both the Compensation Committee and Governance and Nominating Committee in September 2022, serving for 4 months of the year.

The Company's compensation practices for non-employee directors, as determined by the Compensation Committee and our independent compensation consultant, FW Cook, includes annual awards of restricted shares of Common Stock. In February 2022, the Compensation Committee, based upon the recommendation of the independent compensation consultant, FW Cook, determined equity compensation for non-employee directors will be based on a fixed value of $180,000 rather than a fixed number of shares. These awards vest one year from the date of grant, provided such person is still a director on such vesting date.

Director compensation table for the fiscal year ended December 31, 2022

The following table sets forth a summary of the compensation the Company paid to its non-employee directors in the year ended December 31, 2022.

Name	Fees Earned or Paid in Cash ($) (1)	Stock Awards ($) (2)	Total Compensation ($)
Amy DuRoss	45,750	195,969	241,719
Rachel Ellingson	40,833	194,144	234,977
Joydeep Goswami	44,583	195,386	239,970
Tim Moore	20,000	180,011	200,011
Joseph Schick	49,000	196,984	245,984

(1) For three months of the year ended December 31,2022, the Directors agreed to be compensated in stock awards in lieu of their cash retainer fees. The totals below therefore represent cash paid to each Director. The remainder of their compensation is captured in the Stock Awards column. Tim Moore was not compensated in lieu of cash during the year as his appointment on September 1, 2022 was subsequent to this event.

(2) Represents the grant date fair value of awards granted in 2022 calculated in accordance with the ASC Topic 718. The assumptions the Company used for calculating the grant date fair values are set forth in Note 1: “Organization and significant accounting policies – Stock-based Compensation.”

The non-employee directors of the Board who held such position on December 31, 2022 held the following aggregate number of unvested restricted stock units as of such date:

Name	Number of Unvested Restricted Stock Units (#)
Amy DuRoss	14,730
Rachel Ellingson	14,730
Joydeep Goswami	14,730
Tim Moore	7,589
Joseph Schick	14,730

The following table presents the grant date fair value of each restricted stock award in the fiscal year ended December 31, 2022 to non-employee directors, computed in accordance with the ASC Topic 718:

Name	Grant Date	Number of Securities Stock Awards (#)	Grant Date Fair Value of Stock Awards ($)
Amy DuRoss	5/6/2022	14,730	180,001
Amy DuRoss	6/1/2022(1)	343	4,582
Amy DuRoss	7/1/2022(1)	389	5,695
Amy DuRoss	8/1/2022(1)	295	5,691
Rachel Ellingson	5/6/2022	14,730	180,001
Rachel Ellingson	6/1/2022(1)	311	4,155
Rachel Ellingson	7/1/2022(1)	341	4,992
Rachel Ellingson	8/1/2022(1)	259	4,996
Joydeep Goswami	5/6/2022	14,730	180,001
Joydeep Goswami	6/1/2022(1)	343	4,582
Joydeep Goswami	7/1/2022(1)	369	5,402
Joydeep Goswami	8/1/2022(1)	280	5,401
Tim Moore	9/1/2022	7,589	180,011
Joseph Schick	5/6/2022	14,730	180,001
Joseph Schick	6/1/2022(1)	374	4,997
Joseph Schick	7/1/2022(1)	409	5,988
Joseph Schick	8/1/2022(1)	311	5,999

(1) The grants awarded on dates indicated here were made in lieu of director fees for each applicable distribution date.

Compensation Committee interlocks and insider participation

Ms. DuRoss, Mr. Schick, Ms. Ellingson, and Mr. Moore were the members of the Compensation Committee during the year ended December 31, 2022. No member of the Compensation Committee is a current or former employee of the Company or had any relationship with the Company requiring disclosure herein. No interlocking relationship exists between any member of the Board or the Compensation Committee and any member of the board or Compensation Committee of any other company and no such interlocking relationship has existed in the past.

Second Amended and Restated 2013 Performance Incentive Plan

The Second Amended and Restated 2013 Performance Incentive Plan and the award agreements entered into thereunder include certain provisions that may result in a payment to, or acceleration of vesting of awards held by, a named executive officer in connection with a change in control. A change in control is defined as: (a) the acquisition, directly or indirectly, in one transaction or a series of related transactions, by any person or group (within the meaning of Section 13(d)(3) of the Exchange Act) of the beneficial ownership of securities of the Company possessing more than fifty percent (50%) of the total combined voting power of all outstanding securities of the Company; (b) a merger or consolidation of the Company with any other entity, whether or not the Company is the surviving entity in such transaction, except for a transaction in which the holders of the outstanding voting securities of the Company immediately prior to such merger or consolidation hold as a result of holding Company securities prior to such transaction, in the aggregate, securities possessing more than fifty percent (50%) of the total combined voting power of all outstanding voting securities of the Company or of the surviving entity (or the parent of the surviving entity) immediately after such merger or consolidation; (c) the sale, transfer or other disposition (in one transaction or a series of related transactions) of all or substantially all of the assets of the Company; or (d) the approval by the stockholders of a plan or proposal for the liquidation or dissolution of the Company.

In the event of a change in control, the Administrator (as defined in the plan) has the discretion to provide in each award agreement for (i) the vesting of options to accelerate automatically upon a change in control of the Company (as defined in the plan) and (ii) the assumption of awards by the acquiring or successor entity (or parent thereof) or replacement by such entity with new options or other incentives upon a change in control of the Company. The terms of the Company's outstanding option agreements under the plan provide for accelerated vesting upon the occurrence of the change in control transaction, provided, that the Administrator in its sole discretion may provide for the purchase or exchange of each option for an amount of cash or other property having a value equal to the difference between (x) the value of the cash or other property that you would have received pursuant to the change in control transaction in exchange for the shares issuable upon exercise of the option had the option been exercised immediately prior to the change in control transaction, and (y) the exercise price of the option. Outstanding options shall terminate and cease to be exercisable upon consummation of a change in control except to the extent that such awards are assumed by the successor entity pursuant to the terms of the change in control transaction. The Administrator shall give written notice of a proposed change in control transaction to the holder not less than fifteen (15) days prior to the anticipated effective date of the proposed transaction.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT RELATED STOCKHOLDER MATTERS

The following table sets forth, as of March 21, 2023, certain information regarding the beneficial ownership of Common Stock by (i) each stockholder known by the Company to be the beneficial owner of more than 5% of the outstanding shares thereof; (ii) each director and nominee of the Company; (iii) each named executive officer of the Company; and (iv) all of the Company's current directors and executive officers (including executive officers that are not named executive officers) as a group. This table is based upon information supplied by officers, directors, and principal stockholders and Schedule 13D(s) and Schedule 13G(s) filed with the SEC.

Name and Address of Beneficial Owner	Common Stock	Percentage of Class
Directors and Executive Officers		
Aby J. Mathew (Officer)(1)	380,112	0.9%
Michael Rice (Officer and Director)(2)	355,264	0.8%
Karen Foster (Officer)(3)	190,382	0.4%
Todd Berard (Officer)(4)	122,964	0.3%
Roderick de Greef (Director)(5)	35,254	0.1%
Geraint Phillips (Officer)(6)	28,315	0.1%
Joseph Schick (Director)(7)	21,449	0.0%
Rachel Ellingson (Director)(8)	20,641	0.0%
Joydeep Goswami (Director)(9)	18,660	0.0%
Amy DuRoss (Director)(10)	18,157	0.0%
Troy Wichterman (Officer)(11)	16,261	0.0%
Sarah Aebersold (Officer)(12)	16,038	0.0%
Marcus Schulz (Officer)(13)	10,672	0.0%
Tim Moore (Director)	-	0.0%
Total shares owned by Executive Officers and Directors (12 persons)	1,234,169	2.8%
5% Stockholders		
Casdin Capital, LLC(14)	7,566,292	17.3%
Blackrock, Inc.(15)	5,477,126	12.5%
The Vanguard Group(16)	2,466,931	5.7%

Except as indicated by footnote, and subject to community property laws where applicable, we believe that the persons named in the table have sole voting and investment power with respect to all shares shown as beneficially owned by them. Unless otherwise indicated, the business address of each person listed is in care of 3303 Monte Villa Parkway, #310, Bothell, WA 98021.

(1) Includes options to purchase 150,000 shares of Common Stock issuable under stock options exercisable within 60 days from March 21, 2023 and 6,975 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(2) Includes options to purchase 60,000 shares of Common Stock issuable under stock options exercisable within 60 days from March 21, 2023 and 10,226 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(3) Includes options to purchase 100,000 shares of Common Stock issuable under stock options exercisable within 60 days from March 21, 2023 and 5,928 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(4) Includes options to purchase 30,000 shares of Common Stock issuable under stock options exercisable within 60 days from March 21, 2023 and 5,085 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(5) Includes 4,470 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(6) Includes 337 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(7) Includes 14,730 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(8) Includes 14,730 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(9) Includes 14,730 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(10) Includes 14,730 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(11) Includes 1,687 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(12) Includes 4,101 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(13) Includes 5,696 shares of Common Stock to be issued pursuant to restricted stock awards within 60 days from March 21, 2023.
(14) Based on a Form 4 filed on September 1, 2021. Consists of 7,566,292 shares of Common Stock. The business address of Casdin Capital, LLC is 1350 Avenue of the Americas, Suite 2405, New York, New York 10019.
(15) Based on a Schedule 13G filed on January 26, 2023. Consists of 5,477,126 shares of Common Stock. The business address of Blackrock, Inc. is 55 East 52nd Street, New York, New York 10055.
(16) Based on a Schedule 13G filed on February 9, 2023. Consists of 2,466,931 shares of Common Stock. The business address of The Vanguard Group is 100 Vanguard Blvd., Malvern, Pennsylvania 19355.

Section 16(a) of the Exchange Act requires the Company's directors and executive officers, and persons who own more than 10% of a registered class of the Company's equity securities, to file with the SEC reports of beneficial ownership and reports of changes in beneficial ownership in the Company's securities. Based solely upon a review of Forms 3, 4 and 5, and amendments thereto, filed electronically with the SEC during the year ended December 31, 2022, the Company believes that all Section 16(a) filings applicable to its directors, officers, and 10% stockholders were filed on a timely basis during the year ended December 31, 2022, except those filed by Michael Rice, Aby Mathew, Karen Foster, Roderick de Greef, Troy Wichterman, Sarah Aebersold, Todd Berard, and Marcus Schulz each filed one late Form 4 reporting one transaction on March 9, 2022.

Equity Compensation Plan Information

The following table sets forth information as of December 31, 2022 relating to all our equity compensation plans:

Plan category	Number of securities to be issued upon exercise of outstanding options (in thousands)	Weighted Average exercise price of outstanding options	Number of granted restricted stock awards outstanding (in thousands)	Number of securities remaining available for future issuance (in thousands)
Second amended and restated 2013 performance incentive plan	401	$ 2.00	2,054	2,150

Changes in Control

The Company knows of no arrangements resulting in a change in control of the Company. No officer, director, promoter, or affiliate of the Company has, or proposes to have, any direct or indirect material interest in any asset proposed to be acquired by the Company through security holdings, contracts, options, or otherwise.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

Certain relationships and related transactions

Since January 1, 2022, there has not been, nor has there been proposed, any transaction, arrangement or relationship or series of similar transactions, arrangements or relationships, including those involving indebtedness not in the ordinary course of business, to which we or our subsidiaries were or are a party, or in which we or our subsidiaries were or are a participant, in which the amount involved exceeded or exceeds the lesser of $120,000 or 1% of the average of our total assets at year-end for the last two completed fiscal years and in which any of our directors, nominees for director, executive officers, beneficial owners of more than 5% of any class of our voting securities, or any member of the immediate family of any of the foregoing persons, had or will have a direct or indirect material interest, other than as described above under the headings “Executive Compensation” and “Board of Directors-Director Compensation” and other than the transactions described below. Each of the transactions described below was reviewed and approved or ratified by the Audit Committee of the Board. It is anticipated that any future transactions between us and our officers, directors, principal stockholders and affiliates will be on terms no less favorable to us than could be obtained from unaffiliated third-parties. In accordance with our Audit Committee’s charter, all such transactions will be reviewed and approved by our Audit Committee and a majority of the independent and disinterested members of the Board.

Director independence

Our board of directors is responsible for determining the independence of our directors. For purposes of determining director independence, our board of directors has applied the definitions set forth in NASDAQ Rule 5605(a)(2) and the related rules of the SEC. Based upon its evaluation, our board of directors has affirmatively determined that the following directors meet the standards of independence: Mr. Schick, Ms. DuRoss, Ms. Ellingson, Mr. Goswami, and Mr. Moore.

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES

Independent Registered Public Accounting Firm Fees

The following table sets forth the aggregate fees billed by our current independent auditors, Grant Thornton LLP (“Grant Thornton”), for professional services rendered in the fiscal year ended December 31, 2022.

	2022
Audit fees(1)	$ 1,257,800
Total	$ 1,257,800

(1) Audit fees consist of professional services for the audit of our annual financial statements, review of financial statements included in our Form 10-Q or services that are normally provided by the accountant in connection with statutory and regulatory filings or engagement for those fiscal years.

Audit Committee Pre-Approval Policies and Procedures

The Audit Committee must pre-approve all services to be performed for us by our independent auditors. Pre-approval is granted usually at regularly scheduled meetings of the Audit Committee. If unanticipated items arise between regularly scheduled meetings of the Audit Committee, the Audit Committee has delegated authority to the chairman of the Audit Committee to pre-approve services. The Audit Committee also may approve the additional unanticipated services by either convening a special meeting or acting by unanimous written consent. During the years ended December 31, 2022 and 2021, all services billed by Grant Thornton and BDO were pre-approved by the Audit Committee Chair in accordance with this policy.

Change in Accounting Firm

On April 2, 2022, as approved by our Audit Committee, the Company dismissed BDO as the Company’s independent registered public accounting firm.

During the fiscal years ended December 31, 2021 and 2020, BDO’s audit reports on the Company's financial statements did not contain an adverse opinion or disclaimer of opinion, nor were they qualified or modified as to uncertainty, audit scope or accounting principles. However, BDO’s audit report on the Company’s internal control over financial reporting as of December 31, 2021, contained an adverse opinion due to the material weaknesses noted below. BDO was not required to report on the Company’s internal control over financial reporting as of December 31, 2020.

During the fiscal years ended December 31, 2021 and 2020 and the subsequent period through the date of the Current Report on Form 8-K filed on April 7, 2022, (i) there were no disagreements between the Company and BDO on any matter of accounting principles or practices, financial statement disclosure or auditing scope or procedures, which disagreements, if not resolved to BDO's satisfaction, would have caused BDO to make reference to the subject matter of the disagreements in connection with its audit reports on the Company's financial statements; and (ii) there were no "reportable events" as the term is described in Item 304(a)(1)(v) of Regulation S-K, except for the disclosure of material weaknesses in the Company's internal controls over financial reporting as disclosed in Part II, Item 9A of the Company's Form 10-K for the years ended December 31, 2021 and December 31, 2020, related to inappropriately designed entity-level controls impacting the control environment, risk assessment, and monitoring activities to prevent or detect material misstatements to the consolidated financial statements attributed to an insufficient number of qualified resources and inadequate oversight and accountability over the performance of controls, ineffective identification and assessment of risks impacting internal control over financial reporting, and ineffective monitoring controls; information system logical access within certain key financial systems; accounting policies and procedures and related controls over complex financial statement areas; accounting policies, procedures, and related controls over assets held for lease; accounting policies, procedures, and related controls over the preparation and review of projected financial information used in determining the valuation of acquired intangible assets and contingent consideration in business combinations as well as the quantitative impairment analysis of indefinite-lived intangible assets; and policies, procedures, and related controls over the presentation and disclosure of amounts presented in the consolidated financial statements in accordance with the applicable financial reporting requirements.

The Committee approved the engagement of Grant Thornton as the Company's new independent registered public accounting firm, which engagement was effective as of April 6, 2022. During the fiscal years ended December 31, 2021 and 2020 and through the date of their engagement, neither the Company nor anyone acting on its behalf consulted Grant Thornton with respect to (i) the application of accounting principles to a specified transaction, either completed or proposed, nor the type of audit opinion that might be rendered on the Company's financial statements, and neither a written report was provided to the Company nor oral advice provided that Grant Thornton concluded was an important factor considered by the Company in reaching a decision as to any accounting, auditing or financial reporting issue; or (ii) any matter that was the subject of a disagreement or a "reportable event" as described in Items 304(a)(1)(iv) and (v), respectively, of Regulation S-K.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) The following documents are filed as part of this Annual Report on Form 10-K:

(1) Financial Statements (Included Under Item 8): The Index to the Financial Statements is included in this Annual Report on Form 10-K and is incorporated herein by reference.

(2) Financial Statement Schedules: Schedules to the Financial Statements have been omitted because the information required to be set forth therein is not applicable or is shown in the accompanying Financial Statements or notes thereto.

(b) Exhibits

Exhibit Number	Document
2.1†*	Stock Purchase Agreement, dated September 18, 2020, by and among the Company, SciSafe, the stockholders of SciSafe party thereto and Garrie Richardson (included as Exhibit 2.1 to the current report on Form 8-K filed on September 24, 2020)
2.2†*	Agreement and Plan of Merger, dated as of March 19, 2021, by and among the Company, BLFS Merger Subsidiary, Inc., Global Cooling, Inc. and Albert Vierling and William Baumel, in their capacity as the representatives of the stockholders of Global Cooling, Inc. (included as Exhibit 2.1 to the current report on Form 8-K filed on March 25, 2021)
2.3†	Agreement and Plan of Merger, dated as of August 9, 2021, by and among the Company, BLFS Merger Sub, Inc., Sexton Biotechnologies, Inc. and Fortis Advisors LLC, in their capacity as the representatives of the stockholders of Sexton Biotechnologies, Inc. (incorporated by reference to Exhibit 2.6 to Company's report on Form 10-K filed March 31, 2022)
3.1	Amended and Restated Certificate of Incorporation of BioLife Solutions, Inc. (included as Exhibit 4.1 to the Registration Statement on Form S-8 filed on June 24, 2013)
3.2	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of BioLife Solutions, Inc. (included as Exhibit 3.1 to the Current Report on Form 8-K filed on January 30, 2014)
3.3	Amended and Restated Bylaws of BioLife Solutions, Inc., effective April 25, 2013 (included as Exhibit A to the Registrant's Definitive Information Statement on Schedule 14C filed March 27, 2013)
3.4	Certificate of Designations, Preferences, and Rights of Series A Preferred Stock (included as Exhibit 3.1 to the current report on Form 8-K filed on July 6, 2017)
4.1	Description of the Company's Securities Registered under Section 12 of the Exchange Act (incorporated by reference to the Company's registration statement on Form 8-A, as filed on March 19, 2014)
10.1**	Second Amended and Restated 2013 Performance Incentive Plan (included as Appendix A to the Registrant's Definitive Proxy Statement filed on April 14, 2017)

10.2**	Amendment No. 1 to Second Amended and Restated 2013 Performance Incentive Plan (included as Exhibit 10.2 to the Annual Report on Form 10-K for the fiscal y ear ended December 31, 2020 filed March 31, 2021)
10.3**	BioLife Solutions, Inc. Form of Non-Plan Stock Option Agreement (included as Exhibit 4.4 to the Registration Statement on Form S-8 filed on June 24, 2013)
10.4**	Form of Restricted Stock Purchase Agreement pursuant to the Second Amended & Restated 2013 Performance Incentive Plan (included as Exhibit 10.4 to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2016 filed on May 16, 2016)
10.5**	Form of Stock Option Agreement pursuant to the Second Amended & Restated 2013 Performance Incentive Plan (included as Exhibit 10.5 to the Quarterly Report on Form 10-Q for the quarter ended March 31, 2016 filed on May 16, 2016)
10.6	Amendment No. 2 to BioLife Solutions, Inc. Second Amended and Restated 2013 Performance Incentive Plan (incorporated by reference to Exhibit 4.5 of the Registrant's Registration Statement on Form S-8 filed on July 7, 2021)
10.7	Amendment No. 3 to BioLife Solutions, Inc. Second Amended and Restated 2013 Performance Incentive Plan (incorporated by reference to Exhibit 4.6 of the Registrant's Registration Statement on Form S-8 filed on September 12, 2022)
10.8	Lease Agreement dated August 1, 2007 for facility space 3303 Monte Villa Parkway, Bothell, WA 98021 (included as Exhibit 10.27 and Exhibit 10.29 to the Annual Report on Form 10-KSB for the fiscal year ended December 31, 2007 filed April 1, 2008)
10.9	Eleventh Amendment to the Lease, dated February 22, 2022, by and between the Company and ARE-SEATTLE No. 38, LLC (incorporated by reference to Exhibit 10.20 to Company's report on Form 10-K filed March 31, 2022)
10.10	Lease Agreement dated January 29, 2021 for facility space 301 Treble Cove Road, Billerica, MA 01862 (filed incorporated by reference to Exhibit 10.21 to Company's report on Form 10-K filed March 31, 2022)
10.11	Commercial Lease and Deposit Receipt Agreement dated November 2, 2020 for facility space 3505 and 3507 Edison Way, Menlo Park, CA 94025 (incorporated by reference to Exhibit 10.22 to Company's report on Form 10-K filed March 31, 2022)
10.12	Extension and Amendment of Lease dated December 19, 2022 for facility space 3505 and 3507 Edison Way, Menlo Park, CA 94025 (filed herewith)
10.13	Lease Agreement dated April 1, 2011 for facility space 6000 Poston Road, The Plains, OH 45710 (incorporated by reference to Exhibit 10.24 to Company's report on Form 10-K filed March 31, 2022)
10.14	Lease Extension Agreement dated May 30, 2018 for facility space 6000 Poston Road, The Plains, OH 45710 (incorporated by reference to Exhibit 10.25 to Company's report on Form 10-K filed March 31, 2022)
10.15	Lease Agreement dated October 1, 2019 for facility space 1102 Indiana Avenue, Indianapolis, IN 46202 (incorporated by reference to Exhibit 10.26 to Company's report on Form 10-K filed March 31, 2022)
10.16	First Amendment to the Lease, dated August 31, 2021 for facility space 1102 Indiana Avenue, Indianapolis, IN 46202 (incorporated by reference to Exhibit 10.27 to Company's report on Form 10-K filed March 31, 2022)
10.17	Loan and Security Agreement, dated September 20, 2022, between BioLife Solutions, Inc. and Silicon Valley Bank (incorporated by reference to Exhibit 10.1 to the Company's report on Form 10-Q filed November 9, 2022)
10.18	Amended Employment Agreement dated December 1, 2020 between the Company and Michael Rice (incorporated by reference to Exhibit 10.11 to the Company's report on Form 10-K filed March 31, 2022)
10.19	Amended Employment Agreement dated December 1, 2020 between the Company and Aby Mathew (incorporated by reference to Exhibit 10.12 to the Company's report on Form 10-K filed March 31, 2022)
10.20	Amended Employment Agreement dated December 1, 2020 between the Company and Todd Berard (incorporated by reference to Exhibit 10.13 to the Company's report on Form 10-K filed March 31, 2022)
10.21	Amended Employment Agreement effective December 1, 2020 between the Company and Karen Foster (incorporated by reference to Exhibit 10.17 to the Company's report on Form 10-K filed March 31, 2022)
10.22	Amended Employment Agreement dated November 4, 2021 between the Company and Roderick de Greef (incorporated by reference to Exhibit 10.33 to the Company's report on Form 10-K filed March 31, 2022)
10.23	Employment Agreement dated January 1, 2021 between the Company and Sarah Aebersold (incorporated by reference to Exhibit 10.24 to the Company's report on Form 10-K filed March 31, 2022)
10.24	Amended Employment Agreement dated December 31, 2020 between the Company and Marcus Schulz (incorporated by reference to Exhibit 10.11 to the Company's report on Form 10-K filed March 31, 2022)
10.25	Amended Employment Agreement dated November 4, 2021 between the Company and Troy Wichterman (incorporated by reference to Exhibit 10.36 to the Company's report on Form 10-K filed March 31, 2022)

10.26	Employment Agreement dated November 9, 2021 between the Company and Geraint Phillips (filed herewith)
10.27	Board of Directors Services Agreement entered into May 4, 2015 by and between the Company and Other Non-Employee Directors (included as Exhibit 10.3 to the Current Report on Form 8-K filed on May 5, 2015)
10.28	Amended Employment Agreement dated January 1, 2023 between the Company and Executive Officers (filed herewith)
21.1	List of the Company's Subsidiaries
23.1	Consent of Grant Thornton LLP (filed herewith)
23.2	Consent of BDO USA, LLP (filed herewith)
31.1	Certification pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 (filed herewith)
31.2	Certification pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 (filed herewith)
32.1	Certification pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (filed herewith)
32.2	Certification pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (filed herewith)
101.INS	Inline XBRL Instance Document (filed herewith)
101.SCH	Inline XBRL Taxonomy Extension Schema (filed herewith)
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase (filed herewith)
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase (filed herewith)
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase (filed herewith)
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase (filed herewith)
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)

* Certain sensitive financial, commercial and strategic information relating to the Company has been redacted in the marked portions of the exhibit.
** Management contract or compensatory plan or arrangement.
† The exhibits and schedules to this Exhibit have been omitted in accordance with Regulation S-K Item 601(b)(2). The Registrant agrees to furnish supplementally a copy of all omitted exhibits and schedules to the Securities and Exchange Commission upon its request.

(c) Excluded financial statements:

None.

ITEM 16. FORM 10-K SUMMARY

The Company has elected not to include a summary pursuant to this Item 16.

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.

Date: March 31, 2023

BIOLIFE SOLUTIONS, INC.

/s/ MICHAEL RICE
Michael Rice
Chief Executive Officer (principal executive officer) and Chairman of the Board of Directors

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.

Date: March 31, 2023

/s/ MICHAEL RICE
Michael Rice
Chief Executive Officer (principal executive officer) and Chairman of the Board of Directors

Date: March 31, 2023

/s/ TROY WICHTERMAN
Troy Wichterman
Chief Financial Officer (principal financial officer and principal accounting officer)

Date: March 31, 2023

/s/ RODERICK DE GREEF
Roderick De Greef
Director

Date: March 31, 2023

/s/ JOSEPH SCHICK
Joseph Schick
Director

Date: March 31, 2023

/s/ AMY DUROSS
Amy DuRoss
Director

Date: March 31, 2023

/s/ RACHEL ELLINGSON
Rachel Ellingson
Director

Date: March 31, 2023

/s/ JOYDEEP GOSWAMI
Joydeep Goswami
Director

Date: March 31, 2023

/s/ TIM MOORE
Tim Moore
Director

Exhibit 10.12

December 19, 2022

Biolife Solutions

3505/3507 Edison Way

Menlo Park, CA, 94025

Re: Rent increases for 2023 for suites 3505/3507

Greetings Biolife Solutions Team,

Based on the latest executed lease extension clause 6, it was agreed upon to have a 6% rental rate increase for the 2023 year. There was an option to increase the common area, however, Edison Technology Park has decided to keep the common area cost as is, even though the cost to ETP has increased for all utilities.

The new rental rates for your suites are as follows:

3505/3507 Edison Way Rental rate increase for the months of January 1, 2023 thru December 31, 2023	Total Sq Ft	Cost / sq. ft.	Total Cost
Based on lease extension clause 6- Base rent increase of 6% ($.21/sq.ft.) from latest payment rate of $ 3.50 / sq. ft. for a new rate of $ 3.71 / sq. ft.	3460	$ 3.71	$ 12,836.60
Common area remains unchanged from current rate of $ .17/ sq. ft.	3460	$ 0.17	$ 588.20
Until 2022 True up is complete, the monthly estimated electrical charge will remain unchanged			$ 660.00
Total monthly charges			$ 14,084.80

We will send out new January invoices to reflect the new rental rates. We appreciate your longstanding commitment to Edison Technology Park, and we wish your company the best in 2023. If you have any questions, please do not hesitate to reach out.

AMENDED EXECUTIVE EMPLOYMENT AGREEMENT

THIS EXECUTIVE EMPLOYMENT AGREEMENT ("Agreement") is made between BioLife Solutions Inc., a Delaware corporation ("Employer" or the "Company"), and Geraint Phillips ("Executive"). Executive and the Company are sometimes referred to herein as the "Parties." The effective date is November 9, 2021. This Agreement supersedes and replaces all prior employment agreements between Company and Executive, including any amendments thereto.

RECITALS

A. Employer is in the business (the "Business") of manufacturing and marketing biopreservation media and cold chain products for cells, tissues, and organs.

B. Employer desires to obtain the services of Executive, in which capacity Executive has access to Employer's Confidential Information (as hereinafter defined), and to obtain assurance that Executive will protect Employer's Confidential Information and will not compete with Employer or solicit its customers or its other employees during the term of employment and for a reasonable period of time after termination of employment pursuant to this Agreement, and Executive is willing to agree to these terms.

C. Executive desires to be assured of the salary and other benefits provided for in this Agreement.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual covenants herein contained, and other good and valuable consideration, the sufficiency and receipt of which are hereby acknowledged, the parties agree as follows:

1. **Employment**.

a. Employer hereby employs Executive, and Executive agrees to be employed as Vice President of Operations, ULT Freezer Platform ("VP Ops – ULT Freezer"), reporting to the Chief Operating Officer, in accordance with the terms and conditions set forth in this Agreement. Changes may be made from time to time by Employer and/or the Board in its sole discretion to the duties, authorities, reporting relationships and title of Executive.

b. Executive will devote full time, attention, and best efforts to achieving the purposes and discharging the responsibilities of the VP Ops – ULT Freezer. Executive will comply with all rules, policies and procedures of Employer as modified from time to time, including without limitation, rules and procedures set forth in the Employer's employee handbook, supervisor's manuals and operating manuals. Executive will perform all of Executive's responsibilities in compliance with all applicable laws and will ensure that the operations that Executive manages are in compliance with all applicable laws. During Executive's employment, Executive will not engage in any other business activity which, in the reasonable judgment of the Employer, conflicts with the duties of Executive under this Agreement, whether or not such activity is pursued for gain, profit or other pecuniary advantage.

c. Nothing herein shall preclude Executive from: (1) continuing to serve on the board of directors or trustees of any business corporation or any charitable organization on which Executive currently serves and which is identified on Exhibit A hereto, or (2) subject to the prior approval of the Board, appointment to any additional directorships or trusteeships, or (3) serving in an advisory role for other business entities, provided in each case, and in the aggregate, that such activities do not interfere with the performance of Executive's duties hereunder or conflict with Section 7 of this Agreement.

2. **Term of Employment**. The term of employment ("Term") will not be for a definite period, but rather continue indefinitely until terminated in accordance with the terms and conditions of this Agreement.

3. **Compensation**. For the duration of Executive's employment hereunder, the Executive will be entitled to compensation which will be computed and paid pursuant to the following subparagraphs.

a. **Base Salary**. Employer will pay to Executive a base salary ("Base Salary") at an annual rate of three hundred thousand dollars ($300,000), payable in such installments (but in no event less than monthly), subject to withholdings and deductions as required or permitted by law, as is Employer's policy with respect to other employees. Executive's Base Salary will be reviewed periodically by the Board of Directors of Employer during the term of Executive's employment and may be adjusted in the sole discretion of the Board of Directors based on such review, but will not be reduced by Employer unless a material adverse change in the financial condition or operations of Employer has occurred or unless Executive's responsibilities are altered to reflect less responsibility.

b. **Performance Bonus**. Employer under direction of its Board may pay or cause to be paid to Executive such Bonus as it from time to time determines appropriate.

4. **Other Benefits**.

a. **Certain Benefits.** Executive will be eligible to participate in all employee benefit programs established by Employer that are applicable to management personnel such as medical, pension, disability and life insurance plans on a basis commensurate with Executive's position and in accordance with Employer's policies from time to time, but nothing herein shall require the adoption or maintenance of any such plan.

b. **Vacations, Holidays and Expenses**. Executive will be provided accrued paid vacation of four (4) weeks each calendar year, which shall be the maximum number of days Executive may accrue at any time, and which shall be taken at such times as are consistent with Executive's responsibilities hereunder. Executive will be provided such holidays and vacation as Executive makes available to its management level employees generally. Employer will reimburse Executive in accordance with company policies and procedures for reasonable expenses necessarily incurred in the performance of duties hereunder against appropriate receipts and vouchers indicating the specific business purpose for each such expenditure. In no case shall any reimbursement be made later than December 31st of the year following the calendar year in which such expense is incurred.

c. **Right of Set-off**. By accepting this Agreement, Executive consents to a deduction from any amounts Employer owes Executive from time to time (including amounts owed to Executive as wages or other compensation, fringe benefits, or vacation pay, as well as any other amounts owed to Executive by Employer), to the extent of the amounts Executive owes to Employer. Whether or not Employer elects to make any set-off in whole or in part, if Employer does not recover by means of set-off the full amount Executive owes it, calculated as set forth above, Executive agrees to pay immediately the unpaid balance to Employer.

5. **Termination, Discharge**.

a. **For Cause.** Employer will have the right to immediately terminate Executive's services and this Agreement for Cause. "Cause" means the Employer's belief that any of the following has occurred:

(i) any breach of this Agreement by Executive, including, without limitation, breach of Executive's covenants in Sections 7, 8, 9, 10, 11 or 12;

(ii) any failure to perform assigned job responsibilities that continues unremedied for a period of ten (10) days after written notice to Executive by Employer;

(iii) Executive's malfeasance or misconduct in connection with Executive's duties hereunder or any act or omission of Executive which is materially injurious to the financial condition or business reputation of the Company or any of its subsidiaries or affiliates,

(iv) commission or conviction of a felony or misdemeanor (other than a misdemeanor traffic violation), including a plea of guilty or failure to contest prosecution for a felony or misdemeanor;

(v) the Employer's reasonable belief that Executive engaged in a violation of any statute, rule or regulation, any of which in the judgment of Employer is harmful to the Business or to Employer's reputation;

(vi) the Employer's reasonable belief that Executive engaged in unethical practices, dishonesty or disloyalty, unless Executive has evidence establishing that Employer directed Executive to commit such practice or act;

(vii) or any reason that would constitute Cause under the laws the State of Washington.

Upon termination of Executive's employment hereunder for Cause, the Company shall pay the Executive no later than fourteen (14) days from the termination date in a lump sum: (x) Executive's salary through the date of termination, (y) for any unused vacation time, and (z) for any unreimbursed business expenses that are subject to reimbursement under Employer's then current policy on business expenses. Executive will have no rights to any unvested benefits or any other compensation or payments after the termination date.

b. **Due to Death or Disability.** Employer will have the right to immediately terminate Executive's services and this Agreement due to death or disability. For purposes of this Agreement, "disability" means the incapacity or inability of Executive, whether due to accident, sickness or otherwise, as determined by a medical doctor acceptable to the Board of Directors of Employer and confirmed in writing by such doctor, to perform the essential functions of Executive's position under this Agreement, with or without reasonable accommodation (provided that no accommodation that imposes undue hardship on Employer will be required) for a period of sixty (60) consecutive days or for an aggregate of ninety (90) days during any period of twelve (12) months, or such longer period as may be required under disability law.

Upon termination of Executive's employment hereunder due to death or disability, the Company shall pay the Executive no later than fourteen (14) days from the termination date in a lump sum: (i) Executive's salary through the date of termination, (ii) a prorated portion of any incentive bonus opportunity previously approved by the Board, (iii) for any unused vacation time, and (iv) for any unreimbursed business expenses that are subject to reimbursement under Employer's then current policy on business expenses. Upon termination of Executive's employment hereunder due to death or disability, all unvested stock options, awards, or other equity grants or awards shall immediately fully vest for the benefit of Executive's estate. Executive or Executive's estate (as the case may be) shall be entitled to receive any vested benefits required to be paid by law and any vested compensation required to be paid by law.

c. **Without Cause.** Employer may terminate Executive's employment under this Agreement without cause and without advance notice; provided, however, that Employer will pay (unless subparagraph 5(d) of this Agreement applies, in which case the provisions therein shall govern), no later than fourteen (14) days from the termination date in a lump sum:

(i) (x) Executive's salary through the date of termination, (y) for any unused vacation time, and (z) for any unreimbursed business expenses that are subject to reimbursement under Employer's then current policy on business expenses.

(ii) severance pay of twelve (12) months' worth of Executive's salary at the rate in effect on the termination date.

(iii) the amount equal to the cost of twelve (12) months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date; and

(iv) an additional tax gross up payment in an amount necessary so that the amount received by Executive to cover COBRA premiums under Section 5(c)(iii) after all applicable withholding tax is deducted (using applicable supplemental wage withholding rates) is the full amount Executive would have received under Section 5(c)(iii) if no tax withholding was made.

Such payments will be subject to all appropriate deductions and withholdings. Upon termination of Executive's employment hereunder due to termination without cause, all unvested stock options, awards, or other equity grants or awards shall immediately fully vest. Executive or Executive's estate (as the case may be) shall be entitled to receive any vested benefits required to be paid by law and any vested compensation required to be paid by law.

Executive shall only be entitled to such severance pay if, within thirty (30) days following the date of termination, both Employer and Executive have signed (and then Executive does not rescind, as may be permitted by law) a mutual general release of claims in a form mutually acceptable to both parties (provided, however, that such release of claims shall only require each party to release the other party from claims relating directly to Executive's employment and the termination thereof, and shall not require Executive to release claims relating to vested employee benefits or relating to other matters, including, but not limited to, claims relating to Executive's status as a shareholder of the Company.

d. **Change in Control**.

(i) For purposes of this Agreement, Change in Control shall mean (x) the consummation of a merger or consolidation of the Company with or into another entity, (y) the dissolution, liquidation or winding up of the Company or (z) the sale of all or substantially all of the Company's assets. The foregoing notwithstanding, a merger or consolidation of the Company shall not constitute a "Change in Control" if immediately after such merger or consolidation a majority of the voting power of the capital stock of the continuing or surviving entity, or any direct or indirect parent corporation of such continuing or surviving entity, will be owned by the persons who were the Company's stockholders immediately prior to such merger or consolidation in substantially the same proportions as their ownership of the voting power of the Company's capital stock immediately prior to such merger or consolidation.

(ii) Employer may terminate Executive's employment under this Agreement upon or within 90 days following a Change in Control without advance notice; provided, however, that Employer will pay, no later than sixty (60) days from the termination date in a lump sum:

(A) (i) Executive's salary through the date of termination, (ii) for any unused vacation time, and (iii) for any unreimbursed business expenses that are subject to reimbursement under Employer's then current policy on business expenses;

(B) as severance pay, twelve (12) months' worth of Executive's salary at the rate in effect on the termination date;

(C) 100% of any incentive cash and/or stock bonus opportunity for the current year;

(D) the amount equal to the cost of twelve (12) months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date; and

(E) an additional tax gross up payment in an amount necessary so that the amount received by Executive to cover COBRA premiums under Section 5(d)(ii)(D) after all applicable withholding tax is deducted (using applicable supplemental wage withholding rates) is the full amount Executive would have received under Section 5(d)(ii)(D) if no tax withholding was made.

(iii) Executive shall only be entitled to such severance pay if, within thirty (30) days following the date of termination, both Employer and Executive have signed (and then Executive does not rescind, as may be permitted by law) a mutual general release of claims in a form mutually acceptable to both parties (provided, however, that such release of claims shall only require each party to release the other party from claims relating directly to Executive's employment and the termination thereof, and shall not require Executive to release claims relating to vested employee benefits or relating to other matters, including, but not limited to, claims relating to Executive's status as a shareholder of the Company.

(iv) Upon termination of Executive's employment hereunder due to a Change in Control, all unvested stock options, awards, or other equity grants or awards shall immediately fully vest. Executive or Executive's estate (as the case may be) shall be entitled to receive any vested benefits required to be paid by law and any vested compensation required to be paid by law.

e. **No Fault Termination By Executive.** Executive may terminate Executive's employment under this Agreement for any reason provided that Executive gives Employer at least ninety (90) days' notice in writing. Employer may, at its option, accelerate such termination date to any date at least two weeks after Executive's notice of termination. Employer may also, at its option, relieve Executive of all duties and authority after notice of termination has been provided. Upon termination of Executive's employment in accordance with this Section, Company shall pay the Executive no later than fourteen (14) days from the termination date in a lump sum: (i) Executive's salary through the date of termination, (ii) for any unused vacation time, and (iii) for any unreimbursed business expenses that are subject to reimbursement under Employer's then current policy on business expenses. Such payments will be subject to all appropriate deductions and withholdings. Upon termination, Executive will have no rights to any unvested benefits or any other compensation.

f. **Termination By Executive for Good Reason**. Executive's employment pursuant to this Agreement shall terminate in the event Executive shall determine that there is "Good Reason" to terminate Executive's employment, which shall mean the following:

(i) Employer's material breach of the terms of this Agreement or any other written agreement between Executive and Employer; or

(ii) The occurrence of any of the following conditions, without Executive's consent:

(A) a significant diminution in the nature or scope of Executive's authority, title, function or duties, excluding a change in reporting to a person other than who executive reports to as of the Effective Date of this Agreement;

(B) a ten percent (10%) reduction in Executive's base salary or a twenty-five percent (25%) reduction in Executive's target bonus opportunity (unless such reduction is part of a Company officer-wide program to reduce expenses);

(C) any material breach of the terms of this Agreement by the Company; or

(D) failure of any successor or assignee to the Company to assume this Agreement.

Provided that Executive has provided with notice of the existence of a condition giving rise to "Good Reason" to terminate within ninety (90) days following the initial existence of such a condition, Employer shall have thirty (30) days to cure any such alleged breach, assignment, reduction or requirement referenced above, after Executive provides Employer written notice of the actions or omissions constituting such breach, assignment, reduction or requirement.

If Executive resigns Executive's employment for Good Reason, Executive shall be paid no later than fourteen (14) days from the termination date in a lump sum:

I. (i) Executive's salary through the date of termination, (ii) for any unused vacation time, and (iii) for any unreimbursed business expenses that are subject to reimbursement under Employer's then current policy on business expenses.

II. severance pay of twelve (12) months' worth of Executive's salary at the rate in effect on the termination date.

III. the amount equal to the cost of twelve (12) months' medical insurance premiums at a monthly amount equal to the amount of COBRA coverage in effect as of the termination date; and

IV. an additional tax gross up payment in an amount necessary so that the amount received by Executive to cover COBRA premiums under Section 5(f)(III) after all applicable withholding tax is deducted (using applicable supplemental wage withholding rates) is the full amount Executive would have received under Section 5(f)(III) if no tax withholding was made.

Such payments will be subject to all appropriate deductions and withholdings. Upon termination of Executive's employment hereunder due to resignation for good reason, all unvested stock options, awards, or other equity grants or awards shall immediately fully vest. Executive or Executive's estate (as the case may be) shall be entitled to receive any vested benefits required to be paid by law and any vested compensation required to be paid by law.

Executive shall only be entitled to such severance pay if, within thirty (30) days following the date of termination, both Employer and Executive have signed (and then Executive does not rescind, as may be permitted by law) a mutual general release of claims in a form mutually acceptable to both parties (provided, however, that such release of claims shall only require each party to release the other party from claims relating directly to Executive's employment and the termination thereof, and shall not require Executive to release claims relating to vested employee benefits or relating to other matters, including, but not limited to, claims relating to Executive's status as a shareholder of the Company.

6. **Return of Company Property.** Upon termination of this Agreement or upon request of the Company, Executive shall deliver to the Corporation all property, documents and materials pertaining to the Company's business including, but not limited to, memoranda, notes, records, drawings, manuals, disks, copies, representations, extracts, summaries and analyses, all inventory, demonstration units, and any other property, documents or media of the Corporation, and all equipment belonging to the company, including but not limited to corporate cards, access cards, office keys, office equipment, laptop and desktop computers, cell phones and other wireless devices, thumb drives, zip drives and all other media storage devices.

7. **Covenant Not To Compete.** During Executive's employment by Employer and for a period expiring one (1) year after the termination of Executive's employment for any reason, Executive covenants and agrees that Executive will not:

a. Directly, indirectly, or otherwise, own, manage, operate, control, serve as a consultant to, be employed by, participate in, or be connected, in any manner, with the ownership, management, operation or control of any business that competes with the Business or that competes with Employer or any of its affiliates or that is engaged in any type of business which, at any time during Executive's employment with Employer, Employer or any of its affiliates planned to develop;

b. Hire, offer to hire, entice away or in any other manner persuade or attempt to persuade any officer, employee or agent of Employer or any of its affiliates to alter or discontinue a relationship with Employer or to do any act that is inconsistent with the interests of Employer or any of its affiliates;

c. Directly or indirectly solicit, divert, take away or attempt to solicit, divert or take away any customers of Employer or any of its affiliates; or

d. Directly or indirectly solicit, divert, or in any other manner persuade or attempt to persuade any supplier of Employer or any of its affiliates to alter or discontinue its relationship with Employer or any of its affiliates.

For the purposes of this Section 7, businesses that are deemed to compete with Employer include, without limitation, businesses engaged in manufacturing and marketing biopreservation media for cells, tissues, and organs or cold chain management products and/or services. The geographic scope of the prohibitions in this Section 7 shall be any city, town or county in which the Company conducts or does any business as of or within one (1) year of Executive's last day of employment with the Company. Notwithstanding Executive's obligations under this Section 7, Executive will be entitled to own, as a passive investor, up to five percent (5%) of any publicly traded company without violating this provision.

Employer and Executive agree that: this provision does not impose an undue hardship on Executive and is not injurious to the public; that this provision is necessary to protect the business of Employer and its affiliates; the nature of Executive's responsibilities with Employer under this Agreement require Executive to have access to confidential information which is valuable and confidential to all of the Business; the scope of this Section 7 is reasonable in terms of length of time and geographic scope; and adequate consideration supports this Section 7, including consideration herein.

8. **Confidential Information**. Executive recognizes that Employer's business and continued success depend upon the use and protection of confidential and proprietary business information, including, without limitation, the information and technology developed by or available through licenses to Employer, to which Executive has access (all such information being "Confidential Information"). For purposes of this Agreement, the phrase "Confidential Information" includes, for Employer and its current or future subsidiaries and affiliates, without limitation, and whether or not specifically designated as confidential or proprietary: all business plans and marketing strategies; information concerning existing and prospective markets and customers; financial information; information concerning the development of new products and services; information concerning any personnel of Employer (including, without limitation, skills and compensation information); intellectual property; and technical and non-technical data related to software programs, designs, specifications, compilations, inventions, improvements, methods, processes, procedures and techniques; provided, however, that the phrase does not include information that (a) was lawfully in Executive's possession prior to disclosure of such information by Employer; (b) was, or at any time becomes, available in the public domain other than through a violation of this Agreement; (c) is documented by Executive as having been developed by Executive outside the scope of Executive's employment and independently; or (d) is furnished to Executive by a third party not under an obligation of confidentiality to Employer. Executive agrees that during Executive's employment and after termination of employment irrespective of cause, Executive will use Confidential Information only (i) while employed by the Company, in the business of and for the benefit of the Company, or (ii) when required to do so by a court of competent jurisdiction, by any governmental agency having supervisory authority over the business of the Company, or by any administrative body or legislative body (including a committee thereof) with jurisdiction to order Executive to divulge, disclose or make accessible such information, and then only after providing written notice to Employer that such a demand has been made. Executive's obligation under this Agreement is in addition to any obligations Executive has under state or federal law. Executive agrees to deliver to Employer immediately upon termination of Executive's employment, or at any time Employer so requests, all tangible items containing any Confidential Information (including, without limitation, all memoranda, photographs, records, reports, manuals, drawings, blueprints, prototypes, notes taken by or provided to Executive, and any other documents or items of a confidential nature belonging to Employer), together with all copies of such material in Executive's possession or control. Executive agrees that in the course of Executive's employment with Employer, Executive will not violate in any way the rights that any entity has with regard to trade secrets or proprietary or confidential information. Executive's obligations under this Section 8 are indefinite in term and shall survive the termination of this Agreement.

9. **Work Product and Copyrights.** Executive agrees that all right, title and interest in and to the materials resulting from the performance of Executive's duties at Employer and all copies thereof, including works in progress, in whatever media, (the "Work"), will be and remain in Employer upon their creation. Executive will mark all Work with Employer's copyright or other proprietary notice as directed by Employer. Executive further agrees:

a. To the extent that any portion of the Work constitutes a work protectable under the copyright laws of the United States (the "Copyright Law"), that all such Work will be considered a "work made for hire" as such term is used and defined in the Copyright Law, and that Employer will be considered the "author" of such portion of the Work and the sole and exclusive owner throughout the world of copyright therein; and

b. If any portion of the Work does not qualify as a "work made for hire" as such term is used and defined in the Copyright Law, that Executive hereby assigns and agrees to assign to Employer, without further consideration, all right, title and interest in and to such Work or in any such portion thereof and any copyright therein and further agrees to execute and deliver to Employer, upon request, appropriate assignments of such Work and copyright therein and such other documents and instruments as Employer may request to fully and completely assign such Work and copyright therein to Employer, its successors or nominees, and that Executive hereby appoints Employer as attorney-in-fact to execute and deliver any such documents on Executive's behalf in the event Executive should fail or refuse to do so within a reasonable period following Employer's request.

10. **Inventions and Patents.** For purposes of this Agreement, "Inventions" includes, without limitation, information, inventions, contributions, improvements, ideas, or discoveries, whether protectable or not, and whether or not conceived or made during work hours. Executive agrees that all Inventions conceived or made by Executive during the period of employment with Employer belong to Employer, provided they grow out of Executive's work with Employer or are related in some manner to the Business, including, without limitation, research and product development, and projected business of Employer or its affiliated companies. Accordingly, Executive will:

a. Make adequate written records of such Inventions, which records will be Employer's property;

b. Assign to Employer, at its request, any rights Executive may have to such Inventions for the U.S. and all foreign countries;

c. Waive and agree not to assert any moral rights Executive may have or acquire in any Inventions and agree to provide written waivers from time to time as requested by Employer; and

d. Assist Employer (at Employer's expense) in obtaining and maintaining patents or copyright registrations with respect to such Inventions.

Executive understands and agrees that Employer or its designee will determine, in its sole and absolute discretion, whether an application for patent will be filed on any Invention that is the exclusive property of Employer, as set forth above, and whether such an application will be abandoned prior to issuance of a patent. Employer will pay to Executive, either during or after the term of this Agreement, the following amounts if Executive is sole inventor, or Executive's proportionate share if Executive is joint inventor: $750 upon filing of the initial application for patent on such Invention; and $1,500 upon issuance of a patent resulting from such initial patent application, provided Executive is named as an inventor in the patent.

Executive further agrees that Executive will promptly disclose in writing to Employer during the term of Executive's employment and for one (1) year thereafter, all Inventions whether developed during the time of such employment or thereafter (whether or not Employer has rights in such Inventions) so that Executive's rights and Employer's rights in such Inventions can be determined. Except as set forth on the initialed Exhibit B (List of Inventions) to this Agreement, if any, Executive represents and warrants that Executive has no Inventions, software, writings or other works of authorship useful to Employer in the normal course of the Business, which were conceived, made or written prior to the date of this Agreement and which are excluded from the operation of this Agreement.

NOTICE: In accordance with Washington law, this Section 10 does not apply to Inventions for which no equipment, supplies, facility, or trade secret information of Employer was used and which was developed entirely on Executive's own time, unless: (a) the Invention relates (i) directly to the business of Employer or (ii) to Employer's actual or demonstrably anticipated research or development, or (b) the Invention results from any work performed by Executive for Employer.

11. **Cooperation.** The parties agree that certain matters in which Executive will be involved during the Term may necessitate Executive's cooperation in the future. Accordingly, following the termination of Executive's employment for any reason, to the extent reasonably requested by the Board, Executive shall cooperate with the Employer in connection with matters arising out of Executive's service to the Employer; provided that, the Employer shall make reasonable efforts to minimize disruption of Executive's other activities. The Employer shall reimburse Executive for reasonable expenses incurred in connection with such cooperation.

12. **Non-Disparagement.** Executive agrees and covenants that Executive will not at any time make, publish or communicate to any person or entity or in any public forum any defamatory or disparaging remarks, comments, or statements concerning the Employer or its businesses, or any of its employees, officers, and existing and prospective customers, suppliers, investors and other associated third parties. This Section 12 does not, in any way, restrict or impede Executive from exercising protected rights to the extent that such rights cannot be waived by agreement or from complying with any applicable law or regulation or a valid order of a court of competent jurisdiction or an authorized government agency, provided that such compliance does not exceed that required by the law, regulation, or order. The Executive shall promptly provide written notice of any such order to the Chief Executive Officer.

13. **Remedies**. Notwithstanding other provisions of this Agreement regarding dispute resolution, Executive agrees that Executive's violation of any of Sections 7, 8, 9, 10, 11 or 12 of this Agreement would cause Employer irreparable harm which would not be adequately compensated by monetary damages and that an injunction may be granted by any court or courts having jurisdiction, restraining Executive from violation of the terms of this Agreement, upon any breach or threatened breach of Executive of the obligations set forth in any of Sections 7, 8, 9, 10, 11 or 12. The preceding sentence shall not be construed to limit Employer from any other relief or damages to which it may be entitled as a result of Executive's breach of any provision of this Agreement, including Sections 7, 8, 9, 10, 11 or 12. Executive also agrees that a violation of any of Sections 7, 8, 9, 10, 11 or 12 would entitle Employer, in addition to all other remedies available at law or equity, to recover from Executive any and all funds, including, without limitation, wages, salary and profits, which will be held by Executive in constructive trust for Employer, received by Executive in connection with such violation.

14. **Dispute Resolution.** Except for the right of Employer and Executive to seek injunctive relief in court, any controversy, claim or dispute of any type arising out of or relating to Executive's employment or the provisions of this Agreement shall be resolved in accordance with this Section 144 regarding resolution of disputes, which will be the sole and exclusive procedure for the resolution of any disputes. This Agreement shall be enforced in accordance with the Federal Arbitration Act, the enforcement provisions of which are incorporated by this reference. Matters subject to these provisions include, without limitation, claims or disputes based on statute, contract, common law and tort and will include, for example, matters pertaining to termination, discrimination, harassment, compensation and benefits. Matters to be resolved under these procedures also include claims and disputes arising out of statutes such as the Fair Labor Standards Act, Title VII of the Civil Rights Act, the Age Discrimination in Employment Act, the Washington Minimum Wage Act, and the Washington Law Against Discrimination. Nothing in this provision is intended to restrict Executive from submitting any matter to an administrative agency with jurisdiction over such matter.

a. **Mediation.** Employer and Executive will make a good faith attempt to resolve any and all claims and disputes by submitting them to mediation in Snohomish County, Washington before resorting to arbitration or any other dispute resolution procedure. The mediation of any claim or dispute must be conducted in accordance with the then-current JAMS procedures for the resolution of employment disputes by mediation, by a mediator who has had both training and experience as a mediator of general employment and commercial matters. If the parties to this Agreement cannot agree on a mediator, then the mediator will be selected by JAMS in accordance with JAMS' strike list method. Within thirty (30) days after the selection of the mediator, Employer and Executive and their respective attorneys will meet with the mediator for one mediation session of at least four hours. If the claim or dispute cannot be settled during such mediation session or mutually agreed continuation of the session, either Employer or Executive may give the mediator and the other party to the claim or dispute written notice declaring the end of the mediation process. All discussions connected with this mediation provision will be confidential and treated as compromise and settlement discussions. Nothing disclosed in such discussions, which is not independently discoverable, may be used for any purpose in any later proceeding. The mediator's fees will be paid in equal portions by Employer and Executive, unless Employer agrees to pay all such fees.

b. **Arbitration.** If any claim or dispute has not been resolved in accordance with Section 14.a., then the claim or dispute will be determined by arbitration in accordance with the then-current JAMS employment arbitration rules and procedures, except as modified herein. The arbitration will be conducted by a sole neutral arbitrator who has had both training and experience as an arbitrator of general employment and commercial matters and who is and for at least ten (10) years has been, a partner, a shareholder, or a member in a law firm. The arbitration shall be held in Snohomish County, Washington. If Employer and Executive cannot agree on an arbitrator, then the arbitrator will be selected by JAMS in accordance with Rule 15 of the JAMS employment arbitration rules and procedures. No person who has served as a mediator under the mediation provision, however, may be selected as the arbitrator for the same claim or dispute. Reasonable discovery will be permitted and the arbitrator may decide any issue as to discovery. The arbitrator may decide any issue as to whether or as to the extent to which any dispute is subject to the dispute resolution provisions in Section 14 and the arbitrator may award any relief permitted by law. The arbitrator must base the arbitration award on the provisions of Section 14 and applicable law and must render the award in writing, including an explanation of the reasons for the award. Judgment upon the award may be entered by any court having jurisdiction of the matter, and the decision of the arbitrator will be final and binding. The statute of limitations applicable to the commencement of a lawsuit will apply to the commencement of an arbitration under Section 14.b. The arbitrator's fees will be paid in equal portions by Employer and Executive, unless Employer agrees to pay all such fees.

15. **Fees Related to Dispute Resolution**. Unless otherwise agreed, the prevailing party will be entitled to its costs and attorneys' fees incurred in any litigation or dispute relating to the interpretation or enforcement of this Agreement.

16. **409A.** It is intended that any payment or benefit that is provided pursuant to or in connection with this Agreement that is considered to be deferred compensation subject to Section 409A of the Internal Revenue Code of 1986, as amended ("Code") shall be paid and provided in a manner, and at such time and form, as complies with the applicable requirements of Section 409A of the Code to avoid the unfavorable tax consequences provided therein for non-compliance. It is further intended that the payments hereunder shall, to the maximum extent permissible under Section 409A of the Code, be exempt from Section 409A of the Code under either (i) the exception for involuntary separation pay to the extent that all payments are payable within the limitations described in Treasury Regulation Section 1.409A-1(b)(9), or (ii) the short-term deferral exception described in Treasury Regulation Section 1.409A-1(b)(4) to the extent that all payments are payable no later than two and a half months after the end of the first taxable year in which the right to the payment is no longer subject to a substantial risk of forfeiture.

a. If the Executive is a "specified employee" for purposes of Section 409A(a)(2)(B)(i) of the Code at such time, any payments to be made or benefits to be delivered in connection with the Executive's "Separation from Service" (as defined below) that constitute deferred compensation subject to Section 409A of the Code shall not be made until the later of (i) eighteen months following the Effective Date or (ii) six months plus one day after the Executive's Separation from Service (the "409A Deferral Period") as required by Section 409A of the Code, provided that the payment of any such deferred compensation may be paid immediately following the Executive's death. Payments of any such deferred compensation otherwise due to be made in installments or periodically during the 409A Deferral Period shall be accumulated and paid in a lump sum as soon as the 409A Deferral Period ends, and the balance of the payment shall be made as otherwise scheduled.

b. For purposes of this Agreement, all rights to payments and benefits hereunder shall be treated as rights to receive a series of separate payments and benefits to the fullest extent allowed by Section 409A of the Code.

c. For purposes of this Agreement, with respect to the timing of any amounts that constitute deferred compensation subject to Section 409A of the Code that depends on termination of employment or separation from service, termination of employment or separation from service shall mean a "separation from service" within the meaning of Section 409A of the Code where it is reasonably anticipated that no further services would be performed after such date or that the level of bona fide services the Executive would perform after that date (whether as an employee or independent contractor) would permanently decrease to a level less than or equal to twenty percent (20%) of the average level of bona fide services the Executive performed over the immediately preceding thirty-six (36) month period.

17. **Disclosure**. Executive agrees fully and completely to reveal the terms of this Agreement to any future employer or potential employer of Executive and authorizes Employer, at its election, to make such disclosure.

18. **Representation of Executive**. Executive represents and warrants to Employer that Executive is free to enter into this Agreement and has no contract, commitment, arrangement or understanding to or with any party that restrains or is in conflict with Executive's performance of the covenants, services and duties provided for in this Agreement, and is not contravene the terms of any statute, law, or regulation to which Executive is subject. Executive agrees to indemnify Employer and to hold it harmless against any and all liabilities or claims arising out of any unauthorized act or acts by Executive that, the foregoing representation and warranty to the contrary notwithstanding, are in violation, or constitute a breach, of any such contract, commitment, arrangement or understanding.

19. **Conditions of Employment.** Employer's obligations to Executive under this Agreement are conditioned upon Executive's timely compliance with requirements of the United States immigration laws.

20. **Assignability**. This Agreement shall not be assignable by Executive. This Agreement may be assigned by the Company to a company which is a successor in interest to substantially all of the business operations of the Company. Such assignment shall become effective when the Company notifies the Executive of such assignment or at such later date as may be specified in such notice. Upon such assignment, the rights and obligations of the Company hereunder shall become the rights and obligations of such successor company, provided that any assignee expressly assumes the obligations, rights and privileges of this Agreement.

21. **Notices.** Any notices required or permitted to be given hereunder are sufficient if in writing and delivered by hand, by facsimile, by registered or certified mail, postage prepaid, or by overnight courier, to Executive at Executive's home address as most recently updated in Executive's Human Resources records, or to BioLife Solutions, Inc., 3303 Monte Villa Parkway, #310, Bothell, WA 98021, Attention: Chief Executive Officer. Notices shall be deemed to have been given (i) upon delivery, if delivered by hand or by email, (ii) seven days after mailing, if mailed, (iii) one business day after delivery, if delivered by courier, and (iv) one business day following receipt of an appropriate electronic confirmation, if by facsimile.

22. **Severability**. If any provision of this Agreement or compliance by any of the parties with any provision of this Agreement constitutes a violation of any law, or is or becomes unenforceable or void, then such provision, to the extent only that it is in violation of law, unenforceable or void, shall be deemed modified to the extent necessary so that it is no longer in violation of law, unenforceable or void, and such provision will be enforced to the fullest extent permitted by law. The Parties shall engage in good faith negotiations to modify and replace any provision which is declared invalid or unenforceable with a valid and enforceable provision, the economic effect of which comes as close as possible to that of the invalid or unenforceable provision which it replaces. If such modification is not possible, said provision, to the extent that it is in violation of law, unenforceable or void, shall be deemed severable from the remaining provisions of this Agreement, which provisions will remain binding on the parties.

23. **Waivers.** No failure on the part of either party to exercise, and no delay in exercising, any right or remedy hereunder will operate as a waiver thereof; nor will any single or partial waiver of a breach of any provision of this Agreement operate or be construed as a waiver of any subsequent breach; nor will any single or partial exercise of any right or remedy hereunder preclude any other or further exercise thereof or the exercise of any other right or remedy granted hereby or by law.

24. **Governing Law.** Except as provided in Section 14 above, the validity, construction and performance of this Agreement shall be governed by the laws of the State of Washington without regard to the conflicts of law provisions of such laws. The parties hereto expressly recognize and agree that the implementation of this Section 2424 is essential in light of the fact that Employer has its corporate headquarters and its principal executive offices within the State of Washington, and there is a critical need for uniformity in the interpretation and enforcement of the employment agreements between Employer and its key employees. Aside from any disputes that must be resolved by arbitration as provided for in Section 14, the Snohomish County Superior Court in Washington shall have exclusive jurisdiction of any lawsuit arising from or relating to Executive's employment with, or termination from, Employer, or arising from or relating to this Agreement. Executive consents to such venue and personal jurisdiction.

25. **Counterparts.** This Agreement may be executed in counterpart in different places, at different times and on different dates, and in that case all executed counterparts taken together collectively constitute a single binding agreement.

26. **Costs and Fees Related to Negotiation and Execution of Agreement.** Each Party shall be responsible for the payment of its own costs and expenses, including legal fees and expenses, in connection with the negotiation and execution of this Agreement. Neither Party will be liable for the payment of any commissions or compensation in the nature of finders' fees or brokers' fees, gratuity or other similar thing or amount in consideration of the other Party entering into this Agreement to any broker, agent or third party acting on behalf of the other Party.

27. **Entire Agreement**. This instrument contains the entire agreement of the parties with respect to the relationship between Executive and Employer and supersedes all prior agreements and understandings, and there are no other representations or agreements other than as stated in this Agreement related to the terms and conditions of Executive's employment. This Agreement may be changed only by an agreement in writing signed by the party against whom enforcement of any waiver, change, modification, extension or discharge is sought, and any such modification will be signed by an authorized representative of Employer.

IN WITNESS WHEREOF, the parties have duly signed and delivered this Agreement as of the day and year first above written.

EMPLOYER

By: /s/ Roderick de Greef

TITLE: COO

EXECUTIVE

/s/ Geraint Phillips

DISCLOSURE OF OUTSIDE BOARD OF DIRECTORS AND TRUSTEE POSITIONS

EXHIBIT B

LIST OF INVENTIONS

Exhibit 10.28

FIRST AMENDMENT TO AMENDED EXECUTIVE EMPLOYMENT AGREEMENT

THIS FIRST AMENDMENT TO AMENDED EXECUTIVE EMPLOYMENT AGREEMENT ("Amendment") is an agreement made between BioLife Solutions, Inc., a Delaware corporation ("Employer" or the "Company"), and [NAME] ("Executive"). Executive and the Employer are sometimes referred to herein as the "Parties." The effective date is January 1, 2023 ("Effective Date").

WHEREAS, the Parties entered into that certain Amended Executive Employment Agreement effective [DATE], as amended (the "Agreement"); and

WHEREAS, the Parties wish to amend the Agreement as set forth herein;

NOW, THEREFORE, in consideration of the mutual promises and covenants set forth herein, and for other good and valuable consideration, the receipt of and sufficiency of which are hereby acknowledged, the Employer and the undersigned Executive agree as follows:

1. *Defined Terms*. Except as specifically provided herein, capitalized terms not defined herein shall have the meanings ascribed to them in the Agreement.

2. *Amendment of Section 5.d(ii)*. As of the Effective Date, Section 5.d(ii) of the Agreement is hereby deleted and replaced in its entirety with the following (exclusive of subparagraphs (A) through (E) of the Agreement which are not deleted shall remain in full force and effect):

5. . . .
d. . . .
ii. Employer may terminate Executive's employment under this Agreement or Executive may resign for Good Reason upon or within 12 months following a Change in Control without advance notice; provided, however, that Employer will pay, no later than sixty (60) days from the termination date in a lump sum:

. . .

3. *Amendment of Section 5.(d)(iv).* As of the Effective Date, Section 5.d(iv) of the Agreement is hereby deleted and replaced in its entirety with the following:

5 . . . .
d. . . .
iv. Upon termination of Executive's employment hereunder due to a Change in Control, including by Executive for Good Reason, all unvested stock options, awards, or other equity grants or awards shall immediately fully vest. Executive or Executive's estate (as the case may be) shall be entitled to receive any vested benefits required to be paid by law and any vested compensation required to be paid by law.

4. *No Other Amendments*. Nothing in this Amendment is intended to amend any language of the Agreement other than as specifically set forth above, and the remainder of the Agreement shall be unmodified and in full force and effect.

In Witness Whereof, the parties hereto have executed this First Amendment to Amended Executive Employment Agreement as of the date and year first above written.

BIOLIFE SOLUTIONS, INC.

By: /s/
Michael Rice
Chief Executive Officer and
Chairman of the Board of Directors

Executive:

[NAME]

Exhibit 21.1

SUBSIDIARIES OF THE REGISTRANT

Subsidiaries	Place of Incorporation
SAVSU Technologies, Inc.	Delaware
Arctic Solutions, Inc. dba Custom Biogenic Systems	Delaware
SciSafe Holdings, Inc.	Delaware
Global Cooling, Inc.	Delaware
Sexton Biotechnologies, Inc.	Delaware
BioLife B.V.	Netherlands

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

BioLife Solutions, Inc.
Bothell, Washington

We have issued our reports dated March 31, 2023, with respect to the consolidated financial statements and internal control over financial reporting included in the Annual Report of BioLife Solutions, Inc. on Form 10-K for the year ended December 31, 2022. We consent to the incorporation by reference of said reports in the Registration Statements of BioLife Solutions, Inc. on Forms S-3 (File Nos. 333-259249, 333-239637, 333-233912, 333-222433, and 333-208912) and on Forms S-8 (File Nos. 333-267391, 333-222437, 333-205101, and 333-189551).

/s/ Grant Thornton LLP

Bellevue, Washington
March 31, 2023

Exhibit 23.2

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

BioLife Solutions, Inc.
Bothell, Washington

We hereby consent to the incorporation by reference in the Registration Statements on Form S-3 (Nos. 333-259249, 333-239637, 333-233912, 333-222433 and 333-208912) and Form S-8 (Nos. 333-267391, 333-222437, 333-205101, and 333-189551) of BioLife Solutions, Inc. of our report dated March 31, 2022 relating to the consolidated financial statements, which appears in this Form 10-K.

/s/ BDO USA, LLP

Seattle, Washington
March 31, 2023

Exhibit 31.1

CERTIFICATION PURSUANT TO
RULE 13a-14(a) or RULE 13d-14(a) OF THE
SECURITIES EXCHANGE ACT OF 1934

I, Michael Rice, certify that:

1. I have reviewed this annual report on Form 10-K of BioLife Solutions, Inc.;

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

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

4. The registrant's other certifying officer 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 controls 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 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: March 31, 2023

/s/ Michael Rice
Michael Rice

Exhibit 31.2

CERTIFICATION PURSUANT TO
RULE 13a-14(a) or RULE 13d-14(a) OF THE
SECURITIES EXCHANGE ACT OF 1934

I, Troy Wichterman, certify that:

1. I have reviewed this annual report on Form 10-K of BioLife Solutions, Inc.;

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

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

4. The registrant's other certifying officer 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 controls 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 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: March 31, 2023

/s/ Troy Wichterman
Troy Wichterman

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 BioLife Solutions, Inc. (the "Company") on Form 10-K for the fiscal year ended December 31, 2022, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Michael Rice, Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

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

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

Dated: March 31, 2023

/s/ Michael Rice
Michael Rice
Chief Executive Officer and Chairman of the Board of Directors

Exhibit 32.2

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 BioLife Solutions, Inc. (the "Company") on Form 10-K for the fiscal year ended December 31, 2022, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Troy Wichterman, Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

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

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

Dated: March 31, 2023

/s/ Troy Wichterman
Troy Wichterman
Chief Financial Officer