UNITED STATES
SECURITIES AND EXCHANGE COMMISSION WASHINGTON, DC 20549
FORM 10-Q

☒ **Quarterly report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934**

For the quarterly period ended June 30, 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 001-33957

HARVARD BIOSCIENCE, INC.
(Exact Name of Registrant as Specified in Its Charter)

Delaware (State or other jurisdiction of Incorporation or organization)	**04-3306140** (I.R.S. Employer Identification No.)

84 October Hill Road, Holliston, Massachusetts 01746
(Address of Principal Executive Offices, including zip code)

(508) 893-8999
(Registrant's telephone number, including area code)

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

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, $0.01 par value	HBIO	The Nasdaq Global Market

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

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

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

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

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

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

As of July 29, 2022, there were 41,636,502 shares of the registrant's common stock issued and outstanding.

HARVARD BIOSCIENCE, INC.

FORM 10-Q

INDEX

	Page
PART I - FINANCIAL INFORMATION	3
Item 1. Condensed Consolidated Financial Statements (unaudited)	3
Consolidated Balance Sheets	3
Consolidated Statements of Operations	4
Consolidated Statements of Comprehensive Loss	5
Consolidated Statements of Stockholders' Equity	6
Consolidated Statements of Cash Flows	7
Notes to Unaudited Consolidated Financial Statements	8
Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations	17
Item 3. Quantitative and Qualitative Disclosures about Market Risk	23
Item 4. Controls and Procedures	23
PART II - OTHER INFORMATION	24
Item 1. Legal Proceedings	24
Item1A. Risk Factors	24
Item 2. Unregistered Sales of Equity Securities and Use of Proceeds.	24
Item 3. Defaults Upon Senior Securities	24
Item 4. Mine Safety Disclosures	24
Item 5. Other Information	24
Item 6. Exhibits	24
SIGNATURES	25

PART I. FINANCIAL INFORMATION

Item 1. Financial Statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED BALANCE SHEETS
(Unaudited, in thousands, except share and per share data)

	June 30, 2022	December 31, 2021
Assets		
Current assets:		
Cash and cash equivalents	$ 4,259	$ 7,821
Accounts receivable, net	17,847	21,834
Inventories	29,336	27,587
Other current assets	5,056	4,341
Total current assets	56,498	61,583
Property, plant and equipment, net	3,394	3,415
Operating lease right-of-use assets	6,236	6,897
Goodwill	56,232	57,689
Intangible assets, net	24,219	27,385
Other long-term assets	8,694	5,375
Total assets	$ 155,273	$ 162,344
Liabilities and Stockholders' Equity		
Current liabilities:		
Current portion of long-term debt	$ 2,720	$ 3,235
Current portion of operating lease liabilities	2,108	2,142
Accounts payable	6,810	4,911
Deferred revenue	3,612	4,266
Other current liabilities	8,104	10,762
Total current liabilities	23,354	25,316
Long-term debt, net	45,764	45,095
Deferred tax liability	2,427	1,558
Operating lease liabilities	5,806	6,488
Other long-term liabilities	418	486
Total liabilities	77,769	78,943
Commitments and contingencies - Note 12		
Stockholders' equity:		
Preferred stock, par value $0.01 per share, 5,000,000 shares authorized	-	-
Common stock, par value $0.01 per share, 80,000,000 shares authorized: 41,499,741 shares issued and outstanding at June 30, 2022; 41,142,876 shares issued and outstanding at December 31, 2021	453	452
Additional paid-in-capital	227,413	225,650
Accumulated deficit	(137,119)	(132,674)
Accumulated other comprehensive loss	(13,243)	(10,027)
Total stockholders' equity	77,504	83,401
Total liabilities and stockholders' equity	$ 155,273	$ 162,344

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF OPERATIONS
(Unaudited, in thousands, except per share data)

	Three Months Ended June 30, 2022	Three Months Ended June 30, 2021	Six Months Ended June 30, 2022	Six Months Ended June 30, 2021
Revenues	$ 29,208	$ 29,197	$ 57,986	$ 56,186
Cost of revenues	12,571	12,844	25,172	24,402
Gross profit	16,637	16,353	32,814	31,784
Sales and marketing expenses	6,587	5,730	13,274	11,116
General and administrative expenses	5,981	6,399	12,306	12,732
Research and development expenses	3,497	2,701	6,717	5,188
Amortization of intangible assets	1,454	1,465	2,920	2,929
Settlement of litigation, net - Note 13	(4,880)	-	311	-
Total operating expenses	12,639	16,295	35,528	31,965
Operating income (loss)	3,998	58	(2,714)	(181)
Other expense:				
Interest expense	(515)	(377)	(899)	(788)
Other expense, net	(62)	(313)	16	(347)
Total other expense	(577)	(690)	(883)	(1,135)
Income (loss) before income taxes	3,421	(632)	(3,597)	(1,316)
Income tax expense (benefit)	986	(222)	848	(237)
Net income (loss)	$ 2,435	(410)	$ (4,445)	$ (1,079)
Income (loss) per share:				
Basic income (loss) per common share	$ 0.06	$ (0.01)	$ (0.11)	$ (0.03)
Diluted income (loss) per common share	$ 0.06	$ (0.01)	$ (0.11)	$ (0.03)
Weighted-average common shares:				
Basic	41,304	40,152	41,256	39,960
Diluted	42,560	40,152	41,256	39,960

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(Unaudited, in thousands)

	Three Months Ended June 30,		Six Months Ended June 30,	
	2022	**2021**	**2022**	**2021**
Net loss	$ 2,435	$ (410)	$ (4,445)	$ (1,079)
Other comprehensive loss:				
Foreign currency translation adjustments	(2,517)	523	(3,216)	(802)
Comprehensive income (loss)	$ (82)	$ 113	$ (7,661)	$ (1,881)

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(Unaudited, in thousands)

Three Months Ended June 30, 2022	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Other Comprehensive Loss	Treasury Stock	Total Stockholders' Equity
Balance at March 31, 2022	41,241	$ 452	$ 226,203	$ (139,554)	$ (10,726)	$ -	$ 76,375
Stock option exercises	5	1	11	-	-	-	12
Stock purchase plan	78	-	239	-	-	-	239
Vesting of restricted stock units	244	-	-	-	-	-	-
Shares withheld for taxes	(68)	-	(279)	-	-	-	(279)
Stock-based compensation expense	-	-	1,239	-	-	-	1,239
Net income	-	-	-	2,435	-	-	2,435
Other comprehensive loss	-	-	-	-	(2,517)	-	(2,517)
Balance at June 30, 2022	41,500	$ 453	$ 227,413	$ (137,119)	$ (13,243)	$ -	$ 77,504

Three Months Ended June 30, 2021	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Other Comprehensive Loss	Treasury Stock	Total Stockholders' Equity
Balance at March 31, 2021	47,696	$ 448	$ 234,781	$ (133,055)	$ (14,391)	$ (10,668)	$ 77,115
Retirement of treasury stock	(7,746)	-	(10,668)	-	-	10,668	-
Stock option exercises	186	3	630	-	-	-	633
Stock purchase plan	56	-	202	-	-	-	202
Vesting of restricted stock units	363	-	-	-	-	-	-
Shares withheld for taxes	(69)	-	(526)	-	-	-	(526)
Stock-based compensation expense	-	-	1,164	-	-	-	1,164
Net loss	-	-	-	(410)	-	-	(410)
Other comprehensive loss	-	-	-	-	523	-	523
Balance at June 30, 2021	40,486	$ 451	$ 225,583	$ (133,465)	$ (13,868)	$ -	$ 78,701

Six Months Ended June 30, 2022	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Other Comprehensive Loss	Treasury Stock	Total Stockholders' Equity
Balance at December 31, 2021	41,143	$ 452	$ 225,650	$ (132,674)	$ (10,027)	$ -	$ 83,401
Stock option exercises	16	1	42	-	-	-	43
Stock purchase plan	78	-	239	-	-	-	239
Vesting of restricted stock units	395	-	-	-	-	-	-
Shares withheld for taxes	(132)	-	(780)	-	-	-	(780)
Stock-based compensation expense	-	-	2,262	-	-	-	2,262
Net loss	-	-	-	(4,445)	-	-	(4,445)
Other comprehensive loss	-	-	-	-	(3,216)	-	(3,216)
Balance at June 30, 2022	41,500	$ 453	$ 227,413	$ (137,119)	$ (13,243)	$ -	$ 77,504

Six Months Ended June 30, 2021	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Other Comprehensive Loss	Treasury Stock	Total Stockholders' Equity
Balance at December 31, 2020	47,153	$ 444	$ 232,357	$ (132,386)	$ (13,066)	$ (10,668)	$ 76,681
Retirement of treasury stock	(7,746)	-	(10,668)	-	-	$ 10,668	-
Stock option exercises	497	7	2,550	-	-	-	2,557
Stock purchase plan	56	-	202	-	-	-	202
Vesting of restricted stock units	703	-	-	-	-	-	-
Shares withheld for taxes	(177)	-	(990)	-	-	-	(990)
Stock-based compensation expense	-	-	2,132	-	-	-	2,132
Net loss	-	-	-	(1,079)	-	-	(1,079)
Other comprehensive loss	-	-	-	-	(802)	-	(802)
Balance at June 30, 2021	40,486	$ 451	$ 225,583	$ (133,465)	$ (13,868)	$ -	$ 78,701

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
(Unaudited, in thousands)

	Six Months Ended June 30, 2022	Six Months Ended June 30, 2021
Cash flows from operating activities:		
Net loss	$ (4,445)	$ (1,079)
Adjustments to reconcile net loss to net cash provided by operating activities:		
Depreciation	758	891
Amortization of intangible assets	2,920	2,929
Amortization of deferred financing costs	140	140
Stock-based compensation expense	2,262	2,132
Deferred income taxes and other	1,040	(303)
Investment in Convertible Preferred Stock - Note 13	(3,900)	-
Changes in operating assets and liabilities:		
Accounts receivable	3,587	323
Inventories	(2,667)	(2,526)
Other assets	(250)	(1,517)
Accounts payable and accrued expenses	(435)	1,629
Deferred revenue	(611)	(100)
Other liabilities	(575)	(714)
Net cash (used in) provided by operating activities	(2,176)	1,805
Cash flows from investing activities:		
Additions to property, plant and equipment	(913)	(357)
Additions to intangible assets	-	(150)
Net cash used in investing activities	(913)	(507)
Cash flows from financing activities:		
Borrowing on bank line of credit	5,300	-
Repayment on bank line of credit	(3,600)	(4,000)
Repayment of term debt	(1,686)	(1,000)
Debt issuance costs	-	(102)
Proceeds from exercise of stock options	282	2,759
Taxes paid related to net share settlement of equity awards	(780)	(990)
Net cash used in financing activities	(484)	(3,333)
Effect of exchange rate changes on cash	11	(45)
Decrease in cash and cash equivalents	(3,562)	(2,080)
Cash and cash equivalents at beginning of period	7,821	8,317
Cash and cash equivalents at end of period	$ 4,259	$ 6,237
Supplemental disclosures of cash flow information:		
Cash paid for interest	$ 845	$ 834
Cash paid for income taxes, net of refunds	$ 352	$ 168

See accompanying notes to condensed consolidated financial statements.

NOTES TO UNAUDITED CONSOLIDATED FINANCIAL STATEMENTS

1. Basis of Presentation and Summary of Significant Accounting Policies, and Risks and Uncertainties

Basis of Presentation and Summary of Significant Accounting Policies

The unaudited consolidated financial statements of Harvard Bioscience, Inc. and its wholly-owned subsidiaries (collectively, the "Company") as of June 30, 2022 and for the three and six months ended June 30, 2022 and 2021, have been prepared by the Company pursuant to the rules and regulations of the Securities and Exchange Commission (the "SEC"). Certain information and footnote disclosures normally included in financial statements prepared in accordance with U.S. generally accepted accounting principles ("U.S. GAAP") have been condensed or omitted pursuant to such rules and regulations. The December 31, 2021, consolidated balance sheet was derived from audited financial statements but does not include all disclosures required by U.S. GAAP. However, the Company believes that the disclosures are adequate to make the information presented not misleading. These unaudited consolidated financial statements should be read in conjunction with the consolidated financial statements and the notes thereto included in the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2021.

In the opinion of management, all adjustments, which include normal recurring adjustments necessary to present a fair statement of financial position as of June 30, 2022, results of operations and comprehensive loss and cash flows for the three and six months ended June 30, 2022 and 2021, as applicable, have been made. The results of operations for the three and six months ended June 30, 2022, are not necessarily indicative of the operating results for the full fiscal year or any future periods.

The accounting policies underlying the accompanying unaudited consolidated financial statements are set forth in Note 2 to the consolidated financial statements included in the Company's Annual Report on Form 10-K for the year ended December 31, 2021. There have been no material changes in the Company's significant accounting policies during the three and six months ended June 30, 2022.

Risks and Uncertainties

The COVID-19 pandemic has had a negative impact on the Company's operations to date and the future impacts of the pandemic and any resulting economic impact are largely unknown and continuously evolving. Since the global outbreak of COVID-19, many customers, particularly academic research institutions, have reduced laboratory work which has negatively impacted, and will continue to negatively impact, the Company's sales. Also, countries world-wide continue to issue COVID-19 related policies in an attempt to control the pandemic. In particular, during the beginning of 2022, China implemented area-wide shutdowns in order to control the spread of COVID-19, which have continued for different parts of China throughout the first half of 2022. To ensure business continuity while maintaining a safe environment for employees aligned with guidance from government and health organizations, the Company transitioned a significant portion of its workforce to work-from-home and while a portion of the workforce has returned to in-office work, travel is still being managed and the Company continues to have restrictions which can impact productivity including sales and marketing activities.

The global supply chain has experienced significant disruptions due to electronic component and labor shortages and other macroeconomic factors which have emerged since the onset of COVID-19, leading to increased cost of freight, purchased materials, and manufacturing labor costs, while also delaying customer shipments. Accordingly, these conditions in addition to the overall impact on the global economy have negatively impacted results of operations and cash flows.

Additionally, during 2022 the global economy has experienced high levels of inflation, rising interest rates and significant fluctuations in currency values. The Company's results of operations have been negatively impacted by higher costs of raw materials, labor and freight resulting from inflationary pressures and the ongoing military conflict between Russia and Ukraine, and we expect the interest paid on our debt will continue to increase in the current rising interest rate environment.

If business interruptions resulting from COVID-19 or current macroeconomic conditions described above were to be prolonged or expanded in scope, the Company's business, financial condition, results of operations and cash flows would be negatively impacted.

2. Recently Issued Accounting Pronouncements

Accounting Pronouncements to be Adopted

In November 2021, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2021-10, *Government Assistance (Topic 832), Disclosures by Business Entities About Government Assistance*, which requires entities to provide disclosures on material government assistance transactions for annual reporting periods. The disclosures include information around the nature of the assistance, the related accounting policies used to account for government assistance, the effect of government assistance on the entity's financial statements, and any significant terms and conditions of the agreements, including commitments and contingencies. The new standard impacts footnote disclosures and is effective for the Company's December 31, 2022 annual financial statements. The Company is currently evaluating the potential impact of adopting ASU 2021-10 will have on its consolidated financial statements.

In January 2017, the FASB issued ASU 2017-04, *Intangibles—Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment* (ASU 2017-04), which eliminates the performance of Step 2 from the goodwill impairment test. In performing its annual or interim impairment testing, an entity will instead compare the fair value of the reporting unit with its carrying amount and recognize any impairment charge for the amount by which the carrying amount exceeds the reporting unit's fair value. Additionally, an entity should consider income tax effects from any tax-deductible goodwill on the carrying amount of the reporting unit when measuring the goodwill impairment loss. ASU 2017-04 is effective for the Company for fiscal years beginning after December 15, 2022. The Company is currently evaluating the potential impact that adopting ASU 2017-04 will have on its consolidated financial statements.

In September 2016, the FASB issued ASU No. 2016-13, *Financial Instruments—Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments (ASU 2016-13),* which amends the impairment model by requiring entities to use a forward-looking approach based on expected losses rather than incurred losses to estimate credit losses on certain types of financial instruments, including trade receivables. This may result in the earlier recognition of allowances for losses. The FASB issued several ASUs after ASU 2016-13 to clarify implementation guidance and to provide transition relief for certain entities. ASU 2016-13 is effective for the Company for fiscal years beginning after December 15, 2022, with early adoption permitted. The Company is evaluating the impact that adopting ASU 2016-13 and related amendments will have on its consolidated financial statements.

3. Goodwill and Intangible Assets

Goodwill

The change in the carrying amount of goodwill for the six months ended June 30, 2022, were as follows:

(in thousands)	
Carrying amount at December 31, 2021	$ 57,689
Effect of change in currency translation	(1,457)
Carrying amount at June 30, 2022	$ 56,232

Intangible Assets

Identifiable intangible assets at June 30, 2022 and December 31, 2021 consist of the following:

(in thousands) Amortizable intangible assets:	Average Life*	June 30, 2022 Gross	June 30, 2022 Accumulated Amortization	June 30, 2022 Net	December 31, 2021 Gross	December 31, 2021 Accumulated Amortization	December 31, 2021 Net
Distribution agreements/customer relationships	7.4	$ 17,182	$ (8,965)	$ 8,217	$ 17,689	$ (8,675)	$ 9,014
Existing technology	3.7	38,220	(25,348)	12,872	38,707	(23,962)	14,745
Trade names and patents	4.0	8,324	(5,416)	2,908	8,496	(5,108)	3,388
Total amortizable intangible assets		$ 63,726	$ (39,729)	$ 23,997	$ 64,892	$ (37,745)	$ 27,147
Indefinite-lived intangible assets:				222			238
Total intangible assets				$ 24,219			$ 27,385

* Weighted average life in years as of June 30, 2022

Intangible asset amortization expense was $1.5 million for each of the three months ended June 30, 2022 and 2021, and $2.9 million for each of the six months ended June 30, 2022 and 2021. Estimated amortization expense of existing amortizable intangible assets for each of the five succeeding years and thereafter as of June 30, 2022, is as follows:

(in thousands)	Amortization Expense
2022 (remainder of year)	$ 2,870
2023	5,672
2024	5,375
2025	4,100
2026	2,360
Thereafter	3,620
Total	$ 23,997

4. Balance Sheet Information

The following tables provide details of selected balance sheet items as of the periods indicated:

Inventories: (in thousands)	June 30, 2022	December 31, 2021
Finished goods	$ 6,150	$ 5,646
Work in process	3,974	3,410
Raw materials	19,212	18,531
Total	$ 29,336	$ 27,587

Other Current Liabilities: (in thousands)	June 30, 2022	December 31, 2021
Compensation	$ 3,119	$ 6,048
Professional fees	628	480
Warranty costs	240	240
Customer related costs	2,097	2,265
Litigation related	472	-
Accrued income taxes	52	224
Other	1,496	1,505
Total	$ 8,104	$ 10,762

5. Restructuring and Other Exit Costs

On an ongoing basis, the Company reviews the global economy, the healthcare industry, and the markets in which it competes to identify operational efficiencies, enhance commercial capabilities, and align its cost base and infrastructure with customer needs and its strategic plans. In order to realize these opportunities, the Company undertakes restructuring-type activities from time to time to transform its business. A portion of these transformation activities are considered restructuring costs under *ASC 420 – Exit or Disposal Cost Obligations* and are discussed below.

During 2019, the Company initiated a restructuring program to improve operational efficiency and reduce costs which entailed consolidating and downsizing several sites and headcount reductions in Europe and North America. This program was completed in 2021. Restructuring costs under this program were $0.7 million and $1.2 million for the three and six months ended June 30, 2021, respectively, substantially all of which have been included as a component of general and administrative expenses.

6. Related Party Transactions

In connection with the 2014 acquisitions of Multi Channel Systems MCS GmbH (“MCS”), the Company entered into a facility lease agreement with the former principal owner of MCS who became an employee of the Company at the time of the acquisition and subsequently retired in 2021. The MCS agreement expires on December 31, 2024. Pursuant to this lease agreement, the Company made rent payments of approximately $0.1million for each of the three months ended June 30, 2022 and 2021, and $0.2 million for each of the six months ended June 30, 2022 and 2021.

7. Leases

The Company has noncancelable operating leases for offices, manufacturing facilities, warehouse space, automobiles and equipment expiring at various dates through 2030.

The components of lease expense for the three and six months ended June 30, 2022 and 2021, are as follows:

	Three Months Ended June 30,		Six Months Ended June 30,	
(in thousands)	2022	2021	2022	2021
Operating lease cost	$ 493	$ 506	$ 997	$ 1,023
Short-term lease cost	58	55	122	101
Sublease income	(26)	(26)	(51)	(51)
Total lease cost	$ 525	$ 535	$ 1,068	$ 1,073

Supplemental cash flow information related to the Company's operating leases was as follows:

	Six Months Ended June 30,	
(in thousands)	2022	2021
Cash paid for amounts included in the measurement of lease liabilities:	$ 1,173	$ 1,061
Right-of-use assets obtained in exchange for lease obligations:	$ 65	$ 400

Supplemental balance sheet information related to the Company's operating leases was as follows:

(in thousands)	June 30, 2022	December 31, 2021
Operating lease right-of-use assets	$ 6,236	$ 6,897
Current portion, operating lease liabilities	$ 2,108	$ 2,142
Operating lease liabilities, long-term	5,806	6,488
Total operating lease liabilities	$ 7,914	$ 8,630
Weighted average remaining lease term (years)	6.4	6.7
Weighted average discount rate	9.3%	9.3%

Future minimum lease payments for operating leases for each twelve-month period subsequent to June 30, 2022, are as follows:

Year Ending December 31,	
(in thousands)	
2022 (remainder of year)	$ 1,066
2023	2,105
2024	1,747
2025	1,019
2026	980
Thereafter	3,871
Total lease payments	10,788
Less imputed interest	(2,874)
Total operating lease liabilities	$ 7,914

8. Capital Stock and Stock-Based Compensation

Stock-Based Payment Awards

Stock-based awards consist of stock options, time-based restricted stock units ("RSUs"), performance-based RSUs and shares issued under the Company's employee stock purchase plan. Activity under the Company's equity incentive plans for the six months ended June 30, 2022 was as follows:

	Stock Options Outstanding	Weighted Average Exercise Price	Time-Based RSUs Outstanding	Grant Date Fair Value	Performance-Based RSUs Outstanding	Grant Date Fair Value
Balance at December 31, 2021	1,404,816	$ 3.10	1,141,164	$ 3.57	860,155	$ 3.13
Granted	-	-	690,051	5.11	205,122	5.92
Exercised	(15,597)	2.72	-	-	-	-
Vested (RSUs)	-	-	(232,157)	3.77	(163,223)	2.98
Cancelled/Forfeited	(29,928)	2.93	(54,631)	4.47	(7,823)	3.18
Balance at June 30, 2022	1,359,291	$ 3.11	1,544,427	$ 4.19	894,231	$ 3.80

Stock-based compensation expense for the three and six months ended June 30, 2022 and 2021 was allocated as follows:

	Three Months Ended June 30,		Six Months Ended June 30,	
(in thousands)	2022	2021	2022	2021
Cost of revenues	$ 52	$ 31	$ 88	$ 51
Sales and marketing expenses	192	131	346	224
General and administrative expenses	923	969	1,714	1,803
Research and development expenses	72	33	114	54
Total stock-based compensation expenses	$ 1,239	$ 1,164	$ 2,262	$ 2,132

As of June 30, 2022, the total compensation costs related to unvested awards not yet recognized is $7.4 million and the weighted average period over which it is expected to be recognized is approximately 1.9 years. The Company did not capitalize any stock-based compensation.

The weighted average estimated fair value of the performance-based RSUs that were granted during the six months ended June 30, 2022 was $5.92 per unit. The following assumptions were used to estimate the fair value of the performance-based RSUs granted during the six months ended June 30, 2022 using a Monte-Carlo valuation simulation:

	2022
Volatility	65.1%
Risk-free interest rate	1.4%
Correlation coefficient	38.5%
Dividend yield	-%

Earnings (Loss) Per Share

Basic earnings (loss) per share (EPS) is calculated by dividing net income (loss) by the number of weighted average shares of common stock outstanding during the period. The calculation of diluted earnings per share assumes conversion of stock options, time-based RSUs, and performance-based RSUs into common stock using the treasury method. The weighted average number of shares used to compute basic and diluted EPS consists of the following:

	Three Months Ended June 30,		Six Months Ended June 30,	
(in thousands)	2022	2021	2022	2021
Basic	41,304	40,152	41,256	39,960
Dilutive effect of equity awards	1,256	-	-	-
Diluted	42,560	40,152	41,256	39,960

The Company excludes from the calculation of diluted EPS the weighted average shares of underlying stock-based awards if the impact of including these potential shares would be anti-dilutive. The Company has excluded the impact of approximately 0.9 million shares and 4.8 million shares for the three months ended June 30, 2022 and 2021, and 3.7 million shares and 4.7 million shares for the six months ended June 30, 2022 and 2021, respectively.

9. Long-Term Debt

As of June 30, 2022 and December 31, 2021, the Company's borrowings were comprised of:

(in thousands)	June 30, 2022	December 31, 2021
Long-term debt:		
Term loan	$ 36,314	$ 38,000
Revolving line	13,150	11,450
Less: unamortized deferred financing costs	(980)	(1,120)
Total debt	48,484	48,330
Less: current installments	(3,000)	(3,515)
Current unamortized deferred financing costs	280	280
Long-term debt	$ 45,764	$ 45,095

On December 22, 2020, the Company entered into a Credit Agreement (the "Credit Agreement") with Citizens Bank, N.A., Wells Fargo Bank, National Association, and Silicon Valley Bank (together, the "Lenders"). The Credit Agreement provides for a term loan of $40.0 million and a $25.0 million senior revolving credit facility (including a $10.0 million sub-facility for the issuance of letters of credit and a $10.0 million swingline loan sub facility) (collectively, the "Credit Facility"). The Company's obligations under the Credit Agreement are guaranteed by certain of the Company's direct, domestic wholly-owned subsidiaries; none of the Company's direct or indirect foreign subsidiaries has guaranteed the Credit Facility. The Company's obligations under the Credit Agreement are secured by substantially all of the assets of Harvard Bioscience, Inc., and each guarantor (including all or a portion of the equity interests in certain of the Company's domestic and foreign subsidiaries). The Credit Facility matures on December 22, 2025. Issuance costs of $1.4 million are amortized over the contractual term to maturity date on a straight-line basis, which approximates the effective interest method. Available and unused borrowing capacity under the revolving line of credit was $2.9 million as of June 30, 2022. Total revolver borrowing capacity is limited by the consolidated net leverage ratio as defined under the Credit Agreement. The Credit Facility replaced the Company's prior credit facility, which was repaid with borrowings under the Credit Facility.

Borrowings under the Credit Facility will, at the option of the Company, bear interest at either (i) a rate per annum based on LIBOR for an interest period of one, two, three or six months, plus an applicable interest rate margin determined as provided in the Credit Agreement (a “LIBOR Loan”), or (ii) an alternative base rate plus an applicable interest rate margin, each as determined as provided in the Credit Agreement (an “ABR Loan”). LIBOR interest under the Credit Agreement is subject to applicable market rates and a floor of 0.50%. The alternative base rate is based on the Citizens Bank prime rate or the federal funds effective rate of the Federal Reserve Bank of New York and is subject to a floor of 1.0%. The applicable interest rate margin varies from 2.0% per annum to 3.25% per annum for LIBOR Loans, and from 1.5% per annum to 3.0% per annum for ABR Loans, in each case depending on the Company’s consolidated leverage ratio and is determined in accordance with a pricing grid set forth in the Credit Agreement. The LIBOR benchmark is expected to be phased out over time and the terms of the Credit Agreement provide for a transition to an alternate benchmark rate when that occurs. Interest on LIBOR Loans is payable in arrears on the last day of each applicable interest period, and interest on ABR Loans is payable in arrears at the end of each calendar quarter. There are no prepayment penalties in the event the Company elects to prepay and terminate the Credit Facility prior to its scheduled maturity date, subject to LIBOR breakage and redeployment costs in certain circumstances.

The effective interest rate for the three months ended June 30, 2022 and 2021, was 4.0% and 3.4%, respectively, and for the six months ended June 30, 2022 and 2021, was 3.6% and 3.3%, respectively. The carrying value of the debt approximates fair value because the interest rate under the obligation approximates market rates of interest available to the Company for similar instruments.

Commencing on March 31, 2021, the outstanding term loans amortizes in quarterly installments of $0.5 million per quarter on such date and during each of the next three quarters thereafter, $0.75 million per quarter during the next eight quarters thereafter and $1.0 million per quarter thereafter, with a balloon payment at maturity. Furthermore, within ninety days after the end of the Company’s fiscal year, the term loans may be permanently reduced pursuant to certain mandatory prepayment events including an annual “excess cash flow sweep” of 50% of the consolidated excess cash flow, as defined in the agreement; provided that, in any fiscal year, any voluntary prepayments of the term loans shall be credited against the Company’s “excess cash flow” prepayment obligations on a dollar-for-dollar basis for such fiscal year. Amounts outstanding under the revolving credit facility can be repaid at any time but are due in full at maturity.

The Credit Agreement includes customary affirmative, negative, and financial covenants binding on the Company. The negative covenants limit the ability of the Company, among other things, to incur debt, incur liens, make investments, sell assets and pay dividends on its capital stock. The financial covenants include a maximum consolidated net leverage ratio and a minimum consolidated fixed charge coverage ratio. The Credit Agreement also includes customary events of default.

On April 28, 2022, the Company entered into an amendment to the Credit Agreement and Pledge and Security Agreement (the “Amendment”), pursuant to which the Lenders and the Administrative Agent have agreed, among other things, (i) to modify the financial covenant relating to the consolidated net leverage ratio and (ii) to consent to the settlement described in Note 13- *Litigation Settlement*. In consideration for the Amendment, the Company paid a fee of $0.2 million to the Lenders and the Administrative Agent. The Company was in compliance with the covenants of the Credit Agreement, as amended by the Amendment, as of June 30, 2022.

10. Revenues

The following tables represent a disaggregation of revenue from contracts with customers for the three and six months ended June 30, 2022 and 2021:

(in thousands)	Three Months Ended June 30, 2022	Three Months Ended June 30, 2021	Six Months Ended June 30, 2022	Six Months Ended June 30, 2021
Instruments, equipment, software and accessories	$ 27,765	$ 27,992	$ 55,303	$ 53,819
Service, maintenance and warranty contracts	1,443	1,205	2,683	2,367
Total revenues	$ 29,208	$ 29,197	$ 57,986	$ 56,186

The following tables represent a disaggregation of revenue by geographic destination for the three and six months ended June 30, 2022 and 2021:

(in thousands)	Three Months Ended June 30, 2022	Three Months Ended June 30, 2021	Six Months Ended June 30, 2022	Six Months Ended June 30, 2021
United States	$ 14,075	$ 13,151	$ 26,314	$ 24,328
Europe	7,194	8,026	15,017	16,615
Asia	5,618	5,695	12,351	11,233
Rest of the world	2,321	2,325	4,304	4,010
Total revenues	$ 29,208	$ 29,197	$ 57,986	$ 56,186

Deferred revenue

The following tables provide details of deferred revenue as of the periods indicated:

(in thousands)	June 30, 2022	December 31, 2021
Service contracts	$ 1,653	$ 1,976
Customer advances	1,959	2,290
Total deferred revenue	$ 3,612	$ 4,266

During the three months ended June 30, 2022 and 2021, the Company recognized revenue of $0.6 million and $0.3 million from contract liabilities existing at December 31, 2021 and 2020, respectively. During the six months ended June 30, 2022 and 2021 the Company recognized revenue of $1.3 million and $1.5 million from contract liabilities existing at December 31, 2021 and 2020, respectively.

Allowance for Doubtful Accounts

Allowance for doubtful accounts is based on the Company's assessment of the collectability of accounts receivable. Activity in the allowance for doubtful accounts is as follows:

(in thousands)	Six Months Ended June 30, 2022	Six Months Ended June 30, 2021
Balance, beginning of period	$ 136	$ 227
Bad debt (credit) expense	107	(17)
Charge-offs and other	(48)	(65)
Balance, end of period	$ 195	$ 145

Concentrations

No customer accounted for more than 10% of revenues for the three and six months ended June 30, 2022 and 2021. At June 30, 2022 and December 21, 2021, no customer accounted for more than 10% of net accounts receivable.

11. Income Tax

Income tax expense (benefit) was $1.0 million and $(0.2) million for the three months ended June 30, 2022 and 2021, respectively, and was $0.8 million and $(0.2) million for the six months ended June 30, 2022 and 2021, respectively. The effective tax rates for the three months ended June 30, 2022 and 2021, were 28.8% and 35.1%, respectively. The effective tax rates for the six months ended June 30, 2022 and 2021, were (23.6)% and 18.0%, respectively.

The difference between the Company's effective tax rates in 2022 and 2021 compared to the U.S. statutory tax rate of 21% is primarily due to changes in valuation allowances associated with the Company's assessment of the likelihood of the recoverability of deferred tax assets. The Company currently has valuation allowances against substantially all of its net operating loss carryforwards and tax credit carryforwards.

12. Commitments and Contingent Liabilities

On April 27, 2022, the Company and Biostage, Inc. (f/k/a Harvard Apparatus Regenerative Technology, Inc.) ("Biostage") executed a settlement with the plaintiffs which resolves all claims relating to the litigation as described in Note 13 – "Litigation Settlement".

The Company is involved in various other claims and legal proceedings arising in the ordinary course of business. After consultation with legal counsel, the Company has determined that the ultimate disposition of such proceedings is not likely to have a material adverse effect on its business, financial condition, results of operations or cash flows. Although unfavorable outcomes in the proceedings are possible, the Company has not accrued for loss contingencies relating to any such matters as they are not considered to be probable and reasonably estimable. If one or more of these matters are resolved in a manner adverse to the Company, the impact on the Company's business, financial condition, results of operations and cash flows could be material.

13. Litigation Settlement

On April 14, 2017, representatives for the estate of an individual plaintiff filed a wrongful death complaint with the Suffolk Superior Court, in the County of Suffolk, Massachusetts, against the Company and other defendants, including Biostage, a former subsidiary of the Company that was spun off in 2013, as well as another third party. The complaint seeks payment for an unspecified amount of damages and alleges that the plaintiff sustained terminal injuries allegedly caused by products, including one synthetic trachea scaffold and two bioreactors, provided by certain of the named defendants and utilized in connection with surgeries performed by third parties in Europe in 2012 and 2013.

On April 27, 2022, the Company and Biostage executed a settlement with the plaintiffs of the litigation and Biostage's products liability insurance carriers (the "Settlement"), which resolved all claims by and between the parties and Biostage's product liability insurance carriers and resulted in the dismissal with prejudice of the wrongful death claim and all claims between the Company, Biostage and the insurance carriers. The Settlement was entered into solely by way of compromise and settlement and is not in any way an admission of liability or fault by the Company or Biostage. Biostage has indemnified the Company for all losses and expenses, including legal expenses, that the Company incurs in connection with the litigation and the Settlement.

During the three months ended March 31, 2022, the Company accrued $5.2 million of costs related to legal fees and the Settlement. Additionally, during the year ended December 31, 2021, the Company had incurred $0.3 million in legal fees in connection with the litigation. Due to the financial condition of Biostage, the Company determined that it was uncertain as to whether Biostage would be able to meet its indemnification obligation and had fully reserved any receivable from Biostage.

During the three months ended June 30, 2022, the Company recorded a credit of $4.9 million as a result of adjustments to the reserves against the indemnification receivable from Biostage. The adjustments reflect: i) the issuance by Biostage of 4,000 shares of its Series E Convertible Preferred Stock (the "Series E Preferred Stock") to the Company on June 10, 2022, in satisfaction of $4.0 million of Biostage's total indemnification obligation, ii) the payment by Biostage of a portion of the legal fees associated with the Settlement, and iii) other accrual adjustments. As of June 30, 2022, the Company has fully reserved approximately $0.5 million of unpaid indemnification obligation receivables from Biostage.

The Series E Preferred Stock was recorded at an estimated fair value of $3.9 million, and is included in the June 30, 2022 Consolidated Balance Sheet as a component of Other Long-Term Assets. The Series E Preferred Stock ranks senior to all classes of common stock of Biostage and all classes of preferred stock of Biostage (unless the Company consents to Biostage's issuance of other preferred stock that is senior to or pari passu with the Series E Preferred Stock) and accrues dividends at a rate of 8% per annum that are payable in additional shares of Series E Preferred Stock. Each share of Series E Preferred Stock is convertible at any time at the option of the Company into such number of shares of Biostage common stock determined by dividing (x) the $1,000 face value of the Series E Preferred Stock plus all accrued and unpaid dividends thereon by (b) the average of the volume weighted average trading prices of Biostage's common stock, which is currently quoted on the OTCQB Marketplace, for the 60 consecutive trading days prior to the conversion. In the event Biostage has a subsequent qualified offering of its common stock, (which is defined as an offering of Biostage common stock that coincides with its uplisting onto Nasdaq, the first subsequent public offering by Biostage, or the first subsequent private placement by Biostage resulting in gross proceeds to Biostage of at least $4,000,000), the Series E Preferred Stock is mandatorily converted into Biostage common stock at the applicable qualified offering price. Due to Biostage's limited operating history, their overall financial condition and the limited trading volume and liquidity of Biostage's common stock, the value of the Series E Preferred Stock could fluctuate considerably from time to time. The Company intends to liquidate its position in Biostage following future qualifying events but does not anticipate any material cash inflows in the next twelve months.

The Company has elected the provisions within *ASC 321 Investment Securities* to subsequently measure the Series E Preferred Stock at its original cost minus impairment, if any, plus or minus changes resulting from observable price changes in orderly transactions for the identical or a similar investment of Biostage.

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

Forward-Looking Statements

This Quarterly Report on Form 10-Q contains statements that are not statements of historical fact and are forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934 (the "Exchange Act"). The forward-looking statements are principally, but not exclusively, contained in "Item 2: Management's Discussion and Analysis of Financial Condition and Results of Operations." These statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance, or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements. Forward-looking statements include, but are not limited to, statements about management's confidence or expectations, and our plans, objectives, expectations, and intentions that are not historical facts. In some cases, you can identify forward-looking statements by terms such as "may," "will," "should," "could," "would," "seek," "expects," "plans," "aim," "anticipates," "believes," "estimates," "projects," "predicts," "intends," "think," "potential," "objectives," "optimistic," "strategy," "goals," "sees," "new," "guidance," "future," "continue," "drive," "growth," "long-term," "projects," "develop," "possible," "emerging," "opportunity," "pursue" and similar expressions intended to identify forward-looking statements. These statements reflect our current views with respect to future events and are based on assumptions and subject to risks and uncertainties. Given these uncertainties, you should not place undue reliance on these forward-looking statements. We discuss many of these risks in detail in our Annual Report on Form 10-K for year ended December 31, 2021. You should carefully review all of these factors, as well as other risks described in our public filings, and you should be aware that there may be other factors, including factors of which we are not currently aware, that could cause these differences. Also, these forward-looking statements represent our estimates and assumptions only as of the date of this report. We may not update these forward-looking statements, even though our situation may change in the future, unless we have obligations under the federal securities laws to update and disclose material developments related to previously disclosed information. Harvard Bioscience, Inc. is referred to herein as "we," "our," "us," and "the Company."

Recent Developments

COVID-19

The COVID-19 pandemic has had a negative impact on our operations to date and the future impacts of the pandemic and any resulting economic impact are largely unknown and continuously evolving. Since the global outbreak of COVID-19, many customers, particularly academic research institutions, reduced laboratory work which has negatively impacted, and will continue to negatively impact, our sales. Also, countries world-wide continue to issue COVID-19 related policies in an attempt to control the pandemic. In particular, during the beginning of 2022, China implemented area-wide shutdowns in order to control the spread of COVID-19, which have continued for different parts of China throughout the first half of 2022. To ensure business continuity while maintaining a safe environment for employees aligned with guidance from government and health organizations, we transitioned a significant portion of our workforce to work-from-home and while a portion of the workforce has returned to in-office work, travel is still being managed and the Company continues to have restrictions which can impact productivity including sales and marketing activities.

Global Supply Chain and Economic Environment

The global supply chain has experienced significant disruptions due to electronic component and labor shortages and other macroeconomic factors which have emerged since the onset of COVID-19, leading to increased cost of freight, purchased materials and manufacturing labor costs, while also delaying customer shipments. We believe these supply chain trends will continue through the rest of 2022. These conditions in addition to the overall impact on the global economy have negatively impacted our results of operations and cash flows.

Additionally, during 2022 the global economy has experienced high levels of inflation, rising interest rates and significant fluctuations in currency values. Our results of operations have been negatively impacted by higher labor costs associated with inflation, and we expect the interest paid on our debt will continue to increase as a result of these conditions.

If business interruptions resulting from COVID-19 or the current macroeconomic conditions described above were to be prolonged or expanded in scope, our business, financial condition, results of operations and cash flows would be negatively impacted. We will continue to actively monitor this situation and will implement actions necessary to maintain business continuity.

Selected Results of Operations

Three months ended June 30, 2022 compared to three months ended June 30, 2021.

	Three Months Ended June 30,			
(dollars in thousands)	2022	% of revenue	2021	% of revenue
Revenues	$ 29,208		$ 29,197	
Gross profit	16,637	57.0%	16,353	56.0%
Sales and marketing expenses	6,587	22.6%	5,730	19.6%
General and administrative expenses	5,981	20.5%	6,399	21.9%
Research and development expenses	3,497	12.0%	2,701	9.3%
Amortization of intangible assets	1,454	5.0%	1,465	5.0%
Settlement of litigation, net	(4,880)	-16.7%	-	-
Interest expense	515	1.8%	377	1.3%
Income tax expense (benefit)	986	3.4%	(222)	-0.8%

Revenue

Revenues for the three months ended June 30, 2022, were $29.2 million as compared to revenues of $29.2 million for the three months ended June 30, 2021. Revenue from our cellular and molecular products increased due to improvements in order fulfillment processes which reduced order backlog. These increases were offset by decreases from our preclinical product family related to lower order volume in Europe and China. Also, revenue was negatively impacted in the three months ended June 30, 2022, by unfavorable currency adjustments.

Gross profit

Gross profit increased $0.3 million, or 1.7%, to $16.6 million for the three months ended June 30, 2022, compared with $16.4 million for the three months ended June 30, 2021. Gross margin increased to 57.0% for the three months ended June 30, 2022, compared with 56.0% for the three months ended June 30, 2021. The increase in gross margin percentage was due to a pricing improvements over last year.

Sales and marketing expenses

Sales and marketing expenses increased $0.9 million, or 15.0%, to $6.6 million for the three months ended June 30, 2022, compared to $5.7 million during the same period in 2021. The increase was due to new marketing and sales support personnel and increases in travel and attendance at in-person trade shows. Travel and tradeshow costs were lower in the prior year quarter due to COVID restrictions.

General and administrative expenses

General and administrative expenses decreased $0.4 million, or 6.5%, to $6.0 million for the three months ended June 30, 2022, compared to $6.4 million during the same period in 2021. The decrease was primarily due to lower restructuring expenses and variable compensation.

Research and development expenses

Research and development expenses were $3.5 million for the three months ended June 30, 2022, an increase of $0.8 million, or 29.5%, compared with $2.7 million for the three months ended June 30, 2021. The increase was primarily due to higher costs associated with new product development for our preclinical product lines.

Amortization of intangible assets

Amortization of intangible assets of $1.5 million for the three months ended June 30, 2022, was comparable to the three months ended June 30, 2021.

Settlement of litigation

During the three months ended March 31, 2022, we accrued $5.2 million of costs related to the Settlement as discussed in Note *13 Litigation Settlement* to our Consolidated Financial Statements. Due to the financial condition of Biostage, we determined that it was uncertain as to whether Biostage would be able to satisfy its indemnification obligations to us and had fully reserved any receivable from Biostage.

During the three months ended June 30, 2022, we recorded a credit of $4.9 million as a result of adjustments to the reserves against the indemnification receivable from Biostage. These adjustments reflect: i) the issuance by Biostage of Series E Preferred Convertible Stock to us on June 10, 2022, in satisfaction of $4.0 million of Biostage's total indemnification obligations, ii) the payment by Biostage of a portion of the legal fees associated with the Settlement, and iii) other accrual adjustments.

Interest expense

Interest expense was $0.5 million for the three months ended June 30, 2022, and $0.4 million for the three months ended June 30, 2021. The increase was the result of higher interest rates under our Credit Agreement as well as higher average borrowing balances.

Income tax benefit

Income tax expense (benefit) for the three months ended June 30, 2022 was $1.0 million and was $(0.2) million for the three months ended June 30, 2021. The effective tax rates for the three months ended June 30, 2022 and 2021 were 28.8% and 35.1%, respectively. The difference between our effective tax rates in 2022 and 2021 compared to the U.S. statutory tax rate of 21% is primarily due to changes in valuation allowances associated with our assessment of the likelihood of the recoverability of our deferred tax assets. We currently have valuation allowances against substantially all of our net operating loss carryforwards and tax credit carryforwards.

Six months ended June 30, 2022 compared to six months ended June 30, 2021.

	Six Months Ended June 30,			
(dollars in thousands)	**2022**	**% of revenue**	**2021**	**% of revenue**
Revenues	$ 57,986		$ 56,186	
Gross profit	32,814	56.6%	31,784	56.6%
Sales and marketing expenses	13,274	22.9%	11,116	19.8%
General and administrative expenses	12,306	21.2%	12,732	22.7%
Research and development expenses	6,717	11.6%	5,188	9.2%
Amortization of intangible assets	2,920	5.0%	2,929	5.2%
Settlement of litigation, net	311	0.5%	-	-
Interest expense	899	1.6%	788	1.4%
Income tax expense (benefit)	848	1.5%	(237)	-0.4%

Revenue

Revenues for the six months ended June 30, 2022 were $58.0 million, an increase of approximately $1.8 million, or 3.2% compared to revenues of $56.2 million for the six months ended June 30, 2021. Revenue improved in the first half of 2022 due to improvements in order fulfillment processes which reduced backlog. Revenue was negatively impacted by lower orders outside the United States. Orders from customers in Asia continue to be lower than the prior year due to COVID lockdowns in China. We expect sales to China customers to remain at reduced levels until lockdown conditions are removed. Also, revenue was negatively impacted in the six months ended June 30, 2022 by unfavorable currency adjustments.

Gross profit

Gross profit increased $1.0 million, or 3.2%, to $32.8 million for the six months ended June 30, 2022, compared with $31.8 million for the six months ended June 30, 2021 due primarily to the increase in revenue noted. Gross margin was 56.6% for both the three months ended June 30, 2022 and June 30, 2021. Increases in gross margin percentage due to pricing improvements and volume were offset by the impact of supply chain disruption. The global supply chain has experienced significant disruptions due to electronic component and labor shortages and other macroeconomic factors, leading to increased costs. We believe these supply chain trends will continue to impact our results of operations through the rest of 2022.

Sales and marketing expenses

Sales and marketing expenses increased $2.2 million, or 19.4%, to $13.3 million for the six months ended June 30, 2022, compared to $11.1 million during the same period in 2021. The increase was primarily due to new marketing and sales support personnel and increases in travel and attendance at in-person trade shows offset by lower variable compensation. Travel and tradeshow costs were lower in the prior year quarter due to COVID restrictions.

General and administrative expenses

General and administrative expenses decreased $0.4 million, or 3.3%, to $12.3 million for the six months ended June 30, 2022, compared to $12.7 million during the same period in 2021. The decrease was primarily due to lower variable compensation.

Research and development expenses

Research and development expenses were $6.7 million for the six months ended June 30, 2022, an increase of $1.5 million, or 29.5%, compared with $5.2 million for the six months ended June 30, 2021. The increase was primarily due to higher costs associated with new product development in our preclinical product lines.

Amortization of intangible assets

Amortization of intangible asset expenses were $2.9 million for both the six months ended June 30, 2022, and June 30, 2021.

Settlement of litigation

During the six months ended June 30, 2022, we incurred a net expense of $0.3 million related to the Settlement consisting of $5.2 million in settlement and legal expenses accrued during the three months ended March 31, 2022 offsets by a credit recorded during the three months ended June 30, 2022 of $4.9 million as a result of adjustments to the reserves against the indemnification receivable from Biostage. These adjustments reflect: i) the issuance by Biostage of Series E Convertible Preferred Stock to us on June 10, 2022, in satisfaction of $4.0 million of Biostage's total indemnification obligations, ii) the payment by Biostage of a portion of the legal fees associated with the Settlement, and iii) other accrual adjustments.

Interest expense

Interest expense was $0.9 million for the six months ended June 30, 2022, and $0.8 million for the six months ended June 30, 2021. The increase was the results of both higher interest rates under our Credit Agreement as well as higher average borrowing balances.

Income tax benefit

Income tax expense (benefit) for the six months ended June 30, 2022 was $0.8 million and was $(0.2) million for the six months ended June 30, 2021. The effective tax rates for the six months ended June 30, 2022 and 2021 were (23.6)% and 18.0%, respectively. The difference between our effective tax rates in 2022 and 2021 compared to the U.S. statutory tax rate of 21% is primarily due to changes in valuation allowances associated with our assessment of the likelihood of the recoverability of our deferred tax assets. We currently have valuation allowances against substantially all of our net operating loss carryforwards and tax credit carryforwards.

Liquidity and Capital Resources

Our primary sources of liquidity are cash and cash equivalents, internally generated cash flow from operations and our revolving credit facility. Our expected cash outlays relate primarily to cash payments due under our Credit Agreement described below as well as capital expenditures and payments associated with ongoing business improvement initiatives.

As of June 30, 2022, we held cash and cash equivalents of $4.3 million, compared with $7.8 million at December 31, 2021. Borrowings outstanding was $49.5 million and $49.4 million as of June 30, 2022 and December 31, 2021, respectively.

On December 22, 2020, we entered into a Credit Agreement which provides for a term loan of $40.0 million and a $25.0 million senior revolving credit facility and matures on December 22, 2025 (See Note 9 to our Condensed Consolidated Financial Statements included in “Part I, Item 1. Financial Statement” of this report). As of June 30, 2022, the weighted average interest rate on our borrowings was 5.3%, and the available and unused borrowing capacity under the revolving line of credit was $2.9 million. Total revolver borrowing capacity is limited by our consolidated net leverage ratio as defined under the Credit Agreement.

On April 28, 2022, we entered into an amendment to the Credit Agreement and Pledge and Security Agreement (see Note 9 to our Condensed Consolidated Financial Statements included in “Part I, Item 1. Financial Statements” of this report). We are in compliance with the covenants of the Credit Agreement, as amended, as of June 30, 2022.

Based on our current operating plans, we expect that our available cash, cash generated from current operations and debt capacity will be sufficient to finance current operations, any costs associated with restructuring activities and capital expenditures for at least the next 12 months. This assessment includes consideration of our best estimates of the impact of the COVID-19 pandemic and other macroeconomic trends on our financial results described above. Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement that involves risks and uncertainties, and actual results could vary as a result of a number of factors.

CONDENSED CONSOLIDATED CASH FLOW STATEMENTS

	Six Months Ended June 30,	
(in thousands)	2022	2021
Cash (used in) provided by operating activities	$ (2,176)	$ 1,805
Cash used in investing activities	(913)	(507)
Cash used in financing activities	(484)	(3,333)
Effect of exchange rate changes on cash	11	(45)
Decrease in cash and cash equivalents	$ (3,562)	$ (2,080)

Cash (used in) provided by operating activities was $(2.2) million and $1.8 million for the six months ended June 30, 2022 and 2021, respectively. Cash flow from operations for the six months ended June 30, 2022 was lower than the comparable period in the prior year due to increased operating losses as noted, and offset by the positive impact of improved accounts receivable collections. Also, during the six months ended June 30, 2022, we paid approximately $4.0 million in connection with the Settlement.

Cash used in investing activities was $0.9 million and $0.5 million for the six months ended June 30, 2022 and 2021, respectively, and primarily consisted of capital expenditures in manufacturing and information technology infrastructure.

Cash used in financing activities was $0.5 million and $3.3 million for the six months ended June 30, 2022 and 2021, respectively. During the six months ended June 30, 2022, total debt outstanding under our credit facility was unchanged. Payments of $1.7 million paid against the term loan were offset by net drawings against our revolver of $1.7 million. We also paid $0.5 million for taxes related to net share settlement of equity awards. During the six months ended June 30, 2021, we repaid $5.0 million of debt, which included a term loan installment payment of $1.0 million and paydown of debt under our revolving facility of $4.0 million, we received proceeds of $2.8 million from the exercise of stock options and we paid $1.0 million for taxes related to net share settlements of equity awards.

Impact of Foreign Currencies

Our international operations in some instances operate in a natural hedge as we sell our products in many countries and a substantial portion of our revenues, costs and expenses are denominated in foreign currencies, especially the British pound, the euro, the Canadian dollar, and the Swedish krona.

During the three months ended June 30, 2022, changes in foreign currency exchange rates resulted in an unfavorable translation effect on our consolidated revenues of approximately $0.9 million and a favorable effect on expense of approximately $0.9 million. During the six months ended June 30, 2022, changes in foreign currency exchange rates resulted in an unfavorable translation effect on our consolidated revenues of approximately $1.3 million and a favorable effect on expenses of approximately $1.3 million.

The loss associated with the translation of foreign equity into U.S. dollars included as a component of comprehensive (loss) income during the three months ended June 30, 2022 was $(2.5) million, compared to gain of approximately $0.5 million for the three months ended June 30, 2021. The loss associated with the translation of foreign equity into U.S. dollars included as a component of comprehensive loss during the six months ended June 30, 2022 was $(3.2) million, compared to loss of $(0.8) million for the six months ended June 30, 2021.

In addition, currency exchange rate fluctuations included as a component of net income resulted in currency losses of approximately $(0.2) million and $(0.2) million during each of the three months ended June 30, 2022 and 2021, and $(0.2) million and $(0.1) million during each of the six months ended June 30, 2022 and 2021, respectively.

Critical Accounting Policies

The critical accounting policies underlying the accompanying unaudited consolidated financial statements are those set forth in Part II, Item 7 included in our Annual Report on Form 10-K for the fiscal year ended December 31, 2021.

Recently Issued Accounting Pronouncements

For information on recent accounting pronouncements impacting our business, see “Recently Issued Accounting Pronouncements” included in Note 2 to our Condensed Consolidated Financial Statements included in “Part I, Item 1. Financial Statements” of this report.

Item 3. Quantitative and Qualitative Disclosures about Market Risk.

Not Applicable.

Item 4. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

As of June 30, 2022, the end of the period covered by this report, our management, including our Chief Executive Officer and our Chief Financial Officer, reviewed and evaluated the effectiveness of our disclosure controls and procedures (as defined in Rule 13a-15(e) or 15d-15(e) of the Exchange Act). Based upon management's review and evaluation, our Chief Executive Officer and Chief Financial Officer have concluded that, as of the end of the period covered by this Quarterly Report on Form 10-Q, our disclosure controls and procedures were effective to provide reasonable assurance that information required to be disclosed in our Exchange Act reports is recorded, processed, summarized and reported within the time periods specified by the SEC and is accumulated and communicated to management, including the Chief Executive Officer and Chief Financial Officer, as appropriate, to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting during the second quarter of fiscal 2022 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting. We continue to monitor the impact of the COVID-19 pandemic and, despite many of our employees working remotely, have not experienced any changes that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Limitations on Effectiveness of Controls and Procedures

In designing and evaluating our controls and procedures, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives, and management is required to apply its judgment in evaluating the cost-benefit relationship of possible controls and procedures. 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 within the Company have been detected.

PART II. OTHER INFORMATION

Item 1 Legal Proceedings.

The information included in Note 12 and Note 13 to the Condensed Consolidated Financial Statements (Unaudited) included in Part I, Item 1 of this quarterly report is incorporated herein by reference.

Item 1A. Risk Factors.

You should carefully consider the risk factors set forth below together with the risk factors discussed in Part I, “Item 1A. Risk Factors” in our Annual Report on Form 10-K for the fiscal year ended December 31, 2021, which could materially affect our business, financial position, or future results of operations. The risks described below and in our Annual Report on Form 10-K are not the only risks we face. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also materially adversely affect our business, financial position, or future results of operations.

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

There were no unregistered sales of equity securities during the period covered by this report.

Item 3. Defaults Upon Senior Securities.

None.

Item 4. Mine Safety Disclosures.

Not applicable.

Item 5. Other Information.

None.

Item 6. Exhibits

10.1	First Amendment to Credit Agreement and Amendment to Pledge and Security Agreement, dated April 28, 2022, among Harvard Bioscience, Inc., Citizens Bank, N.A., as the administrative agent, and the lenders party thereto (previously filed as an exhibit to the Company’s Current Report on Form 8-K on April 28, 2022 and incorporated by reference thereto).
10.2	Harvard Bioscience, Inc. Employee Stock Purchase Plan, as amended (previously filed as an exhibit to the Company’s Current Report on Form 8-K on May 17, 2022 and incorporated by reference thereto).
31.1	Certification of Chief Financial Officer of Harvard Bioscience, Inc., pursuant to Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of Chief Executive Officer of Harvard Bioscience, Inc., pursuant to Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification of Chief Financial Officer of Harvard Bioscience, Inc., pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2*	Certification of Chief Financial Officer of Harvard Bioscience, Inc., pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.

101.INS	Inline XBRL Instance Document
101.SCH	Inline XBRL Taxonomy Extension Schema Document
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	Inline XBRL Taxonomy Extension Labels Linkbase Document
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document
104	Cover Page Interactive Data File (formatted in Inline XBRL and contained in Exhibit 101)
*	This certification shall not be deemed “filed” for purposes of Section 18 of the Securities Exchange Act of 1934, or otherwise subject to the liability of that section, nor shall it be deemed to be incorporated by reference into any filing under the Securities Act of 1933 or the Securities Exchange Act of 1934.

SIGNATURES

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

HARVARD BIOSCIENCE, INC.

Date: August 4, 2022

By: /s/ JAMES GREEN
James Green
Chief Executive Officer

By: /s/ MICHAEL A. ROSSI
Michael A. Rossi
Chief Financial Officer

EXHIBIT 31.1

Certification

I, Michael A. Rossi, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Harvard Bioscience, Inc.

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

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

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

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

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

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

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

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

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

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

Date: August 4, 2022

/s/ MICHAEL A. ROSSI

Michael A. Rossi
Chief Financial Officer

EXHIBIT 31.2

Certification

I, James Green, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Harvard Bioscience, Inc.

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

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

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

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

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

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

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

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

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

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

Date: August 4, 2022

/s/ JAMES GREEN

James Green
Chief Executive Officer

EXHIBIT 32.1

CERTIFICATION OF PERIODIC FINANCIAL REPORT PURSUANT TO 18 U.S.C. SECTION 1350

The undersigned officer of Harvard Bioscience, Inc. (the “Company”) hereby certifies to his knowledge that the Company’s Quarterly Report on Form 10-Q for the quarterly period ended June 30, 2022 (the “Report”) to which this certification is being furnished as an exhibit, as filed with the Securities and Exchange Commission on the date hereof, fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company. This certification is provided solely pursuant to 18 U.S.C. Section 1350 and Item 601(b)(32) of Regulation S-K (Item 601(b)(32)) promulgated under the Securities Act of 1933, as amended (the “Securities Act”), and the Exchange Act. In accordance with clause (ii) of Item 601(b)(32), this certification (A) shall not be deemed “filed” for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section, and (B) shall not be deemed to be incorporated by reference into any filing under the Securities Act or the Exchange Act, except to the extent that the Company specifically incorporates it by reference.

Date: August 4, 2022

/s/ MICHAEL A. ROSSI

Name: Michael A. Rossi
Title: Chief Financial Officer

EXHIBIT 32.2

CERTIFICATION OF PERIODIC FINANCIAL REPORT PURSUANT TO 18 U.S.C. SECTION 1350

The undersigned officer of Harvard Bioscience, Inc. (the “Company”) hereby certifies to his knowledge that the Company’s Quarterly Report on Form 10-Q for the quarterly period ended June 30, 2022 (the “Report”) to which this certification is being furnished as an exhibit, as filed with the Securities and Exchange Commission on the date hereof, fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company. This certification is provided solely pursuant to 18 U.S.C. Section 1350 and Item 601(b)(32) of Regulation S-K (Item 601(b)(32)) promulgated under the Securities Act of 1933, as amended (the “Securities Act”), and the Exchange Act. In accordance with clause (ii) of Item 601(b)(32), this certification (A) shall not be deemed “filed” for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section, and (B) shall not be deemed to be incorporated by reference into any filing under the Securities Act or the Exchange Act, except to the extent that the Company specifically incorporates it by reference.

Date: August 4, 2022

/s/ JAMES GREEN

Name: James Green
Title: Chief Executive Officer