
**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 20549**

**FORM S-1
REGISTRATION STATEMENT
under the
SECURITIES ACT OF 1933**

YIELD10 BIOSCIENCE, INC.
(Exact Name of Registrant as Specified in Its Charter)

Delaware
(State or other
jurisdiction of incorporation or organization)

2870
(Primary Standard Industrial
Classification Code Number)

04-3158289
(IRS Employer
Identification No.)

**19 Presidential Way
Woburn, Massachusetts 01801
(617) 583-1700**
(Address, including zip code, and telephone number, including area
code, of registrant's principal executive offices)

**Dr. Oliver P. Peoples
President & Chief Executive Officer
Yield10 Bioscience, Inc.
19 Presidential Way
Woburn, Massachusetts 01801
(617) 583-1700**
(Name, address, including zip code, and telephone number, including area
code, of agent for service)

Copies to:

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Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.
919 Third Avenue
New York, NY 10022
(212) 935-3000**

Approximate date of commencement of proposed sale to the public:

From time to time after this registration statement becomes effective.

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933 check the following box.

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering.

If this Form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering.

If this Form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering.

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

Large accelerated filer	<input type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input checked="" type="checkbox"/>	Smaller reporting company	<input checked="" type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

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 7(a)(2)(B) of the Securities Act.

THE INFORMATION IN THIS PROSPECTUS IS NOT COMPLETE AND MAY BE CHANGED. THE SECURITY HOLDERS IDENTIFIED IN THIS PROSPECTUS MAY NOT SELL THESE SECURITIES UNTIL THE REGISTRATION STATEMENT FILED WITH THE SECURITIES AND EXCHANGE COMMISSION IS EFFECTIVE. THIS PROSPECTUS IS NOT AN OFFER TO SELL THESE SECURITIES AND IS NOT SOLICITING AN OFFER TO BUY THESE SECURITIES IN ANY STATE WHERE THE OFFER OR SALE IS NOT PERMITTED.

SUBJECT TO COMPLETION, DATED June 30, 2023

PRELIMINARY PROSPECTUS



YIELD10 BIOSCIENCE, INC.

1,006,710 SHARES OF COMMON STOCK

ISSUABLE UPON EXERCISE OF OUTSTANDING WARRANTS

This prospectus relates to the proposed resale from time to time, by the selling security holders identified in this prospectus of up to 1,006,710 shares of Yield10 Bioscience, Inc. (the "Company"), common stock, \$0.01 par value per share, which are issuable upon the exercise of certain outstanding warrants.

These shares will be resold from time to time by the entities or individuals listed in the section titled "Selling Security Holders" beginning on page 6, which we refer to as the selling security holders or Selling Stockholders. The shares of common stock offered under this prospectus by the selling security holders are issuable upon exercise of warrants (the "Private Warrants") issued pursuant to the Securities Purchase Agreement by and among the Company and the selling security holders, dated as of May 3, 2023 (the "Securities Purchase Agreement"). We are not selling any securities under this prospectus and will not receive any of the proceeds from the sale of securities by the selling security holders. However, the Company will receive the proceeds of any cash exercise of the Private Warrants. See "Use of Proceeds" beginning on page 6 of this prospectus for more information.

The selling security holders may sell the shares of common stock described in this prospectus in a number of different ways and at varying prices. We provide more information about how a selling security holder may sell its shares of common stock in the section titled "Plan of Distribution" on page 8. We will pay the expenses incurred in registering the securities covered by the prospectus, including legal and accounting fees.

Our common stock is traded on The Nasdaq Capital Market ("Nasdaq") under the symbol "YTEN". On June 29, 2023, the last reported sale price of our common stock was \$2.09 per share.

AN INVESTMENT IN OUR COMMON STOCK INVOLVES RISKS. SEE THE SECTION ENTITLED "RISK FACTORS" BEGINNING ON PAGE 5.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The date of this prospectus is , 2023

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You should read this prospectus and any applicable prospectus supplement before making an investment in the securities of Yield10 Bioscience, Inc. See “Where You Can Find More Information” for more information. You should rely only on the information contained in this prospectus or a prospectus supplement. The Company has not authorized anyone to provide you with different information. This document may be used only in jurisdictions where offers and sales of these securities are permitted. You should assume that information contained in this prospectus, or in any prospectus supplement, is accurate only as of any date on the front cover of the applicable document. Our business, financial condition, results of operations and prospects may have changed since that date. Unless otherwise noted in this prospectus, “Yield10 Bioscience,” “Yield10,” “the Company,” “we,” “us,” “our” and similar terms refer to Yield10 Bioscience, Inc.

Smaller Reporting Company – Scaled Disclosure

Pursuant to Item 10(f) of Regulation S-K promulgated under the Securities Act of 1933, as amended (the "Securities Act"), as indicated herein, we have elected to comply with the scaled disclosure requirements applicable to “smaller reporting companies,” including providing two years of audited financial statements.

PROSPECTUS SUMMARY

This summary highlights some information from this prospectus. It may not contain all the information important to making an investment decision. You should read the following summary together with the more detailed information regarding our Company and the securities being sold in this offering, including “Risk Factors” and other information incorporated by reference herein.

Business Overview

Yield10 Bioscience, Inc. (“Yield10” or the “Company”) is an agricultural bioscience company focused on the large-scale production of low carbon sustainable products from processing Camelina seed using the oilseed Camelina sativa (“Camelina”) as a platform crop. These seed products include:

- Camelina oil for use as a low carbon biofuel feedstock
- Omega-3 oils for nutrition
- PHA Bioplastics for biodegradable zero waste packaging solutions

The co-product from producing these seed products is Camelina meal which has a protein content of over 40% and is currently approved for use in a range of animal feed rations.

Our commercial plan is based on developing and releasing a series of proprietary elite Camelina seed varieties incorporating genetic traits from our development pipeline which are being designed to offer improved on-farm performance that we anticipate will lead to increased acreage adoption and seed product revenue. Yield10 is headquartered in Woburn, Massachusetts and has a Canadian subsidiary, Yield10 Oilseeds Inc., located in Saskatoon, Saskatchewan, Canada.

Camelina, an annual oilseed plant in the mustard family, was selected as our platform crop based on its unique attributes, including its excellent agronomic traits such as low water and fertilizer input, drought resistance and short life cycle, making it suitable as a rotation crop within the U.S. Northwest and regions of Canada, as well as a relay or cover crop with corn and soybean in the U.S. Midwest. We estimate there is the potential for over 30 million acres of Camelina production in North America. Camelina is in the same plant family as canola and naturally produces a relatively abundant harvest of oil-containing protein-rich seeds. Camelina is highly amenable to advanced genetic engineering and genome-editing technologies. Over the last twelve years, we have been developing improved Camelina seed varieties through identification and deployment of our gene trait discoveries followed by performance evaluation in field tests. Our new seed product traits include the PHA bioplastic trait developed by us and the omega-3 (EPA, DHA+EPA) oil traits on which we secured exclusive rights to a commercial license option in 2020.

Our capital light business model is based on contracting with growers to produce Camelina grain using our proprietary Camelina seed. Yield10 will have the exclusive right to purchase the harvested grain from these growers for downstream processing to separate and sell the seed products into the different markets. Our commercial launch plan is to leverage the growing global demand for biofuels to decarbonize the transportation sector, and in particular, the renewable diesel (“RD”) and sustainable aviation fuel (“SAF”) markets. We recognized early on that we could play an important role in the biofuel value chain through the use of our advanced Camelina platform to address a key industry bottleneck; the significant shortfall in the supply of low carbon intensity feedstock oil. The establishment of downstream value chain partnerships represents a critical step towards enabling Yield10 to scale this business. We expect to build the operating foundation of our products business by securing offtake agreements with downstream oilseed processing/ biofuel partners. Sources of revenue from our first Camelina seed product will be based on the financial terms negotiated with these biofuel offtake partners. Here our goal is to link the base oil price for other commodity seed oils, such as soybean, and share in the economic value of the lower carbon intensity score of the Camelina oil. We expect that initial revenue growth from this business will scale up based on increasing the number of acres of our Camelina planted during each growing season. Feedback from our grower outreach has identified weed control and soil residues from the herbicides used on prior crop as key limitations to the adoption of existing Camelina varieties. To achieve our revenue targets, improved Camelina varieties with new genetic traits are being accelerated through our development pipeline in order to offer farmers weed control and a seamless integration into their current crop rotations. We expect to be able to substantially increase revenue for our growers by introducing proprietary performance traits from the Yield10 pipeline, including higher seed oil content and seed yield traits that can increase the per acre harvest value of the Camelina grain. Improved grower income is expected to lead to increasing numbers of growers under contract, increased acres planted and higher product revenue and income for the Company.

Advancements in Camelina varieties, seed operations capabilities, grower network and supply chain developed for biofuels and underwritten by biofuel partnerships will position Yield10 for the subsequent launch of its second Camelina seed product omega-3 oils and in the future, PHA bioplastics.

As a first stage in our initial Camelina commercialization, during the third quarter of 2022, we engaged growers in contracts for the production of Camelina grain and Camelina seed having a total acreage of approximately 1,000 acres. These growers are located in the U.S. and Canada with each grower planting between 30 and 160 acres of our WDH2 (winter, cold tolerant) and WDH3 (winter, early maturing) seed varieties, with harvest expected to occur in the summer of 2023. We intend to use the seed harvest for toll crushing and further seed production that will provide us with seed inventory for future grower contracts during 2023 and beyond. Also, during 2022, we contracted with other growers to plant our E3902 (spring, high oil yield), WDH2 (winter, increased cold tolerance) and WDH3 (winter, early flowering) Camelina plant varieties to produce commercial planting seed. This activity is an essential part of our business model to produce commercial seed inventory for future grower contracts. We expect future grower contracts to cover Camelina grain production for large-scale grain processing to supply low-carbon intensity feedstock oil for the biofuel market and high-protein meal for the animal feed market.

We are currently pursuing the development of elite Camelina germplasm exhibiting herbicide tolerance, disease resistance and other traits that we believe in the near future, will form improved elite Camelina varieties for the biofuel market and will later be combined with the new seed product traits in development to expand our markets. We ultimately expect to have three types of elite Camelina seed varieties in contracted production to address our product markets.

We believe the market opportunity for biofuel feedstocks from our elite Camelina varieties, as well as our other proprietary seed products in development, including performance traits for use in other crops, is significant. We are targeting uses for our Camelina seed products in commercial applications such as: low- carbon feedstock oils for renewable diesel and sustainable aviation fuel, omega-3 oils for aquaculture and nutrition, and PHA bioplastics. In July 2022, we signed a nonbinding memorandum of understanding (“MOU”) with Mitsubishi Corporation to evaluate the establishment of a partnership to supply, offtake and market Camelina as a low-carbon feedstock oil for biofuel, and in February 2023, we signed another nonbinding MOU with American Airlines to collaborate in the development of the value chain for Camelina as a low-carbon feedstock oil for sustainable aviation fuel. We believe performance traits from our gene discovery and development platform (the “Trait Factory”) and value-added product strategy will provide strong differentiation for Yield10’s elite Camelina seed varieties, making them preferred by growers to address large product market opportunities as illustrated below. These traits will also be made available to leading seed companies for use in other crops to create licensing revenue.

Platform	Product	Main Markets	Revenue Potential ¹	Status
Elite Camelina	Feedstock oil	<ul style="list-style-type: none"> Renewable diesel Aviation biofuel \$27 billion	\$0.18 - \$1 billion	<ul style="list-style-type: none"> Early commercial Accelerating elite variety development Focus: US, Canada Biofuel partner outreach
Elite PHA Camelina	PHA Bioplastics Feedstock oil	<ul style="list-style-type: none"> Single use plastic \$200 billion	\$3.6 billion	<ul style="list-style-type: none"> Trait optimization Pilot process development Partner outreach
Elite Omega-3 Camelina	Omega-3 Oil (DHA+EPA)	<ul style="list-style-type: none"> Aquaculture feed Nutrition \$4-6 billion	\$0.5 billion	<ul style="list-style-type: none"> Pre-commercial development Partner outreach

1. Internal Company estimates of 2030 product revenue potential

Our Camelina platform and each of our seed product targets are well-aligned with global trends in reducing carbon emissions and improving sustainability, including the need for:

- Producing low-carbon intensity biofuel feedstock oil for renewable diesel and aviation biofuel.
- Increasing the production of cover crops to reduce the climate change impact from agriculture.
- Producing PHA bioplastics to enable single use food service items and packaging with zero waste.
- Increasing global food security by:
- producing land-based omega-3 (EPA, DHA+EPA) fatty acid oils for use in aquaculture and nutraceuticals;

- increasing high quality protein production from Camelina seed; and
- developing performance traits to increase yield and/or seed oil per acre for major food crops.

We have a pipeline of more than 10 novel yield and/or seed oil content performance traits currently in research and development. Today, we also have research agreements in place for a number of our yield trait gene candidates, including agreements with GDM Seeds (“GDM”) and JR Simplot Company (“Simplot”). These companies are currently making progress on the development of our traits in soybean and potato. Our plan is to support these licensees as they work to generate proof points using our traits in their crops of interest.

We also plan to find partners for our traits in canola, corn and other crops as we generate additional data and new trait leads using our Trait Factory.

We are building an intellectual property portfolio around our crop technologies and traits. As of March 31, 2023, we own or hold exclusive rights to 19 patent families, including 15 issued patents and 41 pending patent applications, related to advanced technologies for increasing crop performance and composition traits in oils and PHA bioplastics, in the United States and throughout the world. As part of our agreement with Rothamsted Research Limited (“Rothamsted”), we have an exclusive option to license two patent families, including six issued patents and four pending applications, including both the original patent filing for the production of EPA, DHA+EPA oil in Camelina and for an improvement patent filed after the agreement was signed. In November 2022, Yield10 and Rothamsted agreed to extend the exclusive option and license agreement until December 31, 2023.

Corporate Information

We were incorporated in Massachusetts in 1992 under the name Metabolix, Inc. In September 1998, we reincorporated in Delaware. We changed our name to Yield10 Bioscience, Inc. in January 2017 to reflect our change in mission around innovations in agricultural biotechnology focused on developing disruptive technologies for step-change improvements in crop yield and niche crop products. Our corporate headquarters are located at 19 Presidential Way, Woburn, MA 01801, and our telephone number is +1 (617) 583-1700. Our website address is www.yield10bio.com. The information contained on our website or that can be accessed through our website is not part of this prospectus and investors should not rely on any such information in deciding whether to purchase our securities.

Offering of Common Stock and Warrants

On May 3, 2023, we entered into the Securities Purchase Agreement with an institutional investor and an existing investor, pursuant to which the Company agreed to issue and sell (i) an aggregate of 931,600 shares (the “Shares”) of the Company’s common stock, (ii) a pre-funded warrant (the “Pre-Funded Warrant”) to purchase 75,110 shares of common stock, and (iii) private placement warrants (the “Private Warrants”) to purchase an aggregate of 1,006,710 shares of common stock. The Shares, Pre-Funded Warrant and Private Warrants were sold on a combined basis for consideration equating to \$2.98 for one Share and a Private Warrant to purchase one underlying share of common stock (or in lieu thereof, \$2.9799 for a Pre-Funded Warrant to purchase one underlying share of common stock and a Private Warrant to purchase one underlying share of common stock). The exercise price of the Pre-Funded Warrant was \$0.0001 per underlying share. The exercise price of the Private Warrant was \$2.98 per underlying share. The Private Warrants will be exercisable beginning six months from the date of issuance and will terminate five years from the initial exercisability date. The Shares and the Pre-Funded Warrant were offered pursuant to an effective registration statement on Form S-3 (File No. 333- 254830), and a related prospectus supplement. The Private Warrant was sold in a concurrent private placement exempt from registration pursuant to Section 4(a)(2) and/or Rule 506 of the Securities Act. The offering closed on May 5, 2023. The gross proceeds were \$3.0 million before deducting the placement agent fees and other offering expenses.

THE OFFERING

Issuer	Yield10 Bioscience, Inc.
Common stock offered by the selling security holders	1,006,710 shares issuable upon exercise of warrants issued pursuant to the Securities Purchase Agreement (which warrants have an exercise price of \$2.98 and will be exercisable 6-months from the issuance date and will expire five and a half years from the date of issuance).
Terms of the offering	The selling security holders and any of their pledgees, assignees and successors-in-interest may, from time to time, sell any or all of their shares covered hereby on Nasdaq or any other stock exchange, market or trading facility on which the shares are traded or in private transactions. These sales may be at fixed or negotiated prices. See “Plan of Distribution.”
Common stock to be outstanding after this offering	7,101,415 shares
Use of proceeds	We will not receive any of the proceeds from the sale of our common stock by the selling security holders pursuant to this prospectus. However, the Company will receive the proceeds of any cash exercise of the Private Warrants. If all of the Private Warrants were exercised for cash, we would receive aggregate proceeds of approximately \$3 million. If we receive proceeds, we currently intend to use the proceeds for general corporate purposes, including working capital.
Nasdaq Capital Market symbol	YTEN
Risk factors	Investing in our securities involves a high degree of risk. See “Risk Factors” on page 5 of this prospectus to read about factors that you should consider carefully before buying our securities.

The number of shares of common stock that will be outstanding after this offering is based on 6,094,705 shares outstanding as of June 27, 2023, and excludes:

- 1,157,359 shares of common stock issuable upon exercise of options to purchase our common stock outstanding as of June 27, 2023 at a weighted average exercise price of \$12.04 per share;
- 14,270 shares of common stock issuable upon exercise of warrants outstanding as of June 27, 2023 and issued pursuant to the Securities Purchase Agreement we entered into with certain investors on July 3, 2017 (which warrants became exercisable on January 7, 2018 at an exercise price of \$201.60 per share and expire on January 7, 2024);
- 1,114,278 shares of common stock issuable upon exercise of Series B Warrants issued in public offerings in November 2019 and outstanding as of June 27, 2023 at an exercise price of \$8.00 per share and which expire on May 19, 2027; and
- 750 shares of common stock issuable upon exercise of immediately vested warrants outstanding as of June 27, 2023 and issued to an investor relations consultant on September 12, 2017 at an exercise price of \$116.00 per share and which expire on September 11, 2024.

RISK FACTORS

An investment in our securities involves a high degree of risk. Before deciding whether to invest in our securities, you should consider carefully the risks and uncertainties described below and in the section captioned “Risk Factors” contained in our Annual Report on Form 10-K for the fiscal year ended December 31, 2022 filed with the Securities and Exchange Commission (“SEC”) on March 14, 2023 and our Quarterly Report on Form 10-Q for the fiscal quarter ended March 31, 2023 filed with the SEC on May 12, 2023, and other filings we make with the SEC from time to time, which are incorporated by reference herein in their entirety, together with other information in this prospectus and the information incorporated by reference herein. If any of these risks actually occurs, our business, financial condition, results of operations or cash flow could suffer materially. In such event, the trading price of our common stock could decline, and you might lose all or part of your investment.

There can be no assurance that we will be able to comply with the continued listing standards of Nasdaq.

We cannot assure you that we will be able to comply with the standards that we are required to meet in order to maintain a listing of our common stock on Nasdaq. Nasdaq listing rules require us to maintain certain closing bid price, stockholders’ equity and other financial metric criteria in order for our common stock to continue trading on Nasdaq. For example, Nasdaq Listing Rule 5550(a)(4) requires companies to maintain a minimum of 500,000 publicly held shares. Nasdaq Listing Rule 5550(a)(2) requires listed securities to maintain a minimum bid price of \$1.00 per share, and Listing Rule 5810(c)(3)(A) provides that a failure to meet the minimum bid price requirement exists if the deficiency continues for a period of 30 consecutive business days.

On May 18, 2023, we received a deficiency letter (the “Letter”) from the Listing Qualifications Department (the “Staff”) of Nasdaq notifying the Company that it is not in compliance with the minimum stockholders’ equity requirement for continued listing on Nasdaq. Nasdaq Listing Rule 5550(b)(1) requires companies listed on Nasdaq to maintain stockholders’ equity of at least \$2,500,000 (the “Stockholders’ Equity Requirement”). The Company’s Quarterly Report on Form 10-Q for the quarter ended March 31, 2023, filed with the SEC on May 12, 2023, reported stockholders’ equity of \$1,143,000, which is below the Stockholders’ Equity Requirement for continued listing on Nasdaq. As of June 27, 2023, the Company does not have a market value of listed securities of \$35 million, or net income from continued operations of \$500,000 in the most recently completed fiscal year or in two of the last three most recently completed fiscal years, the alternative quantitative standards for continued listing on Nasdaq. The Letter has no immediate effect on the Company’s continued listing on Nasdaq, subject to the Company’s compliance with the other continued listing requirements. In accordance with Nasdaq rules, the Company has been provided 45 calendar days, or until July 3, 2023, to submit a plan to regain compliance (the “Compliance Plan”). If the Compliance Plan is acceptable to the Staff, they may grant an extension of 180 calendar days from the date of the Staff notification to regain compliance with the Stockholders’ Equity Requirement. If the Staff does not accept the Compliance Plan, the Staff will provide written notification to the Company that the Compliance Plan has been rejected. At that time, the Company may appeal the Staff’s determination to a Nasdaq Hearings Panel. The Company intends to submit the Compliance Plan on or before July 3, 2023, monitor its stockholders’ equity and, if appropriate, consider further available options to regain compliance with the Stockholders’ Equity Requirement. There can be no assurance that the Company will be able to regain compliance with the Stockholders’ Equity Requirement.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus and the information incorporated by reference in this prospectus contain forward-looking statements within the meaning of Section 27A of the Securities Act and Section 21E of the Securities Exchange Act of 1934 (“Exchange Act”), regarding our strategy, future, operations, future financial position, future revenues, projected costs, and plans and objectives of management. You can identify these forward-looking statements by their use of words such as “anticipate,” “believe,” “estimate,” “expect,” “intend,” “may,” “plan,” “project,” “target,” “potential,” “will,” “would,” “could,” “should,” “continue,” and similar expressions. You also can identify them by the fact that they do not relate strictly to historical or current facts. There are a number of important risks and uncertainties that could cause our actual results to differ materially from those indicated by forward-looking statements. For a description of these risks and uncertainties, please refer to the section entitled “Risk Factors,” any other risk factors set forth in any information incorporated by reference in this prospectus, as well as any other risk factors and cautionary statements we include or incorporate by reference into this prospectus in the future. While we may elect to update forward-looking statements wherever they appear in this prospectus or in the documents incorporated by reference in this prospectus, we do not assume, and specifically disclaim, any obligation to do so, whether as a result of new information, future events or otherwise.

USE OF PROCEEDS

We will not receive any of the proceeds from the sale of securities by the selling security holders pursuant to this prospectus. However, the Company will receive the proceeds of any cash exercise of the Private Warrants. If all of the Private Warrants were exercised for cash, we would receive aggregate proceeds of approximately \$3 million. If we receive proceeds, we currently intend to use the proceeds for general corporate purposes, including working capital.

MARKET FOR OUR COMMON STOCK

Market Information

Our common stock currently trades under the symbol “YTEN” on Nasdaq.

Stockholders

As of June 27, 2023, there were approximately 28 stockholders of record.

DIVIDEND POLICY

We have never declared or paid any cash dividends on our capital stock and do not expect to pay any cash dividends for the foreseeable future. We intend to use future earnings, if any, in the operation and expansion of our business. Any future determination relating to our dividend policy will be made at the discretion of our board of directors, based on our financial condition, results of operations, contractual restrictions, capital requirements, business properties, restrictions imposed by applicable law and other factors our board of directors may deem relevant.

SELLING SECURITY HOLDERS

The shares of common stock being offered by the selling security holders are those issued upon the exercise of the Private Warrants. For additional information regarding the issuance of these securities, see “Prospectus Summary -Offering of Common Stock and Warrants”. We are registering the shares of common stock in order to permit the selling security holders to offer the shares for resale from time to time. The Private Warrants have an exercise price of \$2.98 and will be exercisable 6-months from the issuance date and will expire five and a half years from the date of issuance. Other than as described below, the selling security holders have not had any material relationship with us within the past three years.

The selling security holders might not sell any or all of the shares covered by this prospectus or may sell or dispose of some or all of the shares other than pursuant to this prospectus. Because the selling security holders may not sell or otherwise dispose of some or all of the shares covered by this prospectus and because there are currently no agreements, arrangements or understandings with respect to the sale or other disposition of any of the shares, we cannot estimate the number of the shares that will be held by the selling security holders after completion of the offering.

The table below lists the selling security holders and other information regarding the beneficial ownership (as determined under Section 13(d) of the Exchange Act and the rules and regulations thereunder) of the shares of common stock held by each of the selling security holders. The table is prepared based on information supplied to us by the selling security holders. The second column lists the number of shares of common stock beneficially owned by the selling security holders, based on their respective ownership of shares as of June 27, 2023. The third column lists the shares of common stock being offered by this prospectus by the selling security holders. The fourth column assumes the sale of all of the shares offered by the selling security holders pursuant to this prospectus.

	Prior to the Offering			After the Offering		
	Number of Shares of Common Stock Beneficially Owned (2)	Percent of Common Stock Outstanding (3)	Number of Shares of Common Stock Being Registered for Resale	Number of Shares of Common Stock Beneficially Owned (4)	Percent of Common Stock Outstanding (3)(4)	
Selling Security Holder (1)						
Jack W. Schuler Living Trust (5)	1,361,341	21.0 %	335,570	1,361,341	21.0 %	
Armistice Capital Master Fund Ltd. (6)	671,140	11.0 %	671,140	671,140	11.0 %	
Total Shares of Common Stock	2,032,481	32.0 %	1,006,710	2,032,481	32.0 %	

- (1) This table and the information in the notes below are based upon information supplied by the selling security holders, including reports and amendments thereto filed with the SEC on Schedule 13D.
- (2) The number of shares of common stock beneficially owned includes shares of common stock underlying warrants that are convertible or exercisable within 60 days of June 27, 2023. The Private Warrants become exercisable on November 5, 2023 and the shares of common stock underlying the Private Warrants are not included in the shares of common stock beneficially owned as of June 27, 2023.
- (3) Percentage ownership is based on a denominator equal to the sum of (i) 6,094,705 shares of common stock outstanding as of June 27, 2023 and (ii) the number of shares of common stock underlying warrants that are convertible or exercisable within 60 days of June 27, 2023 that are beneficially owned by the applicable selling stockholder.
- (4) Assumes that all shares of common stock being registered under the registration statement of which this prospectus forms a part are sold in this offering, and that none of the selling stockholders acquire additional shares of our common stock after the date of this prospectus and prior to completion of this offering.
- (5) Consists of 962,956 shares of common stock and 398,385 warrants to purchase common stock exercisable within 60 days of June 27, 2023. Jack W. Schuler is the trustee of the Jack W. Schuler Living Trust, an Illinois trust, and has sole voting and investment control over the shares being offered. Mr. Schuler may be deemed to be the beneficial owner of all shares of common stock held by the Jack W. Schuler Living Trust.
- (6) Consists of shares of common stock. Armistice Capital, LLC is the investment manager of Armistice Capital Master Fund Ltd., the direct holder of the securities, and pursuant to an Investment Management Agreement, Armistice Capital, LLC exercises voting and investment power over the securities held by the Armistice Capital Master Fund Ltd. and thus may be deemed to beneficially own the securities held by Armistice Capital Master Fund Ltd. Steven Boyd, as the managing member of Armistice Capital, LLC, may be deemed to beneficially own the securities held by Armistice Capital Master Fund Ltd. Armistice Capital Master Fund Ltd. specifically disclaims beneficial ownership of the securities directly held by it by virtue of its inability to vote or dispose of such securities as a result of its Investment Management Agreement with Armistice Capital, LLC.

Relationships with Selling Security Holders

The transactions described below involve entities affiliated with Jack W. Schuler within the past three years.

May 2023 Offering

On May 3, 2023, we entered into the Securities Purchase Agreement with Jack W. Schuler Living Trust and Armistice Capital Master Fund Ltd., pursuant to which we agreed to issue and sell (i) an aggregate of 931,600 Shares of the Company's common stock, (ii) a Pre-Funded Warrant to purchase 75,110 shares of common stock, and (iii) Private Warrants to purchase an aggregate of 1,006,710 shares of common stock. The Shares, Pre-Funded Warrant and Private Warrants were sold on a combined basis for consideration equating to \$2.98 for one Share and a Private Warrant to purchase one underlying share of common stock (or in lieu thereof, \$2.9799 for a Pre-Funded Warrant to purchase one underlying share of common stock and a Private Warrant to purchase one underlying share of common stock). The exercise price of the Pre-Funded Warrant was \$0.0001 per underlying share. The exercise price of the Private Warrant was \$2.98 per underlying share. The Private Warrants will be exercisable beginning six months from the date of issuance and will terminate five years from the initial exercisability date. The Shares and the Pre-Funded Warrant were offered pursuant to

an effective registration statement on Form S-3 (File No. 333- 254830), and a related prospectus supplement. The Private Warrant was sold in a concurrent private placement exempt from registration pursuant to Section 4(a)(2) and/or Rule 506 of the Securities Act. The offering closed on May 5, 2023. The gross proceeds were \$3.0 million before deducting the placement agent fees and other offering expenses.

August 2020 Offerings

On August 22, 2020, we entered into the August Securities Purchase Agreement with Mr. Schuler and entities related to him to sell 396,450 shares of our Common Stock for gross proceeds of approximately \$1.7 million. The closing of the private placement occurred on August 26, 2020. The issuance and sale of the securities in the private placement was exempt from registration pursuant to Section 4(a)(2) of the Securities Act.

Concurrently with the private placement, on August 22, 2020, we entered into an underwriting agreement with Maxim Group LLC, pursuant to which we sold, in a registered public offering, 835,000 shares of Common Stock at a public offering price of \$4.25 per share. In addition to their participation in the private placement, Mr. Schuler and entities affiliated with him purchased an aggregate of 178,791 shares of our Common Stock in the registered public offering. The closing of the registered offering occurred on August 26, 2020.

PLAN OF DISTRIBUTION

Each selling stockholder of the shares of the securities and any of their pledgees, assignees and successors-in-interest may, from time to time, sell any or all of their securities covered hereby on Nasdaq or any other stock exchange, market or trading facility on which the securities are traded or in private transactions. These sales may be at fixed or negotiated prices. A selling stockholder may use any one or more of the following methods when selling securities:

- ordinary brokerage transactions and transactions in which the broker-dealer solicits purchasers;
- block trades in which the broker-dealer will attempt to sell the securities as agent but may position and resell a portion of the block as principal to facilitate the transaction;
- purchases by a broker-dealer as principal and resale by the broker-dealer for its account;
- an exchange distribution in accordance with the rules of the applicable exchange;
- privately negotiated transactions;
- settlement of short sales;
- in transactions through broker-dealers that agree with the Selling Stockholders to sell a specified number of such securities at a stipulated price per security;
- through the writing or settlement of options or other hedging transactions, whether through an options exchange or otherwise;
- a combination of any such methods of sale; or
- any other method permitted pursuant to applicable law.

The Selling Stockholders may also sell securities under Rule 144 or any other exemption from registration under the Securities Act, if available, rather than under this prospectus.

Broker-dealers engaged by the Selling Stockholders may arrange for other brokers-dealers to participate in sales. Broker-dealers may receive commissions or discounts from the Selling Stockholders (or, if any broker-dealer acts as agent for the purchaser of securities, from the purchaser) in amounts to be negotiated, but, except as set forth in a supplement to this Prospectus, in the case of an agency transaction not in excess of a customary brokerage commission in compliance with FINRA Rule 2440; and in the case of a principal transaction a markup or markdown in compliance with FINRA IM-2440.

In connection with the sale of the securities or interests therein, the Selling Stockholders may enter into hedging transactions with broker-dealers or other financial institutions, which may in turn engage in short sales of the securities in the course of hedging the positions they assume. The Selling Stockholders may also sell securities short and deliver these

securities to close out their short positions, or loan or pledge the securities to broker-dealers that in turn may sell these securities. The Selling Stockholders may also enter into option or other transactions with broker-dealers or other financial institutions or create one or more derivative securities which require the delivery to such broker-dealer or other financial institution of securities offered by this prospectus, which securities such broker-dealer or other financial institution may resell pursuant to this prospectus (as supplemented or amended to reflect such transaction).

The Selling Stockholders and any broker-dealers or agents that are involved in selling the securities may be deemed to be “underwriters” within the meaning of the Securities Act in connection with such sales. In such event, any commissions received by such broker-dealers or agents and any profit on the resale of the securities purchased by them may be deemed to be underwriting commissions or discounts under the Securities Act. Each Selling Stockholder has informed the Company that it does not have any written or oral agreement or understanding, directly or indirectly, with any person to distribute the securities.

The Company is required to pay certain fees and expenses incurred by the Company incident to the registration of the securities. The Company has agreed to indemnify the Selling Stockholders against certain losses, claims, damages and liabilities, including liabilities under the Securities Act.

We agreed to keep this prospectus effective until the earlier of (i) the date on which the securities may be resold by the Selling Stockholders without registration and without regard to any volume or manner-of-sale limitations by reason of Rule 144, without the requirement for the Company to be in compliance with the current public information under Rule 144 under the Securities Act or any other rule of similar effect or (ii) all of the securities have been sold pursuant to this prospectus or Rule 144 under the Securities Act or any other rule of similar effect. The resale securities will be sold only through registered or licensed brokers or dealers if required under applicable state securities laws. In addition, in certain states, the resale securities covered hereby may not be sold unless they have been registered or qualified for sale in the applicable state or an exemption from the registration or qualification requirement is available and is complied with.

Under applicable rules and regulations under the Exchange Act, any person engaged in the distribution of the resale securities may not simultaneously engage in market making activities with respect to the common stock for the applicable restricted period, as defined in Regulation M, prior to the commencement of the distribution. In addition, the Selling Stockholders will be subject to applicable provisions of the Exchange Act and the rules and regulations thereunder, including Regulation M, which may limit the timing of purchases and sales of the common stock by the Selling Stockholders or any other person. We will make copies of this prospectus available to the Selling Stockholders and have informed them of the need to deliver a copy of this prospectus to each purchaser at or prior to the time of the sale (including by compliance with Rule 172 under the Securities Act).

DESCRIPTION OF OUR CAPITAL STOCK

General

The following summary of our capital stock is based on certain provisions of our amended and restated certificate of incorporation, as amended, and amended and restated by-laws and on the applicable provisions of the DGCL. This summary does not purport to be complete and is qualified in its entirety by reference to the applicable provisions in our amended and restated certificate of incorporation, as amended, and amended and restated by-laws and the DGCL. For a complete description you should refer to our amended and restated certificate of incorporation, as amended, and our amended and restated by-laws, copies of which have been incorporated by reference herein, and to the applicable provisions of the DGCL.

Our authorized capital stock consists of 65,000,000 shares, with a par value of \$0.01 per share, of which:

- 60,000,000 shares are designated as common stock; and
- 5,000,000 shares are designated as preferred stock. Previously issued shares of Series A Convertible Preferred Stock and Series B Convertible Preferred Stock have been fully converted to common stock and are no longer outstanding.

Common Stock

The holders of our Common Stock are entitled to one vote per share on all matters submitted to a vote of our stockholders and do not have cumulative voting rights. Subject to preferences that may be applicable to any preferred stock

outstanding at the time, the holders of outstanding shares of Common Stock are entitled to receive ratably any dividends declared by our board of directors out of assets legally available. Upon our liquidation, dissolution or winding up, holders of our Common Stock are entitled to share ratably in all assets remaining after payment of liabilities and the liquidation preference of any then outstanding shares of preferred stock. Holders of Common Stock have no preemptive or conversion rights or other subscription rights. There are no redemption or sinking fund provisions applicable to our Common Stock.

Preferred Stock

Our amended and restated certificate of incorporation, as amended, provides for a class of its authorized stock known as preferred stock, consisting of 5,000,000 shares, \$0.01 par value per share, issuable from time to time in one or more series. Our board of directors may designate the rights, preferences, privileges and restrictions of the preferred stock, including dividend rights, conversion rights, voting rights, terms of redemption, liquidation preference, sinking fund terms and the number of shares constituting any series or the designation of any series.

Warrants

As of June 27, 2023, we had warrants outstanding to purchase 2,136,008 shares of our common stock.

Anti-Takeover Provisions

Certain provisions of the DGCL and our amended and restated certificate of incorporation, as amended, and amended and restated by-laws may have the effect of delaying, deferring or discouraging another party from acquiring control of our company. These provisions, which are summarized below, may discourage certain types of coercive takeover practices and inadequate takeover bids and encourage anyone seeking to acquire control of our company to first negotiate with our board of directors. These provisions might also have the effect of preventing changes in our management and could make it more difficult to accomplish transactions that stockholders might otherwise deem to be in their best interests. However, we believe that the advantages gained by protecting our ability to negotiate with any unsolicited and potentially unfriendly acquirer outweigh the disadvantages of discouraging such proposals, because, among other reasons, the negotiation of such proposals could result in improving their terms.

Amended and Restated Certificate of Incorporation and Bylaw Provisions

Our amended and restated certificate of incorporation, as amended, and amended and restated by-laws include a number of provisions that may have the effect of delaying, deferring or discouraging another party from acquiring control of our company or preventing changes in our management, including the following:

- *Issuance of Undesignated Preferred Stock.* Our board of directors has the authority, without further action by the stockholders, to issue up to 5,000,000 shares of undesignated preferred stock with rights, preferences and privileges designated from time to time by our board of directors without further action by stockholders. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences and sinking fund terms, any or all of which may be greater than the rights of common stock.
- *Size of the Board of Directors and Filling Vacancies.* The number of directors constituting our board of directors may be set only by resolution adopted by a majority vote of our entire board of directors. Any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of the board of directors, may only be filled by the affirmative vote of a majority of our directors then in office, even if less than a quorum.
- *Classified Board.* Our board of directors is divided into three classes of directors, with staggered three-year terms. Only one class of directors will be elected at each annual meeting of our stockholders, with the other classes continuing for the remainder of their respective three-year terms.
- *No Cumulative Voting.* Our amended and restated certificate of incorporation, as amended, and amended and restated by-laws do not permit cumulative voting in the election of directors. Cumulative voting allows a stockholder to vote a portion, or all of its shares for one or more candidates. The absence of cumulative voting makes it more difficult for a minority stockholder to gain a seat.

- *Removal of Directors.* Directors can only be removed by our stockholders for cause and removal of a director will require a 75% stockholder vote.
- *No Written Consent of Stockholders.* All stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting. Stockholders may not take action by written consent in lieu of a meeting. The inability of stockholders to take action by written consent means that a stockholder would need to wait until the next annual or special meeting to bring business before the stockholders for a vote.
- *Special Meetings of Stockholders.* Special meetings of our stockholders may be called only by our board of directors acting pursuant to a resolution approved by the affirmative vote of a majority of the directors then in office. Only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of our stockholders.
- *Advance Notice Requirements for Stockholder Proposals and Director Nominations.* Our amended and restated by-laws provide advance notice procedures for stockholders seeking to bring business before our annual meeting of stockholders or to nominate candidates for election as directors at our annual meeting of stockholders. These procedures provide that notice must be given in writing not later than the close of business on the 90th day nor earlier than the close of business on the 120th day prior to the first anniversary of the preceding year's annual meeting. These procedures may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed or may discourage or deter a potential acquirer from conducting a solicitation of proxies to elect its own slate of directors or otherwise attempt to obtain control of us.
- *Amendment to Amended and Restated Certificate of Incorporation and By-laws.* Any amendment, repeal or modification of certain provisions of our amended and restated certificate of incorporation or amended and restated by-laws requires a 75% stockholder vote. Provisions requiring such supermajority vote include, among other things, any amendment, repeal or modification of the provisions relating to the classification of our board of directors, the requirement that stockholder actions be effected at a duly called annual or special meeting of our stockholders and the designated parties entitled to call a special meeting of our stockholders.

Section 203 of the DGCL

We are subject to Section 203 of the DGCL. In general, Section 203 of the DGCL prohibits a publicly held Delaware corporation from engaging in a “business combination” with an “interested stockholder” for a three-year period following the time that this stockholder becomes an interested stockholder, unless it satisfies one of the following conditions:

- the transaction is approved by the board of directors prior to the time that the interested stockholder became an interested stockholder;
- upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced; or

In general, Section 203 defines “business combination” to include the following:

- at or subsequent to such time that the stockholder became an interested stockholder, the business combination was approved by the board of directors and authorized at an annual or special meeting of stockholders by at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.
- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, lease, exchange, mortgage, pledge, transfer or other disposition of the assets of the corporation with an aggregate market value of 10% or more of either the aggregate market value of all assets of the corporation on a consolidated basis or the aggregate market value of all of the outstanding stock of the corporation involving the interested stockholder;
- subject to certain exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;

- any transaction involving the corporation that has the effect of increasing the proportionate share of the stock or any class or series of the corporation beneficially owned by the interested stockholder; or
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits by or through the corporation.

In general, Section 203 defines an “interested stockholder” as an entity or person who, together with the stockholder’s affiliates and associates (as defined in Section 203), beneficially owns, or within three years prior to the time of determination of interested stockholder status did own, 15% or more of the outstanding voting stock of the corporation.

Treatment of Options Upon Change of Control

In general, under the terms of our Stock Option and Incentive Plans and our executive employment agreements, in the event of certain change in control transactions, if the successor corporation does not assume our outstanding options or issue replacement awards, or if an option holder’s employment is involuntarily terminated in connection with such change in control, the vesting of the options outstanding under such plans will accelerate.

Transfer Agent and Registrar

The transfer agent and registrar for our Common Stock is American Stock Transfer & Trust Company, LLC. The transfer agent’s telephone number is (718) 921-8200.

Stock Exchange Listing

Our Common Stock is listed on Nasdaq under the symbol “YTEN”.

DISCLOSURE OF COMMISSION POSITION ON INDEMNIFICATION FOR SECURITIES ACT LIABILITIES

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers, and controlling persons of the registrant pursuant to the foregoing provisions, or otherwise, the registrant has been informed that in the opinion of the SEC such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable.

LEGAL MATTERS

Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., Boston, Massachusetts, will pass upon the validity of the issuance of the securities offered by this prospectus.

EXPERTS

The consolidated financial statements of Yield10 Bioscience, Inc. as of December 31, 2022 and 2021 and for each of the years in the two-year period ended December 31, 2022 incorporated in this Prospectus by reference from the Yield10 Bioscience, Inc. Annual Report on Form 10-K for the year ended December 31, 2022 have been audited by RSM US LLP, an independent registered public accounting firm, as stated in their report thereon (which report expresses an unqualified opinion and includes an explanatory paragraph relating to the Yield10 Bioscience, Inc.'s ability to continue as a going concern), incorporated herein by reference, and have been incorporated in this Prospectus and Registration Statement in reliance upon such report and upon the authority of such firm as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We file annual, quarterly and other periodic reports, proxy statements and other information with the SEC. You can read our SEC filings over the Internet at the SEC’s website at www.sec.gov.

Our Internet address is www.yield10bio.com. There we make available free of charge, on or through the investor relations section of our website, annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably

practicable after we electronically file such material with the SEC. The information found on our website is not part of this prospectus supplement or the accompanying prospectus.

The SEC maintains a website at <http://www.sec.gov> that contains reports, proxy and information statements and other information regarding issuers that file electronically with the SEC.

INCORPORATION OF CERTAIN DOCUMENTS BY REFERENCE

The SEC allows us to “incorporate by reference” much of the information we file with them, which means that we can disclose important information to you by referring you to those publicly available documents. The information that we incorporate by reference in this prospectus is considered to be part of this prospectus. Because we are incorporating by reference future filings with the SEC, this prospectus is continually updated and those future filings may modify or supersede some of the information included or incorporated in this prospectus. You should refer to the registration statement, including the exhibits, for further information about us and the securities we may offer pursuant to this prospectus. Statements in this prospectus regarding the provisions of certain documents filed with, or incorporated by reference in, the registration statement are not necessarily complete and each statement is qualified in all respects by that reference. We incorporate by reference into this prospectus the documents listed below and any future filings made by us with the SEC under Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act (1) after the date of this prospectus and prior to the time that all of the securities offered by this prospectus are sold or the earlier termination of the offering, and (2) after the date of the initial registration statement of which this prospectus forms a part and prior to the effectiveness of the registration statement (except in each case in which the information contained in such documents is “furnished” and not “filed”). The documents we are incorporating by reference as of their respective dates of filing are:

- [Annual Report on Form 10-K for the year ended December 31, 2022](#), filed with the SEC on March 14, 2023;
- [Definitive Proxy Statement on Schedule 14A for the annual meeting of our stockholders held on May 25, 2023](#), filed with the SEC on April 6, 2023;
- [Quarterly Report on Form 10-Q for the quarter ended March 31, 2023](#), filed with the SEC on May 12, 2023;
- Current Reports on Form 8-K filed on [January 24, 2023](#), [May 1, 2023](#), [May 3, 2023](#), [May 4, 2023](#), [May 19, 2023](#), and [May 30, 2023](#); and
- The description of our common stock contained in Item 1 of our [Registration Statement on Form 8-A](#) filed with the SEC on November 6, 2006, including any amendments or reports filed for the purpose of updating the description.

The SEC file number for each of the documents listed above is 001-33133. We will provide, without charge to each person, including any beneficial owner, to whom this prospectus is delivered, upon written or oral request of such person, a copy of any or all of the documents incorporated herein by reference other than exhibits, unless such exhibits are specifically incorporated by reference into such documents or this document. Requests for such documents should be addressed in writing or by telephone to:

Investor Relations
Yield10 Bioscience, Inc.
19 Presidential Way
Woburn, Massachusetts 01801
(617) 583-1700



**YIELD10 BIOSCIENCE, INC.
1,006,710 SHARES OF COMMON STOCK
ISSUABLE UPON EXERCISE OF OUTSTANDING WARRANTS**

**PROSPECTUS
, 2023**

PART II INFORMATION NOT REQUIRED IN PROSPECTUS

Item 13. Other Expenses of Issuance and Distribution.

The following table sets forth the costs and expenses, payable by the Company in connection with the registration and sale of the common stock being registered. All amounts are estimates except the SEC registration fee.

	Amount to be paid (\$)
SEC registration fee	\$ 218.00
Legal fees and expenses	17,000.00
Other	—
Accounting fees and expenses	20,000.00
Total	\$ 37,218.00

Item 14. Indemnification of Directors and Officers.

Pursuant to Section 145 of the Delaware General Corporation Law (the “DGCL”), our amended and restated bylaws provide that each director or officer of Yield10 Bioscience, who was or is made a party or is threatened to be made a party to or is involved in any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative, by reason of the fact that he or she, or a person of whom he or she is the legal representative, is or was a director or officer of Yield10 Bioscience, or is or was serving at the request of Yield10 Bioscience as a director, officer, employee or agent of another corporation or of a partnership, joint venture, trust or other enterprise, including service with respect to employee benefit plans, shall be indemnified and held harmless by Yield10 Bioscience to the fullest extent authorized by the DGCL.

Pursuant to Section 102(b)(7) of the DGCL, Article 7 of our amended and restated certificate of incorporation, as amended, eliminates the liability of a director to us or our stockholders for monetary damages for such a breach of fiduciary duty as a director, except for liabilities arising:

- from any breach of the director’s duty of loyalty to us or our stockholders;
- from acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law;
- under Section 174 of the Delaware General Corporation Law; and
- from any transaction from which the director derived an improper personal benefit.

We carry insurance policies insuring our directors and officers against certain liabilities that they may incur in their capacity as directors and officers. In addition, we have entered into indemnification agreements with our directors and officers.

The foregoing discussion of our certificate of incorporation, bylaws and Delaware law is not intended to be exhaustive and is qualified in its entirety by such certificate of incorporation, bylaws or law.

Item 15. Recent Sales of Unregistered Securities

On January 4, 2023, the Company issued 17,578 shares of common stock to participants in its Yield10 Bioscience, Inc. 401(k) Plan as quarterly matching contributions. On April 6, 2023, the Company issued 9,438 shares of common stock to participants in the Yield10 Bioscience, Inc. 401(k) Plan as a matching contribution. The issuance of these securities is exempt from registration pursuant to Section 3(a)(2) of the Securities Act as exempted securities. On May 3, 2023, the Company issued warrants to purchase 1,006,710 shares of common stock pursuant to the Securities Purchase Agreement by and among the Company, Jack W. Schuler Living Trust and Armistice Capital Master Fund. The issuance and sale of the securities in the private placement was exempt from registration pursuant to Section 4(a)(2) and/or Rule 506 of the

Securities Act. The shares of common stock issuable upon the exercise of these warrants are being registered for resale by the selling security holders pursuant to this Registration Statement.

Item 16. Exhibits and Financial Statement Schedules.

(a) The exhibits listed below are filed as part of or incorporated by reference into this Registration Statement on Form S-1. Where certain exhibits are incorporated by reference from a previous filing, the exhibit numbers and previous filings are identified in parentheses.

Exhibit Number	Exhibit Description	Filed Herewith	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/ Reg. Number
3.1.1	Amended and Restated Certificate of Incorporation, as amended, of the Registrant.		Form 10-Q (Exhibit 3.1)	8/9/2018	001-33133
3.1.2	Certificate of Amendment to the Amended and Restated Certificate of Incorporation of the Registrant.		Form 8-K (Exhibit 3.1)	1/15/2020	001-33133
3.1.3	Certificate of Designation of Preferences, Rights and Limitations with respect to the Series A Preferred Stock.		Form 8-K (Exhibit 3.1)	11/20/2019	001-33133
3.1.4	Certificate of Designation of Preferences, Rights and Limitations with respect to the Series B Preferred Stock.		Form 8-K (Exhibit 3.2)	11/20/2019	001-33133
3.2	Amended and Restated By-laws of the Registrant.		Form 10-Q (Exhibit 3.1)	11/10/2021	001-33133
4.1	Specimen Stock Certificate for shares of the Registrant's Common Stock.		Form 10-Q (Exhibit 4.1)	11/12/2020	001-33133
4.2	Form of Investor Warrant to Purchase Common Stock.		Form 8-K (Exhibit 4.1)	7/5/2017	001-33133
4.3	Form of Series A Common Warrant to purchase shares of Common Stock.		Form S-1/A (Exhibit 4.3)	12/15/2017	333-221283
4.4	Form of Common Stock Purchase Warrant.		Form 8-K (Exhibit 4.1)	11/20/2019	001-33133
4.5	Form of Pre-Funded Common Stock Purchase Warrant		Form 8-K (Exhibit 4.1)	5/4/2023	001-33133
4.6	Form of Common Stock Purchase Warrant		Form 8-K (Exhibit 4.2)	5/4/2023	001-33133
5.1	Opinion of Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.	X			
10.1†	2006 Stock Option and Incentive Plan.		Form S-1/A (Exhibit 10.3)	10/20/2006	333-135760
10.1.1†	2006 Stock Option and Incentive Plan, Form of Incentive Stock Option Agreement.		Form S-1/A (Exhibit 10.3.1)	10/20/2006	333-135760

10.1.2†	2006 Stock Option and Incentive Plan, Form of Non-Qualified Stock Option Agreement.	Form S-1/A (Exhibit 10.3.2)	10/20/2006	333-135760
10.1.3†	2006 Stock Option and Incentive Plan, Form of Director Non-Qualified Stock Option Agreement.	Form S-1/A (Exhibit 10.3.3)	10/20/2006	333-135760
10.2†	2014 Stock Option and Incentive Plan, Revised and Restated.	Form 10-Q (Exhibit 10.1)	8/13/2015	001-33133
10.2.1†	2014 Stock Option and Incentive Plan, Form of Incentive Stock Option Award.	Form 10-K (Exhibit 10.3.1)	3/25/2015	001-33133
10.2.2†	2014 Stock Option and Incentive Plan, Form of Non-Qualified Stock Option Award.	Form 10-K (Exhibit 10.3.2)	3/25/2015	001-33133
10.2.3†	2014 Stock Option and Incentive Plan, Form of Restricted Stock Unit Award.	Form 10-K (Exhibit 10.3.3)	3/25/2015	001-33133
10.3†	Amended and Restated 2018 Stock Option and Incentive Plan.	Form 8-K (Exhibit 10.1)	5/30/2023	001-33133
10.3.1†	Amended and Restated 2018 Stock Option and Incentive Plan, Form of Stock Option Agreement.	Form 10-K (Exhibit 10.2.5)	3/28/2019	001-33133
10.3.2†	2018 Stock Option and Incentive Plan, Form of Restricted Stock Unit Agreement.	Form 10-K (Exhibit 10.2.6)	3/25/2020	001-33133
10.4†	Employment Agreement between the Company and Oliver P. Peoples dated March 28, 2017.	Form 10-K (Exhibit 10.3)	3/30/2017	001-33133
10.5†	Employment Agreement between the Company and Charles B. Haaser dated March 28, 2017.	Form 10-K (Exhibit 10.4)	3/30/2017	001-33133
10.6†	Employment Agreement between the Company and Lynne H. Brum dated March 28, 2017.	Form 10-K (Exhibit 10.6)	3/30/2017	001-33133
10.7†	Employment Agreement between the Company and Kristi Snell dated March 28, 2017.	Form 10-K (Exhibit 10.8)	3/30/2017	001-33133
10.8†	Form of Employee Noncompetition, Confidentiality and Inventions Agreement between the Company and its Employee.	Form 10-K (Exhibit 10.9)	3/30/2017	001-33133
10.9†	Form of Indemnification Agreement between the Registrant and its Directors and Officers.	Form S-1/A (Exhibit 10.14)	10/20/2006	333-135760
10.10	Standstill Agreement dated June 19, 2015 between the Company and Jack W. Schuler, Renate Schuler and the Schuler Family Foundation.	Form 8-K (Exhibit 10.1)	6/17/2015	001-33133

10.11	Lease Agreement between the Company and ARE MA Region No. 20, LLC dated January 20, 2016 for the premises located at 19 Presidential Way, Woburn, MA.		Form 8-K (Exhibit 10.1)	1/26/2016	001-33133
10.12	Sublease between CJ Research Center LLC and the Company, dated as of September 16, 2016.		Form 10-K (Exhibit 10.20)	3/30/2017	001-33133
10.13	Form of Securities Purchase Agreement dated July 3, 2017 between the Company and the Purchasers named therein.		Form 8-K (Exhibit 10.1)	7/5/2017	001-33133
10.14@	Exclusive License Agreement, dated May 17, 2018, between the Company and the University of Missouri.		Form 10-Q (Exhibit 10.2)	8/9/2018	001-33133
10.15	Form of Securities Purchase Agreement dated March 14, 2019 between the Company and the Investors named therein.		Form 8-K (Exhibit 10.1)	3/15/2019	001-33133
10.16	Securities Purchase Agreement, dated as of November 14, 2019, by and between Yield10 Bioscience, Inc. and the Investors listed on Schedule I thereto.		Form 8-K (Exhibit 10.1)	11/20/2019	001-33133
10.17	Securities Purchase Agreement, dated as of August 22, 2020, by and between Yield10 Bioscience, Inc. and the Investors listed on Schedule I thereto.		Form 8-K (Exhibit 10.1)	8/25/2020	001-33133
10.18	Collaboration and Option Agreement, dated November 12, 2020, by and between Yield10 Bioscience, Inc. and Rothamsted Research Institute, as amended.		Form 10-K (Exhibit 10.18)	3/14/2023	001-33133
10.19	Equity Distribution Agreement, dated January 23, 2023, by and between the Company and Maxim Group LLC.		Form 8-K (Exhibit 1.1)	1/24/2023	001-33133
10.20	Securities Purchase Agreement, dated as of May 3, 2023, by and between the Company and the Purchasers.		Form 8-K (Exhibit 10.1)	5/4/2023	001-33133
21.1	Subsidiaries of the Registrant.		Form 10-K (Exhibit 21.1)	3/16/2021	001-33133
23.1	Consent of RSM US LLP, an independent registered public accounting firm.	X			
23.2	Consent of Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C. (included in Exhibit 5.1).	X			

24.1	Power of Attorney (included in the signature pages to the Registration Statement).	
101.INS	XBRL Instance Document	X
101.SCH	XBRL Taxonomy Extension Schema.	X
101.CAL	XBRL Taxonomy Extension Calculation Linkbase.	X
101.DEF	XBRL Taxonomy Extension Definition Linkbase.	X
101.LAB	XBRL Taxonomy Extension Label Linkbase.	X
101PRE	XBRL Taxonomy Extension Presentation Linkbase.	X

† Management contract or compensatory plan or arrangement.

@ Certain confidential portions of this Exhibit were omitted by means of marking such portions with brackets ("****") because the identified confidential portions (i) are not material and (ii) is the type of information that the Company treats as private or confidential.

Item 17. Undertakings.

The undersigned registrant hereby undertakes:

(1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:

(i) To include any prospectus required by Section 10(a)(3) of the Securities Act;

(ii) To reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Commission pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than a 20 percent change in the maximum aggregate offering price set forth in the "Calculation of Registration Fee" table in the effective registration statement.

(iii) To include any material information with respect to the plan of distribution not previously disclosed in the registration statement or any material change to such information in the registration statement;

(2) That, for the purpose of determining any liability under the Securities Act, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

(3) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.

(4) That, for the purpose of determining liability under the Securities Act to any purchaser: each prospectus filed pursuant to Rule 424(b) as part of a registration statement relating to an offering, other than registration statements relying on Rule 430B or other than prospectuses filed in reliance on Rule 430A, shall be deemed to be part of and included in the

registration statement as of the date it is first used after effectiveness; provided, however, that no statement made in a registration statement or prospectus that is part of the registration statement or made in a document incorporated or deemed incorporated by reference into the registration statement or prospectus that is part of the registration statement will, as to a purchaser with a time of contract of sale prior to such first use, supersede or modify any statement that was made in the registration statement or prospectus that was part of the registration statement or made in any such document immediately prior to such date of first use.

(5) Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers, and controlling persons of the registrant pursuant to the foregoing provisions, or otherwise, the registrant has been advised that in the opinion of the SEC such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the registrant of expenses incurred or paid by a director, officer or controlling person of the registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Act and will be governed by the final adjudication of such issue.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, the registrant has duly caused this Registration Statement on Form S-1 to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Woburn, Massachusetts, on June 30, 2023.

YIELD10 BIOSCIENCE, INC.

By /s/ Oliver P. Peoples
Oliver P. Peoples President and Chief Executive Officer

POWER OF ATTORNEY

We, the undersigned officers and directors of Yield10 Bioscience, Inc., hereby severally constitute and appoint Oliver P. Peoples, Charles B. Haaser, and Lynne H. Brum, and each of them singly, our true and lawful attorneys, with full power to them, and to each of them singly, to sign for us and in our names in the capacities indicated below, the registration statement on Form S-1 filed herewith, and any and all pre-effective and post-effective amendments to said registration statement, and any registration statement filed pursuant to Rule 462(b) under the Securities Act of 1933, as amended, in connection with the registration under the Securities Act of 1933, as amended, of equity securities of the Company, and to file or cause to be filed the same, with all exhibits thereto and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as each of us might or could do in person, and hereby ratifying and confirming all that said attorneys, and each of them, or their substitute or substitutes, shall do or cause to be done by virtue of this Power of Attorney.

Pursuant to the requirements of the Securities Act of 1933, this Registration Statement on Form S-1 has been signed below by the following persons in the capacities and on the dates indicated.

<u>/s/ OLIVER P. PEOPLES</u> Oliver P. Peoples, Ph.D.	President and Chief Executive Officer and Director (Principal Executive Officer)	June 30, 2023
<u>/s/ CHARLES B. HAASER</u> Charles B. Haaser	Vice President, Finance, and Chief Accounting Officer (Principal Financial and Accounting Officer)	June 30, 2023
<u>/s/ SHERRI M. BROWN</u> Sherri M. Brown	Director	June 30, 2023
<u>/s/ RICHARD W. HAMILTON</u> Richard W. Hamilton, Ph.D.	Director	June 30, 2023
<u>/s/ Willie Loh, Ph.D.</u> WILLIE LOH, Ph.D.	Director	June 30, 2023
<u>/s/ ANTHONY J. SINSKEY</u> Anthony J. Sinskey, Sc.D.	Director	June 30, 2023
<u>/s/ ROBERT L. VAN NOSTRAND</u> Robert L. Van Nostrand	Chairman	June 30, 2023

Calculation of Filing Fee Table

Form S-1
(Form Type)

Yield10 Bioscience, Inc.
(Exact name of Registrant as Specified in its Charter)

Table 1 — Newly Registered Securities

Security Type	Security Class Title	Fee Calculation Rule	Amount Registered ⁽¹⁾⁽³⁾	Proposed Maximum Offering Price Per Unit ⁽²⁾	Maximum Aggregate Offering Price	Fee Rate	Amount of Registration Fee
Equity	Common stock, par value \$0.01 per share	457(c)	1,006,710	\$1.965	\$1,978,185.15	\$0.00011020	\$218.00
Total Offering Amount					\$1,978,185.15		\$218.00
Total Fees Previously Paid							—
Total Fee Offsets							—
Net Fee Due							\$218.00

- (1) Pursuant to Rule 416(a) promulgated under the Securities Act of 1933, as amended, this Registration Statement shall also cover any additional shares of common stock of Yield10 Bioscience, Inc. (the “Registrant”) that become issuable with respect of the securities identified in the above table by reason of any stock dividend, stock split, recapitalization or other transaction effected without the Registrant’s receipt of consideration that results in an increase in the number of outstanding shares of Registrant’s common stock.
- (2) Estimated in accordance with Rules 457(c) solely for purposes of calculating the registration fee on the basis of \$1.965, the weighted average of the high and low prices of the Registrant’s common stock as reported on the Nasdaq Capital Market on June 28, 2023.
- (3) Consists of 1,006,710 shares of common stock registered for resale by the selling security holders named in this Registration Statement, issuable upon the exercise of outstanding warrants.



June 30, 2023

Yield10 Bioscience, Inc.
19 Presidential Way
Woburn, Massachusetts 01801

Re: Securities Being Registered under Registration Statement on Form S-1

Ladies and Gentlemen:

We have acted as counsel to Yield10 Bioscience, Inc., a Delaware corporation (the “Company”) in connection with the filing by the Company of a Registration Statement on Form S-1 (the “Registration Statement”) with the Securities and Exchange Commission (the “Commission”) relating to the registration under the Securities Act of 1933, as amended (the “Securities Act”), of the offering from time to time by the selling stockholders (the “Selling Security Holders”), as described in the Registration Statement, of up to 1,006,710 shares (the “Shares”) of the Company’s common stock, par value \$0.01 per share (“Common Stock”), issuable upon the exercise of the issued and outstanding warrants held by the Selling Security Holders (the “Warrants”) to purchase shares of Common Stock (the “Warrant Shares”).

In connection with this opinion, we have examined the Company’s Amended and Restated Certificate of Incorporation and Amended and Restated Bylaws, each as currently in effect; such other records of the corporate proceedings of the Company and certificates of the Company’s officers as we have deemed relevant; and the Registration Statement and the exhibits thereto.

In our examination, we have assumed the genuineness of all signatures, the legal capacity of natural persons, the authenticity of all documents submitted to us as originals, the conformity to original documents of all documents submitted to us as certified or photostatic copies and the authenticity of the originals of such copies and the truth and correctness of any representations and warranties contained therein. As to questions of fact material to this opinion, we have relied upon certificates or comparable documents of public officials and of officers and representatives of the Company.

Our opinion is limited to the general corporate laws of the State of Delaware and we express no opinion with respect to the laws of any other jurisdiction. No opinion is expressed herein with respect to the qualification of the Warrant Shares under the securities or blue sky laws of any state or any foreign jurisdiction.

Based upon and subject to the foregoing, it is our opinion that the Warrant Shares have duly authorized, and when issued and sold in accordance with the terms and conditions of the Warrants and the Registration Statement, as applicable, will be validly issued, fully paid and non-assessable.

Please note that we are opining only as to the matters expressly set forth herein, and no opinion should be inferred as to any other matters. This opinion is based upon currently existing statutes, rules, regulations and judicial decisions, and we disclaim any obligation to advise you of any change in any of these sources of law or subsequent legal or factual developments which might affect any matters or opinions set forth herein.

We understand that you wish to file this opinion with the Commission as an exhibit to the Registration Statement in accordance with the requirements of Item 601(b)(5) of Regulation S-K promulgated under the Securities Act and to reference the firm’s name under the caption “Legal Matters” in the prospectus which forms part of the Registration Statement, and we hereby consent thereto. In giving this consent, we do not admit that we are within the category of



persons whose consent is required under Section 7 of the Securities Act or the rules and regulations of the Commission promulgated thereunder.
Very truly yours.

/s/ Mintz, Levin, Cohn, Ferris, Glovsky and
Popeo, P.C.
MINTZ, LEVIN, COHN, FERRIS, GLOVSKY AND
POPEO, P.C.

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in this Registration Statement on Form S-1 and related Prospectus of Yield10 Bioscience, Inc. of our report dated March 14, 2023, relating to the consolidated financial statements of Yield10 Bioscience, Inc., appearing in the Annual Report on Form 10-K of Yield10 Bioscience, Inc. for the year ended December 31, 2022.

We also consent to the reference to our firm under the heading "Experts" in such Prospectus.

/s/ RSM US LLP
Boston, Massachusetts
June 30, 2023