PROSPECTUS



11,010,513 Shares of Common Stock Offered by the Selling Stockholders

The selling stockholders of Molecular Templates, Inc. ("Molecular," "we," "us" or the "Company") identified in this prospectus, including their pledgees, donees, transferees, assigns or other successors in interest ("selling stockholders"), may, from time to time, offer and resell under this prospectus up to 11,010,513 shares ("Shares") of common stock, par value \$0.001 per share, of the Company (the "Common Stock"), which consist of (i) 1,209,612 shares of Common Stock held by the selling stockholders, (ii) 2,460,559 shares of Common Stock issuable upon the exercise of prefunded warrants (the "Prefunded Warrants") to purchase shares of Common Stock issuable upon the exercise of common stock warrants (the "Warrants") to purchase shares of Common Stock held by certain selling stockholders. We will not receive any proceeds from the sale of the Shares offered by this prospectus. We may receive proceeds upon any exercise for cash of the Prefunded Warrants and Warrants, in which case such proceeds will be used to fund our ongoing clinical studies, working capital and for general corporate purposes.

Our registration of the Shares covered by this prospectus does not mean that the selling stockholders will offer or sell any of the Shares. The selling stockholders may sell any, all or none of the Shares offered by this prospectus and we do not know when or in what amount the selling stockholders may sell their Shares hereunder following the effective date of this registration statement. The timing and amount of any sale are within the sole discretion of the selling stockholders.

The selling stockholders may sell the Shares through public or private transactions at market prices prevailing at the time of sale or at negotiated prices. For further information regarding the possible methods by which the Shares may be distributed, see "Plan of Distribution" beginning on page 15 in this prospectus.

Our Common Stock is listed on The Nasdaq Capital Market under the symbol "MTEM". On May 1, 2024, the last reported sale price for our Common Stock was \$1.65 per share.

Investing in our Common Stock involves a high degree of risk. Please consider carefully the risks described in this prospectus under "<u>Risk Factors</u>" beginning on page 5 of this prospectus and in our filings with the Securities and Exchange Commission.

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.

This prospectus is dated May 3, 2024

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ABOUT THIS PROSPECTUS

This prospectus is part of a registration statement on Form S-3 that we have filed with the Securities and Exchange Commission (the "SEC") pursuant to which the selling stockholders named herein may, from time to time, offer and sell or otherwise dispose of the Shares covered by this prospectus. You should not assume that the information contained in this prospectus is accurate on any date subsequent to the date set forth on the front cover of this prospectus or that any information we have incorporated by reference is correct on any date subsequent to the date of the document incorporated by reference, even though this prospectus is delivered or Shares are sold or otherwise disposed of on a later date.

This prospectus does not contain all of the information included in the registration statement. For a more complete understanding of the offering of the Shares, you should refer to the registration statement including the exhibits. Copies of some of the documents referred to herein have been filed, will be filed or will be incorporated by reference as exhibits to the registration statement of which this prospectus is a part, and you may obtain copies of those documents as described below under the heading "Where You Can Find More Information." We further note that the representations, warranties and covenants made by us in any agreement that is filed as an exhibit to any document that is incorporated by reference in the accompanying prospectus were made solely for the benefit of the parties to such agreement, including in some cases, for the purpose of allocating risk among the parties to such agreements, and should not be deemed to be a representation, warranty or covenant to you. Moreover, such representations, warranties or covenants were accurate only as of the date when made. Accordingly, such representations, warranties and covenants should not be relied on as accurately representing the current state of our affairs. It is important for you to read and consider all information contained in this prospectus, including the documents incorporated by reference therein, in making your investment decision. You should also read and consider the information in the documents to which we have referred you under "Where You Can Find More Information" and "Incorporation of Certain Documents by Reference" in this prospectus.

We and the selling stockholders have not authorized anyone to give any information or to make any representation to you other than those contained or incorporated by reference in this prospectus. You must not rely upon any information or representation not contained or incorporated by reference in this prospectus. This prospectus does not constitute an offer to sell or the solicitation of an offer to buy any of our shares of Common Stock other than the Shares covered hereby, nor does this prospectus constitute an offer to sell or the solicitation of an offer to buy any securities in any jurisdiction to any person to whom it is unlawful to make such offer or solicitation in such jurisdiction. Persons who come into possession of this prospectus in jurisdictions outside the United States are required to inform themselves about, and to observe, any restrictions as to the offering and the distribution of this prospectus applicable to those jurisdictions.

This prospectus, including the documents incorporated by reference herein, include statements that are based on various assumptions and estimates that are subject to numerous known and unknown risks and uncertainties. Some of these risks and uncertainties are described in the section entitled "Risk Factors" beginning on page 5 of this prospectus and as described in Part I, Item 1A (Risk Factors) of our most recent Annual Report on Form 10-K for the year ended December 31, 2023 filed with the SEC on March 29, 2024, as updated by our subsequent filings with the SEC under the Securities Exchange Act of 1934, as amended (the "Exchange Act"). These and other important factors could cause our future results to be materially different from the results expected as a result of, or implied by, these assumptions and estimates. You should read the information contained in, or incorporated by reference into, this prospectus completely and with the understanding that future results may be materially different from and worse than what we expect. See the information included under the heading "Special Note Regarding Forward-Looking Statements."

In this prospectus, references to "Molecular," "Molecular Templates," the "Company," "we," "us," and "our" refer to Molecular Templates, Inc. and its subsidiaries. The phrase "this prospectus" refers to this prospectus and any applicable prospectus supplement, unless the context requires otherwise.

PROSPECTUS SUMMARY

The following is a summary of what we believe to be the most important aspects of our business and the offering of our securities under this prospectus. We urge you to read this entire prospectus, including the more detailed consolidated financial statements, notes to the consolidated financial statements and other information incorporated by reference from our other filings with the SEC. Investing in our securities involves risks. Therefore, carefully consider the risk factors set forth in this prospectus and in our most recent annual and quarterly filings with the SEC, as well as other information in this prospectus and the documents incorporated by reference herein.

About Molecular Templates, Inc.

Molecular Templates, Inc. is a clinical-stage biopharmaceutical company focused on the discovery and development of targeted biologic therapeutics for cancer. Our proprietary biologic drug platform technology, known as engineered toxin bodies, leverages the resident biology of a genetically engineered form of Shiga-like Toxin A subunit ("SLTA") to create novel therapies with potent and differentiated mechanisms of action for cancer.

To date, we have not generated any revenue from therapeutic sales and do not expect to generate significant revenue from the sale of our therapeutics in development in the foreseeable future. If our development efforts for our therapeutic candidates are successful and result in regulatory approval, we may generate revenue in the future from these sales. We cannot predict if, when, or to what extent we will generate revenue from the commercialization and sale of our therapeutic candidates. We may never succeed in obtaining regulatory approval for any of our therapeutic candidates.

2024 Private Placement

On July 12, 2023, the Company entered into a Securities Purchase Agreement with certain institutional and accredited investors providing for a private placement of up to \$40 million in gross proceeds to the Company in two tranches. The initial tranche consisted of the issuance of 2.84 million shares (as adjusted for the Company's August 2024 reverse stock split) of Common Stock, or prefunded warrants in lieu thereof, for gross proceeds of approximately \$20 million. The initial tranche closed on July 17, 2023.

On March 28, 2024, the Company and certain institutional and accredited investors (the "Purchasers") entered into an Amended and Restated Securities Purchase Agreement (as amended and restated, the "Securities Purchase Agreement") pursuant to which the Company issued securities with an aggregate purchase price of \$9.5 million on amended and restated second tranche terms (the "Private Placement"). The Private Placement consisted of the sale and issuance of (i) 1,209,612 shares of Common Stock (and, in lieu thereof, Prefunded Warrants to purchase 2,460,559 shares of Common Stock) for a purchase price of \$2.35 per share of Common Stock (he closing price of the Common Stock on March 27, 2024 as reported by the Nasdaq Capital Market) and \$2.349 per Prefunded Warrant, and (ii) Warrants to purchase up to 7,340,342 shares of Common Stock (or Prefunded Warrants in lieu thereof) at an exercise price of \$2.35 per share of Common Stock or \$2.349 per Prefunded Warrant, in exchange for the payment of \$0.125 per share of Common Stock underlying the Warrants. The Warrants have a term of five years, and the Prefunded Warrants expire when fully exercised in accordance with their terms.

Under the terms of the Prefunded Warrants and the Warrants, a selling stockholder may not exercise the Prefunded Warrants or Warrants to the extent such exercise would cause such selling stockholder, together with its affiliates, to beneficially own a number of shares of Common Stock that would exceed 4.99%, 9.99% or 19.99%, as applicable, of our then outstanding shares of Common Stock following such exercise, excluding for

purposes of such determination shares of Common Stock issuable upon exercise of the Prefunded Warrants or Warrants which have not been exercised (the "Beneficial Ownership Limitation"); provided, however, that each selling stockholder may increase or decrease the Beneficial Ownership Limitation by giving 61 days' notice to us, but not to any percentage in excess of 19.99%.

Pursuant to the Securities Purchase Agreement, the Company granted to the Purchasers certain registration rights, pursuant to which, among other things, the Company agreed to (i) file with the SEC a registration statement on Form S-3 after the second tranche to register for resale the Shares (and the shares of Common Stock issuable upon exercise of the Prefunded Warrants and Warrants) issued in the second tranche, within 30 calendar days following the second tranche closing, and (ii) use its commercially reasonable efforts to have the registration statement declared effective as soon as practicable, and in any event no later than 90 days following the second tranche closing date (or 120 days following the second tranche closing date if the registration statement is reviewed by the SEC).

The registration statement of which this prospectus is a part relates to the offer and resale of the shares of Common Stock issued to the Purchasers pursuant to the Securities Purchase Agreement in the closing of the second tranche that occurred on April 2, 2024, including the shares issuable upon exercise of the Prefunded Warrants and Warrants. When we refer to the selling stockholders in this prospectus, we are referring to the Purchasers named in this prospectus as the selling stockholders and, as applicable, any donee, pledgees, assignees, transferees or other successors-in-interest selling the shares of Common Stock received after the date of this prospectus from the selling stockholders as a gift, pledge, or other non-sale related transfer.

The securities issued in the Private Placement were issued and offered pursuant to the exemption from registration provided in Section 4(a)(2) of the Securities Act and Rule 506(b) promulgated thereunder.

Corporate History and Information

We were incorporated in Delaware on October 17, 2001. On August 1, 2017, we completed our business combination with Molecular Templates OpCo, Inc., or what was then known as "Molecular Templates, Inc." ("Private Molecular"; formerly D5 Pharma Inc., a Delaware corporation incorporated on February 19, 2009), in accordance with the terms of an Agreement and Plan of Merger and Reorganization, dated as of March 16, 2017, by and among us (formerly known as Threshold Pharmaceuticals, Inc.) (Nasdaq: THLD), Trojan Merger Sub, Inc. ("Merger Sub"), our wholly owned subsidiary, and Private Molecular, pursuant to which Merger Sub merged with and into Private Molecular, with Private Molecular surviving as our wholly owned subsidiary, now "Molecular Templates OpCo, Inc." (the "Merger"). Upon the consummation of the Merger, we changed our name to "Molecular Templates, Inc."

Molecular and Molecular Templates OpCo, Inc. each have a principal executive office at 9301 Amberglen Boulevard, Suite 100, Austin, Texas 78729 and telephone number (512) 869-1555. Our website address is www.mtem.com. The information contained in, or accessible through, our website does not constitute a part of this prospectus. You should not rely on our website or any such information in making your decision whether to purchase our Common Stock.

THE OFFERING

This prospectus relates to the resale from time to time by the selling stockholders identified herein of up to 11,010,513 shares of our Common Stock. We are not offering any shares for sale under the registration statement of which this prospectus is a part.

Shares of Common Stock that may be offered by the

selling stockholders:

Up to 11,010,513 shares of Common Stock, which consist of (i) 1,209,612 shares of Common Stock held by the selling stockholders, (ii) 2,460,559 shares of Common Stock issuable upon the exercise of Prefunded Warrants to purchase shares of Common Stock held by certain selling stockholders, and (iii) 7,340,342 shares of Common Stock issuable upon the exercise of Warrants to purchase shares of Common Stock held by certain selling stockholders.

Use of proceeds: We will not receive any proceeds from the sale of the Shares covered by this prospectus. We

may receive proceeds upon any exercise for cash of the Prefunded Warrants and Warrants, in which case such proceeds will be used to fund our ongoing clinical studies, working capital

and for general corporate purposes.

Offering price: The selling stockholders may sell all or a portion of their Shares through public or private

transactions at prevailing market prices or at privately negotiated prices.

Risk factors: Investing in our securities involves a high degree of risk and purchasers may lose their entire

investment. See the disclosure under the heading "Risk Factors" on page 5 of this prospectus.

Nasdaq Capital Market symbol: MTEM

RISK FACTORS

Investing in our Common Stock involves a high degree of risk. You should carefully consider the risks and uncertainties and all other information, documents or reports included or incorporated by reference in this prospectus and, if applicable, any prospectus supplement or other offering materials, including the risks and uncertainties discussed and described in Part I, Item 1A (Risk Factors) of our most recent Annual Report on Form 10-K for the year ended December 31, 2023 filed with the SEC on March 29, 2024, as updated by our subsequent filings with the SEC under Exchange Act, which are incorporated by reference, in this prospectus, and any updates to those risk factors included from time to time in our periodic and current reports filed with the SEC and incorporated by reference in this prospectus, before making any decision to invest in shares of our Common Stock. If any of the events discussed in these risk factors occurs, our business, prospects, results of operations, financial condition and cash flows could be materially harmed. If that were to happen, the trading price of our Common Stock could decline, and you could lose all or part of your investment. Additional risks not currently known to us or other factors not perceived by us to present significant risks to our business at this time also may impair our business operations.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus and the documents we have filed with the SEC that are incorporated by reference contain "forward-looking statements" within the meaning of Section 27A of the Securities Act and Section 21E of the Exchange Act that involve substantial risks and uncertainties. In some cases, forward-looking statements are identified by the words "anticipate," "believe," "continue," "could," "estimate," "expect," "future," "goals," "intend," "likely," "may," "might," "ongoing," "objective," "plan," "potential," "predict," "project," "seek," "should," "strategy," "will" and "would" or the negative of these terms, or other comparable terminology intended to identify statements about the future. These statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to be materially different from the information expressed or implied by these forward-looking statements.

Although we believe that we have a reasonable basis for each forward-looking statement contained in this prospectus and the documents that we have filed with the SEC that are incorporated by reference, such statements are based on a combination of facts and factors currently known by us and our expectations of the future, about which we cannot be certain. Forward-looking statements include statements about:

- the implementation of our business strategies, including our ability to continue to pursue development pathways and regulatory strategies for MT-6402, MT-8421, MT-0169 and other engineered toxin body ("ETB") biologic candidates;
- our utilization of a de-immunized ETB scaffold that has been designed to reduce or eliminate the propensity for innate immunity, including capillary leak syndrome, via de-immunization of the SLTA as well as chemistry, manufacturing, and controls improvements;
- the timing and our ability to advance the development of our biologic candidates;
- our plans to pursue discussions with regulatory authorities, and the anticipated timing, scope and outcome of related regulatory actions or guidance;
- our ability to establish and maintain potential new partnering or collaboration arrangements for the development and commercialization of ETB biologic candidates;
- · our ability to obtain the benefits we anticipate from partnering, collaboration, or supply agreements that we may enter into;
- our financial condition, including our ability to obtain the funding necessary to advance the development of our biologic candidates and our ability to continue as a going concern;
- our ability to comply with the terms of our Contingent Value Rights Agreement pursuant to which our obligations are secured, subject to certain limited exceptions, by substantially all of our assets;
- our ability to comply with applicable listing standard within theone-year monitoring period that commenced on August 2, 2023 and to maintain the listing of shares of our common stock on the Nasdaq Capital Market;
- the ongoing effect of the reverse stock split of our common stock that we completed in August 2023 on the price or trading of our common stock; including potential continued adverse impacts on the liquidity of our common stock;
- the anticipated progress of our biologic candidate development programs, including whether our ongoing and potential future clinical trials will achieve clinically relevant results;
- our ability to generate data and conduct analyses to support the regulatory approval of our biologic candidates;
- our ability to establish and maintain intellectual property rights for our biologic candidates;
- whether any biologic candidates that we are able to commercialize are safer or more effective than other marketed products, treatments or therapies;

- our ability to discover and develop additional biologic candidates suitable for clinical testing;
- · our ability to identify, in-license or otherwise acquire additional biologic candidates and development programs;
- our anticipated research and development activities and projected expenditures;
- · our ability to complete preclinical and clinical testing successfully for new drug or biologic candidates that we may develop or license;
- our ability to have manufactured active pharmaceutical ingredient and drug or biologic product that meet required release and stability specifications;
- · our ability to have manufactured sufficient supplies of drug product for clinical testing and commercialization;
- · our ability to obtain licenses to any necessary third-party intellectual property;
- our anticipated use of proceeds from any financing activities;
- potential uncertainty regarding the outcome of our exploration of strategic alternatives, and the impacts that it may have on our business;
- the expected cost savings from our strategic restructuring that we completed in 2023;
- the extent to which global economic and political developments, including the indirect and/or long-term impact of inflation, will affect our business operations, clinical trials, or financial condition;
- · the impact of laws and regulations;
- our projected financial performance; and
- the sufficiency of our cash resources.

Any forward-looking statements in this prospectus reflect our current views with respect to future events or to our future financial performance and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by these forward-looking statements. Factors that may cause actual results to differ materially from current expectations include, among others, our ability to raise the additional funding we will need to continue to pursue our business and product development plans; the inherent uncertainties associated with developing new drug or biologic candidates or technologies and operating as a development stage company; our ability to develop, complete clinical trials for, obtain approvals for and commercialize any of our biologic candidates, including our ability to recruit and enroll patients in our studies; our ability to address the requests of the FDA; competition in the industry in which we operate; and market conditions. You should refer to the section titled "Risk Factors" of this prospectus and as described in Part I, Item 1A (Risk Factors) of our most recent Annual Report on Form 10-K for the year ended December 31, 2023 filed with the SEC on March 29, 2024, as updated by our subsequent filings with the SEC under the Exchange Act, for further discussion of the important factors that may cause our actual results to differ materially from those expressed or implied by our forward-looking statements. As a result of these factors, we cannot assure that the forward-looking statements in this prospectus the documents we have filed with the SEC that are incorporated by reference will prove to be accurate. Furthermore, if our forward-looking statements prove to be inaccurate, the inaccuracy may be material. In light of the significant uncertainties in these forward-looking statements, these statements should not be regarded as representations or warranties by us or any other person that we will achieve our objectives and plans in any specified time frame, or at all. We undertake no obligation to publicly update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by law.

In addition, statements that "we believe" and similar statements reflect our beliefs and opinions on the relevant subject. These statements are based upon information available to us as of the date of this prospectus, and while

we believe such information forms a reasonable basis for such statements, such information may be limited or incomplete, and our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all potentially available relevant information. These statements are inherently uncertain and investors are cautioned not to unduly rely upon these statements as predictions of future events.

You should read this prospectus, the documents that we have incorporated by reference herein and the documents we have filed as exhibits to the registration statement, completely and with the understanding that our actual future results may be materially different from what we expect. We qualify all of our forward-looking statements by these cautionary statements.

USE OF PROCEEDS

We are filing the registration statement of which this prospectus forms a part to permit the holders of the Shares of our Common Stock described in the section entitled "Selling Stockholders" to resell such Shares. We are not selling any securities under this prospectus, and we will not receive any proceeds from the sale or other disposition of shares of our Common Stock held by the selling stockholders. We may receive proceeds upon any exercise for cash of the Prefunded Warrants and Warrants, in which case such proceeds will be used to fund our ongoing clinical studies, working capital and for general corporate purposes.

The selling stockholders will pay any underwriting discounts and commissions and expenses incurred by the selling stockholders for brokerage, accounting, tax or legal services or any other expenses incurred by the selling stockholders in disposing of these Shares. We will bear all other costs, fees and expenses incurred in effecting the registration of the Shares covered by this prospectus, including, without limitation, all registration and filing fees, Nasdaq listing fees and fees and expenses of our counsel and our accountants.

SELLING STOCKHOLDERS

This prospectus covers the resale from time to time of up to an aggregate of 11,010,513 Shares of our Common Stock by the selling stockholders, which consist of (i) 1,209,612 shares of Common Stock held by the selling stockholders, (ii) 2,460,559 shares of Common Stock issuable upon the exercise of Prefunded Warrants to purchase shares of Common Stock held by certain selling stockholders, and (iii) 7,340,342 shares of Common Stock issuable upon the exercise of Warrants to purchase shares of Common Stock held by certain selling stockholders. The Shares registered for resale herein are pursuant to the Securities Purchase Agreement between us and the selling stockholders and relate to shares held by the selling stockholders not otherwise previously registered for resale.

The selling stockholders identified in the table below may from time to time offer and sell under this prospectus any or all of the Shares described under the column "Number of Shares of Common Stock Being Offered" in the table below. The table below has been prepared based upon information furnished to us by the selling stockholders as of April 8, 2024. The selling stockholders identified below may have sold, transferred or otherwise disposed of some or all of their shares since the date on which the information in the following table is presented in transactions exempt from or not subject to the registration requirements of the Securities Act. Information concerning the selling stockholders may change from time to time and, if necessary, we will amend or supplement this prospectus accordingly and as required.

The following table and footnote disclosure following the table sets forth the name of each selling stockholder, the nature of any position, office or other material relationship, if any, that the selling stockholders have had within the past three years with us or with any of our predecessors or affiliates, and the number of shares of our Common Stock beneficially owned by the selling stockholders before this offering. The number of shares described under the column "Shares of Common Stock Beneficially Owned Before this Offering" for each selling stockholder includes all shares of our Common Stock beneficially beld by such selling stockholder as of April 8, 2024, which includes (i) all shares of our Common Stock purchased by such selling stockholder in the Private Placement, (ii) all of the shares of Common Stock issuable upon exercise of the Prefunded Warrants purchased by such selling stockholder in the Private Placement, subject to the Beneficial Ownership Limitation, and (iii) all of the shares of Common Stock issuable upon exercise of the Warrants purchased by such selling stockholder in the Private Placement, subject to the Beneficial Ownership Limitation. The number of shares reflected are those beneficially owned, as determined under applicable rules of the SEC, and the information is not necessarily indicative of beneficial ownership for any other purpose. Under applicable SEC rules, beneficial ownership includes any shares of Common Stock as to which a person has sole or shared voting power or investment power and any shares of Common Stock which the person has the right to acquire within 60 days after April 8, 2024 through the exercise of any option, warrant or right or through the conversion of any convertible security. Unless otherwise indicated in the footnotes to the table below and subject to community property laws where applicable, we believe, based on information furnished to us that each of the selling stockholders named in this table has sole voting and investment power with respect to the

We have assumed that all shares of Common Stock reflected in the table as being offered in the offering covered by this prospectus will be sold from time to time in this offering. We cannot provide an estimate as to the number of shares of Common Stock that will be held by the selling stockholders upon termination of the offering covered by this prospectus because the selling stockholders may offer some, all or none of their shares of Common Stock

being offered in the offering. Information about the selling stockholders may change over time. Any changedinformation will be set forth in an amendment to the registration statement or supplement to this prospectus, to the extent required by law.

	Shares of Common Stock Beneficially Owned Before this Offering		Number of Shares of Common Stock Being	Shares of Co To Be Be Owned Upon of this C	neficially Completion
	Number	Percentage(2)	Offered(3)	Number (4)	(2)(4)
Selling Stockholder (1)					
Entities affiliated with BVF Partners L.P.(5)	672,767	9.99%	5,771,445	672,767	9.99%
SHV MTEM SPV, LLC(6)	711,306	9.99%	1,731,231	_	_
Biotech Target N.V.(7)	1,279,820	19.44%	1,154,001	1,029,820	15.64%
Lytton-Kambara Foundation(8)	329,739	4.99%	576,921	113,304	1.72%
Entities affiliated with Empery Asset Management, LP(9)	334,066	4.99%	576,921	30,911	*
Allostery Investments LP(10)	323,919	4.78%	288,459	35,460	*
Stephen Howard(11)	181,347	2.73%	103,845	77,502	1.18%
Entities affiliated with SilverArc Capital Management, LLC(12)	671,435	9.99%	807,690	265,006	4.03%

- * Represents beneficial ownership of less than one percent of our outstanding Common Stock.
- (1) All information regarding selling stockholders was provided by the selling stockholders as of April 8, 2024.
- (2) Percentage ownership is based on a denominator equal to the sum of (i) 6,583,880 shares of our Common Stock outstanding as of April 8, 2024 and (ii) the number of shares of Common Stock issuable upon exercise or conversion of convertible securities beneficially owned by the applicable selling stockholder.
- (3) The number of shares of Common Stock in the column "Number of Shares of Common Stock Being Offered" represents all of the shares of Common Stock that a selling stockholder may offer and sell from time to time under this prospectus, including (i) all shares of our Common Stock purchased by such selling stockholder in the Private Placement, (ii) all of the shares of Common Stock issuable upon exercise of the Prefunded Warrants purchased by such selling stockholder in the Private Placement, without giving effect to the Beneficial Ownership Limitation, and (iii) all of the shares of Common Stock issuable upon exercise of the Warrants purchased by such selling stockholder in the Private Placement, without giving effect to the Beneficial Ownership Limitation.
- (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) The shares reported under "Shares of Common Stock Beneficially Owned Before this Offering" consist of (i) 1,017,314 shares of Common Stock issuable upon exercise of the Prefunded Warrants held by Biotechnology Value Fund, L.P. ("BVF"); (ii) 2,034,628 shares of Common Stock issuable upon exercise of the Warrants held by BVF; (iii) 274,190 shares of Common Stock held by BVF; (iv) 8,533 shares of Common Stock issuable upon conversion of 128 shares of Series A Convertible Preferred Stock ("Series A Preferred Stock") held by BVF; (v) 651,521 shares of Common Stock issuable upon exercise of prefunded warrants held by BVF; (vi) 11,233 shares of Common Stock issuable upon exercise of warrants held by BVF; (vii) 816,467 shares of Common Stock issuable upon exercise of the Prefunded Warrants held by Biotechnology Value Fund II, L.P. ("BVF2"); (viii) 1,632,934 shares of Common Stock issuable upon exercise of the Warrants held by BVF2; (ix) 215,721 shares of Common Stock held by BVF2; (x) 6,933 shares of Common Stock issuable upon conversion of 104 shares of Series A Preferred Stock held by BVF2; (xi) 495,905 shares of Common Stock issuable upon exercise of prefunded warrants held by BVF2; (xii) 61,177 shares of Common Stock issuable upon exercise of the Prefunded Warrants held by Biotechnology Value Trading Fund OS LP ("BVTF"); (xiv) 122,354 shares of Common Stock issuable upon exercise of the Warrants held

by BVTF; (xv) 24,806 shares of Common Stock held by BVTF; (xvii) 1,200 shares of Common Stock issuable upon conversion of 18 shares of Series A Preferred Stock held by BVTF; (xvii) 57,921 shares of Common Stock issuable upon exercise of prefunded warrants held by BVTF; (xviii) 2,012 shares of Common Stock issuable upon exercise of warrants held by BVTF; (xix) 28,857 shares of Common Stock issuable upon exercise of the Prefunded Warrants by MSI BVF SPV, LLC ("MSI BVF"); (xx) 57,714 shares of Common Stock issuable upon exercise of the Warrants held by MSI BVF; (xxii) 7,521 shares of Common Stock held by MSI BVF; (xxii) 16,753 shares of Common Stock issuable upon exercise of prefunded warrants held by MSI BVF; and (xxiii) 2,366 shares of Common Stock issuable upon exercise of warrants held by MSI BVF, certain of which are not included in the shares reported because they are subject to limitations on conversion if such conversion would result in the selling stockholder beneficially owning more than 4.99% or 9.99% of our outstanding Common Stock. BVF I GP LLC is the general partner of BVF. BVF II GP LLC is the general partner of BVF. BVF Partners OS Ltd. is the general partner of BVF. BVF QF Holdings LLC is the sole member of BVF I GP LLC and BVF II GP LLC. BVF Partners L.P. is the sole member of BVF Partners OS Ltd. and investment manager of BVF, BVF2, BVTF and MSI BVF. BVF Inc. is the general partner of BVF Partners L.P. Mark N. Lampert is director and officer of BVF Inc. Each of BVF I GP LLC, BVF II GP LLC, BVF Partners CS Ltd., BVF GP Holdings LLC, BVF Partners L.P., BVF Inc. and Mr. Lampert disclaims beneficial ownership of securities beneficially owned by the selling stockholders. The address of BVF, BVF2, BVFF and MSI BVF is 44 Montgomery St, 40th Floor, San Francisco, CA 94104.

- (6) The shares reported under "Shares of Common Stock Beneficially Owned Before this Offering" consist of (i) 175,000 shares of Common Stock purchased in the Private Placement by SHV MTEM SPV, LLC ("SHV SPV"); (ii) 402,077 shares of Common Stock issuable upon exercise of the Prefunded Warrants held by SHV SPV; and (iii) 1,154,154 shares of Common Stock issuable upon exercise of the Warrants held by SHV SPV, certain of which are not included in the shares reported because they are subject to limitations on conversion if such conversion would result in the selling stockholder beneficially owning more than 9.99% of our outstanding Common Stock. Santé Health Ventures IV, L.P. ("Accel IV") is the managing member of SHV SPV. Santé Health Ventures IV, L.P. ("SHV IV") is the manager of Accel IV. SHV Management Services IV, LP ("SHV IV Services") is the general partner of SHV IV and SHV Management Services IV, LP ("SHV IV Management") is the general partner of SHV IV Services. Each of SHV IV, SHV IV Services and SHV IV Management may be deemed to have sole voting and dispositive power over the shares. Joe H. Cunningham, Douglas D. French and Kevin Lalande are the managing members of SHV IV Management and may be deemed to share voting and dispositive power over these shares. Kevin Lalande is a member of our Board of Directors. The selling stockholder's address is 201 W 5th St, Ste 1500, Austin, TX 78701.
- (7) The shares reported under "Shares of Common Stock Beneficially Owned Before this Offering" consist of (i) 250,000 shares of Common Stock purchased in the Private Placement by Biotech Target N.V. ("BB Biotech"); (ii) 134,667 shares of Common Stock issuable upon exercise of the Prefunded Warrants held by BB Biotech; (iii) 769,334 shares of Common Stock issuable upon exercise of the Warrants held by BB Biotech; and (iv) 1,029,820 shares of Common Stock held by BB Biotech, certain of which are not included in the shares reported because they are subject to limitations on conversion if such conversion would result in the selling stockholder beneficially owning more than 9.99% of our outstanding Common Stock. Biotech Target N.V. is a wholly-owned subsidiary of BB Biotech AG. Accordingly, BB Biotech AG may be deemed to be the indirect beneficial owner of the securities of the Company held directly or indirectly by Biotech Target N.V. BB Biotech AG is a publicly listed entity in Switzerland. The selling stockholder's address is Ara Hill Top Building, Unit A-5, Pletterijweg Oost 1, Curacao.
- (8) The shares reported under "Shares of Common Stock Beneficially Owned Before this Offering" consist of (i)192,307 shares of Common Stock purchased in the Private Placement by Lytton-Kambara Foundation; (ii) 384,614 shares of Common Stock issuable upon exercise of the Warrants held by Lytton-Kambara Foundation; and (iii) 113,304 shares of Common Stock held by Lytton-Kambara Foundation, certain of which are not included in the shares reported because they are subject to limitations on conversion if such conversion would result in the selling stockholder beneficially owning more than 4.99% of our outstanding Common Stock. Laurence Lytton has voting and/or investment power over the shares held by Lytton-Kambara Foundation and may be deemed to be the beneficial owner of these shares. Mr. Lytton disclaims

- beneficial ownership of these shares, except to the extent of his pecuniary interest therein. The selling stockholder's address is 467 Central Park West, 17-A. New York, NY 10025.
- (9) The shares reported under "Shares of Common Stock Beneficially Owned Before this Offering" consist of (i) 117,039 shares of Common Stock purchased in the Private Placement by Empery Asset Master, Ltd. ("EAM"); (ii) 234,078 shares of Common Stock issuable upon exercise of the Warrants held by EAM; (iii) 18,813 shares of Common Stock held by EAM; (iv) 31,900 shares of Common Stock purchased in the Private Placement by Empery Tax Efficient, LP ("ETE"); (v) 63,800 shares of Common Stock issuable upon exercise of the Warrants held by ETE; (vi) 5,132 shares of Common Stock held by ETE; (vii) 43,368 shares of Common Stock purchased in the Private Placement by Empery Tax Efficient III, LP ("ETE III"); (viii) 86,736 shares of Common Stock issuable upon exercise of the Warrants held by ETE III; and (ix) 6,966 shares of Common Stock held by ETE III, certain of which are not included in the shares reported because they are subject to limitations on conversion if such conversion would result in the selling stockholder beneficially owning more than 4.99% of our outstanding Common Stock. Empery Asset Management, LP, the authorized agent of EAM, ETE and ETE III, has discretionary authority to vote and dispose of the shares held by each of EAM, ETE and ETE III and may be deemed to be the beneficial owner of these shares. Martin Hoe and Ryan Lane, in their capacity as investment managers of Empery Asset Management LP, may also be deemed to have investment discretion and voting power over the shares held by each of EAM, ETE and ETE III. EAM, ETE, ETE III, Mr. Hoe and Mr. Lane each disclaim any beneficial ownership of these shares. The address of EAM, ETE and ETE III is c/o Empery Asset Management, LP, One Rockefeller Plaza, Suite 1205, New York, NY 11530.
- (10) The shares reported under "Shares of Common Stock Beneficially Owned Before this Offering" consist of (i) 96,153 shares of Common Stock purchased in the Private Placement by Allostery Investment LP; (ii) 192,306 shares of Common Stock issuable upon exercise of the Warrants held by Allostery Investment LP; (iii) 35,460 shares of Common Stock held by Allostery Investment LP. David Modest and Christopher Staral are Principals of Allostery Investments LP and may be deemed to have shared voting and investment power of the securities held by Allostery Investments LP. Mr. Modest and Mr. Staral each disclaim any beneficial ownership of these securities. The selling stockholder's address is c/o Maples Corporate Services Limited, P.O. Box 309 Ugland House, Grand Cayman KY1-1104 Cayman Islands.
- (11) The shares reported under "Shares of Common Stock Beneficially Owned Before this Offering" consist of (i) 34,615 shares of Common Stock purchased in the Private Placement by Stephen Howard, (ii) 69,230 shares of Common Stock issuable upon exercise of the Warrants held by Stephen Howard, and (iii) 77,502 shares of Common Stock held by Stephen Howard. The selling stockholder's address is c/o Molecular Templates, Inc., 9301 Amberglen Blvd, Suite 100, Austin, TX 78729.
- (12) The shares reported under "Shares of Common Stock Beneficially Owned Before this Offering" consist of (i) 11,846 shares of Common Stock purchased in the Private Placement by SilverArc Capital Alpha Fund I, L.P. ("SilverArc I"); (ii) 23,692 shares of Common Stock issuable upon exercise of the Warrants held by SilverArc I; (iii) 14,110 shares of Common Stock held by SilverArc I; (iv) 257,384 shares of Common Stock purchased in the Private Placement by SilverArc Capital Alpha Fund II, L.P. ("SilverArc II"); (v) 514,768 shares of Common Stock issuable upon exercise of the Warrants held by SilverArc II; and (vi) 250,896 shares of Common Stock held by SilverArc II, certain of which are not included in the shares reported because they are subject to limitations on conversion if such conversion would result in the selling stockholder beneficially owning more than 9.99% of our outstanding Common Stock. SilverArc Capital Management, LLC is the controlling entity of SilverArc I and SilverArc II and is solely owned by Devesh Gandhi. Mr. Gandhi may be deemed to have shared voting and investment power of the securities managed by SilverArc Capital Management, LLC. Mr. Gandhi disclaims beneficial ownership of such securities, except to the extent of his pecuniary interest therein. The selling stockholder's address is 20 Park Plaza, 4th Floor, Boston, MA 02116.

Relationship with Selling Stockholders

As discussed in greater detail above under the section titled "Prospectus Summary-2024 Private Placement," in March 2024, we entered into the Securities Purchase Agreement with the selling stockholders, pursuant to which

we sold and issued shares of our Common Stock, Prefunded Warrants and Warrants to purchase our Common Stock. Pursuant to the Securities Purchase Agreement, we also agreed to file a registration statement with the SEC to cover the resale by the selling stockholders of the shares of our Common Stock, including the shares of Common Stock issuable upon exercise of the Prefunded Warrants and Warrants, issued pursuant to the Securities Purchase Agreement.

Except as set forth above, none of the selling stockholders has had a material relationship with us or any of our predecessors or affiliates within the past three years, other than as a result of the ownership of our shares of Common Stock or other securities, and none of the selling stockholders has held any position or office with us or our affiliates within the last three years.

PLAN OF DISTRIBUTION

The selling stockholders, which as used herein includes donees, pledgees, transferees or othersuccessors-in-interest selling shares of Common Stock or interests in shares of Common Stock received after the date of this prospectus from a selling stockholder as a gift, pledge, partnership distribution or other transfer, may, from time to time, sell, transfer or otherwise dispose of any or all of their shares of Common Stock or interests in shares of Common Stock on any stock exchange, market or trading facility on which the shares are traded or in private transactions. These dispositions may be at fixed prices, at prevailing market prices at the time of sale, at prices related to the prevailing market price, at varying prices determined at the time of sale, or at negotiated prices.

The selling stockholders may use any one or more of the following methods when disposing of shares or interests therein:

- ordinary brokerage transactions and transactions in which the broker-dealer solicits purchasers;
- block trades in which the broker-dealer will attempt to sell the shares 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;
- · short sales effected after the date the registration statement of which this prospectus is a part is declared effective by the SEC;
- · through the writing or settlement of options or other hedging transactions, whether through an options exchange or otherwise;
- broker-dealers may agree with the selling stockholders to sell a specified number of such shares at a stipulated price per share;
- · a combination of any such methods of sale; and
- · any other method permitted by applicable law.

The selling stockholders may, from time to time, pledge or grant a security interest in some or all of the shares of Common Stock, Prefunded Warrants or Warrants owned by them and, if they default in the performance of their secured obligations, the pledgees or secured parties may offer and sell such shares of Common Stock, Prefunded Warrants or Warrants, from time to time, under this prospectus, or under an amendment to this prospectus under Rule 424(b)(3) or other applicable provision of the Securities Act amending the list of selling stockholders to include the pledgee, transferee or other successors in interest as selling stockholders under this prospectus. The selling stockholders also may transfer the shares of Common Stock, Prefunded Warrants or Warrants in other circumstances, in which case the transferees, pledgees or other successors in interest will be the selling beneficial owners for purposes of this prospectus.

In connection with the sale of our Common Stock 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 Common Stock in the course of hedging the positions they assume. The selling stockholders may also sell shares of our Common Stock short and deliver these securities to close out their short positions, or loan or pledge the Common Stock 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 the creation of one or more derivative securities which require the delivery to such broker-dealer or other financial institution of shares offered by this prospectus, which shares such broker-dealer or other financial institution may resell pursuant to this prospectus (as supplemented or amended to reflect such transaction).

The aggregate proceeds to the selling stockholders from the sale of the Common Stock offered by them will be the purchase price of the Common Stock less discounts or commissions, if any. Each of the selling stockholders reserves the right to accept and, together with their agents from time to time, to reject, in whole or in part, any proposed purchase of Common Stock to be made directly or through agents. We will not receive any of the proceeds from this offering. Upon any exercise of the Prefunded Warrants or Warrants by payment of cash, however, we will receive the exercise price of the Prefunded Warrants or Warrants.

The selling stockholders also may resell all or a portion of the shares in open market transactions in reliance upon Rule 144 under the Securities Act of 1933, provided that they meet the criteria and conform to the requirements of that rule.

The selling stockholders and any underwriters, broker-dealers or agents that participate in the sale of the Common Stock or interests therein may be "underwriters" within the meaning of Section 2(11) of the Securities Act. Any discounts, commissions, concessions or profit they earn on any resale of the shares may be underwriting discounts and commissions under the Securities Act. Selling stockholders who are "underwriters" within the meaning of Section 2(11) of the Securities Act will be subject to the prospectus delivery requirements of the Securities Act.

To the extent required, the shares of our Common Stock to be sold, the names of the selling stockholders, the respective purchase prices and public offering prices, the names of any agents, dealer or underwriter, any applicable commissions or discounts with respect to a particular offer will be set forth in an accompanying prospectus supplement or, if appropriate, a post-effective amendment to the registration statement that includes this prospectus.

In order to comply with the securities laws of some states, if applicable, the Common Stock may be sold in these jurisdictions only through registered or licensed brokers or dealers. In addition, in some states the Common Stock may not be sold unless it has been registered or qualified for sale or an exemption from registration or qualification requirements is available and is complied with.

We have advised the selling stockholders that the anti-manipulation rules of Regulation M under the Exchange Act may apply to sales of shares in the market and to the activities of the selling stockholders and their affiliates. In addition, to the extent applicable we will make copies of this prospectus (as it may be supplemented or amended from time to time) available to the selling stockholders for the purpose of satisfying the prospectus delivery requirements of the Securities Act. The selling stockholders may indemnify any broker-dealer that participates in transactions involving the sale of the shares against certain liabilities, including liabilities arising under the Securities Act.

We will pay certain expenses of the registration of the shares of Common Stock pursuant to the Securities Purchase Agreement, including, without limitation, SEC filing fees and expenses of compliance with state securities or "blue sky" laws; provided, however, that each selling stockholder will pay all underwriting discounts and selling commissions, if any and any related legal expenses incurred by it. We will indemnify the selling stockholders against certain liabilities, including some liabilities under the Securities Act, in accordance with the securities purchase agreement, or the selling stockholders will be entitled to contribution. We may be indemnified by the selling stockholders against civil liabilities, including liabilities under the Securities Act, that may arise from any written information furnished to us by the selling stockholders specifically for use in this prospectus, in accordance with the related Securities Purchase Agreement, or we may be entitled to contribution. We have agreed with the selling stockholders to keep the registration statement of which this prospectus constitutes a part effective until the earlier of (1) such time as all of the shares covered by this prospectus have been disposed of pursuant to and in accordance with the registration statement or (2) the date on which all of the shares may be sold without restriction pursuant to Rule 144 of the Securities Act.

LEGAL MATTERS

The validity of the Common Stock being offered by this prospectus is being passed upon by Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., Boston, Massachusetts.

EXPERTS

The consolidated financial statements of Molecular Templates, Inc. appearing in its Annual Report (Forml 0-K) for the year ended December 31, 2023 have been audited by Ernst & Young LLP, independent registered public accounting firm, as set forth in their report thereon (which contains an explanatory paragraph describing conditions that raise substantial doubt about the Company's ability to continue as a going concern as described in Note 1 to the consolidated financial statements), included therein, and incorporated herein by reference. Such consolidated financial statements are incorporated herein by reference in reliance upon such report given on the authority of such firm as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We are subject to the reporting requirements of the Exchange Act, and file annual, quarterly and current reports, proxy statements and other information with the SEC. The SEC maintains an internet website at www.sec.gov that contains periodic and current reports, proxy and information statements, and other information regarding registrants that are filed electronically with the SEC. You can request copies of these documents by writing to the SEC and paying a fee for the copying cost.

This prospectus is only part of a registration statement on FormS-3 that we have filed with the SEC under the Securities Act, and therefore omits certain information contained in the registration statement. We have also filed exhibits and schedules with the registration statement that are excluded from this prospectus, and you should refer to the applicable exhibit or schedule for a complete description of any statement referring to any contract or other document. You may obtain a copy of the registration statement, including the exhibits and schedules, from the SEC's website.

We also maintain a website at http://www.mtem.com, through which you can access our SEC filings free of charge. The information set forth on our website is not part of this prospectus.

INCORPORATION OF CERTAIN DOCUMENTS BY REFERENCE

The SEC allows us to "incorporate by reference" information into this prospectus, which means that we can disclose important information to you by referring you to another document filed separately with the SEC. The information incorporated by reference is deemed to be part of this prospectus, and subsequent information that we file later with the SEC will automatically update and supersede this information. We filed a registration statement on Form S-3 under the Securities Act with the SEC with respect to the securities we may offer pursuant to this prospectus. This prospectus omits certain information contained in the registration statement, as permitted by the SEC. 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. Copies of all or any part of the registration statement, including the documents incorporated by reference or the exhibits, may be obtained from the SEC's website at http://www.sec.gov. The documents we are incorporating by reference are:

- our Annual Report on Form 10-K for the year ended December 31, 2023 that we filed with the SEC on March 29, 2024 and as amended on Form 10-K/A that we filed with the SEC on April 25, 2024;
- Our Current Reports on Form 8-K that we filed with the SEC on January 17, 2024, March 15, 2024, March 28, 2024, and April 12, 2024; and
- the description of our Common Stock contained in our Registration Statement on Form 8-A initially filed on January 28, 2005, including any amendment or report filed for the purpose of updating such description.

In addition, all reports and other documents filed by us pursuant to the Exchange Act after the date of the initial registration statement and prior to effectiveness of the registration statement shall be deemed to be incorporated by reference into this prospectus and deemed to be a part of this prospectus from the date of filing of such reports and documents. Notwithstanding the foregoing, we are not incorporating by reference any documents or portions thereof that are not deemed "filed" with the SEC, including our Compensation Committee report and performance graph or any information furnished pursuant to Items 2.02 or 7.01 of Form 8-K or related exhibits furnished pursuant to Item 9.01 of Form8-K.

Any statement contained in this prospectus or in a document incorporated or deemed to be incorporated by reference into this prospectus will be deemed to be modified or superseded for purposes of this prospectus to the extent that a statement contained in this prospectus or any other subsequently filed document that is deemed to be incorporated by reference into this prospectus modifies or supersedes the statement. Any statement so modified or superseded will not be deemed, except as so modified or superseded, to constitute a part of this prospectus.

You may request, orally or in writing, a copy of any or all of the documents incorporated herein by reference. These documents will be provided to you at no cost, by contacting:

Molecular Templates, Inc. 9301 Amberglen Blvd Suite 100 Austin, TX 78729 Telephone: (512) 869-1555

You may also access these documents on our website, http://www.mtem.com. The information contained on, or that can be accessed through, our website is not a part of this prospectus. We have included our website address in this prospectus solely as an inactive textual reference.

You should rely only on information contained in, or incorporated by reference into, this prospectus. We and the selling stockholders have not authorized anyone to provide you with information different from that contained in this prospectus or incorporated by reference in this prospectus. We and the selling stockholders are not making

offers to sell the securities in any jurisdiction in which such an offer or solicitation is not authorized or in which the person making such offer or solicitation is not qualified to do so or to anyone to whom it is unlawful to make such offer or solicitation.

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Common Stock

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