

As filed with the Securities and Exchange Commission on May 3, 2024

Registration Statement No. 333-

**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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Approximate date of commencement of proposed sale to the public:

As soon as practicable after the effective date of this registration statement.

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 Registrant hereby amends this registration statement on such date or dates as may be necessary to delay its effective date until the Registrant shall file a further amendment which specifically states that this registration statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act or until the registration statement shall become effective on such date as the Securities and Exchange Commission, acting pursuant to said Section 8(a), may determine.

SUBJECT TO COMPLETION, DATED MAY 3, 2024

PRELIMINARY PROSPECTUS



YIELD10 BIOSCIENCE, INC.

UP TO _____ UNITS CONSISTING OF SHARES OF COMMON STOCK OR PRE-FUNDED WARRANTS TO PURCHASE SHARES OF COMMON STOCK AND COMMON WARRANTS TO PURCHASE SHARES OF COMMON STOCK

UP TO _____ SHARES OF COMMON STOCK UNDERLYING PRE-FUNDED WARRANTS UP TO _____ SHARES OF COMMON STOCK UNDERLYING COMMON WARRANTS

This preliminary prospectus relates to the offering, on a reasonable best-efforts basis, of _____ units (the “units”), each unit consisting of one share of Yield10 Bioscience, Inc. (the “Company”), common stock, \$0.01 par value per share and one common warrant (each, a “common warrant”) to purchase one share of our common stock.

We are also offering to each purchaser whose purchase of shares of common stock in this offering would otherwise result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% of our outstanding common stock immediately following the consummation of this offering, the opportunity to purchase, if the purchaser so chooses, pre-funded units, each pre-funded unit consisting of one pre-funded warrant to purchase one share of common stock (each, a “pre-funded warrant,” and together with the common warrants, the “warrants”), in lieu of shares of common stock, and one common warrant. Each pre-funded warrant will be exercisable for one share of our common stock. The purchase price of each pre-funded unit will equal the price per unit at which the units are being sold to the public in this offering, minus \$0.001, and the exercise price of each pre-funded warrant will be \$0.001 per share.

This preliminary prospectus also relates to the shares of common stock issuable upon exercise of any pre-funded warrants and common warrants sold in this offering. For each pre-funded unit we sell, the number of units (and shares of common stock) we are offering will be decreased on a one-for-one basis. Each common warrant will be exercisable for one share of our common stock and have an exercise price of \$ _____ per share. Because we will issue a common warrant to purchase one share of our common stock for each share of our common stock and for each pre-funded warrant sold in this offering, the number of common warrants sold in this offering will not change as a result of a change in the mix of the shares of our common stock and pre-funded warrants sold. The common warrants will be exercisable immediately and will expire five years from the date of issuance. The shares of common stock or pre-funded warrants, and the accompanying common warrants, can only be purchased together in this offering but will be issued separately and will be immediately separable upon issuance. We refer to the units, common stock, pre-funded warrants, and common warrants to be sold in this offering collectively as the “securities.”

The securities will be offered at a fixed price and are expected to be issued in a single closing. The offering will terminate on _____, 2024, unless completed sooner or unless we decide to terminate the offering (which we may do at any time in our discretion) prior to that date; however, notwithstanding the foregoing, the shares of our common stock underlying each of the pre-funded warrants and the common warrants will be offered on a continuous basis pursuant to Rule 415 under the Securities Act of 1933, as amended. We expect this offering to be completed not later than three business days following the commencement of sales in this offering (after the effective date of the registration statement of which this prospectus forms a part) and we will deliver all securities to be issued in connection with this offering delivery versus payment or receipt versus payment, as the case may be, upon receipt of investor funds received by us. Accordingly, neither we nor the placement agent for this offering have made any arrangements to place investor funds in an escrow account or trust account since the placement agent will not receive investor funds in connection with the sale of the securities offered hereunder.

The placement agent for this offering will use its reasonable best efforts to arrange for the sale of the securities offered by this prospectus. The placement agent is not purchasing or selling any of the securities we are offering, and the placement agent is not required to arrange the purchase or sale of any specific number of securities or dollar amount. We have agreed to compensate the placement agent as set forth in the table below, which assumes that we sell all of the

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

securities offered by this prospectus. There is no arrangement for funds to be received in escrow, trust or similar arrangement. There is no minimum offering requirement as a condition of closing of this offering. We may sell fewer than all of the shares of common stock and/or pre-funded warrants and accompanying common warrants offered hereby, which may significantly reduce the amount of proceeds received by us. Because there is no escrow account and no minimum number of securities or amount of proceeds, investors could be in a position where they have invested in us, but we have not raised sufficient proceeds in this offering to adequately fund the intended uses of the proceeds as described in this prospectus. See “Risk Factors” on page 7 of this prospectus.

On May 2, 2024, we effected a 1:24 reverse stock split of our outstanding shares of common stock. Unless specifically provided herein, the share and per-share information that follows in this prospectus assumes the effect of the reverse stock split. Our common stock is traded on The Nasdaq Capital Market, or Nasdaq, under the symbol “YTEN”. On May 2, 2024, the last reported sale price of our common stock was \$5.50 per share, as adjusted to reflect the reverse stock split effected on May 2, 2024.

The actual number of securities, the offering price per unit and the exercise price for the accompanying common warrant, will be as determined between us, the placement agent and the investors in this offering based on market conditions at the time of pricing, and may be at a discount to the current market price. Therefore, the recent market price used throughout this prospectus may not be indicative of the actual public offering price for our units. There is no established public trading market for the pre-funded warrants or the common warrants, and we do not expect a market to develop. In addition, we do not intend to apply for a listing of the pre-funded warrants or the common warrants on any national securities exchange.

AN INVESTMENT IN OUR SECURITIES INVOLVES RISKS. SEE THE SECTION ENTITLED “RISK FACTORS” BEGINNING ON PAGE 7.

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.

	Per Unit Share and Accompanying Common Warrant	Per Pre-Funded Warrant and Accompanying Common Warrant	Total ⁽¹⁾
Public offering price ⁽²⁾			
Placement Agent Fees ⁽²⁾			
Proceeds, before expenses, to us ⁽³⁾			

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- (1) Assumes no sale of pre-funded warrants.
- (2) We have agreed to pay the placement agent an aggregate cash fee equal to % of the aggregate gross proceeds raised in this offering, and to reimburse the placement agent for certain of their offering-related expenses. See “Plan of Distribution” on page 29 of this prospectus for a description of the compensation to be received by the placement agent. Because there is no minimum number of securities or amount of proceeds required as a condition to closing this offering, the actual public offering amount, placement agent fees, and proceeds to us, if any, are not presently determinable and may be substantially less than the total maximum offering amounts set forth above. See “Plan of Distribution” for more information.
- (3) Does not include proceeds from the exercise of the common warrants and/or pre-funded warrants in cash, if any.

Delivery of the securities to investors is expected on or about , 2024, subject to satisfaction of customary closing conditions.

The date of this prospectus is , 2024

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You should read this prospectus, any applicable prospectus supplement and any documents incorporated by reference into this prospectus before making an investment in the securities of Yield10 Bioscience, Inc. See “Where You Can Find More Information” for more information. We and the placement agent take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. Neither we nor the placement agent have 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. The information contained in this prospectus, or in any prospectus supplement, is accurate only as of its date. Our business, financial condition, results of operations and prospects may have changed since such 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 from our other filings with the Securities and Exchange Commission (the “SEC”).

Business Overview

Yield10 Bioscience, Inc. (“Yield10” or the “Company”) is an agricultural bioscience company focused on commercializing sustainable products using the oilseed *Camelina sativa* (“Camelina”) as a platform crop. Yield10 is headquartered in Woburn, Massachusetts and has a Canadian subsidiary, Yield10 Oilseeds Inc., located in Saskatoon, Saskatchewan, Canada.

We are pursuing Camelina seed oil products for two market opportunities and value chains. The first product is seed oil produced by Camelina, which has been genetically engineered to enable production of high levels of the omega-3 fatty acids eicosapentanoic acid (“EPA”) and docosahexanoic acid (“DHA”). Our development is driven by the growing demand for new sources of omega-3 ingredients and the production constraints and supply volatility of the traditional raw material source fish oil. This growing omega-3 supply gap offers a market opportunity with the potential for revenue and margin growth at acreage levels operationally accessible to Yield10. When commercially available, the Company’s omega-3 products will address an unmet need for a reliable, scalable supply of EPA and DHA omega-3 ingredients for aquaculture and pet/animal feed. Multiple opportunities exist for further product development to address higher value markets for omega-3 oils in nutraceuticals and pharmaceuticals. Earlier this year, we received regulatory approval from USDA-APHIS for two engineered Camelina lines, the first produces our EPA Omega-3 product and the second produces our EPA+DHA Omega-3 product.

The second product is Camelina seed oil for use as a low-carbon intensity feedstock oil for biofuels, including biodiesel, renewable diesel and sustainable aviation fuel. Markets for biofuels are driven by government policies, have the potential to be very large, and will require the production of tens of millions of acres of new oilseed cover crops like Camelina that do not compete for land with food production.

We selected Camelina, an annual oilseed plant in the mustard family, as our platform crop based on its unique attributes, including its excellent agronomic traits, such as low water and fertilizer input, drought resistance and its short growing cycle. Based on Camelina’s flexible agronomic profile, we believe growers have the option of using Camelina as a winter cover crop, as a relay crop with soybean in the U.S. Midwest, and as a spring rotation crop within the U.S. and regions of Canada. Meeting the growing demand for biofuel feedstocks in North America will require tens of millions of acres of new non-food oilseed production. Given today’s crop production practices, the best way to access this acreage scale is through double cropping using short season winter oilseeds as cash cover crops integrated into crop rotations in a second growing season with the major food crops corn and soybean. Winter cover crops reduce soil erosion and nutrient runoff, promote soil health and trap subsoil moisture. Camelina is in the same plant family as canola and naturally produces a relatively abundant harvest of oil-containing protein-rich seeds. Camelina has no close plant relatives in North America and as a new non-food crop it is readily segregated from commodity crops making it advantaged for producing novel seed products. This dramatically simplifies the regulatory path for engineered products in North America. Planting, harvesting, storage and transportation of Camelina does not require growers to make capital investments in new equipment. The grain can be processed in soft seed (e.g. canola) crushing facilities, using either cold press or solvent extraction and the residual protein meal can be used in certain animal feed rations in the U.S. and Canada once regulatory approval has been obtained. To unlock this potential and make Camelina an attractive option for farmers, we are developing and plan to commercialize advanced varieties with elite weed control herbicide tolerance traits, improved agronomic performance, and increased crop value.

We learned through our interactions with growers that developing elite weed control technology for Camelina to enable seamless integration into current crop rotations is a critical factor in achieving large-scale adoption of Camelina as a new crop. As a result, we prioritized the development of herbicide tolerant Camelina over the past four years. We have successfully developed commercial-quality Camelina varieties

containing an herbicide tolerant (“HT”) trait for glufosinate tolerance alone or as a stacked herbicide tolerant (“stacked HT”) trait for glufosinate tolerance in combination with tolerance to Group 2 herbicides, specifically including tolerance to both imidazolinones and sulfonyleureas. The prevalence and persistence of Group 2 soil residues in some production regions limit the amount of land available for planting conventional Camelina. In November of 2023, our HT and stacked HT technologies received regulatory approval from USDA-APHIS indicating that the agency does not consider our Camelina varieties with these traits to be regulated in the United States. In early 2024, over 50 acres of our spring E3902 HT Camelina was harvested from a contra season seed scale-up conducted in Chile. This accomplishment from first field trials of HT Camelina in the spring of 2022 to regulatory approval in Q4 of 2023 and seed bulk up to tonnage scale in Q1 of 2024 reflects Yield10’s development strengths. We believe this outcome, together with the more recent approvals for our Omega-3 Camelina, reflects the favorable regulatory path for engineered Camelina in the U.S. and bodes well for the accelerated development of this crop using Yield10s advanced technology, gene traits and capabilities. Subject to the availability of sufficient financial resources, we plan to continue our development work with spring E3902 stack HT Camelina and winter stacked HT Camelina during 2024, in order to continue our assessment of the efficacy of the traits in-field agronomics, seed yields and oil content.

We plan to bring both Omega-3 Camelina products forward in development with 2026 being the target for the first commercial-scale production of the EPA8 oil. Herbicide tolerance is critical in Camelina for on-farm performance. We are currently breeding HT traits into both current Omega-3 Camelina varieties to create second generation varieties for large acreage production. As a world leader in Camelina seed genetics and advanced trait technology development, Yield10 shares a common goal with the aquaculture industry including feed and salmon producers to establish the commercial production of thousands of tons of Camelina omega-3 oil as a new scalable, cost effective, and sustainable supplement to fish oil. We believe Camelina omega-3 oil production at scale (50,000 tons per year, based on approximately 200,000 acres) can reduce supply and price volatility in aquafeed and farmed salmon production leading to a potential increase the growth rate of the industry.

Business Strategy

In addition to our Camelina products addressing key sustainability drivers, we believe they should also reward farmers and increase profitability across the value chain with any sustainability benefits providing a marketing advantage for our future customers along with potential upside from any available government credits.

Our business strategy for our omega-3 products is to produce omega-3 oil in a closed loop production system based on the capabilities we established and demonstrated in 2022/2023. We aim to contract with growers to produce omega-3 Camelina solely for sale to Yield10 and contract crushing to produce the oil. Yield10 plans to sell the EPA or EPA+DHA oil focused initially on the aquafeed market through offtake agreements. Our plan is to generate sales for the first 50,000 tons of omega-3 oil in Chile to serve the demand in that market. We plan to file for regulatory approval for the use of our omega-3 oils in aquafeed formulations in Chile this year.

In early 2024, we revised our business strategy for biofuels to focus on providing research and development services to third parties better resourced and interested in scaling Camelina production for biofuels with the goal of generating R&D service and licensing revenues. By becoming an R&D partner and/or licensing our technologies on a non-exclusive basis to third parties, we hope to enable them to accelerate grower adoption and supporting robust value chains to supply the oil. Provided that this strategy is successful, we believe Yield10 will be able to build a royalty revenue stream from trait licensing for Camelina which can grow as the number of acres of Camelina planted increases year over year.

We plan to launch a business focused on the production of EPA and EPA+DHA oils based on the Omega-3 Camelina traits developed over the last 10 years by Rothamsted in the U.K. Yield10 signed an Exclusive Collaboration and Option Agreement for this technology with Rothamsted in November 2020, and this agreement was extended until December 31, 2023. In October of 2023, Yield10 executed its exclusive option and expects to finalize the Exclusive Commercial License in the second quarter of 2024. The Omega-3 Camelina business model is to establish closed-loop production of the oil for sale into the different omega-3 markets. For the largest volume opportunity, aquafeed, we are looking to form a partnership with

one of the world's major aquafeed producers to facilitate and accelerate our entry into that market. For these reasons, we plan to continue developing our grower network by shifting to a traditional seed sales model for some of our Camelina varieties. We have a considerable number of growers interested in the buildup of agronomic experience and the development of other applications for Camelina as a crop. Once we complete the regulatory work for the HT and stacked HT Camelina varieties, we expect to make them available to growers as well. The grower network built up for these activities will form the foundation for the future contracted production of the Omega-3 Camelina that is currently in early commercial development.

Yield10 will continue its focus on developing elite Camelina varieties with herbicide tolerance, disease resistance, higher yield and oil content, with the intent to breed Rothamsted's omega-3 product trait into this germplasm in the future. In the meantime, Yield10 plans to use the existing EPA8 and DHA1 Omega-3 Camelina varieties to begin scaling up omega-3 oils production in the near term.

Recent Developments

Warrant Exercise

On March 22, 2024, we entered into warrant exercise agreements (the "Warrant Exercise Agreements") with certain existing institutional investors, pursuant to which the institutional investors agreed to exercise (the "Warrant Exercise") for cash (i) a portion of the warrants issued to such institutional investors in May 2023, which were exercisable for 27,964 shares of the common stock and had an exercise price of \$71.52 per share (the "May 2023 Warrants") and (ii) a portion of the warrants issued to such institutional investors in August 2023, which were exercisable for 105,000 shares of common stock and had an exercise price of \$15.60 per share (together with the May 2023 Warrants, the "Existing Warrants"). In consideration for the immediate exercise of 132,964 of the Existing Warrants for cash, we agreed to reduce the exercise price of the Existing Warrants held by such institutional investors, including any unexercised portion thereof, to \$10.32 per share, which was equal to the most recent closing price of our common stock on the Nasdaq Capital Market prior to the execution of the Warrant Exercise Agreements, as adjusted to reflect the reverse stock split effected on May 2, 2024. In addition, in consideration for the Warrant Exercise, the institutional investors received new unregistered warrants to purchase up to an aggregate of 265,928 shares of common stock, equal to 200% of the shares of common stock issued in connection with the Warrant Exercise, with an exercise price of \$10.32 per share (the "New Warrants"), in a private placement pursuant to Section 4(a)(2) of the Securities Act.

The Company received aggregate gross proceeds of approximately \$1.4 million from the Warrant Exercise. The New Warrants will only be exercisable contingent upon and after receiving stockholder approval as required by listing rules of Nasdaq and may be exercised until five years from the date of such stockholder approval, if and when obtained. The New Warrants contain standard adjustments to the exercise price including for stock splits, stock dividends, rights offerings and pro rata distributions. The New Warrants also include certain rights upon "fundamental transactions" (as described in the New Warrants), including the right of the holders thereof to receive from the Company or a successor entity the same type or form of consideration (and in the same proportion) that is being offered and paid to the holders of common stock in such fundamental transaction in the amount of the Black-Scholes value (as described in the New Warrants) of the unexercised portion of the New Warrants on the date of the consummation of such fundamental transaction.

We have agreed to seek stockholder approval of the issuance of the shares of our common stock underlying the New Warrants at our 2024 Annual Meeting of Stockholders on June 7, 2024. The share and per-share information in the description of the Warrant Exercise reflects adjustments pursuant to the reverse stock split effected on May 2, 2024.

Nasdaq Minimum Stockholders' Equity Deficiency

On May 18, 2023, the Nasdaq Listing Qualifications Department (the "Staff") informed us that the Company did not comply with the minimum stockholders' equity requirement pursuant to Nasdaq Listing Rule 5550(b)(1) ("Rule 5550(b)(1)"). The Staff granted the Company's request for an extension until September 30, 2023, which was subsequently extended until November 14, 2023, to comply with Rule 5550(b)(1).

On November 15, 2023, we received a notice from Nasdaq of the Staff's determination that the Company had not met the terms of such extension. The Company requested an appeal of the Staff's determination and submitted a hearing request to the Panel, which request stayed any delisting action by the Staff until the hearing process was concluded. Yield10 participated in a hearing before the Panel on February 6, 2024, and on February 13, 2024, we were notified by the Panel that the Company had been granted an additional extension to remain listed on The Nasdaq Capital Market until May 13, 2024, subject to certain conditions. These conditions included that the Company provide a written update on the status of its plans to obtain financing and strengthen its balance sheet by March 15, 2024, as well as provide prompt notification of any significant events that may occur during the period of extension that may affect the Company's compliance with Nasdaq requirements. We provided the Panel with the requested update on March 14, 2024.

Nasdaq Minimum Bid Price Deficiency

On September 25, 2023, we received a separate notice from the Staff notifying the Company that we were not in compliance with the requirement to maintain a minimum bid price of at least \$1.00 per share pursuant to Nasdaq Listing Rule 5550(a)(2) (the "Minimum Bid Price Rule"). The second notice stated that pursuant to Nasdaq Listing Rule 5810(c)(3)(A), the Company would be afforded 180 calendar days, or until March 25, 2024, to regain compliance with the Minimum Bid Price Rule. In order to regain compliance, shares of the Company's common stock must maintain a minimum bid closing price of at least \$1.00 per share for a minimum of ten consecutive business days. On March 26, 2024, the Company received another notice from the Staff stating that the Company was not eligible for a second 180-day compliance period for the Minimum Bid Price Rule deficiency because the Company did not comply with the minimum stockholders' equity initial listing requirement for The Nasdaq Capital Market. As required under this notice, we presented our views with respect to this deficiency to the Panel in writing on April 2, 2024, indicating, among other measures, our intent to effect a reverse stock split in order to increase the price of our common stock to a level that would satisfy the Minimum Bid Price Rule. On May 1, 2024, we were granted an extension until May 20, 2024 to regain compliance with the Minimum Bid Price Rule.

Reverse Stock Split

In order to regain compliance with the Minimum Bid Price Rule, on April 26, 2024, we held a special meeting of stockholders, at which our stockholders approved an amendment to our amended and restated certificate of incorporation, as amended (the "Charter Amendment"), to effect a reverse stock split of the outstanding shares of our common stock at a ratio between 1:5 and 1:25 as determined by our board of directors.

Pursuant to such authority granted by our stockholders, our board of directors approved a 1:24 reverse stock split of our common stock and the filing of the Charter Amendment to effectuate the reverse stock split. The Amendment was filed with the Secretary of State of the State of Delaware, and the reverse stock split became effective in accordance with the terms of the Charter Amendment at 5:00 p.m. Eastern Time on May 2, 2024 (the "Effective Time"). The Charter Amendment provides that, at the Effective Time, every 24 of our issued and outstanding common stock will automatically be combined into one issued and outstanding share of common stock, without any change in par value per share, which will remain \$0.01.

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. We have included our website address in this prospectus solely as an inactive textual reference.

THE OFFERING

Units offered	Up to _____ units, each unit consisting of one share of common stock and one common warrant to purchase one share of common stock, at an assumed public offering price of \$ _____ per unit (the last reported sale price of our shares of common stock on the Nasdaq on _____, 2024, as adjusted for the reverse stock split effected on May 2, 2024).
Pre-funded units offered	We are also offering to those purchasers, if any, whose purchase of units in this offering would otherwise result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding shares of common stock immediately following the consummation of this offering, the opportunity to purchase, if such purchasers so choose, pre-funded units (each pre-funded unit consisting of one pre-funded warrant to purchase one share of common stock and one common warrant to purchase one share of common stock), in lieu of units that would otherwise result in any such purchaser's beneficial ownership exceeding 4.99% (or, at the election of the purchaser, 9.99%) of our outstanding shares of common stock. The purchase price of each pre-funded unit will equal the public offering price at which units are being sold to the public in this offering, minus \$0.001. For each pre-funded unit we sell, the number of units we are offering will be decreased on a one-for-one basis.
Common warrants offered	Up to _____ common warrants to purchase an aggregate of _____ shares of common stock. Each unit and pre-funded unit includes one common warrant. Each common warrant will have an exercise price of \$ _____ per share, will be immediately exercisable and will expire on the fifth anniversary of the original issuance date. This prospectus also relates to the offering of the shares of common stock issuable upon exercise of the common warrants.
Common stock to be outstanding after this offering	_____ shares (assuming the sale of all units covered by this prospectus, no sale of pre-funded units, no exercise of any warrants or pre-funded warrants issued in this offering and no exercise of outstanding options issued under our equity incentive plans and based on 501,357 shares outstanding as of December 31, 2023) (as adjusted for the reverse stock split effected on May 2, 2024).
Use of proceeds	We intend to use the net proceeds from this offering for general corporate purposes, including working capital. See "Use of Proceeds".
Nasdaq Capital Market symbol	YTEN
Reasonable best efforts offering	We have agreed to offer and sell the securities offered hereby to the purchasers through the placement agent. The placement agent is not required to buy or sell any specific number or dollar amount of the securities offered hereby, but it will use its reasonable best efforts to solicit offers to purchase the securities offered by this prospectus. See " <i>Plan of Distribution</i> " on page 29 of this prospectus.

Risk factors

An investment in our securities involves a high degree of risk. See the section titled “*Risk Factors*” beginning on page 7 of this prospectus and the similarly titled sections in the documents incorporated by reference into this prospectus.

The number of shares of common stock that will be outstanding after this offering is based on 501,357 shares outstanding as of December 31, 2023 (as adjusted for the reverse stock split effected on May 2, 2024), and excludes:

- 55,790 shares of common stock issuable upon exercise of options to purchase our common stock outstanding as of December 31, 2023 at a weighted average exercise price of \$212.79 per share;
- 239,583 shares of common stock issuable upon exercise of warrants issued in a public offering in August 2023 and outstanding as of December 31, 2023 at an exercise price of \$15.60 per share (subsequently repriced to have an exercise price of \$10.32 per share for certain warrant holders) and which expire on August 15, 2028;
- 41,947 shares of common stock issuable upon exercise of warrants issued in a registered direct and private placement in May 2023 and outstanding as of December 31, 2023 at an exercise price of \$71.52 per share (subsequently repriced to have an exercise price of \$10.32 per share for certain warrant holders) and which expire on November 6, 2028;
- 46,429 shares of common stock issuable upon exercise of Series B Warrants issued in public offerings in November 2019 and outstanding as of December 31, 2023 at an exercise price of \$192.00 per share and which expire on May 19, 2027; and
- 31 shares of common stock issuable upon exercise of immediately vested warrants outstanding as of December 31, 2023 and issued to an investor relations consultant on September 12, 2017 at an exercise price of \$2,784.00 per share and which expire on September 11, 2024.

Except as otherwise noted, the information above reflects and assumes (i) no sale of pre-funded units in this offering, which, if sold, would reduce the number of units that we are offering on a one-for-one basis, (ii) no exercise of any warrants or pre-funded warrants issued in this offering and (iii) a 1:24 reverse stock split of our issued and outstanding shares of common stock effected on May 2, 2024 and the corresponding adjustment of all common stock price per-share data and stock option and warrant exercise price per share data.

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, 2023 filed with the SEC on April 1, 2024](#) 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.

Risks Relating to this Offering

This is a reasonable best-efforts offering, with no minimum amount of securities required to be sold, and we may sell fewer than all of the securities offered hereby.

The placement agent has agreed to use its reasonable best efforts to solicit offers to purchase the units and the pre-funded units in this offering. The placement agent has no obligation to buy any of the securities from us or to arrange for the purchase or sale of any specific number or dollar amount of the securities. There is no required minimum number of securities that must be sold as a condition to completion of this offering. As there is no minimum offering amount required as a condition to the closing of this offering, the actual offering amount, aggregate placement agent fees and proceeds to us are not presently determinable and may be substantially less than the maximum amounts set forth above. We may sell fewer than all of the securities offered hereby, which may significantly reduce the amount of proceeds received by us, and investors in this offering will not receive a refund in the event that we do not sell all of the units or pre-funded units offered by us in this offering. The success of this offering will impact our ability to use the proceeds to execute our business plans. We may have insufficient capital to implement our business plans, potentially resulting in greater operating losses unless we are able to raise the required capital from alternative sources. There is no assurance that alternative capital, if needed, would be available on terms acceptable to us, or at all.

Management will have broad discretion as to the use of the proceeds from this offering and we may not use the proceeds effectively.

Our management will have broad discretion with respect to the use of proceeds of this offering, including for any of the purposes described in the section entitled “Use of Proceeds” beginning on page [12](#) of this prospectus. You will be relying on the judgment of our management regarding the application of the proceeds of this offering. The results and effectiveness of the use of proceeds are uncertain, and we could spend the proceeds in ways that you do not agree with or that do not improve our results of operations or enhance the value of our common stock. Our failure to apply these funds effectively could harm our business and cause the price of our common stock to decline.

We may not receive any additional funds upon the exercise of the common warrants.

Each common warrant has an exercise price of \$ _____ per share and may also be exercised in certain circumstances by way of a cashless exercise, meaning that the holder may not pay a cash purchase price upon exercise, but instead would receive upon such exercise the net number of shares of our common stock determined according to the formula set forth in the common warrant. Accordingly, we may not receive any additional funds, or any significant additional funds, upon the exercise of the common warrants.

You will experience immediate and substantial dilution as a result of this offering and may experience additional dilution in the future.

You will incur immediate and substantial dilution as a result of this offering. After giving effect to the sale by us of securities offered in this offering at an assumed public offering price of \$ _____ per share unit (the last reported sale price per share of our common stock on the Nasdaq on _____, 2024, as adjusted for the reverse stock split effected on May 2, 2024), and after deducting placement agent fees and estimated offering expenses payable by us, investors in this offering would experience immediate dilution of approximately \$ _____ per share. See the section entitled “Dilution” beginning on page [17](#) of this prospectus

for a more detailed discussion of the dilution you will incur if you purchase securities in this offering. The discussion above assumes no exercise of the warrants being offered in this offering. The discussion above assumes (i) no sale of pre-funded warrants, which, if sold, would reduce the number of shares of common stock that we are offering on a one-for-one basis, and (ii) no exercise of the warrants being offered in this offering.

To raise additional capital, we may in the future sell additional shares of our common stock or other securities convertible into or exchangeable for our common stock at prices that are lower than the prices paid by existing stockholders, and investors purchasing shares or other securities in the future could have rights superior to existing stockholders. If we issue shares of common stock or securities convertible or exercisable into shares of common stock, our stockholders would experience additional dilution and, as a result, our share price may decline.

There is no public market for the common warrants or pre-funded warrants being offered in this offering.

There is no established public trading market for the common warrants or pre-funded warrants being offered in this offering, and we do not expect a market to develop. In addition, we do not intend to apply to list the common warrants or pre-funded warrants on any securities exchange or nationally recognized trading system, including The Nasdaq Capital Market. Without an active market, the liquidity of the common warrants and pre-funded warrants will be limited.

Holders of common warrants or pre-funded warrants purchased in this offering will have no rights as common stockholders until such holders exercise their warrants or pre-funded warrants and acquire our common stock.

Until holders of common warrants or pre-funded warrants acquire shares of our common stock upon exercise thereof, holders of warrants will have no rights with respect to the shares of our common stock underlying such warrants. Upon exercise of the common warrants or pre-funded warrants, the holders will be entitled to exercise the rights of a common stockholder only as to matters for which the record date occurs after the exercise date.

Risks Relating to our Common Stock

If we are unable to raise substantial additional funds in the near term, we will be unable to continue to operate our business and remain a going concern.

We have identified conditions and events that raise substantial doubt about our ability to continue as a going concern. We had cash, cash equivalents and short-term investments of \$1.1 million as of December 31, 2023. In our efforts to obtain additional funding, in February of 2024, we granted a global license to Vision Bioenergy Oilseeds, LLC (“Vision”) to certain proprietary varieties of Camelina for the production of feedstock oils for biofuels. In consideration for the license and our completion of certain deliverables, Vision has agreed to make cash payments to us of \$3.0 million. Further, in March of 2024, we raised an additional \$1.4 million in gross proceeds from the Warrant Exercise pursuant to the Warrant Exercise Agreements. Taken together, we believe our cash resources will only provide funding for our operations into the second quarter of 2024. Our management is urgently evaluating and pursuing different strategies to obtain the required funding for our operations in the near term. These strategies may include, but are not limited to, public and private placements of equity and/or debt, licensing and/or collaboration arrangements and strategic alternatives with third parties, or other funding from the government or third parties. There can be no assurance that these funding efforts will be successful. The sale of equity and convertible debt securities would result in dilution to our stockholders and, in the case of preferred equity securities or convertible debt, those securities could provide for rights, preferences or privileges senior to those of our common stock. The terms of debt securities issued or borrowings pursuant to a credit agreement could impose significant restrictions on our operations. If we raise funds through collaborations and licensing arrangements, we might be required to relinquish significant rights to our technologies or products or grant licenses on terms that are not favorable to us. Additional capital may not be available on reasonable terms, or at all. If we are unable to obtain funds when needed or on acceptable terms, we may be required to curtail our current development programs, cut operating costs, forego future development and other opportunities or even terminate our operations, which may involve seeking bankruptcy protection.

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

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 Rule exists if the deficiency continues for a period of 30 consecutive business days.

Minimum Stockholders' Equity Deficiency

On May 18, 2023, the Staff informed us that the Company did not comply with the minimum stockholders' equity requirement pursuant to Nasdaq Listing Rule 5550(b)(1). The Staff granted the Company's request for an extension until September 30, 2023, which was subsequently extended until November 14, 2023, to comply with Rule 5550(b)(1).

On November 15, 2023, we received a notice from Nasdaq of the Staff's determination that the Company had not met the terms of such extension. The Company requested an appeal of the Staff's determination and submitted a hearing request to the Panel, which request stayed any delisting action by the Staff until the hearing process was concluded. Yield10 participated in a hearing before the Panel on February 6, 2024, and on February 13, 2024, we were notified by the Panel that the Company had been granted an additional extension to remain listed on The Nasdaq Capital Market until May 13, 2024, subject to certain conditions. These conditions included that the Company provide a written update on the status of its plans to obtain financing and strengthen its balance sheet by March 15, 2024, as well as provide prompt notification of any significant events that may occur during the period of extension that may affect the Company's compliance with Nasdaq requirements. We provided the Panel with the requested update on March 14, 2024.

Minimum Bid Price Deficiency

On September 25, 2023, we received a separate notice from the Staff notifying the Company that it was not in compliance with the requirement to maintain a minimum bid price of at least \$1.00 per share pursuant to Nasdaq Listing Rule 5550(a)(2). The second notice stated that pursuant to Nasdaq Listing Rule 5810(c)(3)(A), the Company would be afforded 180 calendar days, or until March 25, 2024, to regain compliance with the Minimum Bid Price Rule. In order to regain compliance, shares of the Company's common stock must maintain a minimum bid closing price of at least \$1.00 per share for a minimum of ten consecutive business days. On March 26, 2024, the Company received another notice from the Staff stating that the Company was not eligible for a second 180-day compliance period for the Minimum Bid Price Rule deficiency because the Company did not comply with the minimum stockholders' equity initial listing requirement for The Nasdaq Capital Market. As required pursuant to this notice, we presented our views with respect to this deficiency to the Panel in writing on April 2, 2024, indicating, among other measures, our intent to effect a reverse stock split in order to increase the price of our common stock to a level that would satisfy the Minimum Bid Price Rule. On May 1, 2024, we were granted an extension until May 20, 2024 to regain compliance with the Minimum Bid Price Rule.

Delisting from Nasdaq could make trading our common stock more difficult for investors, potentially leading to further declines in our share price and liquidity. If our common stock is delisted by Nasdaq, our common stock may be eligible to trade on an over-the-counter quotation system, where an investor may find it more difficult to sell our stock or obtain accurate quotations as to the market value of our common stock. We cannot assure you that our common stock, if delisted from Nasdaq, will be listed on another national securities exchange or quoted on an over-the counter quotation system.

We have completed a reverse stock split on May 2, 2024 in an effort to regain compliance with Nasdaq listing rules, and we cannot predict the effect that such reverse stock split will have on the market price for shares of our common stock.

In order to regain compliance with the Minimum Bid Price Rule, on April 26, 2024, we held a special meeting of stockholders, at which our stockholders approved the Charter Amendment to effect a reverse stock split of the outstanding shares of our common stock at a ratio between 1:5 and 1:25 as determined by our board of directors. Pursuant to such authority granted by our stockholders, our board of directors approved a 1:24 reverse stock split of our common stock and the filing of the Charter Amendment to effectuate the reverse stock split. The Amendment was filed with the Secretary of State of the State of Delaware, and the reverse stock split became effective in accordance with the terms of the Charter Amendment at 5:00 p.m. Eastern Time on May 2, 2024. The Charter Amendment provides that, at the Effective Time, every 24 of our issued and outstanding common stock will automatically be combined into one issued and outstanding share of common stock, without any change in par value per share, which will remain \$0.01.

We cannot predict the effect that the reverse stock split will have on the market price for shares of our common stock, and the history of similar reverse stock splits for companies in like circumstances has varied. Some investors may have a negative view of a reverse stock split. Even if the reverse stock split has a positive effect on the market price for shares of our common stock, performance of our business and financial results, general economic conditions and the market perception of our business, and other adverse factors which may not be in our control could lead to a decrease in the price of our common stock following the reverse stock split.

Furthermore, even if the reverse stock split does result in an increased market price per share of our common stock, the market price per share following the reverse stock split may not increase in proportion to the reduction of the number of shares of our common stock outstanding before the implementation of the reverse stock split. Accordingly, even with an increased market price per share, the total market capitalization of shares of our common stock after a reverse stock split could be lower than the total market capitalization before the reverse stock split. Also, even if there is an initial increase in the market price per share of our common stock after a reverse stock split, the market price may not remain at that level.

If the market price of shares of our common stock declines following the reverse stock split, the decline as an absolute number and as a percentage of our overall market capitalization may be greater than would occur in the absence of the reverse stock split due to decreased liquidity in the market for our common stock. Accordingly, the total market capitalization of our common stock following the reverse stock split could be lower than the total market capitalization before the reverse stock split.

The reverse stock split was not accompanied by a decrease in our authorized shares.

The reduction in outstanding shares that resulted from the reverse stock split reduced the proportion of shares owned by our stockholders relative to the number of shares authorized for issuance, giving our board of directors an effective increase in the relative number of authorized shares available for issuance, in its discretion. Our board of directors may from time to time may deem it to be in the best interests of the Company and its stockholders to enter into transactions and other ventures that may include the issuance of shares of our common stock. If our board of directors authorizes the issuance of additional shares of common stock subsequent to a reverse stock split, the dilution to the ownership interest of our existing stockholders may be greater than would occur had such reverse stock split not been effected.

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 estimate that the net proceeds from our issuance and sale of the units in this offering will be approximately \$ million (assuming the sale of the maximum number of units offered hereby) after deducting placement agent fees and estimated offering expenses payable by us, based on an assumed public offering price of \$ per unit (the last reported sale price of our shares of common stock on the Nasdaq on , 2024, adjusted to reflect the 1:24 reverse split effected on May 2, 2024), excluding the proceeds, if any, from the exercise of any warrants. However, because this is a reasonable best-efforts offering with no minimum number of securities or amount of proceeds as a condition to closing, the actual offering amount, placement agent fees, and net proceeds to us are not presently determinable and may be substantially less than the maximum amounts set forth on the cover page of this prospectus, and we may not sell all or any of the securities we are offering. As a result, we may receive significantly less in net proceeds. Based on the assumed offering price set forth above, we estimate that our net proceeds from the sale of 75% and 50% of the units offered in this offering would be approximately \$ million and \$ million, respectively, after deducting placement agent fees and estimated offering expenses payable by us, and assuming no pre-funded warrants are sold and no exercise of any warrants.

As of December 31, 2023, we had cash and cash equivalents of approximately \$1.1 million. In our efforts to obtain additional funding, during February of 2024, we granted a global license to Vision Bioenergy Oilseeds, LLC to certain proprietary varieties of Camelina for the production of feedstock oils for biofuels. In consideration for the license and our completion of certain deliverables, Vision has agreed to make cash payments to us of \$3.0 million. Further, in March of 2024, we raised an additional \$1.4 million in gross proceeds pursuant to a warrant exchange agreement with certain existing investors.

We intend to use the net proceeds from this offering for general corporate purposes.

This expected use of net proceeds from this offering and our existing cash and cash equivalents represents our intentions based upon our current plans and business conditions, which could change in the future as our plans and business conditions evolve. The amounts and timing of our actual expenditures may vary significantly depending on numerous factors, including the progress of our development, any collaborations that we may enter with third parties, and any unforeseen cash needs. As a result, our management will retain broad discretion over the allocation of the net proceeds from this offering. We have no current agreements, commitments or understandings for any material acquisitions or licenses of any products, businesses or technologies.

We anticipate existing cash and cash equivalents and the net proceeds from this offering will be sufficient to fund our planned operations into the second quarter of 2024. We plan to raise additional capital in the future to fund our ongoing working capital requirements.

As of the date of this prospectus, we cannot predict with certainty all the uses for the net proceeds to be received upon the completion of this offering or the amounts we will spend on the uses set forth above. Pending our use of the net proceeds from this offering, we intend to invest a portion of the net proceeds in a variety of capital preservation investments, including short-term, interest-bearing instruments and U.S. government securities.

MARKET FOR OUR COMMON STOCK

Market Information

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

Stockholders

As of April 23, 2024, 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.

CAPITALIZATION

The following table sets forth our cash and cash equivalents and our capitalization as of December 31, 2023 (as adjusted for the reverse stock split effected on May 2, 2024):

- on an actual basis as of December 31, 2023; and
- on an as adjusted basis to give effect to the sale of _____ units in this offering (each unit consisting of one share of common stock and one common warrant to purchase one share of common stock), at an assumed public offering price of \$ _____ per unit (which is the last reported sale price of our common stock on Nasdaq on _____, 2024, as adjusted for the reverse stock split effected on May 2, 2024), after deducting the underwriting discounts and commissions and estimated offering expenses payable by us.

Our capitalization following the closing of this offering will be adjusted based on the actual public offering price and other terms of this offering determined at pricing. You should read this table together with our consolidated financial statements and the related notes and the sections titled “*Management’s Discussion and Analysis of Financial Condition and Results of Operations*” in our [Annual Report on Form 10-K for the year ended December 31, 2023](#), which is incorporated by reference herein.

in thousands	(unaudited)	
	As of December 31, 2023	
	Actual	As Adjusted ⁽¹⁾
Cash, cash equivalents and short-term investments	\$ 1,068	
Stockholders’ Equity (Deficit)		
Preferred stock (\$0.01 par value per share); 5,000,000 shares authorized; no shares issued or outstanding	—	
Common stock (\$0.01 par value per share); 60,000,000 shares authorized; 501,357 shares issued and outstanding; actual and _____ shares issued and outstanding, on an adjusted basis	5	
Additional paid-in-capital	411,929	
Accumulated other comprehensive loss	(265)	(265)
Accumulated deficit	(414,152)	(414,152)
Total stockholders’ equity (deficit)	(2,483)	
Total capitalization	\$ (2,483)	

- (1) Each \$0.10 increase (decrease) in the assumed public offering price per unit would increase (decrease) the amount of cash and cash equivalents, working capital, total assets, and total stockholders’ equity by approximately \$ _____ million, assuming the number of securities offered by us, as set forth on the cover page of this prospectus, remains the same, no pre-funded warrants are issued and no warrants are exercised, and after deducting placement agent fees and estimated offering expenses payable by us. We may also increase or decrease the number of securities to be issued in this offering. Each increase (decrease) of 1.0 million units offered by us would increase (decrease) the as adjusted amount of cash and cash equivalents, working capital, total assets and total stockholders’ equity by approximately \$ _____ million, assuming the assumed public offering price remains the same, no pre-funded warrants are issued and no warrants are exercised, and after deducting placement agent fees and estimated offering expenses payable by us. The as adjusted information discussed above is illustrative only and will be adjusted based on the actual public offering price and other terms of this offering determined between us, the placement agent, and the investors in this offering at pricing.

Except as otherwise indicated herein, the number of shares of our common stock to be outstanding after this offering is based on 501,357 shares outstanding as of December 31, 2023 (as adjusted for the reverse stock split effected on May 2, 2024), and excludes:

- 55,790 shares of common stock issuable upon exercise of options to purchase our common stock outstanding as of December 31, 2023 at a weighted average exercise price of \$212.79 per share;
- 239,583 shares of common stock issuable upon exercise of warrants issued in a public offering in August 2023 and outstanding as of December 31, 2023 at an exercise price of \$15.60 per share (subsequently repriced to have an exercise price of \$10.32 per share for certain warrant holders) and which expire on August 15, 2028;
- 41,947 shares of common stock issuable upon exercise of warrants issued in a registered direct and private placement in May 2023 and outstanding as of December 31, 2023 at an exercise price of \$71.52 per share (subsequently repriced to have an exercise price of \$10.32 per share for certain warrant holders) and which expire on November 6, 2028;
- 46,429 shares of common stock issuable upon exercise of Series B Warrants issued in public offerings in November 2019 and outstanding as of December 31, 2023 at an exercise price of \$192.00 per share and which expire on May 19, 2027;
- 31 shares of common stock issuable upon exercise of immediately vested warrants outstanding as of December 31, 2023 and issued to an investor relations consultant on September 12, 2017 at an exercise price of \$2,784.00 per share and which expire on September 11, 2024.

Except as otherwise noted, the information above reflects and assumes (i) no sale of pre-funded units in this offering, which, if sold, would reduce the number of units that we are offering on a one-for-one basis, (ii) no exercise of any warrants or pre-funded warrants issued in this offering and (iii) a 1:24 reverse stock split of our issued and outstanding shares of common stock effected on May 2, 2024 and the corresponding adjustment of all common stock price per-share data and stock option and warrant exercise price per share data.

You should read this table together with our financial statements included in our [Annual Report on Form 10-K for the year ended December 31, 2023](#), which is incorporated by reference herein.

DILUTION

If you invest in our securities in this offering, your ownership interest will be diluted immediately to the extent of the difference between the public offering price per unit and the as adjusted net tangible book value per share of our common stock after this offering.

As of December 31, 2023, our net tangible book value was approximately \$(2.5) million, or \$(4.95) per share of our common stock (as adjusted for the reverse stock split effected on May 2, 2024). Net tangible book value per share represents the amount of our total tangible assets less our total liabilities, divided by the total number of shares of our common stock outstanding as of December 31, 2023.

After giving effect to the assumed issuance and sale of the maximum of _____ units (each unit consisting of one share of common stock and one common warrant to purchase one share of common stock) in this offering at an assumed offering price of \$ _____ per unit (which is the last reported sale price of our common stock on Nasdaq on _____, 2024, as adjusted for the reverse stock split effected on May 2, 2024), and after deducting placement agent fees and estimated offering fees and expenses payable by us, our net tangible book value as of December 31, 2023 would have been approximately \$ _____ per share of Common Stock. This represents an immediate increase (decrease) in net tangible book value of \$ _____ per share to our existing stockholders and an immediate dilution in net tangible book value of \$ _____ per share to investors participating in this offering. The following table illustrates this dilution per share of Common Stock to investors participating in this offering:

Assumed public offering price per unit	\$
Historical net tangible book value per share as of December 31, 2023	\$(4.95)
Increase (decrease) in net tangible book value per share attributable to this offering	\$
As adjusted net tangible book value per share after this offering	\$
Dilution per share to new investors in the offering	\$

Each \$0.10 increase (decrease) in the assumed public offering price of \$ _____ per unit, which is the last reported sale price of our common stock on Nasdaq on _____, 2024 (as adjusted for the reverse stock split effected on May 2, 2024), would increase (decrease) our as adjusted net tangible book value per share after this offering by approximately \$ _____ and the dilution per share to investors purchasing securities in this offering by \$ _____, assuming the maximum number of securities offered by us, as set forth on the cover page of this prospectus, remains the same, no pre-funded warrants are issued and no warrants are exercised, and after deducting placement agent fees and estimated offering expenses payable by us. We may also increase or decrease the number of securities to be issued in this offering. Each increase (decrease) of 1.0 million units offered by us would increase (decrease) our pro forma as adjusted net tangible book value per share and the dilution per share to investors purchasing securities in this offering by \$ _____ and \$(_____), respectively assuming that the assumed public offering price remains the same, no pre-funded warrants are issued and no warrants are exercised, and after deducting placement agent fees and estimated offering expenses payable by us. The information discussed above is illustrative only and will be adjusted based on the actual public offering price and other terms of this offering as determined between us, the placement agent, and the investors in this offering at pricing.

Except as otherwise indicated herein, the number of shares of our common stock to be outstanding after this offering is based on 501,357 shares outstanding as of December 31, 2023 (as adjusted for the reverse stock split effected on May 2, 2024), and excludes:

- 55,790 shares of common stock issuable upon exercise of options to purchase our common stock outstanding as of December 31, 2023 at a weighted average exercise price of \$212.79 per share;
- 239,583 shares of common stock issuable upon exercise of warrants issued in a public offering in August 2023 and outstanding as of December 31, 2023 at an exercise price of \$15.60 per share (subsequently repriced to have an exercise price of \$10.32 per share for certain warrant holders) and which expire on August 15, 2028;
- 41,947 shares of common stock issuable upon exercise of warrants issued in a registered direct and private placement in May 2023 and outstanding as of December 31, 2023 at an exercise price of \$71.52

per share (subsequently repriced to have an exercise price of \$10.32 per share for certain warrant holders) and which expire on November 6, 2028;

- 46,429 shares of common stock issuable upon exercise of Series B Warrants issued in public offerings in November 2019 and outstanding as of December 31, 2023 at an exercise price of \$192.00 per share and which expire on May 19, 2027; and
- 31 shares of common stock issuable upon exercise of immediately vested warrants outstanding as of December 31, 2023 and issued to an investor relations consultant on September 12, 2017 at an exercise price of \$2,784.00 per share and which expire on September 11, 2024.

Except as otherwise noted, the information above reflects and assumes (i) no sale of pre-funded units in this offering, which, if sold, would reduce the number of units that we are offering on a one-for-one basis, (ii) no exercise of any warrants or pre-funded warrants issued in this offering and (iii) a 1:24 reverse stock split of our issued and outstanding shares of common stock effected on May 2, 2024 and the corresponding adjustment of all common stock price per-share data and stock option and warrant exercise price per share data.

DESCRIPTION OF SECURITIES WE ARE OFFERING

We are offering on a reasonable best efforts basis up to _____ units, each unit consisting of one share of our common stock and one common warrant to purchase one share of common stock. We are also offering to each purchaser whose purchase of shares of common stock in this offering would otherwise result in the purchaser, together with its affiliates and certain related parties, beneficially owning more than 4.99% of our outstanding common stock immediately following the consummation of this offering, the opportunity to purchase, if the purchaser so chooses, pre-funded units consisting of one pre-funded warrant, in lieu of the share of common stock, and one common warrant. The shares of common stock or pre-funded warrants, and the accompanying common warrants, can only be purchased together in this offering but will be issued separately and will be immediately separable upon issuance. We are also registering the shares of common stock issuable from time to time upon exercise of the pre-funded warrants and common warrants offered hereby.

Common Stock

The material terms and provisions of our common stock and each other class of our securities that qualifies or limits our common stock are described in the section entitled “Description of Capital Stock” beginning on page [32](#) of this prospectus.

Pre-Funded Warrants

The following summary of certain terms and provisions of pre-funded warrants that are being offered hereby is not complete and is subject to, and qualified in its entirety by, the provisions of the pre-funded warrant, the form of which is filed as an exhibit to the registration statement of which this prospectus forms a part. Prospective investors should carefully review the terms and provisions of the form of pre-funded warrant for a complete description of the terms and conditions of the pre-funded warrants.

Duration and Exercise Price

Each pre-funded warrant offered hereby will have an initial exercise price per share equal to \$0.001. The pre-funded warrants will be immediately exercisable and may be exercised at any time until the pre-funded warrants are exercised in full. The exercise price and number of shares of common stock issuable upon exercise is subject to appropriate adjustment in the event of stock dividends, stock splits, reorganizations or similar events affecting our common stock and the exercise price.

Exercisability

The pre-funded warrants will be exercisable, at the option of each holder, in whole or in part, by delivering to us a duly executed exercise notice accompanied by payment in full for the number of shares of our common stock purchased upon such exercise (except in the case of a cashless exercise as discussed below). A holder (together with its affiliates) may not exercise any portion of the pre-funded warrant to the extent that the holder would own more than 4.99% of the outstanding common stock immediately after exercise (the “Beneficial Ownership Limitation”), except that upon at least _____ days’ prior notice from the holder to us, the holder may increase the Beneficial Ownership Limitation to a percentage not to exceed 19.99%. No fractional shares of common stock will be issued in connection with the exercise of a pre-funded warrant. In lieu of fractional shares, we will pay the holder an amount in cash equal to the fractional amount multiplied by the exercise price.

Cashless Exercise

In lieu of making the cash payment otherwise contemplated to be made to us upon such exercise in payment of the aggregate exercise price, the holder may elect instead to receive upon such exercise (either in whole or in part) a reduced number of shares of common stock determined according to a formula set forth in the pre-funded warrants.

Fundamental Transaction

In the event of a fundamental transaction, as described in the pre-funded warrants and generally including any reorganization, recapitalization or reclassification of our common stock, the sale, transfer or

other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the acquisition of more than 50% of our outstanding common stock, or any person or group becoming the beneficial owner of 50% of the voting power represented by our outstanding common stock, the holders of the pre-funded warrants will be entitled to receive upon exercise of the pre-funded warrants the kind and amount of securities, cash or other property that the holders would have received had they exercised the pre-funded warrants immediately prior to such fundamental transaction.

Transferability

Subject to applicable laws, a pre-funded warrant may be transferred at the option of the holder upon surrender of the pre-funded warrant to us together with the appropriate instruments of transfer.

Exchange Listing

We do not intend to list the pre-funded warrants on any securities exchange or nationally recognized trading system.

Rights as a Stockholder

Except as otherwise provided in the pre-funded warrants or by virtue of such holder's ownership of shares of our common stock, the holders of the pre-funded warrants do not have the rights or privileges of holders of our common stock, including any voting rights, until they exercise their pre-funded warrants.

Common Warrants

The following summary of certain terms and provisions of the common warrants that are being offered hereby is not complete and is subject to, and qualified in its entirety by, the provisions of the common warrants, the form of which is filed as an exhibit to the registration statement of which this prospectus forms a part. Prospective investors should carefully review the terms and provisions of the form of common warrant for a complete description of the terms and conditions of the common warrants.

Duration and Exercise Price

Each common warrant offered hereby will have an initial exercise price per share equal to \$ _____ per share. The common warrants will be immediately exercisable and will expire on the fifth anniversary of the original issuance date. The exercise price and number of shares of common stock issuable upon exercise is subject to appropriate adjustment in the event of stock dividends, stock splits, reorganizations or similar events affecting our common stock and the exercise price. See also "— Anti-Dilution" below. The common warrants will be issued separately from the common stock and pre-funded warrants and may be transferred separately immediately thereafter. A common warrant to purchase one share of our common stock will be issued for every one share of common stock (or pre-funded warrant, as applicable) purchased in this offering.

Exercisability

The common warrants will be exercisable, at the option of each holder, in whole or in part, by delivering a duly executed exercise notice accompanied by payment in full for the number of shares of our common stock purchased upon such exercise (except in the case of a cashless exercise as discussed below). Except as agreed with individual holders of warrants, a holder (together with its affiliates) may not exercise any portion of the common warrant to the extent that the holder would own more than 9.99% of the outstanding common stock immediately after exercise (the "Beneficial Ownership Limitation"), except that upon at least 61 days' prior notice from the holder to us, the holder may increase the Beneficial Ownership Limitation to a percentage not to exceed 19.99%. No fractional shares of common stock will be issued in connection with the exercise of a common warrant. In lieu of fractional shares, we will pay the holder an amount in cash equal to the fractional amount multiplied by the exercise price.

Cashless Exercise

If, at the time a holder exercises its common warrants, a registration statement registering the issuance of the shares of common stock underlying the common warrants under the Securities Act is not then effective

or available, then in lieu of making the cash payment otherwise contemplated to be made to us upon such exercise in payment of the aggregate exercise price, the holder may elect instead to receive upon such exercise (either in whole or in part) the net number of shares of common stock determined according to a formula set forth in the common warrants.

Anti-Dilution

In addition to the adjustments noted above under “— Duration and Exercise Price,” common warrants also contain anti-dilution protection upon the issuance of any common stock, securities convertible into common stock or certain other issuances at a price below the then-existing exercise price of the warrants, with certain exceptions. The terms of the warrants, including these anti-dilution protections, may make it difficult for us to raise additional capital at prevailing market terms in the future.

Fundamental Transaction

In the event of a fundamental transaction, as described in the common warrants and generally including any reorganization, recapitalization or reclassification of our common stock, the sale, transfer or other disposition of all or substantially all of our properties or assets, our consolidation or merger with or into another person, the acquisition of more than 50% of our outstanding common stock, or any person or group becoming the beneficial owner of 50% of the voting power represented by our outstanding common stock, the holders of the common warrants will be entitled to receive upon exercise of the common warrants the kind and amount of securities, cash or other property that the holders would have received had they exercised the common warrants immediately prior to such fundamental transaction. In addition, in the event of a fundamental transaction which is approved by our board of directors (but not in a fundamental transaction which is not approved by our board of directors), the holders of the common warrants have the right to require us or a successor entity to redeem the common warrant for the consideration paid in the fundamental transaction in the amount of the Black Scholes value of the unexercised portion of the common warrant on the date of the consummation of the fundamental transaction.

Transferability

Subject to applicable laws, a common warrant may be transferred at the option of the holder upon surrender of the common warrant together with the appropriate instruments of transfer.

Exchange Listing

We do not intend to list the common warrants on any securities exchange or nationally recognized trading system.

Right as a Stockholder

Except as otherwise provided in the common warrants or by virtue of such holder’s ownership of shares of our common stock, the holders of the common warrants do not have the rights or privileges of holders of our common stock, including any voting rights, until they exercise their common warrants.

MATERIAL U.S. FEDERAL INCOME TAX CONSEQUENCES TO HOLDERS OF COMMON STOCK AND WARRANTS

The following is a summary of the material U.S. federal income tax consequences of the acquisition, ownership and disposition of our common stock, and the acquisition, ownership, exercise, expiration or disposition of the common warrants and pre-funded warrants, but does not purport to be a complete analysis of all the potential tax considerations relating thereto. This summary is based upon the provisions of the Internal Revenue Code of 1986, as amended (the “Code”), Treasury Regulations promulgated thereunder, administrative rulings and judicial decisions, all as of the date hereof. These authorities may be changed or subject to differing interpretations, possibly with retroactive effect, so as to result in U.S. federal income tax consequences different from those set forth below. We have not sought and will not seek any ruling from the Internal Revenue Service (the “IRS”) with respect to the statements made and the conclusions reached in the following summary, and there can be no assurance that the IRS or a court will agree with such statements and conclusions.

This summary also does not address the tax considerations arising under the laws of any U.S. state or local or any non-U.S. jurisdiction, estate or gift tax, the 3.8% Medicare tax on net investment income or any alternative minimum tax consequences. In addition, this discussion does not address tax considerations applicable to a holder’s particular circumstances or to a holder that may be subject to special tax rules, including, without limitation:

- banks, insurance companies or other financial institutions;
- tax-exempt or government organizations;
- brokers or dealers in securities or currencies;
- traders in securities that elect to use a mark-to-market method of accounting for their securities holdings;
- persons that own, or are deemed to own, more than five percent of our capital stock;
- certain U.S. expatriates, citizens or former long-term residents of the United States;
- persons who hold our common stock, pre-funded warrants or common warrants as a position in a hedging transaction, “straddle,” “conversion transaction,” synthetic security, other integrated investment, or other risk reduction transaction;
- persons who do not hold our common stock, pre-funded warrants and common warrants as a capital asset within the meaning of Section 1221 of the Code (generally, for investment purposes);
- persons deemed to sell our common stock, pre-funded warrants or common warrants under the constructive sale provisions of the Code;
- pension plans;
- partnerships, S corporations, or other entities or arrangements treated as partnerships for U.S. federal income tax purposes, or investors in any such entities;
- persons for whom our stock constitutes “qualified small business stock” within the meaning of Section 1202 of the Code;
- integral parts or controlled entities of foreign sovereigns;
- controlled foreign corporations;
- passive foreign investment companies and corporations that accumulate earnings to avoid U.S. federal income tax; or
- persons that acquire our common stock, pre-funded warrants or common warrants as compensation for services.

In addition, if a partnership, including any entity or arrangement classified as a partnership for U.S. federal income tax purposes, holds our common stock, pre-funded warrants or common warrants, the tax treatment of a partner generally will depend on the status of the partner, the activities of the partnership, and

certain determinations made at the partner level. Accordingly, partnerships that hold our common stock, pre-funded warrants or common warrants, and partners in such partnerships, should consult their tax advisors regarding the U.S. federal income tax consequences to them of the purchase, ownership, and disposition of our common stock, pre-funded warrants or common warrants.

You are urged to consult your tax advisor with respect to the application of the U.S. federal income tax laws to your particular situation, as well as any tax consequences of the purchase, ownership and disposition of our common stock or common warrants arising under the U.S. federal estate or gift tax rules or under the laws of any U.S. state or local or any non-U.S. or other taxing jurisdiction or under any applicable tax treaty.

Definition of a U.S. Holder

For purposes of this summary, a “U.S. Holder” is any beneficial owner of our common stock, pre-funded warrants or common warrants that is a “U.S. person,” and is not a partnership, or an entity treated as a partnership or disregarded from its owner, each for U.S. federal income tax purposes. A U.S. person is any person that, for U.S. federal income tax purposes, is or is treated as any of the following:

- an individual who is a citizen or resident of the United States;
- a corporation created or organized under the laws of the United States, any state thereof, or the District of Columbia;
- an estate, the income of which is subject to U.S. federal income tax regardless of its source; or
- a trust that (1) is subject to the primary supervision of a U.S. court and the control of one or more U.S. persons (within the meaning of Section 7701(a)(30) of the Code), or (2) has a valid election in effect to be treated as a U.S. person for U.S. federal income tax purposes.

For purposes of this summary, a “Non-U.S. Holder” is any beneficial owner of our common stock, pre-funded warrants or common warrants that is not a U.S. Holder or a partnership, or other entity treated as a partnership or disregarded from its owner, each for U.S. federal income tax purposes.

Treatment of Pre-funded Warrants

Although it is not entirely free from doubt, a pre-funded warrant should be treated as a share of our common stock for U.S. federal income tax purposes and a holder of pre-funded warrants should generally be taxed in the same manner as a holder of common stock, as described below. Accordingly, no gain or loss should be recognized upon the exercise of a pre-funded warrant and, upon exercise, the holding period of a pre-funded warrant should carry over to the share of common stock received. Similarly, the tax basis of the pre-funded warrant should carry over to the share of common stock received upon exercise, increased by the exercise price of \$0.001. Each holder should consult his, her or its own tax advisor regarding the risks associated with the acquisition of pre-funded warrants pursuant to this offering (including potential alternative characterizations). The balance of this discussion generally assumes that the characterization described above is respected for U.S. federal income tax purposes.

Allocation of Purchase Price for Investment Units

Each pre-funded warrant will be sold as a unit with a common warrant and each share of common stock will be sold as a unit with a common warrant, and each of the items is referred to as a component of a unit. The purchase price for each investment unit should be allocated between the two components in proportion to their relative fair market values at the time the unit is purchased by the holder. This allocation of the purchase price for each unit will establish the holder’s initial tax basis for U.S. federal income tax purposes in the components included in each unit: the pre-funded warrants and common warrants in one case, and the common stock and common warrants in the other. Each holder should consult his, her or its own tax advisor regarding the allocation of the purchase price for a unit.

Tax Consequences to U.S. Holders

Distributions on Common Stock

As discussed in “Dividend Policy,” we do not currently expect to make distributions on our common stock. In the event that we do make distributions of cash or other property, distributions paid on common

stock, other than certain pro rata distributions of common stock, will be treated as a dividend to the extent paid out of our current or accumulated earnings and profits and will be includible in income by the U.S. Holder and taxable as ordinary income when received. If a distribution exceeds our current and accumulated earnings and profits, the excess will be first treated as a tax-free return of the U.S. Holder's investment, up to the U.S. Holder's tax basis in the common stock. Any remaining excess will be treated as a capital gain. Subject to applicable limitations, dividends paid to certain non-corporate U.S. Holders may be eligible for taxation as "qualified dividend income" and therefore may be taxable at rates applicable to long-term capital gains. U.S. Holders should consult their tax advisers regarding the availability of the reduced tax rate on dividends in their particular circumstances. Dividends received by a corporate U.S. Holder will be eligible for the dividends-received deduction if the U.S. Holder meets certain holding period and other applicable requirements.

Constructive Dividends on Common Warrants

Under Section 305 of the Code, an adjustment to the number of shares of common stock that will be issued on the exercise of the common warrants, or an adjustment to the exercise price of the common warrants, may be treated as a constructive distribution to a U.S. Holder of the common warrants if, and to the extent that, such adjustment has the effect of increasing such U.S. Holder's proportionate interest in our "earnings and profits" or assets, depending on the circumstances of such adjustment (for example, if such adjustment is to compensate for a distribution of cash or other property to our stockholders). Adjustments to the exercise price of a common warrant made pursuant to a bona fide reasonable adjustment formula that has the effect of preventing dilution of the interest of the holders of the warrants should generally not result in a constructive distribution. Any constructive distributions would generally be subject to the tax treatment described above under "— Distributions on Common Stock".

Sale or Other Disposition of Common Stock

For U.S. federal income tax purposes, gain or loss realized on the sale or other disposition of common stock will be capital gain or loss, and will be long-term capital gain or loss if the U.S. Holder held the common stock for more than one year. The amount of the gain or loss will equal the difference between the U.S. Holder's tax basis in the common stock disposed of and the amount realized on the disposition. Long-term capital gains recognized by non-corporate U.S. Holders will be subject to reduced tax rates. The deductibility of capital losses is subject to limitations.

Sale or Other Disposition, Exercise or Expiration of Common Warrants

For U.S. federal income tax purposes, gain or loss realized on the sale or other disposition of a common warrant (other than by exercise) will be capital gain or loss and will be long-term capital gain or loss if the U.S. Holder held the common warrant for more than one year at the time of the sale or other disposition. The amount of the gain or loss will equal the difference between the U.S. Holder's tax basis in the common warrant disposed of and the amount realized on the disposition.

In general, a U.S. Holder will not be required to recognize income, gain or loss upon the exercise of a common warrant by payment of the exercise price, except to the extent of cash paid in lieu of a fractional share. A U.S. Holder's tax basis in a share of common stock received upon exercise will be equal to the sum of (1) the U.S. Holder's tax basis in the common warrant and (2) the exercise price of the common warrant. A U.S. Holder's holding period in the stock received upon exercise will commence on the day or the day after such U.S. Holder exercises the common warrant. No discussion is provided herein regarding the U.S. federal income tax treatment on the exercise of a common warrant on a cashless basis, and U.S. Holders are urged to consult their tax advisors as to the exercise of a warrant on a cashless basis.

If a common warrant expires without being exercised, a U.S. Holder will recognize a capital loss in an amount equal to such U.S. Holder's tax basis in the common warrant. This loss will be long-term capital loss if, at the time of the expiration, the U.S. Holder's holding period in the common warrant is more than one year. The deductibility of capital losses is subject to limitations.

Sale or Other Disposition, Exercise or Expiration of Pre-funded Warrants

For U.S. federal income tax purposes, gain or loss realized on the sale or other disposition of pre-funded warrants will be capital gain or loss, and will be long-term capital gain or loss if the U.S. Holder held the pre-funded warrant for more than one year. A U.S. Holder's holding period in the stock received upon exercise will commence on the day or the day such U.S. Holder purchased the pre-funded warrant. The amount of the gain or loss will equal the difference between the U.S. Holder's tax basis in the pre-funded warrant or common stock disposed of and the amount realized on the disposition. Long-term capital gains recognized by non-corporate U.S. Holders will be subject to reduced tax rates. The deductibility of capital losses is subject to limitations.

In general, a U.S. Holder will not be required to recognize income, gain or loss upon the exercise of a pre-funded warrant by payment of the exercise price, except to the extent of cash paid in lieu of a fractional share. A U.S. Holder's tax basis in a share of common stock received upon exercise will be equal to the sum of (1) the U.S. Holder's tax basis in the pre-funded warrant and (2) the exercise price of the pre-funded warrant. No discussion is provided herein regarding the U.S. federal income tax treatment on the exercise of a pre-funded warrant on a cashless basis, and U.S. Holders are urged to consult their tax advisors as to the exercise of a pre-funded warrant on a cashless basis.

If a pre-funded warrant expires without being exercised, a U.S. Holder will recognize a capital loss in an amount equal to such U.S. Holder's tax basis in the pre-funded warrant. This loss will be long-term capital loss if, at the time of the expiration, the U.S. Holder's holding period in the pre-funded warrant is more than one year. The deductibility of capital losses is subject to limitations.

Tax Consequences to Non-U.S. Holders***Distributions***

As discussed in "Dividend Policy," we do not anticipate paying any dividends on our common stock in the foreseeable future. If we make distributions on our common stock or are constructively deemed to have made distributions on our pre-funded warrants or common warrants (as described above under "— Constructive Dividends on Common Warrants"), those payments will constitute dividends for U.S. federal income tax purposes to the extent we have current or accumulated earnings and profits, as determined under U.S. federal income tax principles. To the extent those distributions exceed both our current and our accumulated earnings and profits, they will constitute a return of capital and will first reduce a Non-U.S. Holder's basis in our common stock or common warrants or pre-funded warrants, as applicable, but not below zero. Any excess will be treated as capital gain and will be treated as described below under the "— Gain on Sale or Other Disposition of Common Stock or Common Warrants" section. Any such distributions would be subject to the discussions below regarding back-up withholding and Foreign Account Tax Compliance Act ("FATCA").

Subject to the discussion below on effectively connected income, any dividend paid or constructively deemed to have been paid to a Non-U.S. Holder generally will be subject to U.S. withholding tax either at a rate of 30% of the gross amount of the dividend or such lower rate as may be specified by an applicable income tax treaty. To receive a reduced treaty rate, a Non-U.S. Holder must provide us or our agent with an IRS Form W-8BEN, IRS Form W-8 BEN-E or another appropriate version of IRS Form W-8 (or a successor form), which must be updated periodically, and which, in each case, must certify qualification for the reduced rate. Non-U.S. Holders should consult their tax advisors regarding their entitlement to benefits under any applicable income tax treaty.

Dividends paid to a Non-U.S. Holder that are effectively connected with the Non-U.S. Holder's conduct of a trade or business within the United States and that are not eligible for relief from U.S. (net basis) income tax under an applicable income tax treaty, generally are exempt from the (gross basis) withholding tax described above. To obtain this exemption from withholding tax, the Non-U.S. Holder must provide the applicable withholding agent with an IRS Form W-8ECI or successor form or other applicable IRS Form W-8 certifying under penalty of perjury that the dividends are effectively connected with the Non-U.S. Holder's conduct of a trade or business within the United States. Such effectively connected dividends, if not eligible for relief under a tax treaty, would not be subject to a withholding tax, but would be

taxed at the same graduated rates applicable to U.S. persons, net of certain deductions and credits and if, in addition, the Non-U.S. Holder is a corporation, may also be subject to a branch profits tax at a rate of 30% (or such lower rate as may be specified by an applicable income tax treaty).

If you are eligible for a reduced rate of withholding tax pursuant to a tax treaty, you may be able to obtain a refund of any excess amounts withheld if you timely file an appropriate claim for refund with the IRS.

Exercise or Expiration of Common Warrants and Pre-funded Warrants

In general, a Non-U.S. Holder will not be required to recognize income, gain or loss upon the exercise of a common warrant or pre-funded warrant by payment of the exercise price, except to the extent of cash paid in lieu of a fractional share. However, no discussion is provided herein regarding the U.S. federal income tax treatment on the exercise of a common warrant or pre-funded warrant on a cashless basis, and Non-U.S. Holders are urged to consult their tax advisors as to the exercise of a common warrant or pre-funded warrant on a cashless basis.

If a common warrant or pre-funded warrant expires without being exercised, a Non-U.S. Holder that is engaged in a U.S. trade or business to which any income from the common warrant or pre-funded warrant would be effectively connected or who is present in the United States for a period or periods aggregating 183 days or more during the calendar year in which the expiration occurs (and certain other conditions are met) will recognize a capital loss in an amount equal to such Non-U.S. Holder's tax basis in the common warrant or pre-funded warrant.

Gain on Sale or Other Disposition of Common Stock or Common Warrants

Subject to the discussion below regarding backup withholding and FATCA, a Non-U.S. Holder generally will not be required to pay U.S. federal income tax on any gain realized upon the sale or other disposition of our common stock, pre-funded warrants or common warrants unless:

- the gain is effectively connected with the Non-U.S. Holder's conduct of a trade or business within the United States and not eligible for relief under an applicable income tax treaty, in which case the Non-U.S. Holder will be required to pay tax on the net gain derived from the sale under regular graduated U.S. federal income tax rates, and for a Non-U.S. Holder that is a corporation, such Non-U.S. Holder may be subject to the branch profits tax at a 30% rate (or such lower rate as may be specified by an applicable income tax treaty) on such effectively connected gain, as adjusted for certain items;
- the Non-U.S. Holder is an individual who is present in the United States for a period or periods aggregating 183 days or more during the calendar year in which the sale or disposition occurs and certain other conditions are met, in which case the Non-U.S. Holder will be required to pay a flat 30% tax on the gain derived from the sale, which tax may be offset by U.S. source capital losses (even though the Non-U.S. Holder is not considered a resident of the United States) (subject to applicable income tax or other treaties); or
- we are a "U.S. real property holding corporation" (a "USRPHC") for U.S. federal income tax purposes, or a USRPHC, at any time within the shorter of the five-year period preceding the disposition or the Non-U.S. Holder's holding period for our common stock, pre-funded warrants or common warrants. We believe we are not currently and do not anticipate becoming a USRPHC. However, because the determination of whether we are a USRPHC depends on the fair market value of our United States real property interests relative to the fair market value of our other business assets, there can be no assurance that we will not become a USRPHC in the future. Even if we become a USRPHC, however, gain arising from the sale or other taxable disposition by a Non-U.S. Holder of our common stock will not be subject to United States federal income tax if (A) in the case of our common stock, (a) shares of our common stock are "regularly traded," as defined by applicable Treasury Regulations, on an established securities market, such as Nasdaq, and (b) the Non-U.S. Holder owns or owned, actually and constructively, 5% or less of the shares of our common stock throughout the five-year period ending on the date of the sale or exchange; and (B) in the case of our common warrants or pre-funded warrants, either (a)(i) shares of our common stock are "regularly

traded,” as defined by applicable Treasury Regulations, on an established securities market, such as Nasdaq, (ii) our common warrants or pre-funded warrants, as the case may be, are not considered regularly traded on an established securities market and the Non-U.S. Holder does not own, actually or constructively, common warrants and pre-funded warrants with a fair market value greater than the fair market value of 5% of the shares of our common stock, determined as of the date that such Non-U.S. Holder acquired its common warrants or pre-funded warrants, as applicable, or (b)(i) our common warrants or pre-funded warrants are considered regularly traded on an established securities market, and (ii) the Non-U.S. Holder owns or owned, actually and constructively, 5% or less of our common warrants or pre-funded warrants throughout the five-year period ending on the date of the sale or exchange. Our common warrants and pre-funded are not expected to be regularly traded on an established securities market. If the foregoing exceptions do not apply, such Non-U.S. Holder’s proceeds received on the disposition of shares will generally be subject to withholding at a rate of 15% and such Non-U.S. Holder will generally be taxed on any gain in the same manner as gain that is effectively connected with the conduct of a U.S. trade or business, except that the branch profits tax generally will not apply.

Information Reporting and Backup Withholding

Information returns may be filed with the IRS in connection with distributions on common stock or constructive dividends on common warrants and pre-funded warrants, and the proceeds of a sale or other disposition of common stock or common warrants or pre-funded warrants. A non-exempt U.S. Holder may be subject to U.S. backup withholding on these payments if it fails to provide its taxpayer identification number to the withholding agent and comply with certification procedures or otherwise establish an exemption from backup withholding.

A Non-U.S. Holder may be subject to U.S. information reporting and backup withholding on these payments unless the Non-U.S. Holder complies with certification procedures to establish that it is not a U.S. person (within the meaning of the Code). The certification requirements generally will be satisfied if the Non-U.S. Holder provides the applicable withholding agent with a statement on the applicable IRS Form W-8BEN or IRS Form W-8BEN-E (or suitable substitute or successor form), together with all appropriate attachments, signed under penalties of perjury, stating, among other things, that such Non-U.S. Holder is not a U.S. Person. Applicable Treasury Regulations provide alternative methods for satisfying this requirement. In addition, the amount of distributions on common stock or constructive dividends on common stock paid to a Non-U.S. Holder, and the amount of any U.S. federal tax withheld therefrom, must be reported annually to the IRS and the holder. This information may be made available by the IRS under the provisions of an applicable tax treaty or agreement to the tax authorities of the country in which the Non-U.S. Holder resides.

Payment of the proceeds of the sale or other disposition of common stock, pre-funded warrants or common warrants to or through a non-U.S. office of a U.S. broker or of a non-U.S. broker with certain specified U.S. connections generally will be subject to information reporting requirements, but not backup withholding, unless the Non-U.S. Holder certifies under penalties of perjury that it is not a U.S. person or an exemption otherwise applies. Payments of the proceeds of a sale or other disposition of common stock, pre-funded warrants or common warrants to or through a U.S. office of a broker generally will be subject to information reporting and backup withholding, unless the Non-U.S. Holder certifies under penalties of perjury that it is not a U.S. person or otherwise establishes an exemption.

Backup withholding is not an additional tax. The amount of any backup withholding from a payment generally will be allowed as a credit against the holder’s U.S. federal income tax liability and may entitle the holder to a refund, provided that the required information is timely furnished to the IRS.

Foreign Account Tax Compliance Act

FATCA imposes withholding tax on certain types of payments made to foreign financial institutions and certain other non-U.S. entities. The legislation imposes a 30% withholding tax on dividends on, or, subject to the discussion of certain proposed Treasury Regulations below, gross proceeds from the sale or other disposition of, our common stock, pre-funded warrants or common warrants paid to a “foreign financial institution” or to certain “non-financial foreign entities” (each as defined in the Code), unless (i) the

foreign financial institution undertakes certain diligence and reporting obligations, (ii) the non-financial foreign entity either certifies it does not have any “substantial United States owners” (as defined in the Code) or furnishes identifying information regarding each substantial United States owner, or (iii) the foreign financial institution or non-financial foreign entity otherwise qualifies for an exemption from these rules. If the payee is a foreign financial institution and is subject to the diligence and reporting requirements in (i) above, it must enter into an agreement with the U.S. Treasury requiring, among other things, that it undertake to identify accounts held by “specified United States persons” or “United States-owned foreign entities” (each as defined in the Code), annually report certain information about such accounts, and withhold 30% on payments to account holders whose actions prevent it from complying with these reporting and other requirements. If the country in which a payee is resident has entered into an “intergovernmental agreement” with the United States regarding FATCA, that agreement may permit the payee to report to that country rather than to the U.S. Department of the Treasury. The U.S. Treasury recently released proposed Treasury Regulations which, if finalized in their present form, would eliminate the federal withholding tax of 30% applicable to the gross proceeds of a sale or other disposition of our common stock. In its preamble to such proposed Treasury Regulations, the U.S. Treasury stated that taxpayers may generally rely on the proposed regulations until final regulations are issued. Prospective investors should consult their own tax advisors regarding the possible impact of these rules on their investment in our common stock, pre-funded warrants or common warrants, and the possible impact of these rules on the entities through which they hold our common stock, pre-funded warrants or common warrants, including, without limitation, the process and deadlines for meeting the applicable requirements to prevent the imposition of this 30% withholding tax under FATCA.

THE PRECEDING DISCUSSION OF U.S. FEDERAL TAX CONSIDERATIONS IS FOR GENERAL INFORMATION ONLY. IT IS NOT TAX ADVICE. EACH PROSPECTIVE INVESTOR SHOULD CONSULT ITS TAX ADVISOR REGARDING THE PARTICULAR U.S. FEDERAL, STATE AND LOCAL AND NON-U.S. TAX CONSEQUENCES OF PURCHASING, HOLDING AND DISPOSING OF OUR COMMON STOCK, PRE-FUNDED WARRANTS OR COMMON WARRANTS, INCLUDING THE CONSEQUENCES OF ANY PROPOSED CHANGE IN APPLICABLE LAWS.

PLAN OF DISTRIBUTION

The placement agent for this offering is not purchasing or selling any securities, nor is it required to arrange for the purchase and sale of any specific number or dollar amount of securities, other than to use its “reasonable best efforts” to arrange for the sale of the securities by us. Therefore, we may not sell the entire amount of securities being offered.

Investors purchasing securities offered hereby will have the option to execute a securities purchase agreement with us. In addition to the rights and remedies available to all investors in this offering under federal and state securities laws, the investors which enter into a securities purchase agreement will also be able to bring claims of breach of contract against us. Investors who do not enter into a securities purchase agreement shall rely solely on this prospectus in connection with the purchase of our securities in this offering. The placement agent may engage one or more subagents or selected dealers in connection with this offering.

The placement agency agreement provides that the placement agent’s obligations are subject to conditions contained in the placement agency agreement.

We expect this offering to be completed not later than two business days following the commencement of sales in this offering (the effective date of the registration statement of which this prospectus forms a part) and we will deliver all securities to be issued in connection with this offering delivery versus payment or receipt versus payment, as the case may be, upon receipt of investor funds received by us. Accordingly, neither we nor the placement agent has made any arrangements to place investor funds in an escrow account or trust account since the placement agent will not receive investor funds in connection with the sale of the securities offered hereunder.

Indemnification

We have agreed to indemnify the placement agent against certain liabilities, including liabilities under the Securities Act and liabilities arising from breaches of representations and warranties contained in the placement agency agreement, or to contribute to payments that the placement agent may be required to make in respect of those liabilities.

Placement Agent Fees, Commissions and Expenses

Upon the closing of this offering, we will pay the placement agent a cash transaction fee equal to % of the aggregate gross cash proceeds to us from the sale of the securities in the offering. In addition, we will reimburse the placement agent for certain of its out-of-pocket expenses incurred in connection with this offering, including up to \$ for the placement agent’s legal fees. In accordance with FINRA Rule 5110, these reimbursed fees and expenses may be deemed to be underwriting compensation in connection with this offering.

The following table shows the public offering price, placement agent fees and proceeds, before expenses, to us, assuming the sale of all units in this offering, no sale of any pre-funded warrants in this offering, and no exercise of any warrants.

	Per Unit	Per Pre-funded Unit
Public offering price	\$	\$
Placement agent fees	\$	\$
Proceeds, before expenses, to us	\$	\$

We estimate the expenses of this offering payable by us, not including placement agent fees, will be approximately \$.

Lock-Up Agreements and Trading Restrictions

Our executive officers and directors have agreed to a day “lock-up” from the effective date of this prospectus, pursuant to which the signatories to such agreements have agreed not to sell, pledge or

otherwise dispose of any shares of common stock that they beneficially own, including the issuance of common stock upon the exercise of currently outstanding convertible securities and options and options which may be issued, without the prior written consent of the placement agent.

The placement agent has no present intention to waive or shorten the lock-up period; however, the terms of the lock-up agreements may be waived in its discretion. In determining whether to waive the terms of the lockup agreements, the placement agent may base its decision on its assessment of the relative strengths of the securities markets and companies similar to ours in general, and the trading pattern of, and demand for, our securities in general.

In addition, the securities purchase agreement provides that we will not, for a period of _____ days following the effective date of this prospectus, offer, sell or distribute any of our securities, subject to certain exceptions.

Price Stabilization, Short Positions and Penalty Bids

The rules of the SEC generally prohibit the placement agent, who may be deemed an underwriter under the Securities Act in connection with this offering, from trading in our securities on the open market during this offering. However, the placement agent is allowed to engage in some open market transactions and other activities during this offering that may cause the market price of our securities to be above or below that which would otherwise prevail in the open market. These activities may include stabilization, short sales and over-allotments, syndicate covering transactions and penalty bids.

Stabilizing transactions permit bids to purchase shares and are engaged in for the purpose of preventing or retarding a decline in the market price of the shares while the offering is in progress.

Short sales occur when the placement agent sells more shares of common stock than it purchased from us in this offering. To cover the resulting short position, the placement agent may engage in syndicate covering transactions. There is no contractual limit on the size of any syndicate covering transaction.

Syndicate covering transactions involve purchases of shares in the open market after the distribution has been completed in order to cover syndicate short positions. Similar to other purchase transactions, the placement agent's purchases to cover the syndicate short sales may have the effect of raising or maintaining the market price of our common stock or preventing or retarding a decline in the market price of our common stock. If the placement agent commences these activities, it may discontinue them at any time without notice. The placement agent will carry out any such transactions on The Nasdaq Capital Market.

Listing

Our common stock is listed on The Nasdaq Capital Market under the symbol "YTEN."

Electronic Distribution

A prospectus in electronic format may be made available on websites or through other online services maintained by the placement agent of this offering, or by its affiliates. Other than the prospectus in electronic format, the information on the placement agent's website and any information contained in any other website maintained by the placement agent is not part of this prospectus or the registration statement of which this prospectus forms a part, has not been approved and/or endorsed by us or the placement agent.

Other Relationships

The placement agent and its affiliates are full-service financial institutions engaged in various activities, which may include securities trading, commercial and investment banking, financial advisory, investment management, investment research, principal investment, hedging, financing and brokerage activities. The placement agent and certain of its affiliates may, in the future, provide, investment and commercial banking and financial advisory services to us and our affiliates in the ordinary course of business, for which they may receive customary fees and commissions. In the ordinary course of their various business activities, the placement agent and its affiliates may make or hold a broad array of investments and actively trade debt and equity securities (or related derivative securities) and financial instruments (including bank loans) for

their own account and for the accounts of their customers, and such investment and securities activities may involve securities and/or instruments of ours. The placement agent and its affiliates may also make investment recommendations and/or publish or express independent research views in respect of such securities or instruments and may at any time hold, or recommend to clients that they acquire, long and/or short positions in such securities and instruments.

Except for services provided in connection with this offering, the placement agent has not provided any investment banking or other financial services during the 180-day period preceding the date of this prospectus, and we do not expect to retain the placement agent to perform any investment banking or other financial services for at least 90 days after the date of this prospectus.

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 Delaware General Corporation Law (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 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 April 19, 2024, we had warrants outstanding to purchase 195,025 shares of our common stock (as adjusted for the reverse stock split effected on May 2, 2024).

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
- 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.

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

- 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 equity 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 Equiniti Trust Company, LLC. The transfer agent’s telephone number is 1-800-937-5449.

Stock Exchange Listing

Our common stock is listed on the Nasdaq Capital Market under the symbol “YTEN”.

LEGAL MATTERS

Covington & Burling, LLP, Boston, Massachusetts, will pass upon the validity of the securities offered by this prospectus.

EXPERTS

The consolidated financial statements of Yield10 Bioscience, Inc. as of and for the year ended December 31, 2023 incorporated in this prospectus by reference from the Yield10 Bioscience, Inc. [Annual Report on Form 10-K for the year ended December 31, 2023](#) have been audited by Berkowitz Pollack Brant Advisors + CPAs, 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.

The consolidated financial statements of Yield10 Bioscience, Inc. and its subsidiaries as of and for the year 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, 2023](#) 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 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 ADDITIONAL 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. 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 and our website address is included as an inactive textual link only.

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 INFORMATION 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, 2023, filed with the SEC on April 1, 2024](#);
- [The portions of our definitive proxy statement on Schedule 14A, filed with the SEC on April 29, 2024, that are deemed “filed” with the SEC under the Exchange Act](#);
- Current Reports on Form 8-K and 8-K/A filed on [February 6, 2024](#), [February 8, 2024](#), [February 14, 2024](#), [February 16, 2024](#), [February 26, 2024](#), [March 22, 2024](#), and [March 29, 2024](#); 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, including the description of our common stock included as [Exhibit 4.1](#) to our Annual Report on Form 10-K for the year ended December 31, 2023, filed with the SEC on April 1, 2024.

The SEC file number for our filings made under the Exchange Act 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, MA 01801
(617) 583-1700

YIELD10 BIOSCIENCE, INC.

**UP TO UNITS CONSISTING OF
SHARES OF COMMON STOCK OR
PRE-FUNDED WARRANTS TO PURCHASE UP TO
SHARES OF COMMON STOCK AND
COMMON WARRANTS TO PURCHASE UP TO
SHARES OF COMMON STOCK**

**UP TO SHARES OF COMMON STOCK UNDERLYING
PRE-FUNDED WARRANTS
UP TO SHARES OF COMMON STOCK UNDERLYING COMMON
WARRANTS**

PRELIMINARY PROSPECTUS

, 2024

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 and FINRA filing fee.

	Amount to be paid
SEC registration fee	\$ —
FINRA filing fee	\$ —
Legal fees and expenses	\$75,000
Accounting fees and expenses	\$ —
Other	\$ —
Total	\$ —

Item 14. Indemnification of Directors and Officers.

Pursuant to Section 145 of 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 9, 2024, the Company issued 4,356 shares of common stock (as adjusted to reflect the reverse stock split effected on May 2, 2024) to participants in the Yield10 Bioscience, Inc. 401(k) Plan as quarterly matching contributions. On April 8, 2024, the Company issued 802 shares of common stock (as adjusted to reflect the reverse stock split effected on May 2, 2024) to participants in the Yield10 Bioscience, Inc. 401(k) Plan as quarterly matching contributions. The issuance of these securities is exempt from registration pursuant to Section 3(a)(2) of the Securities Act as exempted securities.

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.

<u>Exhibit Number</u>	<u>Exhibit Description</u>	<u>Filed Herewith</u>	<u>Incorporated by Reference herein from Form or Schedule</u>	<u>Filing Date</u>	<u>SEC File/Reg. Number</u>
1.1	Placement Agency Agreement.*				
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 Common Stock Purchase Warrant.		Form 8-K (Exhibit 4.1)	11/20/2019	001-33133
4.3	Senior Unsecured Convertible Promissory Note, dated as of April 28, 2023, between the Company and MPC Investment LLC		Form 8-K (Exhibit 4.1)	5/1/2023	001-33133
4.4	Form of Pre-Funded Common Stock Purchase Warrant		Form 8-K (Exhibit 4.1)	5/4/2023	001-33133
4.5	Form of Common Stock Purchase Warrant		Form 8-K (Exhibit 4.2)	5/4/2023	001-33133
4.6	Form of Pre-funded Warrant		Form S-1 (Exhibit 4.8)	8/2/23	333-273240
4.7	Form of Warrant		Form S-1/A (Exhibit 4.9)	8/2/23	333-273240
4.8	Form of Warrant Agency Agreement		Form S-1/A (Exhibit 4.10)	8/2/23	333-273240
4.9	Form of Warrant		Form 8-K (Exhibit 4.1)	3/22/2024	001-33133
4.10	Form of Pre-Funded Warrant*				
4.11	Form of Warrant*				
5.1	Opinion of Covington & Burling LLP*				

<u>Exhibit Number</u>	<u>Exhibit Description</u>	<u>Filed Herewith</u>	<u>Incorporated by Reference herein from Form or Schedule</u>	<u>Filing Date</u>	<u>SEC File/Reg. Number</u>
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 10-Q (Exhibit 10.1)	8/11/2021	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†	Amendment to the Employment Agreement between the Company and Oliver Peoples dated December 6, 2023.		Form 10-K (Exhibit 10.5)	4/1/2024	001-33133
10.6†	Employment Agreement between the Company and Charles B. Haaser dated March 28, 2017.		Form 10-K (Exhibit 10.4)	3/30/2017	001-33133
10.7†	Amendment to the Employment Agreement between the Company and Charles B. Haaser dated December 6, 2023.		Form 10-K (Exhibit 10.7)	4/1/2024	001-33133
10.8†	Employment Agreement between the Company and Lynne H. Brum dated March 28, 2017.		Form 10-K (Exhibit 10.6)	3/30/2017	001-33133

<u>Exhibit Number</u>	<u>Exhibit Description</u>	<u>Filed Herewith</u>	<u>Incorporated by Reference herein from Form or Schedule</u>	<u>Filing Date</u>	<u>SEC File/Reg. Number</u>
10.9†	<u>Amendment to the Employment Agreement between the Company and Lynne Brum dated December 6, 2023.</u>		Form 10-K (Exhibit 10.9)	4/1/2024	001-33133
10.10†	<u>Employment Agreement between the Company and Kristi Snell dated March 28, 2017.</u>		Form 10-K (Exhibit 10.8)	3/30/2017	001-33133
10.11†	<u>Amendment to the Employment Agreement between the Company and Kristi Snell dated December 6, 2023.</u>		Form 10-K (Exhibit 10.11)	4/1/2024	001-33133
10.12†	<u>Form of Employee Noncompetition, Confidentiality and Inventions Agreement between the Company and its Employee.</u>		Form 10-K (Exhibit 10.9)	3/30/2017	001-33133
10.13†	<u>Form of Indemnification Agreement between the Registrant and its Directors and Officers.</u>		Form S/1/A (Exhibit 10.14)	10/20/2006	333-135760
10.14	<u>Standstill Agreement dated June 19, 2015 between the Company and Jack W. Schuler, Renate Schuler and the Schuler Family Foundation.</u>		Form 8-K (Exhibit 10.1)	6/17/2015	001-33133
10.15	<u>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.</u>		Form 8-K (Exhibit 10.1)	1/26/2016	001-33133
10.16	<u>Sublease between CJ Research Center LLC and the Company, dated as of September 16, 2016.</u>		Form 10-K (Exhibit 10.20)	3/30/2017	001-33133
10.17	<u>Form of Securities Purchase Agreement dated July 3, 2017 between the Company and the Purchasers named therein.</u>		Form 8-K (Exhibit 10.1)	7/5/2017	001-33133
10.18@	<u>Exclusive License Agreement, dated May 17, 2018, between the Company and the University of Missouri.</u>		Form 10-Q (Exhibit 10.2)	8/9/2018	001-33133
10.19	<u>Form of Securities Purchase Agreement dated March 14, 2019 between the Company and the Investors named therein.</u>		Form 8-K (Exhibit 10.1)	3/15/2019	001-33133
10.20	<u>Securities Purchase Agreement, dated as of November 14, 2019, by and between Yield10 Bioscience, Inc. and the Investors listed on Schedule I thereto.</u>		Form 8-K (Exhibit 10.1)	11/20/2019	001-33133

Exhibit Number	Exhibit Description	Filed Herewith	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
10.21	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
10.22	Collaboration and Option Agreement, dated November 12, 2020, by and between the Company and Rothamsted Research Institute, as amended.		Form 10-K (Exhibit 10.18)	3/14/2023	001-33133
10.23	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
10.24	Securities Purchase Agreement, dated April 28, 2023, by and between the Company and MPC Investment LLC.		Form 8-K (Exhibit 10.1)	5/1/2023	001-33133
10.25	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
10.26	Form of Securities Purchase Agreement, dated as of August 10, 2023, by and between the Company and each investor party thereto.		Form 8-K (Exhibit 10.2)	8/11/23	001-33133
10.27	Exchange Agreement, dated as of March 22, 2024, by and among the Company and the warrant holders party thereto.		Form 8-K (Exhibit 10.1)	3/22/2024	001-33133
16.1	Letter from RSM US LLP dated February 5, 2024.		Form 8-K (Exhibit 16.1)	2/6/2024	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.	X			
23.2	Consent of Berkowitz Pollack Brant Advisors +CPAs.	X			
23.3	Consent of Covington & Burling LLP (included in Exhibit 5.1).*				
24.1	Power of Attorney (included in the signature page to the registration statement).	X			
107.1	Filing Fee Table.	X			

* To be filed by amendment.

† Management contract or compensatory plan or arrangement.

@ Certain confidential information contained in this exhibit, marked by brackets, has been omitted pursuant to Item 601(b)(10)(iv) because the information (i) is not material and (ii) is the type of information that the Company both customarily and actually treats as private and 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 BANKERum 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) That, for the purpose of determining liability of the registrant under the Securities Act of 1933 to any purchaser in the initial distribution of the securities, the undersigned registrant undertakes that in a primary offering of securities of the undersigned registrant pursuant to this registration statement, regardless of the underwriting method used to sell the securities to the purchaser, if the securities are offered or sold to such purchaser by means of any of the following communications, the undersigned registrant will be a seller to the purchaser and will be considered to offer or sell such securities to such purchaser:

(i) Any preliminary prospectus or prospectus of the undersigned registrant relating to the offering required to be filed pursuant to Rule 424 (§ 230.424 of this chapter);

(ii) Any free writing prospectus relating to the offering prepared by or on behalf of the undersigned registrant or used or referred to by the undersigned registrant;

(iii) The portion of any other free writing prospectus relating to the offering containing material information about the undersigned registrant or its securities provided by or on behalf of the undersigned registrant; and

(iv) Any other communication that is an offer in the offering made by the undersigned registrant to the purchaser.

(6) 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 May 3, 2024.

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.

Name	Title	Date
<u>/s/ Oliver P. Peoples</u> Oliver P. Peoples, Ph.D.	President and Chief Executive Officer and Director (Principal Executive Officer)	May 3, 2024
<u>/s/ Charles B. Haaser</u> Charles B. Haaser	Vice President, Finance, and Chief Accounting Officer (Principal Financial and Accounting Officer)	May 3, 2024
<u>/s/ Sherri M. Brown</u> Sherri M. Brown, Ph.D.	Director	May 3, 2024
<u>/s/ Richard W. Hamilton</u> Richard W. Hamilton, Ph.D.	Director	May 3, 2024
<u>/s/ Willie Loh</u> Willie Loh, Ph.D.	Director	May 3, 2024
<u>/s/ Anthony J. Sinskey</u> Anthony J. Sinskey, Sc.D.	Director	May 3, 2024
<u>/s/ Robert L. Van Nostrand</u> Robert L. Van Nostrand	Chairman	May 3, 2024

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. and its subsidiaries, appearing in the Annual Report on Form 10-K of Yield10 Bioscience, Inc. for the year ended December 31, 2023.

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

/s/ RSM US LLP

Boston, Massachusetts
May 3, 2024

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 April 1, 2024, 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, 2023.

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

/s/ Berkowitz Pollack Brant Advisors + CPAs

West Palm Beach, FL

May 3, 2024

Calculation of Filing Fee Tables

S-1
(Form Type)

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

Table 1: Newly Registered and Carry Forward Securities

Security Type	Security Class Title	Fee Calculation or Carry Forward Rule	Amount Registered (1)	Proposed Maximum Offering Price Per Unit	Maximum Aggregate Offering Price (2)	Fee Rate	Amount of Registration Fee	Carry Forward Form Type	Carry Forward File Number	Carry Forward Initial effective date	Filing Fee Previously Paid in Connection with Unsold Securities to be Carried Forward
Newly Registered Securities											
Fees to Be Paid	Equity	Units ("Units") consisting of (i) one share of common stock, par value \$0.01 per share ("Common Stock") or a pre-funded warrant ("Pre-funded Warrant") to purchase one share of Common Stock and (ii) a common warrant ("Common Warrant") to purchase one share of Common Stock	457(o)		\$7,000,000.00	0.00014760	\$1,033.20	-	-	-	-
	Other	Common Warrants included in the Units (3)	N/A								
	Other	Pre-funded Warrants included in the Units (3)	N/A								
	Equity	Common Stock underlying the Common Warrants to purchase Common Stock	N/A								
	Equity	Common Stock underlying the Pre-funded Warrants to purchase Common Stock	N/A								
Total Offering Amounts							\$7,000,000.00				
Total Fees Previously Paid											
Total Fee Offsets											
Net Fee Due							\$1,033.20				

(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 solely for the purpose of calculating the amount of the registration fee in pursuant to Rule 457(o) under the Securities Act of 1933, as amended (the "Securities Act").

(3) In accordance with Rule 457(g), the entire registration fee for the Common Warrants and the Pre-funded Warrants is allocated to the shares of Common Stock underlying such Common Warrants and Pre-funded Warrants, and no separate fee is payable for the Common Warrants or the Pre-funded Warrants.