

---

**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:**

**Megan N. Gates, Esq.  
Covington & Burling LLP  
One International Place, Suite 1020  
Boston, Massachusetts 02110  
(617) 603-8805**

**Approximate date of commencement of proposed sale to the public:**  
From time to time after this registration statement becomes effective.

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

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

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

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

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

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

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 7(a)(2)(B) of the Securities Act.

**The registrant hereby amends this registration statement on such date or dates as may be necessary to delay its effective date until the registrant files a further amendment which specifically states that this registration statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933, as amended, 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.**

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

**SUBJECT TO COMPLETION, DATED April 25, 2024**

**PRELIMINARY PROSPECTUS**



**YIELD10 BIOSCIENCE, INC.**

**6,382,280 SHARES OF COMMON STOCK**

**ISSUABLE UPON EXERCISE OF OUTSTANDING WARRANTS**

This prospectus relates to the proposed resale from time to time, by the selling security holders identified in this prospectus, of up to 6,382,280 shares of Yield10 Bioscience, Inc. (the "Company"), common stock, \$0.01 par value per share, which are issuable upon the exercise of certain outstanding warrants.

These shares will be resold from time to time by the entities or individuals listed in the section titled "Selling Security Holders" beginning on page [11](#), which we refer to as the selling security holders or Selling Stockholders. The shares of common stock offered under this prospectus by the selling security holders are issuable upon exercise of warrants (the "Warrants") issued pursuant to the exchange agreement by and among the Company and the selling security holders, dated as of March 22, 2024 (the "Exchange Agreement"). The Warrants are subject to a blocker provision, which restricts the exercise of a Warrant if, as a result of such exercise, the Selling Stockholder, together with its affiliates and any other person whose beneficial ownership of common stock would be aggregated with the Selling Stockholder's for purposes of Section 13(d) of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), would beneficially own in excess of 4.99% or, at the election of the Selling Stockholder, 9.99% of the number of shares of common stock outstanding immediately after giving effect to such exercise (the "Warrant Beneficial Ownership Limitation"); provided, however, that upon 61 days' prior notice to us, the Selling Stockholder may increase the Warrant Beneficial Ownership Limitation, but not to above 19.99%. We are not selling any securities under this prospectus and will not receive any of the proceeds from the sale of securities by the selling security holders. However, the Company will receive the proceeds of any cash exercise of the Warrants. See "Use of Proceeds" beginning on page 10 of this prospectus for more information.

The selling security holders may sell the shares of common stock described in this prospectus in a number of different ways and at varying prices. We provide more information about how a selling security holder may sell its shares of common stock in the section titled "Plan of Distribution" on page 14. We will pay the expenses incurred in registering the securities covered by the prospectus, including legal and accounting fees.

Our common stock is traded on The Nasdaq Capital Market ("Nasdaq") under the symbol "YTEN". On April 23, 2024, the last reported sale price of our common stock was \$0.26 per share.

---

**AN INVESTMENT IN OUR SECURITIES INVOLVES RISKS. SEE THE SECTION ENTITLED "RISK FACTORS" BEGINNING ON PAGE 9.**

---

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

\_\_\_\_\_

The date of this prospectus is \_\_\_\_\_, 2024

## TABLE OF CONTENTS

PROSPECTUS SUMMARY	<a href="#">6</a>
THE OFFERING	<a href="#">8</a>
RISK FACTORS	<a href="#">10</a>
SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS	<a href="#">10</a>
USE OF PROCEEDS	<a href="#">11</a>
MARKET FOR OUR COMMON STOCK	<a href="#">11</a>
DIVIDEND POLICY	<a href="#">11</a>
SELLING SECURITY HOLDERS	<a href="#">11</a>
PLAN OF DISTRIBUTION	<a href="#">13</a>
DESCRIPTION OF OUR CAPITAL STOCK	<a href="#">14</a>
DISCLOSURE OF COMMISSION POSITION ON INDEMNIFICATION FOR SECURITIES ACT LIABILITIES	<a href="#">17</a>
LEGAL MATTERS	<a href="#">17</a>
EXPERTS	<a href="#">17</a>
WHERE YOU CAN FIND ADDITIONAL INFORMATION	<a href="#">18</a>
INCORPORATION OF CERTAIN INFORMATION BY REFERENCE	<a href="#">18</a>

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

### **Smaller Reporting Company – Scaled Disclosure**

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

## PROSPECTUS SUMMARY

*This summary highlights some information from this prospectus. It may not contain all the information important to making an investment decision. You should read the following summary together with the more detailed information in this prospectus regarding our Company and the securities being sold in this offering, including "Risk Factors" and other information incorporated by reference 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 ("RD") and sustainable aviation fuel ("SAF"). 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 sulfonylureas. 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 Yield10's 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 stack 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.

### **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](http://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.

### **March 2024 Warrant Exchange**

On March 22, 2024, we entered into the Exchange Agreement with certain existing institutional investors, pursuant to which the institutional investors agreed to exercise (the "Exercise") (i) a portion of the warrants issued to such institutional investors in May 2023, which were exercisable for 671,140 shares of the Company's common stock, and had an exercise price of \$2.98 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 2,520,000 shares of common stock and had an exercise price of \$0.65 per share (the "August 2023 Warrants" and together with the May 2023 Warrants, the "Existing Warrants"). In consideration for the immediate exercise of 3,191,140 of the Existing Warrants for cash, the Company agreed to reduce the exercise price of the Existing Warrants held by such institutional investors to \$0.43 per share, which was equal to the most recent closing price of the Company's common stock on Nasdaq prior to the execution of the Exchange Agreement. In addition, in consideration for the Exercise, the institutional investors received the Warrants to purchase up to an aggregate of 6,382,280 shares of common stock, equal to 200% of the shares of common stock issued in connection with the Exercise, with an exercise price of \$0.43 per share in a private placement pursuant to Section 4(a)(2) of the Securities Act.

Due to the number of shares of common stock that may be issued upon the exercise of the Warrants, the Company is required to obtain stockholder approval of the issuance of up to 6,382,280 shares of common stock in accordance with Nasdaq Listing Rule 5635(d) (the "Stockholder Approval"). Nasdaq Listing Rule 5635(d) requires stockholder approval prior to the issuance of securities in connection with a transaction other than a public offering involving the sale, issuance or potential issuance of common stock (or securities convertible into or exercisable for common stock) in an amount equal to 20% or more of the common stock or 20% or more of the voting power outstanding before the issuance at a price less than the "Minimum Price." The Minimum Price is defined as the lower of (i) the closing price of the common stock immediately preceding the signing of the sale agreement or (ii) the average closing price of the common stock for the five trading days immediately preceding the signing of the sale agreement.

The Warrants will not be exercisable until the Stockholder Approval is obtained. The Company is seeking the Stockholder Approval at its 2024 Annual Meeting of Stockholders on June 7, 2024. Once the Stockholder Approval is obtained on or after June 7, 2024 the Warrants will be exercisable for five years from such initial exercisability date. The private placement in which we issued the Warrants was exempt from registration pursuant to Section 4(a)(2) and/or Rule 506 of the Securities Act. The Exchange closed on March 26, 2024. The gross proceeds were \$1.4 million before deducting the warrant solicitation agent fees and other expenses.

<b>THE OFFERING</b>	
<b>Issuer</b>	Yield10 Bioscience, Inc.
<b>Common stock offered by the selling security holders</b>	6,382,280 shares issuable upon exercise of Warrants issued pursuant to the Exchange Agreement (which Warrants have an exercise price of \$0.43 and will be exercisable on or after June 7, 2024, once the Stockholder Approval is obtained and will expire five years from such initial exercisability date).
<b>Terms of the offering</b>	The selling security holders and any of their pledgees, assignees and successors-in-interest may, from time to time, sell any or all of their shares covered hereby on Nasdaq or any other stock exchange, market or trading facility on which the shares are traded or in private transactions. These sales may be at fixed or negotiated prices. See “Plan of Distribution.”
<b>Common stock to be outstanding after this offering, assuming cash exercise of the Warrants</b>	18,414,705 shares
<b>Use of proceeds</b>	We will not receive any of the proceeds from the sale of our common stock by the selling security holders. However, the Company will receive the proceeds of any cash exercise of the Warrants. If all of the Warrants were exercised for cash, we would receive aggregate proceeds of approximately \$2.7 million. If we receive proceeds, we currently intend to use the proceeds for general corporate purposes, including working capital.
<b>Nasdaq Capital Market symbol</b>	YTEN
<b>Risk factors</b>	Investing in our securities involves a high degree of risk. See “Risk Factors” on page 9 of this prospectus to read about factors that you should consider carefully before buying our securities.

The number of shares of common stock that will be outstanding after this offering is based on 12,032,425 shares outstanding as of December 31, 2023 and excludes:

- 1,338,921 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 \$8.94 per share;
- 5,750,000 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 \$0.65 per share (subsequently repriced to have an exercise price of \$0.43 per share for warrant holders participating in the offering) and which expire on August 15, 2028;
- 1,006,710 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 \$2.98 per share (subsequently repriced to have an exercise price of \$0.43 per share for warrant holders participating in the offering) and which expire on November 6, 2028;
- 1,114,278 shares of common stock issuable upon exercise of warrants issued in public offerings in November 2019 and outstanding as of December 31, 2023 at an exercise price of \$8.00 per share and which expire on May 19, 2027;
- 14,270 shares of common stock issuable upon exercise of warrants issued pursuant to the Securities Purchase Agreement in July 2017 at an exercise price of outstanding as of December 31, 2023 at an exercise price of \$201.60 per share and which expire on January 7, 2024; and

- 750 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 \$116.00 per share and which expire on September 11, 2024.

## RISK FACTORS

*An investment in our securities involves a high degree of risk. Before deciding whether to invest in our securities, you should consider carefully the risks and uncertainties described below and in the section captioned “Risk Factors” contained in our [Annual Report on Form 10-K for the fiscal year ended December 31, 2023](#), filed with the Securities and Exchange Commission (“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.*

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

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

On September 25, 2023, we received a deficiency letter from the Listing Qualifications Department (the “Staff”) of Nasdaq notifying the Company that for the previous 30 consecutive business days, the bid price for the Company’s common stock had closed below the minimum \$1.00 per share requirement for continued listing on The Nasdaq Capital Market under Nasdaq Listing Rule 5550(a)(2) (the “Minimum Bid Price Rule”). In accordance with Nasdaq Listing Rule 5810(c)(3)(A), the Company was provided an initial period of 180 calendar days, or until March 25, 2024, to regain compliance with the Minimum Bid Price Rule. The Company was unable to regain compliance with the Minimum Bid Price Rule prior to the expiration of the 180 calendar day period. The Company participated in a hearing before the Nasdaq Hearings Panel (the “Panel”) on February 6, 2024. On February 13, 2024, the Company was notified by the Panel that it had been granted an additional extension to remain listed on The Nasdaq Capital Market until May 13, 2024, subject to certain conditions. These conditions include 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 during the period of extension that may affect the Company’s compliance with Nasdaq requirements. The Company provided this update to Nasdaq on March 14, 2024.

On March 26, 2024, the Company received written notice from the Staff stating that the Company is not eligible for a second 180 day compliance period for the Minimum Bid Price Rule deficiency because the Company does not comply with the \$5,000,000 minimum stockholders’ equity initial listing requirement for The Nasdaq Capital Market. The Notice required the Company to present its views with respect to this deficiency to the Panel in writing no later than April 2, 2024. The Company provided a written response on April 2, 2024, indicating that a special meeting of stockholders has been scheduled for April 26, 2024 to approve a reverse stock split, in order to increase the price of its common stock to a level that will satisfy the Minimum Bid Price Rule, among other measures. On April 5, 2024, the Company received an additional notice from the Staff indicating that it has until May 13, 2024 to demonstrate compliance with all applicable requirements for continued listing on Nasdaq.

There continues to be no immediate effect on the listing of the Company’s common stock, which continues to trade on Nasdaq under the symbol “YTEN.” The Company is working diligently to satisfy, and intends to regain compliance with, the applicable requirements for continued listing on Nasdaq. However, there can be no assurance that the Company will be able to regain compliance with these requirements or that Nasdaq will grant the Company a further extension of time to achieve compliance with these requirements.

## 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 Exchange Act, regarding our strategy, future, operations, future financial position, future revenues, projected costs, and plans and objectives of management. You can identify these forward-looking statements by their use of words such as “anticipate,” “believe,” “estimate,” “expect,” “intend,” “may,” “plan,” “project,” “target,” “potential,” “will,” “would,” “could,” “should,” “continue,” and similar expressions. You also can identify them by the fact

that they do not relate strictly to historical or current facts. There are a number of important risks and uncertainties that could cause our actual results to differ materially from those indicated by forward-looking statements. For a description of these risks and uncertainties, please refer to the section entitled “Risk Factors,” any other risk factors set forth in any information incorporated by reference in this prospectus, as well as any other risk factors and cautionary statements we include or incorporate by reference into this prospectus in the future. While we may elect to update forward-looking statements wherever they appear in this prospectus or in the documents incorporated by reference in this prospectus, we do not assume, and specifically disclaim, any obligation to do so, whether as a result of new information, future events or otherwise.

#### **USE OF PROCEEDS**

We will not receive any of the proceeds from the sale of securities by the selling security holders named in this prospectus. However, the Company will receive the proceeds of any cash exercise of the Warrants. If all of the Warrants were exercised for cash, we would receive aggregate proceeds of approximately \$2.7 million. If we do receive any proceeds, we currently intend to use the proceeds for general corporate purposes, including working capital.

#### **MARKET FOR OUR COMMON STOCK**

##### **Market Information**

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

#### **SELLING SECURITY HOLDERS**

The shares of common stock being offered by the selling security holders are those issued upon the exercise of the Warrants. For additional information regarding the issuance of these securities, see “Prospectus Summary - March 2024 Warrant Exchange”. We are registering the shares of common stock in order to permit the selling security holders to offer the shares for resale from time to time. The Warrants have an exercise price of \$0.43 and will be exercisable on or after June 7, 2024, once the Stockholder Approval is obtained] and will expire five years from such initial exercisability date. Other than as described below, the selling security holders have not had any material relationship with us within the past three years.

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

The table below lists the selling security holders and other information regarding the beneficial ownership (as determined under Section 13(d) of the Exchange Act and the rules and regulations thereunder) of the shares of common stock held by each of the selling security holders. The table is prepared based on information supplied to us by the selling security holders. The second column lists the number of shares of common stock beneficially owned by the selling security holders, based on their respective ownership of shares as of April 19, 2024. The fourth column lists the shares of common stock being offered by this prospectus by the selling security holders. The fifth column assumes the sale of all of the shares offered by the selling security holders pursuant to this prospectus. The percentages in the table reflect the shares beneficially owned by the selling security holders as a percentage of the

total number of shares of common stock outstanding as of April 19, 2024. As of such date, 15,420,951 shares of common stock were outstanding.

Selling Security Holder (1)	Prior to the Offering		Maximum Number of Shares of Common Stock Being Registered for Resale	After the Offering	
	Number of Shares of Common Stock Beneficially Owned (2)	Percent of Common Stock Outstanding (3)		Number of Shares of Common Stock Beneficially Owned (4)	Percent of Common Stock Outstanding (3) (4)
Armistice Capital Master Fund Ltd. (5)	5,523,420	28.9 %	3,682,280	1,841,140	11.9 %
Brio Capital Master Fund Ltd. (6)	1,089,856	6.8 %	700,000	389,856	2.5 %
L1 Capital Global Opportunities Master Fund (7)	550,000	3.5 %	200,000	350,000	2.2 %
Lind Global Fund II LP (8)	1,500,000	9.1 %	1,000,000	500,000	3.2 %
S.H.N. Financial Investments Ltd. (9)	1,200,000	7.4 %	800,000	400,000	2.6 %
<b>Total</b>			<b>6,382,280</b>		

- (1) This table and the information in the notes below are based upon information supplied by the selling security holders, including reports and amendments thereto filed with the SEC on Schedule 13D.
- (2) The number of shares of common stock beneficially owned includes shares of common stock underlying the Warrants that are convertible or exercisable within 60 days of April 19, 2024. The Warrants will become exercisable on or after June 7, 2024, subject to Stockholder Approval, which has not yet been obtained.
- (3) Percentage ownership is based on a denominator equal to the sum of (i) 15,420,951 shares of common stock outstanding as of April 19, 2024 and (ii) the number of shares of common stock underlying warrants that are convertible or exercisable within 60 days of April 19, 2024 that are beneficially owned by the applicable Selling Stockholder.
- (4) Assumes that all shares of common stock being registered under the registration statement of which this prospectus forms a part are sold in this offering, and that none of the Selling Stockholders acquire additional shares of our common stock after the date of this prospectus and prior to completion of this offering.
- (5) Consists of 1,841,140 shares of common stock and 3,682,280 shares of common stock issuable upon the exercise of warrants convertible or exercisable within 60 days of April 19, 2024, including 3,682,280 shares of common stock issuable upon exercise of the Warrant held by Armistice Capital Master Fund Ltd., which will become exercisable on or after June 7, 2024, without giving effect to the blocker provision described above. The securities are directly held by Armistice Capital Master Fund Ltd., a Cayman Islands exempted company (the “Master Fund”) and may be deemed to be beneficially owned by: (i) Armistice Capital, LLC (“Armistice Capital”), as the investment manager of the Master Fund; and (ii) Steven Boyd, as the Managing Member of Armistice Capital. The warrants are subject to a beneficial ownership limitation of 4.99%, which such limitation restricts the Selling Stockholder from exercising that portion of the warrants that would result in the Selling Stockholder and its affiliates owning, after exercise, a number of shares of common stock in excess of the beneficial ownership limitation. The address of Armistice Capital Master Fund Ltd. is c/o Armistice Capital, LLC, 510 Madison Avenue, 7th Floor, New York, NY 10022.
- (6) Consists of 358,606 shares of common stock and 731,250 shares of common stock issuable upon the exercise of warrants convertible or exercisable within 60 days of April 19, 2024, including 700,000 shares of common stock issuable upon exercise of the Warrant held by Brio Capital Master Fund Ltd., which will become exercisable on or after June 7, 2024, without giving effect to the blocker provision described above. The address of Brio Capital Master Fund Ltd. is 100 Merrick Road, #401 W, Rockville Centre, New York, 11570.

- (7) Consists of 100,000 shares of common stock and 450,000 shares of common stock issuable upon the exercise of warrants convertible or exercisable within 60 days of April 19, 2024, including 200,000 shares of common stock issuable upon exercise of the Warrant held by L1 Capital Global Opportunities Master Fund, which will become exercisable on or after June 7, 2024, without giving effect to the blocker provision described above. The shares will be directly held by L1 Capital Global Opportunities Master Fund, a Cayman Islands exempted company (the “L1 Fund”). David Feldman and Joel Arber are the Directors of the L1 Fund, Mr. Feldman and Mr. Arber disclaim beneficial ownership over these securities. The address of L1 Capital Global Opportunities Master Fund is 161A Shedden Road, 1 Artillery Court, PO Box 10085, Grand Cayman KY1-1001, Cayman Islands.
- (8) Consists of 500,000 shares of common stock and 1,000,000 shares of common stock issuable upon the exercise of warrants convertible or exercisable within 60 days of April 19, 2024, including 1,000,000 shares of common stock issuable upon exercise of the Warrant held by Lind Global Fund II LP, which will become exercisable on or after June 7, 2024, without giving effect to the blocker provision described above. Lind Global Partners II LLC, the general partner of Lind Global Macro Fund, LP, may be deemed to have sole voting and dispositive power with respect to the shares held by Lind Global Fund II LP. Jeff Easton, the managing member of Lind Global Partners II LLC, may be deemed to have sole voting and dispositive power with respect to the shares held by Lind Global Fund II LP.
- (9) Consists of 400,000 shares of common stock and 800,000 shares of common stock issuable upon the exercise of warrants convertible or exercisable within 60 days of April 19, 2024, including 800,000 shares of common stock issuable upon exercise of the Warrant held by S.H.N. Financial Investments Ltd, which will become exercisable on or after June 7, 2024, without giving effect to the blocker provision described above. The shares will be directly held by S.H.N. Financial Investments Ltd., an Israeli corporation (“S.H.N.”), and may be deemed to be indirectly beneficially owned by Mr. Hadar Shamir and Mr. Nir Shamir who each own 50% of the company and have shared voting and dispositive power over the common shares. Mr. Hadar Shamir and Mr. Nir Shamir disclaim beneficial ownership of the securities except to the extent of their respective pecuniary interests therein. The address of S.H.N. is c/o S.H.N. Financial Investments Ltd., 3 Arik Einstein Street, Herzliya, Israel.

### PLAN OF DISTRIBUTION

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

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

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

Broker-dealers engaged by the Selling Stockholders may arrange for other brokers-dealers to participate in sales. Broker-dealers may receive commissions or discounts from the Selling Stockholders (or, if any broker-dealer acts as agent for the purchaser of securities, from the purchaser) in amounts to be negotiated, but, except as set forth in a supplement to this Prospectus, in the case of an agency transaction not in excess of a customary brokerage commission in compliance with FINRA Rule 2121; and in the case of a principal transaction a markup or markdown in compliance with FINRA Rule 2121.

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

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

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

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

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

## **DESCRIPTION OF OUR CAPITAL STOCK**

### **General**

The following summary of our capital stock is based on certain provisions of our amended and restated certificate of incorporation, as amended, and amended and restated by-laws and on the applicable provisions of the 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 its authorized stock known as preferred stock, consisting of 5,000,000 shares, \$0.01 par value per share, issuable from time to time in one or more series. Currently, there are no shares of preferred stock issued and outstanding. 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 4,680,598 shares of our common stock.

### **Anti-Takeover Provisions**

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

### ***Amended and Restated Certificate of Incorporation and Bylaw Provisions***

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

- *Issuance of Undesignated Preferred Stock.* Our board of directors has the authority, without further action by the stockholders, to issue up to 5,000,000 shares of undesignated preferred stock with rights, preferences and privileges designated from time to time by our board of directors without further action by stockholders. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences and sinking fund terms, any or all of which may be greater than the rights of common stock.
- *Size of the Board of Directors and Filling Vacancies.* The number of directors constituting our board of directors may be set only by resolution adopted by a majority vote of our entire board of directors. Any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of the board of directors, may only be filled by the affirmative vote of a majority of our directors then in office, even if less than a quorum.

- *Classified Board.* Our board of directors is divided into three classes of directors, with staggered three-year terms. Only one class of directors will be elected at each annual meeting of our stockholders, with the other classes continuing for the remainder of their respective three-year terms.
- *No Cumulative Voting.* Our amended and restated certificate of incorporation, as amended, and amended and restated by-laws do not permit cumulative voting in the election of directors. Cumulative voting allows a stockholder to vote a portion, or all of its shares for one or more candidates. The absence of cumulative voting makes it more difficult for a minority stockholder to gain a seat.
- *Removal of Directors.* Directors can only be removed by our stockholders for cause and removal of a director will require a 75% stockholder vote.
- *No Written Consent of Stockholders.* All stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting. Stockholders may not take action by written consent in lieu of a meeting. The inability of stockholders to take action by written consent means that a stockholder would need to wait until the next annual or special meeting to bring business before the stockholders for a vote.
- *Special Meetings of Stockholders.* Special meetings of our stockholders may be called only by our board of directors acting pursuant to a resolution approved by the affirmative vote of a majority of the directors then in office. Only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of our stockholders.
- *Advance Notice Requirements for Stockholder Proposals and Director Nominations.* Our amended and restated by-laws provide advance notice procedures for stockholders seeking to bring business before our annual meeting of stockholders or to nominate candidates for election as directors at our annual meeting of stockholders. These procedures provide that notice must be given in writing not later than the close of business on the 90th day nor earlier than the close of business on the 120<sup>th</sup> 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, as amended, or amended and restated by-laws requires a 75% stockholder vote. Provisions requiring such supermajority vote include, among other things, any amendment, repeal or modification of the provisions relating to the classification of our board of directors, the requirement that stockholder actions be effected at a duly called annual or special meeting of our stockholders and the designated parties entitled to call a special meeting of our stockholders.

### **Section 203 of the DGCL**

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

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

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

- at or subsequent to such time that the stockholder became an interested stockholder, the business combination was approved by the board of directors and authorized at an annual or special meeting of stockholders by at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.
- any merger or consolidation involving the corporation and the interested stockholder;

- any sale, lease, exchange, mortgage, pledge, transfer or other disposition of the assets of the corporation with an aggregate market value of 10% or more of either the aggregate market value of all assets of the corporation on a consolidated basis or the aggregate market value of all of the outstanding stock of the corporation involving the interested stockholder;
- subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;
- subject to exceptions, 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 Nasdaq under the symbol “YTEN”.

#### **DISCLOSURE OF COMMISSION POSITION ON INDEMNIFICATION FOR SECURITIES ACT LIABILITIES**

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

#### **LEGAL MATTERS**

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 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 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](http://www.sec.gov).

Our Internet address is [www.yield10bio.com](http://www.yield10bio.com). There we make available free of charge, on or through the investor relations section of our website, annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after we electronically file such material with the SEC. The information found on our website is not part of this prospectus supplement or the accompanying prospectus.

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

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

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



**YIELD10 BIOSCIENCE, INC.  
6,382,280 SHARES OF COMMON STOCK  
ISSUABLE UPON EXERCISE OF OUTSTANDING WARRANTS**

**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.

	<b>Amount to be paid</b>
SEC registration fee	\$ 244.93
Legal fees and expenses	65,000.00
Accounting fees and expenses	36,000.00
Total	\$ 101,244.93

### 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 DGCL; 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 DGCL 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 104,538 shares of common stock to participants in the Yield10 Bioscience, Inc. 401(k) Plan as quarterly matching contributions. On April 8, 2024, the Company issued 19,245 shares of common stock 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.

<b>Exhibit Number</b>	<b>Exhibit Description</b>	<b>Filed Herewith</b>	<b>Incorporated by Reference herein from Form or Schedule</b>	<b>Filing Date</b>	<b>SEC File/ Reg. Number</b>
3.1.1	<a href="#">Amended and Restated Certificate of Incorporation, as amended, of the Registrant.</a>		Form 10-Q (Exhibit 3.1)	8/9/2018	001-33133
3.1.2	<a href="#">Certificate of Amendment to the Amended and Restated Certificate of Incorporation of the Registrant.</a>		Form 8-K (Exhibit 3.1)	1/15/2020	001-33133
3.1.3	<a href="#">Certificate of Designation of Preferences, Rights and Limitations with respect to the Series A Preferred Stock.</a>		Form 8-K (Exhibit 3.1)	11/20/2019	001-33133
3.1.4	<a href="#">Certificate of Designation of Preferences, Rights and Limitations with respect to the Series B Preferred Stock.</a>		Form 8-K (Exhibit 3.2)	11/20/2019	001-33133
3.2	<a href="#">Amended and Restated By-laws of the Registrant.</a>		Form 10-Q (Exhibit 3.1)	11/10/2021	001-33133
4.1	<a href="#">Specimen Stock Certificate for shares of the Registrant's Common Stock.</a>		Form 10-Q (Exhibit 4.1)	11/12/2020	001-33133
4.2	<a href="#">Form of Common Stock Purchase Warrant.</a>		Form 8-K (Exhibit 4.1)	11/20/2019	001-33133
4.3	<a href="#">Senior Unsecured Convertible Note.</a>		Form 8-K (Exhibit 4.1)	5/1/2023	001-33133
4.4	<a href="#">Form of Pre-Funded Common Stock Purchase Warrant</a>		Form 8-K (Exhibit 4.1)	5/4/2023	001-33133
4.5	<a href="#">Form of Common Stock Purchase Warrant</a>		Form 8-K (Exhibit 4.2)	5/4/2023	001-33133
4.6	<a href="#">Form of Common Stock Purchase Warrant</a>		Form S-1/A (Exhibit 4.9)	8/2/2023	333-273240
4.7	<a href="#">Form of Warrant</a>		Form 8-K (Exhibit 4.1)	3/22/2024	001-33133
5.1	Opinion of Covington & Burling LLP	X			
10.1†	<a href="#">2006 Stock Option and Incentive Plan.</a>		Form S-1/A (Exhibit 10.3)	10/20/2006	333-135760
10.1.1†	<a href="#">2006 Stock Option and Incentive Plan, Form of Incentive Stock Option Agreement.</a>		Form S-1/A (Exhibit 10.3.1)	10/20/2006	333-135760
10.1.2†	<a href="#">2006 Stock Option and Incentive Plan, Form of Non-Qualified Stock Option Agreement.</a>		Form S-1/A (Exhibit 10.3.2)	10/20/2006	333-135760
10.1.3†	<a href="#">2006 Stock Option and Incentive Plan, Form of Director Non-Qualified Stock Option Agreement.</a>		Form S-1/A (Exhibit 10.3.3)	10/20/2006	333-135760
10.2†	<a href="#">2014 Stock Option and Incentive Plan, Revised and Restated.</a>		Form 10-Q (Exhibit 10.1)	8/13/2015	001-33133
10.2.1†	<a href="#">2014 Stock Option and Incentive Plan, Form of Incentive Stock Option Award.</a>		Form 10-K (Exhibit 10.3.1)	3/25/2015	001-33133
10.2.2†	<a href="#">2014 Stock Option and Incentive Plan, Form of Non-Qualified Stock Option Award.</a>		Form 10-K (Exhibit 10.3.2)	3/25/2015	001-33133
10.2.3†	<a href="#">2014 Stock Option and Incentive Plan, Form of Restricted Stock Unit Award.</a>		Form 10-K (Exhibit 10.3.3)	3/25/2015	001-33133
10.3†	<a href="#">Amended and Restated 2018 Stock Option and Incentive Plan.</a>		Form 8-K (Exhibit 10.1)	5/30/2023	001-33133

10.3.1†	<a href="#">Amended and Restated 2018 Stock Option and Incentive Plan, Form of Stock Option Agreement.</a>	Form 10-K (Exhibit 10.2.5)	3/28/2019	001-33133
10.3.2†	<a href="#">2018 Stock Option and Incentive Plan, Form of Restricted Stock Unit Agreement.</a>	Form 10-K (Exhibit 10.2.6)	3/25/2020	001-33133
10.4†	<a href="#">Employment Agreement between the Company and Oliver P. Peoples dated March 28, 2017.</a>	Form 10-K (Exhibit 10.3)	3/30/2017	001-33133
10.5†	<a href="#">Amendment to the Employment Agreement between the Company and Oliver Peoples dated December 6, 2023.</a>	Form 10-K (Exhibit 10.5)	4/1/2024	001-33133
10.6†	<a href="#">Employment Agreement between the Company and Charles B. Haaser dated March 28, 2017.</a>	Form 10-K (Exhibit 10.4)	3/30/2017	001-33133
10.7†	<a href="#">Amendment to the Employment Agreement between the Company and Charles B. Haaser dated December 6, 2023.</a>	Form 10-K (Exhibit 10.7)	4/1/2024	001-33133
10.8†	<a href="#">Employment Agreement between the Company and Lynne H. Brum dated March 28, 2017.</a>	Form 10-K (Exhibit 10.6)	3/30/2017	001-33133
10.9†	<a href="#">Amendment to the Employment Agreement between the Company and Lynne Brum dated December 6, 2023.</a>	Form 10-K (Exhibit 10.9)	4/1/2024	001-33133
10.10†	<a href="#">Employment Agreement between the Company and Kristi Snell dated March 28, 2017.</a>	Form 10-K (Exhibit 10.8)	3/30/2017	001-33133
10.11†	<a href="#">Amendment to the Employment Agreement between the Company and Kristi Snell dated December 6, 2023.</a>	Form 10-K (Exhibit 10.11)	4/1/2024	001-33133
10.12†	<a href="#">Form of Employee Noncompetition, Confidentiality and Inventions Agreement between the Company and its Employee.</a>	Form 10-K (Exhibit 10.9)	3/30/2017	001-33133
10.13†	<a href="#">Form of Indemnification Agreement between the Registrant and its Directors and Officers.</a>	Form S/1/A (Exhibit 10.14)	10/20/2006	333-135760
10.14	<a href="#">Standstill Agreement dated June 19, 2015 between the Company and Jack W. Schuler, Renate Schuler and the Schuler Family Foundation.</a>	Form 8-K (Exhibit 10.1)	6/17/2015	001-33133
10.15	<a href="#">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.</a>	Form 8-K (Exhibit 10.1)	1/26/2016	001-33133
10.16	<a href="#">Sublease between CJ Research Center LLC and the Company, dated as of September 16, 2016.</a>	Form 10-K (Exhibit 10.20)	3/30/2017	001-33133
10.17	<a href="#">Form of Securities Purchase Agreement dated July 3, 2017 between the Company and the Purchasers named therein.</a>	Form 8-K (Exhibit 10.1)	7/5/2017	001-33133
10.18@	<a href="#">Exclusive License Agreement, dated May 17, 2018, between the Company and the University of Missouri.</a>	Form 10-Q (Exhibit 10.2)	8/9/2018	001-33133
10.19	<a href="#">Form of Securities Purchase Agreement dated March 14, 2019 between the Company and the Investors named therein.</a>	Form 8-K (Exhibit 10.1)	3/15/2019	001-33133
10.20	<a href="#">Securities Purchase Agreement, dated as of November 14, 2019, by and between Yield10 Bioscience, Inc. and the Investors listed on Schedule I thereto.</a>	Form 8-K (Exhibit 10.1)	11/20/2019	001-33133

10.21	<a href="#">Securities Purchase Agreement, dated as of August 22, 2020, by and between Yield10 Bioscience, Inc. and the Investors listed on Schedule I thereto.</a>		Form 8-K (Exhibit 10.1)	8/25/2020	001-33133
10.22	<a href="#">Collaboration and Option Agreement, dated November 12, 2020, by and between the Company and Rothamsted Research Institute, as amended.</a>		Form 10-K (Exhibit 10.18)	3/14/2023	001-33133
10.23	<a href="#">Equity Distribution Agreement, dated January 23, 2023, by and between the Company and Maxim Group LLC.</a>		Form 8-K (Exhibit 1.1)	1/24/2023	001-33133
10.24	<a href="#">Securities Purchase Agreement, dated April 28, 2023, by and between the Company and MPC Investment LLC.</a>		Form 8-K (Exhibit 10.1)	5/1/2023	001-33133
10.25	<a href="#">Securities Purchase Agreement, dated as of May 3, 2023, by and between the Company and the Purchasers</a>		Form 8-K (Exhibit 10.1)	5/4/2023	001-33133
10.26	<a href="#">Securities Purchase Agreement, dated as of August 1, 2023, by and between Yield10 Bioscience, Inc. and the Purchasers named therein.</a>		Form S-1/A (Exhibit 10.21)	8/2/2023	333-273240
10.27	<a href="#">Exchange Agreement, dated as of March 22, 2024, by and among the Company and the warrant holders party thereto.</a>		Form 8-K (Exhibit 10.1)	3/22/2024	001-33133
16.1	<a href="#">Letter from RSM US LLP dated February 5, 2024.</a>		Form 8-K (Exhibit 16.1)	2/6/2024	001-33133
21.1	<a href="#">Subsidiaries of the Registrant.</a>		Form 10-K (Exhibit 21.1)	3/16/2021	001-33133
<a href="#">23.1</a>	Consent of RSM US LLP, an independent registered public accounting firm.	X			
<a href="#">23.2</a>	Consent of Berkowitz Pollack Brant Advisors +CPAs, an independent registered public accounting firm.	X			
<a href="#">23.3</a>	Consent of Covington & Burling LLP (included in Exhibit 5.1)	X			
24.1	Power of Attorney (included in the signature pages to the Registration Statement).				
101.INS	XBRL Instance Document.	X			
101.SCH	XBRL Taxonomy Extension Schema.	X			
101.CAL	XBRL Taxonomy Extension Calculation Linkbase.	X			
101.DEF	XBRL Taxonomy Extension Definition Linkbase.	X			
101.LAB	XBRL Taxonomy Extension Label Linkbase.	X			
101PRE	XBRL Taxonomy Extension Presentation Linkbase.	X			
<a href="#">107</a>	<a href="#">Filing Fee Table</a>	X			

- † Management contract or compensatory plan or arrangement.
- @ Certain confidential portions of this Exhibit were omitted by means of marking such portions with brackets ("[\*\*\*]") because the identified confidential portions (i) are not material and (ii) is the type of information that the Company treats as private or confidential.

## Item 17. Undertakings.

The undersigned registrant hereby undertakes:

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

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

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

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

*Provided, however, that:*

Paragraphs (1)(i), (1)(ii) and (1)(iii) of this section do not apply if the information required to be included in a post-effective amendment by those paragraphs is contained in reports filed with or furnished to the SEC by the registrant pursuant to Section 13 or Section 15(d) of the Securities Act that are incorporated by reference in the registration statement, or is contained in a form of prospectus filed pursuant to Rule 424(b) that is part of 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 Securities 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 April 25, 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.

<u>Name</u>	<u>Title</u>	<u>Date</u>
<u>/s/ OLIVER P. PEOPLES</u> Oliver P. Peoples, Ph.D.	President and Chief Executive Officer and Director (Principal Executive Officer)	April 25, 2024
<u>/s/ CHARLES B. HAASER</u> Charles B. Haaser	Vice President, Finance, and Chief Accounting Officer (Principal Financial and Accounting Officer)	April 25, 2024
<u>/s/ SHERRI M. BROWN</u> Sherri M. Brown, Ph.D.	Director	April 25, 2024
<u>/s/ RICHARD W. HAMILTON</u> Richard W. Hamilton, Ph.D.	Director	April 25, 2024
<u>/s/ WILLIE LOH</u> Willie Loh, Ph.D.	Director	April 25, 2024
<u>/s/ ANTHONY J. SINSKEY</u> Anthony J. Sinskey, Sc.D.	Director	April 25, 2024
<u>/s/ ROBERT L. VAN NOSTRAND</u> Robert L. Van Nostrand	Chairman	April 25, 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 Securities

	Security Type	Security Class Title	Fee Calculation or Carry Forward Rule	Amount Registered	Proposed Maximum Offering Price Per Unit	Maximum Aggregate Offering Price	Fee Rate	Amount of Registration Fee (1)	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
<b>Newly Registered Securities</b>												
Fees to be Paid	Equity	Common Stock underlying warrants with an exercise price of \$0.43 per share	457(c)	6,382,280 (2)	\$0.26 (3)	\$1,659,392.80	\$0.00014760	\$244.93	—	—	—	—
	<b>Total Offering Amounts</b>					\$1,659,392.80		\$244.93				
	<b>Total Fees Previously Paid</b>							—				
	<b>Total Fee Offsets</b>							—				
	<b>Net Fee Due</b>							\$244.93				

(1) Rounded up to the nearest cent.

(2) Represents shares of our common stock offered by the selling shareholders issuable upon the exercise of warrants to purchase common stock issued to the selling stockholders in a private placement.

(3) Estimated solely for the purpose of calculating the registration fee in accordance with Rule 457(c) of the Securities Act, based on the average of the high and low prices of the common stock of the registrant as reported on The Nasdaq Capital Market on April 23, 2024.

## COVINGTON

BEIJING BOSTON BRUSSELS DUBAI FRANKFURT  
JOHANNESBURG LONDON LOS ANGELES NEW YORK  
PALO ALTO SAN FRANCISCO SEOUL SHANGHAI WASHINGTON

Covington & Burling LLP  
One International Place  
Suite 1020  
Boston, MA 02110-2600  
T +1 617 603 8800

April 25, 2024

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

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

Ladies and Gentlemen:

We have acted as counsel to Yield10 Bioscience, Inc., a Delaware corporation (the "Company") in connection with the filing by the Company of a Registration Statement on Form S-1 (the "Registration Statement") with the Securities and Exchange Commission (the "Commission") relating to the registration under the Securities Act of 1933, as amended (the "Securities Act"), of the offering from time to time by the selling stockholders (the "Selling Security Holders"), as described in the Registration Statement, of up to 6,382,280 shares (the "Shares") of the Company's common stock, par value \$0.01 per share ("Common Stock"), issuable upon the exercise of the issued and outstanding warrants held by the Selling Security Holders (the "Warrants") to purchase shares of Common Stock (the "Warrant Shares").

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

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

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

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

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

We understand that you wish to file this opinion with the Commission as an exhibit to the Registration Statement in accordance with the requirements of Item 601(b)(5) of Regulation S-K promulgated under the Securities Act and to reference the firm's name under the caption "Legal Matters" in the prospectus which forms part of the Registration

**COVINGTON**

Statement, and we hereby consent thereto. In giving this consent, we do not admit that we are within the category of persons whose consent is required under Section 7 of the Securities Act or the rules and regulations of the Commission promulgated thereunder.

Very truly yours.

/s/ Covington & Burling LLP

**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  
April 25, 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  
April 25, 2024