
**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**
Washington, D.C. 20549

**FORM S-3
REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933**

MOLECULAR TEMPLATES, INC.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation)

94-3409596
(IRS Employer
Identification No.)

**9301 Amberglen Blvd
Suite 100
Austin, TX 78729
(512) 869-1555**

(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Eric E. Poma, Ph.D.
Chief Executive Officer and Chief Scientific Officer
Molecular Templates, Inc.
9301 Amberglen Blvd, Suite 100
Austin, Texas 78729
(512) 869-1555

(Name, address, including zip code, and telephone number, including, area code, of agent for service)

With copies to:

**William C. Hicks, Esq.
Matthew J. Gardella, Esq.
Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.
One Financial Center
Boston, Massachusetts 02111
(617) 542-6000**

Approximate date of commencement of proposed sale to the public:

From time to time after the effective date of this registration statement.

If the only securities being registered on this Form are being offered pursuant to dividend or interest reinvestment plans, please check the following box:

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, other than securities offered only in connection with dividend or interest reinvestment plans, 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, please 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 registration statement pursuant to General Instruction I.D. or a post-effective amendment thereto that shall become effective upon filing with the Commission pursuant to Rule 462(e) under the Securities Act, check the following box.

If this Form is a post-effective amendment to a registration statement filed pursuant to General Instruction I.D. filed to register additional securities or additional classes of securities pursuant to Rule 413(b) under the Securities Act, check the following box.

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

Large accelerated filer
Non-accelerated filer

Accelerated filer
Smaller reporting company
Emerging growth company

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

CALCULATION OF REGISTRATION FEE

Title of each Class of Securities to be Registered	Amount to be Registered(1)	Proposed Maximum Offering Price Per Share	Proposed Maximum Aggregate Offering Price	Amount of Registration Fee
Common Stock, \$0.001 par value per share	9,440,392	\$15.57(2)	\$146,986,903.40	\$19,078.90

- (1) Pursuant to Rule 416 under the Securities Act of 1933, as amended (the "Securities Act"), this registration statement also covers any additional number of shares of common stock issuable upon stock splits, stock dividends or other similar distributions, recapitalizations or similar events with respect to shares of the common stock being registered pursuant to this registration statement.
- (2) In accordance with Rule 457(c) under the Securities Act, the aggregate offering price of the common stock is estimated solely for the calculation of the registration fees due for this filing. This estimate was based on the average of the high and low sales price of our stock reported by The Nasdaq Capital Market on June 2, 2020.

THE REGISTRANT HEREBY AMENDS THIS REGISTRATION STATEMENT ON SUCH DATE OR DATES AS MAY BE NECESSARY TO DELAY ITS EFFECTIVE DATE UNTIL THE REGISTRANT SHALL FILE A FURTHER AMENDMENT WHICH SPECIFICALLY STATES THAT THIS REGISTRATION STATEMENT SHALL THEREAFTER BECOME EFFECTIVE IN ACCORDANCE WITH SECTION 8(a) OF THE SECURITIES ACT 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 without notice. The selling stockholders 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 it is not soliciting an offer to buy these securities in any state where the offer or sale is not permitted.

SUBJECT TO COMPLETION, DATED JUNE 4, 2020

PROSPECTUS



**9,440,392 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 9,440,392 shares (“Shares”) of common stock, par value \$0.001 per share, of the Company (the “Common Stock”). The selling stockholders will receive all of the proceeds from any sales of the Shares offered hereby. We will not receive any of the proceeds.

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 securities offered by this prospectus and we do not know when or in what amount the selling stockholders may sell their shares of Common Stock 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 12 in this prospectus.

Our Common Stock is listed on The Nasdaq Capital Market under the symbol “MTEM”. On June 3, 2020, the last reported sale price for our Common Stock was \$16.05 per share.

Investing in our Common Stock involves a high degree of risk. Please consider carefully the risks described in this prospectus under “[Risk Factors](#)” beginning on page 6 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 _____, 2020

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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 resale registration statement. For a more complete understanding of the offering of the Shares, you should refer to the resale 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 resale 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 6 of this prospectus and described in described in Part II, Item 1A (Risk Factors) of our most recent Quarterly Report on Form 10-Q for the quarter ended March 31, 2020 filed with the SEC on May 11, 2020, 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.”

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.

We are a clinical-stage company focused on the discovery and development of targeted biologic therapeutics. Our proprietary drug platform technology, known as engineered toxin bodies, or ETBs, leverages the resident biology of a genetically engineered form of Shiga-like Toxin A subunit, or SLTA, to create novel therapies with potent and differentiated mechanisms of action for cancer and other serious diseases.

ETBs use a genetically engineered version of SLTA. In its wild-type form, Shiga-like Toxin, or SLT, is thought to induce its own entry into a cell when proximal to the cell surface membrane, self-route to the cytosol, and enzymatically and irreversibly shut down protein synthesis via ribosome inactivation. SLTA is normally coupled to its cognate Shiga-like Toxin B subunit, or SLTB, to target the CD77 cell surface marker, a non-internalizing glycosphingolipid. In our scaffold, a genetically engineered SLTA with no cognate SLTB component is genetically fused to antibody domains or fragments specific to a target, resulting in a biologic therapeutics that can identify the particular target and specifically kill the cell. The antibody domains may be substituted with other antibody domains having different specificities to allow for the rapid development of new drugs to selected targets in cancer and other serious diseases.

ETBs combine the specificity of an antibody with SLTA's potent mechanism of cell destruction. Based on the disease setting, we have created ETBs that have reduced immunogenicity and are capable of delivering additional payloads into a target cell. Immunogenicity is the ability of a foreign substance to provoke an immune response in a host. ETBs have relatively predictable pharmacokinetic, or PK, and absorption, distribution, metabolism and excretion, or ADME, profiles and can be rapidly screened for desired activity in robust cell-based and animal-model assays. Because SLTA can induce internalization against non- and poorly-internalizing receptors, the universe of targets for ETBs should be substantially larger than that seen with antibody drug conjugates, or ADCs, which are not likely to be effective if the target does not readily internalize the ADC payload.

ETBs have a differentiated mechanism of cell kill in cancer therapeutics (the inhibition of protein synthesis via ribosome destruction), and we have preclinical and clinical data demonstrating the utility of these molecules in chemotherapy-refractory cancers. ETBs have shown good safety data in multiple animal models as well as in our clinical studies to date. We believe the target specificity of ETBs, their ability to self-internalize, their potent and differentiated mechanism of cell kill and their safety profile provide opportunities for the clinical development of these agents to address multiple cancer types.

Our initial approach to drug development in oncology involves the selection of lead compounds to validated targets in cancer. We have developed ETBs for various targets, including CD20, CD38, HER2, and PD-L1. CD20 is central to B cell malignancies and is clinically validated as a target for the treatment of lymphomas and autoimmune disease. CD38 has been validated as a meaningful clinical target in the treatment of multiple myeloma. PD-L1 is central to immune checkpoint pathways and is a target expressed in a variety of solid tumor cancers.

Our lead compound, MT-3724, is an ETB that recognizes CD20, a B cell marker and is currently in multiple Phase II studies. The dose escalation portion of the Phase I monotherapy clinical trial has been completed for MT-3724 and was followed by the initiation of a Phase Ib expansion cohort, which was initiated in the fourth quarter of 2017. Results of the Phase I/Ib study were presented at the American Society of Hematology (ASH) Annual Meeting, December 7-10, 2019 in Orlando, FL. Of the 13 serum rituximab negative (RTX-neg) diffuse large B cell lymphoma, or DLBCL or mixed DLBCL/FL subjects, 5 responded (38% objective response rate) across the range of 5 to 100 µg/kg doses. Of the 5 responses, 2 were complete responses (CRs) and 3 were partial responses (PRs). Three patients had stable disease (including 2 patients with 49% and 47% tumor reductions) and 5 patients had progressive disease. Of the 5 serum RTX-neg subjects with DLBCL who received MT-3724 at 50 µg/kg, the maximum tolerated dose (MTD), 3 responded (2 CRs, 1 PR).

In the first quarter of 2019, we initiated a Phase II cohort for the monotherapy trial with MT-3724, which has the potential to be a pivotal study. We have also initiated a Phase II combination study with MT-3724 and chemotherapy (gemcitabine and oxaliplatin) in an earlier line of treatment for DLBCL and a second Phase II combination study with MT-3724 and Revlimid® (lenalidomide), also in an earlier line of DLBCL treatment. The combination study with lenalidomide has demonstrated preliminary evidence of tolerability and efficacy with lenalidomide at standard doses and MT-3724 at 10 µg/kg. MT-3724 dosing at higher doses with lenalidomide is ongoing. The combination study with GemOx has demonstrated preliminary evidence of efficacy but grade 2 innate immune adverse effects were seen with standard doses of gemcitabine and oxaliplatin and 10 µg/kg doses of MT-3724. The study protocol has been amended to include a revised schedule where MT-3724 dosing is initially sequenced with GemOx dosing. We expect to provide updates on all three Phase II studies of MT-3724 in the second half of 2020.

We filed an IND for MT-5111, our ETB targeting HER2, in March 2019 and the IND was accepted in April 2019. We began dosing patients in a Phase I study of MT-5111 in the fourth quarter of 2019. We anticipate providing updates on this study throughout 2020. Millennium Pharmaceuticals, Inc., a wholly owned subsidiary of Takeda Pharmaceutical Company Ltd. (“Takeda”) filed an IND for TAK-169, our jointly discovered ETB targeting CD38, in May 2019 and the IND was accepted in June 2019. Phase I dosing for TAK-169 began in the first quarter of 2020. We anticipate filing an IND for our ETB targeting PD-L1 in the second half of 2020.

We have built up multiple core competencies around the creation and development of ETBs. We developed the ETB technology in-house and continue to make iterative improvements in the scaffold and identify new uses of the technology. We also developed the proprietary process for manufacturing ETBs under Current Good Manufacturing Process, or cGMP, standards and continue to make improvements to its manufacturing processes.

We have conducted multiple cGMP manufacturing runs with our lead compound and believe this process is robust and could support commercial production with gross margins that are similar to those seen with antibodies.

Impact of COVID-19

In March 2020, the outbreak of COVID-19 caused by a novel strain of the coronavirus was recognized as a pandemic by the World Health Organization. The Company is carefully and continually evaluating the potential individual patient risk associated with continuing to enroll in our existing studies during the ongoing COVID-19 pandemic. We have decided, in collaboration with treating investigators, to allow MTEM’s studies to remain open and able to treat enrolled patients and screen new patients. This decision is predicated on the treating investigator determining that the potential benefit to the patient of investigational therapy outweighs the potential risk of contracting COVID-19. Patients enrolled in MTEM trials have relapsed or refractory incurable malignancies with few or no standard-of-care therapeutic options and limited life expectancy. COVID-19 has led to a significant slowdown in the pace of site initiations and patient enrollment in our clinical studies. The degree

of disruption is variable by geography and individual clinical site, with some sites closed to new enrollment, some screening and enrolling only patients with an urgent need for treatment, and a small minority attempting to operate as usual. The COVID-19 pandemic has resulted in a significant slowdown in the pace of site initiations and patient enrollment across our MT-3724 phase II programs. As a CD20-targeting agent for the treatment of hematological malignancy, MT-3724 may impair the ability to generate humoral immunity to coronavirus infection. MT-5111 screening and enrollment has been less impacted than MT-3724 but is still enrolling at slower pace than was projected pre-COVID-19. To date, we have been able to continue to work at our cGMP manufacturing facility and laboratories without interruption from COVID-19. As a result, manufacturing of product supply for clinical trials and research activities to support advancement of our preclinical pipeline (including partnered programs) have not been impacted by COVID-19.

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 (the “Merger Agreement”), dated as of March 16, 2017, by and among us (formerly known as Threshold Pharmaceuticals, Inc. (Nasdaq: THLD) (“Threshold”), 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 9,440,392 shares of our Common Stock. We are not offering any shares for sale under the resale registration statement of which this prospectus is a part.

Number of shares of Common Stock outstanding prior to the offering 45,730,347 shares of Common Stock

Common Stock offered by the selling stockholders Up to 9,440,392 shares of Common Stock

Use of proceeds: We will not receive any proceeds from the sale of Common Stock offered by the selling stockholders under this prospectus.

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 6 of this prospectus.

Nasdaq Capital Market symbol: MTEM

The number of shares of Common Stock outstanding are based on 45,730,347 shares of Common Stock outstanding as of May 29, 2020, and excludes:

- 6,366,526 shares issuable upon the exercise of options outstanding as of May 29, 2020 issued pursuant to our 2018 Equity Incentive Plan, at a weighted average exercise price of \$8.75 per share;
- 8,636 shares reserved for issuance under our Amended and Restated 2004 Employee Stock Purchase Plan as of May 29, 2020;
- 793,308 shares reserved for issuance under our 2018 Equity Incentive Plan as of May 29, 2020;
- 3,144,458 shares issuable upon the exercise of warrants outstanding as of May 29, 2020; and
- 250 shares of Series A Preferred Stock, which are convertible into 250,000 shares of Common Stock.

Except as otherwise indicated, we have presented the information in this prospectus assuming no conversion of Series A Preferred Stock or exercise of the outstanding options or warrants described above.

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 under Item 1A, “Risk Factors,” in our Annual Report, as updated by our subsequent filings with the SEC under the 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 pursue development pathways and regulatory strategies for MT-3724 and other engineered toxin body (ETB) biologic candidates;
- the timing and our ability to advance the development of our drug or biologic candidates;
- our plans to pursue discussions with regulatory authorities, and the anticipated timing, scope and outcome of related regulatory actions or guidance;
- the anticipated progress of our drug or 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 drug or biologic candidates;
- our ability to establish and maintain intellectual property rights for our drug or biologic candidates;
- whether any drug or 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 drug or biologic candidates suitable for clinical testing;
- our ability to identify, in-license or otherwise acquire additional drug or 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 obtain licenses to any necessary third-party intellectual property;
- our anticipated use of proceeds from any financing activities;
- the extent to which COVID-19 may impact our business operations or financial condition; 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

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additional funding we will need to continue to pursue our business and product development plans; the inherent uncertainties associated with developing new products 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 product 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; the timing and nature of data from the impact of COVID-19; and market conditions. You should refer to the section titled “Risk Factors” of this prospectus and in our other filings with the SEC, including our Annual Report, 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 resale 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 will not receive any proceeds from the sale of the Shares offered pursuant to this prospectus. The selling stockholders will receive all of the proceeds from the sale of the Shares offered by this prospectus.

SELLING STOCKHOLDERS

This prospectus covers the resale from time to time of up to an aggregate of 9,440,392 Shares of our Common Stock by the selling stockholders, each of whom, as of the date of this prospectus, is an “affiliate” of the Company for purposes of Rule 144 promulgated under the Securities Act. The Shares registered for resale herein are pursuant the registration rights agreement between us and the selling stockholders dated June 4, 2020 and relate to shares held by affiliates not otherwise previously registered for resale (the “2020 Registration Rights Agreement”).

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 the dates represented in the footnotes accompanying the table. 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 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 May 29, 2020 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 shares indicated as beneficially owned.

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 changed information will be set forth in an amendment to the resale registration statement or supplement to this prospectus, to the extent required by law.

Selling Stockholder⁽¹⁾	Shares of Common Stock Beneficially Owned Before this Offering		Number of Shares of Common Stock Being Offered	Shares of Common Stock To Be Beneficially Owned Upon Completion of this Offering	
	Number	Percentage⁽²⁾		Number⁽³⁾	Percentage⁽²⁾⁽³⁾
Santé Health Ventures Annex Fund, L.P. ⁽⁴⁾	869,492	1.9%	855,010	14,482	0.0%
Santé Health Ventures I, L.P. ⁽⁵⁾	6,616,608	14.5%	6,558,678	57,930	0.1%
SHV Management Services, LP ⁽⁶⁾	50,000	0.0%	50,000	—	0.0%
Longitude Venture Partners III, L.P. ⁽⁷⁾	4,647,302	9.9%	937,500	3,709,802	7.9%
CDK Associates L.L.C. ⁽⁸⁾	2,284,991	5.0%	1,039,204	1,245,787	2.7%

(1) All information regarding selling stockholders was provided by the selling stockholders as of May 29, 2020.

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- (2) Percentage ownership is based on a denominator equal to the sum of (i) 45,730,347 shares of our Common Stock outstanding as of May 29, 2020 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) Assumes that all shares of Common Stock being registered under the resale 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.
- (4) Consists of (i) 864,665 shares of Common Stock held by Santé Health Ventures I Annex Fund, L.P. and (ii) 4,827 shares of Common Stock issuable upon exercise of warrants held by Santé Health Ventures I Annex Fund, L.P. within 60 days of May 29, 2020. The securities held by Santé Health Ventures I Annex Fund, L.P. may be deemed to be beneficially owned by Kevin Lalande, a member of our Board, Joe Cunningham, M.D. and Douglas D. French, who are managing directors (the “SHV Directors”) of SHV Management Services, LLC (“SHV Management”). SHV Management is the general partner of SHV Annex Services, LP, which is the general partner of Santé Health Ventures I Annex Fund, L.P. Each of the SHV Directors, SHV Management and SHV Annex Services, LP disclaims beneficial ownership of these securities except to the extent of its or his pecuniary interest therein. The selling stockholder’s address is 201 West 5th Street, Suite 1500, Austin, TX 78701.
- (5) Consists of (i) 6,597,298 shares of Common Stock held by Santé Health Ventures I, L.P. and (ii) 19,310 shares of Common Stock issuable upon exercise of warrants held by Santé Health Ventures I, L.P. within 60 days of May 29, 2020. The securities held by Santé Health Ventures I, L.P. may be deemed to be beneficially owned by the SHV Directors of SHV Management. SHV Management is the general partner of SHV Management Services, LP, which is the general partner of Santé Health Ventures I, L.P. Each of the SHV Directors, SHV Management, and SHV Management Services, LP disclaims beneficial ownership of these securities except to the extent of its or his pecuniary interest therein. The selling stockholder’s address is 201 West 5th Street, Suite 1500, Austin, TX 78701.
- (6) The securities held by SHV Management Services, LP may be deemed to be beneficially owned by the SHV Directors. SHV Management is the general partner of SHV Management Services, LP. Each of the SHV Directors and SHV Management disclaims beneficial ownership of these securities except to the extent of its or his pecuniary interest therein. The selling stockholder’s address is 201 West 5th Street, Suite 1500, Austin, TX 78701.
- (7) Consists of (i) 3,199,035 shares of Common Stock held by Longitude Venture Partners III, L.P. (“Longitude Venture III”) and (ii) 1,448,267 shares of Common Stock issuable upon exercise of warrants held by Longitude Venture III within 60 days of May 29, 2020. Such securities are held by Longitude Venture III and may be deemed to be beneficially owned by Longitude Capital Partners III, LLC (“Longitude Capital III”), David Hirsch, M.D., Ph.D., a member of the Company’s Board (“Dr. Hirsch”), Patrick G. Enright (“Mr. Enright”), and Juliet Tammenoms Bakker (“Ms. Bakker”). Longitude Capital III is the general partner of Longitude Venture III and may be deemed to share voting and investment power over our securities held by Longitude Venture III. Dr. Hirsch, Mr. Enright and Ms. Bakker are members of Longitude Capital III and Mr. Enright and Ms. Bakker are the managing members of Longitude Capital III, and all of them may be deemed to share voting and investment power over our securities held by Longitude Venture III. Each of Longitude Capital III, Dr. Hirsch, Mr. Enright and Ms. Bakker disclaims beneficial ownership of these securities except to the extent of its, his or her pecuniary interest therein. The selling stockholder’s address is 2740 Sand Hill Road, 2nd Floor, Menlo Park, CA 94025.
- (8) Consists of (i) 2,052,991 shares of Common Stock held by the selling stockholder and (ii) 232,000 shares of Common Stock issuable upon exercise of warrants held by the selling stockholder that are exercisable within 60 days of May 29, 2020. These shares are held by CDK Associates, L.L.C. and may be deemed to be beneficially owned by (x) Scott Morenstein, a member of our board of directors and a Managing Director of Caxton Alternative Management LP, the investment manager of CDK Associates, L.L.C., (y) Caxton Corporation, the manager of CDK Associates, LLC and (z) Bruce Kovner, the chairman and sole shareholder of Caxton Corporation. Each of Scott Morenstein, Caxton Corporation and Bruce Kovner disclaims beneficial ownership of these shares except to the extent of its or his pecuniary interest, if any, therein. The foregoing excludes warrants to purchase 274,893 additional shares of common stock held by the selling stockholder, due to a beneficial ownership limitation. The selling stockholder’s address is 731 Alexander Road, Building 2, Suite 500, Princeton, New Jersey 08540.

PLAN OF DISTRIBUTION

We are registering the Shares to permit the resale of these Shares held by the selling stockholders from time to time after the date of this prospectus. We will not receive any of the proceeds from the sale by the selling stockholders of the Shares. We will bear all fees and expenses incident to our obligation to register the Shares pursuant to the 2020 Registration Rights 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.

The selling stockholders may sell all or a portion of the Shares beneficially owned by them and offered hereby from time to time directly or through one or more underwriters, broker-dealers or agents. If the Shares are sold through underwriters or broker-dealers, the selling stockholders will be responsible for underwriting discounts or commissions or agent’s commissions. The Shares may be sold on any national securities exchange or quotation service on which the securities may be listed or quoted at the time of sale, in the over-the-counter market or in transactions otherwise than on these exchanges or systems or in the over-the-counter market and in one or more transactions at fixed prices, at prevailing market prices at the time of the sale, at varying prices determined at the time of sale, or at negotiated prices. These sales may be effected in transactions, which may involve crosses or block transactions. The selling stockholders may use any one or more of the following methods when selling shares:

- 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;
- settlement of short sales entered into after the effective date of the resale registration statement of which this prospectus is a part;
- broker-dealers may agree with the selling stockholders to sell a specified number of such shares at a stipulated price per share;
- through the writing or settlement of options or other hedging transactions, whether such options are listed on an options exchange or otherwise;
- a combination of any such methods of sale; and
- any other method permitted pursuant to applicable law.

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, as permitted by that rule, or Section 4(a)(1) under the Securities Act, if available, rather than under this prospectus, provided that they meet the criteria and conform to the requirements of those provisions. Broker-dealers engaged by the selling stockholders may arrange for other broker-dealers to participate in sales. If the selling stockholders effect such transactions by selling Shares to or through underwriters, broker-dealers or agents, such underwriters, broker-dealers or agents may receive commissions in the form of discounts, concessions or commissions from the selling stockholders or commissions from purchasers of the Shares for whom they may act as agent or to whom they may sell as principal. Such commissions will be in amounts to be negotiated, but, except as set forth in a supplement to this prospectus, in the case of an agency transaction will not be 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 2121.01.

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In connection with sales of the Shares or otherwise, 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 Shares in the course of hedging in positions they assume. The selling stockholders may also sell Shares short and if such short sale shall take place after the date that this the resale registration statement of which this prospectus forms a part is declared effective by the SEC, the selling stockholders may deliver Shares covered by this prospectus to close out short positions and to return borrowed shares in connection with such short sales. The selling stockholders may also loan or pledge Shares to broker-dealers that in turn may sell such shares, to the extent permitted by applicable law. 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). Notwithstanding the foregoing, the selling stockholders have been advised that they may not use shares registered on the resale registration statement of which this prospectus forms a part to cover short sales of our Common Stock made prior to the date the resale registration statement, of which this prospectus forms a part, has been declared effective by the SEC.

The selling stockholders may, from time to time, pledge or grant a security interest in some or all of the Shares owned by them and, if they default in the performance of their secured obligations, the pledgees or secured parties may offer and sell the Shares from time to time pursuant to this prospectus or any amendment to this prospectus under Rule 424(b)(3) or other applicable provision of the Securities Act, amending, if necessary, 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 and donate the Shares in other circumstances in which case the transferees, donees, pledgees or other successors in interest will be the selling beneficial owners for purposes of this prospectus.

The selling stockholders and any broker-dealer or agents participating in the distribution of the Shares may be deemed to be “underwriters” within the meaning of Section 2(11) of the Securities Act in connection with such sales. In such event, any commissions paid, or any discounts or concessions allowed to, any such broker-dealer or agent and any profit on the resale of the shares purchased by them may be deemed to be underwriting commissions or discounts 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 applicable prospectus delivery requirements of the Securities Act including Rule 172 thereunder and may be subject to certain statutory liabilities of, including but not limited to, Sections 11, 12 and 17 of the Securities Act and Rule 10b-5 under the Exchange Act.

Each selling stockholder has informed the Company that it is not a registered broker-dealer and does not have any written or oral agreement or understanding, directly or indirectly, with any person to distribute the Common Stock. Upon the Company being notified in writing by a selling stockholder that any material arrangement has been entered into with a broker-dealer for the sale of our Common Stock through a block trade, special offering, exchange distribution or secondary distribution or a purchase by a broker or dealer, a supplement to this prospectus will be filed, if required, pursuant to Rule 424(b) under the Securities Act, disclosing (i) the name of each such selling stockholder and of the participating broker-dealer(s), (ii) the number of shares involved, (iii) the price at which such the shares of Common Stock were sold, (iv) the commissions paid or discounts or concessions allowed to such broker-dealer(s), where applicable, (v) that such broker-dealer(s) did not conduct any investigation to verify the information set out or incorporated by reference in this prospectus, and (vi) other facts material to the transaction.

Under the securities laws of some states, the Shares may be sold in such states only through registered or licensed brokers or dealers. In addition, in some states the Shares may not be sold unless such shares have been registered or qualified for sale in such state or an exemption from registration or qualification is available and is complied with.

There can be no assurance that any selling stockholder will sell any or all of the Shares registered pursuant to the resale registration statement, of which this prospectus forms a part.

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Each selling stockholder and any other person participating in such distribution will be subject to applicable provisions of the Exchange Act and the rules and regulations thereunder, including, without limitation, to the extent applicable, Regulation M of the Exchange Act, which may limit the timing of purchases and sales of any of the Shares by the selling stockholder and any other participating person. To the extent applicable, Regulation M may also restrict the ability of any person engaged in the distribution of the shares of Common Stock to engage in market-making activities with respect to the Shares. All of the foregoing may affect the marketability of the shares of Common Stock and the ability of any person or entity to engage in market-making activities with respect to the shares of Common Stock.

Pursuant to the 2020 Registration Rights Agreement, we have agreed to indemnify the selling stockholders against certain liabilities, including some liabilities under the Securities Act. 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 2020 Registration Rights Agreement.

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 Molecular Templates, Inc.'s Annual Report (Form 10-K) for the year ended December 31, 2019, and the effectiveness of Molecular Templates, Inc.'s internal control over financial reporting as of December 31, 2019 have been audited by Ernst & Young LLP, independent registered public accounting firm, as set forth in their reports thereon, included therein, and incorporated herein by reference. Such consolidated financial statements are incorporated herein by reference in reliance upon such reports 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 Form S-3 that we have filed with the SEC under the Securities Act, and therefore omits certain information contained in the resale registration statement. We have also filed exhibits and schedules with the resale 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 resale 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 resale registration statement, as permitted by the SEC. You should refer to the resale 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 resale 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 resale 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, 2019 that we filed with the SEC on March 13, 2020;
- our Quarterly Report on [Form 10-Q](#) for the quarter ended March 31, 2020 as deemed filed with the SEC on May 11, 2020 pursuant to our [Form 12b-25](#) filed on May 12, 2020;
- our Current Reports on Form 8-K that we filed with the SEC on [May 22, 2020](#) and [May 28, 2020](#);
- 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; and
- all reports and other documents subsequently filed by us pursuant to Sections 13(a), 13(c), 14 and 15(d) of the Exchange Act (including between the date of the initial registration statement and the effectiveness of the registration statement and following the effectiveness of the registration statement) and prior to the termination or completion of the offering of securities under this prospectus shall be deemed to be incorporated by reference in this prospectus and to be a part hereof from the date of filing such reports and other documents.

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.

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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.

9,440,392 Shares



Common Stock

PROSPECTUS

, 2020

PART II**INFORMATION NOT REQUIRED IN PROSPECTUS****Item 14. Other Expenses of Issuance and Distribution.**

Set forth below is an estimate (except for registration fees, which are actual) of the approximate amount of the types of fees and expenses listed below that were paid or are payable by us in connection with the issuance and distribution of the shares of common stock to be registered by this registration statement. None of the expenses listed below are to be borne by any of the selling stockholders named in the prospectus that forms a part of this registration statement.

<u>Expense</u>	<u>Amount</u>
SEC Registration Fee	\$ 19,078.90
Accounting Fees and Expenses	25,000.00
Legal Fees and Expenses	50,000.00
Miscellaneous Fees and Expenses	10,000.00
Total	\$ 104,078.90

Item 15. Indemnification of Directors and Officers.***Delaware Law***

Section 102 of the General Corporation Law of the State of Delaware permits a corporation to eliminate the personal liability of directors of a corporation to the corporation or its stockholders for monetary damages for a breach of fiduciary duty as a director, except where the director breached his duty of loyalty, failed to act in good faith, engaged in intentional misconduct or knowingly violated a law, authorized the payment of a dividend or approved a stock repurchase in violation of Delaware corporate law or obtained an improper personal benefit.

Section 145 of the General Corporation Law of the State of Delaware provides that a corporation has the power to indemnify a director, officer, employee, or agent of the corporation, or a person serving at the request of the corporation for another corporation, partnership, joint venture, trust or other enterprise in related capacities against expenses, including attorneys' fees, judgments, fines and amounts paid in settlement actually and reasonably incurred by the person in connection with an action, suit or proceeding to which he was or is a party or is threatened to be made a party to any action, suit or proceeding by reason of such position, if such person acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the corporation, and, in any criminal action or proceeding, had no reasonable cause to believe his conduct was unlawful, except that, in the case of actions brought by or in the right of the corporation, no indemnification shall be made with respect to any claim, issue or matter as to which such person shall have been adjudged to be liable to the corporation unless and only to the extent that the Court of Chancery or other adjudicating court determines that, despite the adjudication of liability but in view of all of the circumstances of the case, such person is fairly and reasonably entitled to indemnity for such expenses which the Court of Chancery or such other court shall deem proper.

Amended and Restated Bylaws

Our amended and restated bylaws provide that we will indemnify each person who was or is a party or threatened to be made a party to any action, suit or proceeding, whether civil, criminal, administrative or investigative by reason of the fact that he or she is or was, or is or was serving at our request, as a director, officer, partner, employee or trustee of, or in a similar capacity with, another corporation, partnership, joint venture, trust or other enterprise (all such persons being referred to as an "Indemnitee"), or by reason of any action alleged to have been taken or omitted in such capacity, against all expense, liability and loss (including attorneys' fees, judgments, fines, ERISA excise taxes or penalties and amounts paid in settlement) reasonably incurred in connection with

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such action, suit or proceeding and any appeal therefrom, to the fullest extent allowed under the General Corporation Law of the State of Delaware. Our amended and restated bylaws also provide that we shall advance to any person who was or is a party or is threatened to be made a party to any action, suit or proceeding, whether civil, criminal, administrative or investigative, by reason of the fact that he or she is or was a director or executive officer of the Company, or is or was serving at our request as a director or executive officer of another corporation, partnership, joint venture, trust or other enterprise, prior to the final disposition of the proceeding, promptly following request therefor, all expenses incurred by any director or executive officer in connection with such proceeding. However, if the General Corporation Law of the State of Delaware requires, an advancement of expenses incurred by a director or executive officer in his or her capacity as a director or executive officer (and not in any other capacity in which service was or is rendered by such indemnitee, including service to an employee benefit plan) shall be made only upon delivery to us of an undertaking by or on behalf of such indemnitee, to repay all amounts so advanced if it shall ultimately be determined by final judicial decision from which there is no further right to appeal that such indemnitee is not entitled to be indemnified for such expenses under our amended and restated bylaws or otherwise.

Indemnification Agreements and Insurance Matters

In addition, we have entered into indemnification agreements with each of our current directors and executive officers and we intend to enter into new indemnification agreements with certain of our current directors and each of our executive officers. These agreements will require us to indemnify these individuals to the fullest extent permitted under Delaware law against liabilities that may arise by reason of their service to us and to advance expenses incurred as a result of any proceeding against them as to which they could be indemnified. We also intend to enter into indemnification agreements with our future directors and executive officers.

We also maintain standard policies of insurance under which coverage is provided to our directors and officers against losses arising from claims made by reason of breach of duty or other wrongful act, and to us with respect to payments which may be made by us to such directors and officers pursuant to the above indemnification provisions or otherwise as a matter of law.

The above discussion of our amended and restated certificate of incorporation, our amended and restated bylaws, our indemnification agreements with our current directors and executive officers and Sections 102 and 145 of the Delaware General Corporation Law is not intended to be exhaustive and is respectively qualified in its entirety by such amended and restated certificate of incorporation, such amended and restated bylaws, such indemnification agreements and such statutes.

To the extent that our directors, officers and controlling persons are indemnified under the provisions contained in our amended and restated certificate of incorporation, Delaware law or contractual arrangements against liabilities arising under the Securities Act, we have been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Securities Act and is therefore unenforceable.

Item 16. Exhibits and Financial Statements Schedules.

The exhibits to this registration statement are listed in the Exhibit Index immediately prior the signature page hereto, which Exhibit Index is hereby incorporated by reference into this Item 16.

Item 17. Undertakings.

- (a) 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 of 1933;

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- (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% change in the maximum aggregate offering price set forth in the "Calculation of Registration Fee" table in the effective registration statement; and
- (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 (a)(1)(i), (a)(1)(ii) and (a)(1)(iii) 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 Commission by the registrant pursuant to section 13 or section 15(d) of the Securities Exchange Act of 1934 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 of 1933, 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 of 1933 to any purchaser:
 - (i) Each prospectus filed by the registrant pursuant to Rule 424(b)(3) shall be deemed to be part of the registration statement as of the date the filed prospectus was deemed part of and included in the registration statement; and
 - (ii) Each prospectus required to be filed pursuant to Rule 424(b)(2), (b)(5), or (b)(7) as part of a registration statement in reliance on Rule 430B relating to an offering made pursuant to Rule 415(a)(1)(i), (vii), or (x) for the purpose of providing the information required by section 10(a) of the Securities Act of 1933 shall be deemed to be part of and included in the registration statement as of the earlier of the date such form of prospectus is first used after effectiveness or the date of the first contract of sale of securities in the offering described in the prospectus. As provided in Rule 430B, for liability purposes of the issuer and any person that is at that date an underwriter, such date shall be deemed to be a new effective date of the registration statement relating to the securities in the registration statement to which that prospectus relates, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof. 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 effective date, 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 effective date.
- (b) The undersigned registrant hereby undertakes that, for purposes of determining any liability under the Securities Act of 1933, each filing of the registrant's annual report pursuant to section 13(a) or section 15(d) of the Securities Exchange Act of 1934 (and, where applicable, each filing of an

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employee benefit plan's annual report pursuant to section 15(d) of the Securities Exchange Act of 1934) that is incorporated by reference in the registration statement 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.

- (c) Insofar as indemnification for liabilities arising under the Securities Act of 1933 may be permitted to directors, officers and controlling persons of the registrant, the registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the registrant of expenses incurred or paid by a director, officer or controlling person of the registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Act and will be governed by the final adjudication of such issue.

EXHIBIT INDEX

Exhibit Number	Item
4.1	Amended and Restated Certificate of Incorporation of the Company, as subsequently amended (incorporated by reference to Exhibit 3.1 to the Company's Annual Report on Form 10-K (File No. 001-32979) filed on March 6, 2014).
4.2	Certificate of Amendment of Amended and Restated Certificate of Incorporation of the Company, dated August 1, 2017 (incorporated by reference to Exhibit 3.1 to the Company's Current Report on Form 8-K (File No. 001-32979) filed on August 1, 2017).
4.3	Certificate of Amendment (Name Change) of Amended and Restated Certificate of Incorporation of the Company, dated August 1, 2017 (incorporated by reference to Exhibit 3.1 to the Company's Current Report on Form 8-K (File No. 001-32979) filed on August 7, 2017).
4.4	Certificate of Designation of Preferences, Rights and Limitations of Series A Convertible Preferred Stock, dated November 22, 2019 (incorporated by reference to Exhibit 3.1 to the Company's Current Report on Form 8-K (File No. 001-32979), filed on November 25, 2019).
4.5	Amended and Restated Bylaws of the Company (incorporated by reference to Exhibit 3.4 to the Company's Annual Report on Form 10-K (File No. 001-32979), filed on March 29, 2019).
4.6*	Registration Rights Agreement, dated June 4, 2020, by and among the Company and the selling stockholders named therein.
5.1*	Opinion of Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.
23.1*	Consent of Ernst & Young LLP.
23.2*	Consent of Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C. (contained in Exhibit 5.1 hereto).
24.1*	Powers of Attorney (included in the signature page of this registration statement).

* Filed herewith.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, the registrant certifies that it has reasonable grounds to believe that it meets all of the requirements for filing on Form S-3 and has duly caused this registration statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Austin, State of Texas, on June 4, 2020.

MOLECULAR TEMPLATES, INC.

By: /s/ Eric. E Poma, Ph.D.

Eric E. Poma, Ph.D.

Chief Executive Officer and Chief Scientific Officer

SIGNATURES AND POWER OF ATTORNEY

We, the undersigned officers and directors of Molecular Templates, Inc., hereby severally constitute and appoint Eric E. Poma, Ph.D. and Adam Cutler and each of them singly (with full power to each of them to act alone), our true and lawful attorneys-in-fact and agents, with full power of substitution and resubstitution in each of them for him and in his name, place and stead, and in any and all capacities, to sign any and all amendments (including, without limitation, post-effective amendments) to this registration statement (or any other registration statement for the same offering that is to be effective upon filing pursuant to Rule 462(b) under the Securities Act of 1933), and to file the same, with all exhibits thereto and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite or necessary to be done in and about the premises, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents or any of them or their or his substitute or substitutes may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed by the following persons in the capacities and on the dates indicated.

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Eric E. Poma, Ph.D.</u> Eric E. Poma, Ph.D.	Chief Executive Officer, Chief Scientific Officer and Director <i>(Principal Executive Officer)</i>	June 4, 2020
<u>/s/ Adam Cutler</u> Adam Cutler	Chief Financial Officer, Treasurer and Secretary <i>(Principal Financial and Accounting Officer)</i>	June 4, 2020
<u>/s/ Harold E. Selick, Ph.D.</u> Harold E. Selick, Ph.D.	Chairman of the Board of Directors	June 4, 2020
<u>/s/ Jonathan Lanfear</u> Jonathan Lanfear	Director	June 4, 2020
<u>/s/ David R. Hoffmann</u> David R. Hoffmann	Director	June 4, 2020
<u>/s/ David Hirsch, M.D., Ph.D.</u> David Hirsch, M.D., Ph.D.	Director	June 4, 2020

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<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Kevin Lalande</u> Kevin Lalande	Director	June 4, 2020
<u>/s/ Scott Morenstein</u> Scott Morenstein	Director	June 4, 2020
<u>/s/ Corazon "Corsee" Sanders, Ph.D.</u> Corazon "Corsee" Sanders, Ph.D.	Director	June 4, 2020

REGISTRATION RIGHTS AGREEMENT

This Registration Rights Agreement (the “Agreement”) is made and entered into as of June 4, 2020 by and among Molecular Templates, Inc., a Delaware corporation (the “Company”), and each Selling Stockholder set forth on the signature pages hereto (each, a “Selling Stockholder” and collectively, the “Selling Stockholders”). The Company and the Selling Stockholders may each be referred to herein individually as a “Party” and collectively as the “Parties.”

WHEREAS, each of the Selling Stockholders currently holds shares of capital stock of the Company that are not currently registered for resale with the Securities and Exchange Commission (the “SEC”); and

WHEREAS, the board of directors of the Company has determined that it is desirable and in the best interests of the Company to grant resale registration rights to the Selling Stockholders as set forth in this Agreement.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties hereby agree as follows:

1. Registration.

(a) Registration Statement.

(i) Resale Registration Statement. The Company shall promptly file with the SEC, to include (by way of filing, amendment or otherwise) the securities held by the Selling Stockholders as set forth on Annex 1 hereto (the “Registrable Securities”) on a registration statement on Form S-3 so as to cover the resale of the Registrable Securities (the “Registration Statement”). The Registration Statement (and each amendment or supplement thereto, and each request for acceleration of effectiveness thereof) shall be provided to the Selling Stockholders and their counsel, if applicable, prior to its filing or other submission.

(ii) Alternative Form of Registration Statement. In the event that Form S-3 is not available for the registration of the resale of Registrable Securities hereunder, the Company shall (i) register the resale of the Registrable Securities on another appropriate form reasonably acceptable to the holders of a majority of the Registrable Securities then held by Selling Stockholders (the “Required Holders”) and (ii) undertake to register the Registrable Securities on Form S-3 promptly after such form is available, provided that the Company shall maintain the effectiveness of the Registration Statement then in effect until such time as a Registration Statement on Form S-3 covering the Registrable Securities has been declared effective by the SEC.

(iii) Expenses. The Company will pay all reasonable expenses associated with effecting the registration of the Registrable Securities pursuant to, and otherwise complying with its obligations under, this Section 1, including filing and printing fees, the Company’s counsel and accounting fees and expenses, costs associated with clearing the Registrable Securities for sale under applicable state securities laws and listing fees, but excluding discounts, commissions, fees of underwriters, selling brokers, dealer managers or similar securities industry professionals with respect to the Registrable Securities being sold. The Selling Stockholders shall bear their own expenses, including with respect to any counsel to the Selling Stockholders, if applicable.

(b) Effectiveness.

(i) The Company shall use commercially reasonable efforts to have the Registration Statement declared effective as soon as practicable after filing, and shall notify the Selling Stockholders by e-mail after the Registration Statement is declared effective and shall provide the Selling Stockholders with copies of any related prospectus to be used in connection with the sale or other disposition of the securities covered thereby.

(ii) The Company may suspend the use of any prospectus included in the Registration Statement contemplated by this Section in the event that the Company determines in good faith that such suspension is necessary to (A) delay the disclosure of material non-public information concerning the Company, the disclosure of which at the time is not, in the good faith opinion of the Company, in the best interests of the Company or (B) amend or supplement the Registration Statement or the related prospectus so that such Registration Statement or prospectus shall not include an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein, in the case of the prospectus in light of the circumstances under which they were made, not misleading (a “Delay”); provided, that the Company shall promptly (a) notify each Selling Stockholder in writing of the commencement of such Delay, but shall not (without the prior written consent of a Selling Stockholder) disclose to such Selling Stockholder any material non-public information giving rise to such Delay and (b) advise the Selling Stockholders in writing to cease all sales under the Registration Statement until the end of such Delay.

(c) Rule 415; Cutback. If at any time the SEC informs the Company that all of the Registrable Securities cannot, based on the provisions of Rule 415 under the Securities Act, be registered for resale as a secondary offering on a single registration statement, or requires any Selling Stockholder to be named as an “underwriter,” the Company shall use its commercially reasonable efforts to persuade the SEC that the offering contemplated by the Registration Statement is a valid secondary offering and not an offering “by or on behalf of the issuer” as defined in Rule 415 and that none of the Selling Stockholders is an “underwriter.” In the event that, despite the Company’s commercially reasonable efforts and compliance with the terms of this Section 2(c), the SEC refuses to alter its position, the Company shall (i) remove from the Registration Statement such portion of the Registrable Securities (the “Cut Back Shares”) and/or (ii) agree to such restrictions and limitations on the registration and resale of the Registrable Securities as the SEC may require to assure the Company’s compliance with the requirements of Rule 415 (collectively, the “SEC Restrictions”); provided, however, that the Company shall not agree to name any Selling Stockholder as an “underwriter” in such Registration Statement without the prior written consent of such Selling Stockholder. Any cut-back imposed on the Selling Stockholders pursuant to this Section 2(c) shall be allocated among the Selling Stockholders on a pro rata basis, in each case subject to a determination by the SEC that certain Selling Stockholders must be reduced first based on the number of Registrable Securities held by such Selling Stockholders. For the avoidance of doubt, for purposes of this Section 2(c), the term “commercially reasonable efforts” shall not require the Company to institute or maintain any action, suit or proceeding against the SEC or any member of the Staff of the SEC. In the event the Company amends the Registration Statement or files a new registration statement, as the case may be, to remove the Cut Back Shares, the Company will use its commercially reasonable efforts to file with the SEC, as promptly as allowed by SEC, one or more registration statements on Form S-3 or such other form available to register for resale those Registrable Securities that were not registered for resale on the initial Registration Statement, as amended, or the new registration statement (and any such new registration statement shall be deemed a “Registration Statement” hereunder).

(d) Notwithstanding anything in this Agreement to the contrary, the Company may, by written notice to the Selling Stockholders, suspend sales under the Registration Statement after the effective date thereof and/or require that the Selling Stockholders immediately cease the sale of any Registrable Securities, pursuant thereto if the Company is engaged in a material merger, acquisition or sale or any other pending development that the Company believes may be material. Upon receipt of such notice, each Selling Stockholder shall immediately discontinue any sales of Registrable Securities pursuant to such registration until such Selling Stockholder is advised in writing by the Company that the current prospectus or amended prospectus, as applicable, may be used. Immediately after the end of any suspension period under this Section 2(c), the Company shall take all necessary actions (including filing any required supplemental prospectus) to restore the effectiveness of the Registration Statement and the ability of the Selling Stockholders to publicly resell their Registrable Securities pursuant to such effective Registration Statement.

2. Company Obligations. In accordance with Section 1, the Company will use commercially reasonable efforts to effect the registration of the Registrable Securities in accordance with the terms hereof, and pursuant thereto the Company will:

(a) use commercially reasonable efforts to cause such Registration Statement to become effective pursuant to the terms of Section 1 hereof and prepare and file with the SEC such amendments and post-effective amendments to the Registration Statement and the prospectus as may be necessary to keep the Registration Statement effective for a period that will terminate upon the earlier of (i) the date on which all Registrable Securities covered by such Registration Statement as amended from time to time, have been sold, (ii) the third anniversary of

the effectiveness of the Registration Statement, or (iii) the date as of which the Investors may sell all of the Registrable Securities covered by such Registration Statement without restriction pursuant to Rule 144 (or any successor thereto) promulgated under the Securities Act, and to comply with the provisions of the Securities Act of 1933, as amended (the "Securities Act"), and the Securities Exchange Act of 1934, as amended (the "Exchange Act") with respect to the distribution of all of the Registrable Securities covered thereby;

(b) furnish to the Selling Stockholders and their legal counsel, if applicable, (i) promptly after the same is prepared and publicly distributed, filed with the SEC, or received by the Company one (1) copy of the Registration Statement and any amendment thereto, each preliminary prospectus and prospectus and each amendment or supplement thereto, and each letter written by or on behalf of the Company to the SEC or the staff of the SEC, and each item of correspondence from the SEC or the staff of the SEC, in each case relating to the Registration Statement (other than any portion thereof which contains information for which the Company has sought confidential treatment), and (ii) such number of copies of a prospectus, including a preliminary prospectus, and all amendments and supplements thereto and such other documents as each Selling Stockholder may reasonably request in order to facilitate the disposition of the Registrable Securities owned by such Selling Stockholder that are covered by the Registration Statement;

(c) immediately notify the Selling Stockholders upon discovery that, or upon the happening of any event as a result of which, the prospectus includes an untrue statement of a material fact or omits to state any material fact required to be stated therein or necessary to make the statements therein not misleading in light of the circumstances then existing, and promptly prepare, file with the SEC and furnish to such holder a supplement to or an amendment of such prospectus as may be necessary so that such prospectus shall not include an untrue statement of a material fact or omit to state a material fact required to be stated therein or necessary to make the statements therein not misleading in light of the circumstances then existing;

(d) in the event of any underwritten public offering, enter into and perform its obligations under an underwriting agreement, in usual and customary form, with the underwriter(s) of such offering;

(e) promptly make available for inspection by the Selling Stockholders, any underwriter(s) participating in any disposition pursuant to such registration statement, and any attorney or accountant or other agent retained by any such underwriter or selected by the Selling Stockholders, all financial and other records, pertinent corporate documents, and properties of the Company, and cause the Company's officers, directors, employees, and independent accountants to supply all information reasonably requested by any such seller, underwriter, attorney, accountant, or agent, in each case, as necessary or advisable to verify the accuracy of the information in such registration statement and to conduct appropriate due diligence in connection therewith; and

(f) otherwise comply with all applicable rules and regulations of the SEC under the Securities Act and the Exchange Act.

3. Obligations of the Selling Stockholders.

(a) Each Selling Stockholder shall furnish in writing to the Company such information regarding itself, the Registrable Securities held by it and the intended method of disposition of the Registrable Securities held by it, as shall be reasonably required to effect the registration of such Registrable Securities and shall execute such documents in connection with such registration as the Company may reasonably request. At least three (3) business days prior to the first anticipated filing date of the Registration Statement, the Company shall notify each Selling Stockholder of the information the Company requires from such Selling Stockholder. It shall be a condition precedent to the obligations of the Company to complete the registration pursuant to this Agreement with respect to the Registrable Securities of a particular Selling Stockholder that (i) such Selling Stockholder furnish to the Company such information regarding itself, the Registrable Securities held by it and the intended method of disposition of the Registrable Securities held by it as shall be reasonably required to effect the effectiveness of the registration of such Registrable Securities, and (ii) the Selling Stockholder execute such documents in connection with such registration as the Company may reasonably request.

(b) Each Selling Stockholder agrees to cooperate with the Company as reasonably requested by the Company in connection with the preparation and filing of the Registration Statement hereunder.

(c) Each Selling Stockholder agrees that, upon receipt of any notice from the Company of either (i) the commencement of an Delay pursuant to Section 1(b)(ii) or (ii) to the happening of an event pursuant to Section 2(c) hereof, such Selling Stockholder will immediately discontinue disposition of Registrable Securities pursuant to the Registration Statement covering such Registrable Securities, until the Selling Stockholder is advised by the Company that such dispositions may again be made.

(d) Each Selling Stockholder covenants and agrees that it will comply with the prospectus delivery requirements of the Securities Act as applicable to it or an exemption therefrom in connection with sales of Registrable Securities pursuant to the Registration Statement.

4. Indemnification.

(a) Indemnification by the Company. In the event that any Registrable Securities are included in the Registration Statement pursuant to this Agreement, the Company will indemnify and hold harmless each Selling Stockholder whose Registrable Securities are included in the Registration Statement and its officers, directors, members, employees and agents, successors and assigns, and each other person, if any, who controls such Selling Stockholder within the meaning of the Securities Act, against any losses, claims, damages or liabilities, joint or several, to which they may become subject under the Securities Act or otherwise, insofar as such losses, claims, damages or liabilities (or actions in respect thereof) arise out of or are based upon: (i) any untrue statement or alleged untrue statement or omission or alleged omission of any material fact contained in the Registration Statement, any preliminary prospectus (if used prior to the effective date of such Registration Statement) or final prospectus, or any amendment or supplement thereof; (ii) any violation by the Company or its agents of any rule or regulation promulgated under the Securities Act applicable to the Company or its agents and relating to action or inaction required of the Company in connection with such registration; or (iii) any failure to register or qualify the Registrable Securities included in the Registration Statement in any state where the Company or its agents has affirmatively undertaken or agreed in writing that the Company will undertake such registration or qualification on a Selling Stockholder's behalf and will reimburse such Selling Stockholder, and each such officer, director or member and each such controlling person for any legal or other expenses reasonably incurred by them in connection with investigating or defending any such loss, claim, damage, liability or action; provided, however, that the Company will not be liable in any such case if and to the extent that any such loss, claim, damage or liability arises out of or is based solely upon (w) an untrue statement or alleged untrue statement or omission or alleged omission so made in conformity with information pertaining to such Selling Stockholder and furnished in writing by such Selling Stockholder or any such controlling person specifically for use in such Registration Statement or prospectus, (x) the use by a Selling Stockholder of an outdated or defective prospectus after the Company has validly notified such Selling Stockholder in writing that the prospectus is outdated or defective, (y) a Selling Stockholder's (or any other indemnified Person's) failure to send or give a copy of the prospectus or supplement (as then amended or supplemented), if required (and not exempted) to the Persons asserting an untrue statement or omission or alleged untrue statement or omission at or prior to the written confirmation of the sale of Registrable Securities if such statement or omission was corrected in such prospectus or supplement, or (z) amounts paid in settlement of any loss, claim, damage or liability if such settlement is effected without the prior written consent of the Company unless, in accordance with Section 6(c) below, such settlement includes an unconditional release of such Indemnified Party from all liability on claims that are the subject matter of the proceeding.

(b) Indemnification by the Selling Stockholders. Each Selling Stockholder agrees, severally but not jointly, to indemnify and hold harmless, to the fullest extent permitted by law, the Company, its directors, officers, employees, stockholders and each person who controls the Company (within the meaning of the Securities Act), to the same extent and in the same manner as is set forth in Section 4(a), against any losses, claims, damages, liabilities and expense (including reasonable attorney fees) resulting from any untrue statement of a material fact or any omission of a material fact required to be stated in the Registration Statement or prospectus or preliminary prospectus or amendment or supplement thereto or necessary to make the statements therein not misleading, to the extent, but only to the extent that such untrue statement or omission is contained in any information pertaining to such Selling Stockholder and furnished in writing by such Selling Stockholder to the Company specifically for inclusion in the Registration Statement or prospectus or amendment or supplement thereto. In no event shall the liability of a Selling Stockholder be greater in amount than the dollar amount of the proceeds (net of all expenses paid by such Selling Stockholder in connection with any claim relating to this Section 4 and the amount of any damages such Selling Stockholder has otherwise been required to pay by reason of such untrue statement or omission) received by such Selling Stockholder upon the sale of the Registrable Securities included in the Registration Statement giving rise to such indemnification obligation.

(c) Conduct of Indemnification Proceedings. Any person entitled to indemnification hereunder shall (i) give prompt notice to the indemnifying party of any claim with respect to which it seeks indemnification and (ii) permit such indemnifying party to assume the defense of such claim with counsel reasonably satisfactory to the indemnified party; provided, that any person entitled to indemnification hereunder shall have the right to employ separate counsel and to participate in the defense of such claim, but the fees and expenses of such counsel shall be at the expense of such person unless (a) the indemnifying party has agreed to pay such fees or expenses or (b) the indemnifying party shall have failed to assume the defense of such claim and employ counsel reasonably satisfactory to such person or (c) in the reasonable judgment of any such person, based upon written advice of its counsel, a conflict of interest exists between such person and the indemnifying party with respect to such claims (in which case, if the person notifies the indemnifying party in writing that such person elects to employ separate counsel at the expense of the indemnifying party, the indemnifying party shall not have the right to assume the defense of such claim on behalf of such person); and provided, further, that the failure of any indemnified party to give notice as provided herein shall not relieve the indemnifying party of its obligations hereunder, except to the extent that such failure to give notice shall materially adversely affect the indemnifying party in the defense of any such claim or litigation. It is understood that the indemnifying party shall not, in connection with any proceeding in the same jurisdiction, be liable for fees or expenses of more than one separate firm of attorneys at any time for all such indemnified parties.

No indemnifying party will, except with the consent of the indemnified party, consent to entry of any judgment or enter into any settlement unless such settlement includes an unconditional release of such indemnified party from all liability on claims that are the subject matter of such proceeding and such settlement does not include any non-monetary limitation on the actions of any indemnified party or any of its affiliates or any admission of fault or liability on behalf of any such indemnified party.

Subject to the terms of this Agreement, all fees and expenses of the indemnified party (including reasonable fees and expenses to the extent incurred in connection with investigating or preparing to defend such proceeding in a manner not inconsistent with this Section 4) shall be paid to the indemnified party, as incurred, within twenty (20) business days of written notice thereof to the indemnifying party; provided, that the indemnified party shall promptly reimburse the indemnifying party for that portion of such fees and expenses applicable to such actions for which such indemnified party is finally judicially determined to not be entitled to indemnification hereunder).

(d) Contribution. If for any reason the indemnification provided for in the preceding paragraphs (a) and (b) is unavailable to an indemnified party or insufficient to hold it harmless, other than as expressly specified therein, then the indemnifying party shall contribute to the amount paid or payable by the indemnified party as a result of such loss, claim, damage or liability in such proportion as is appropriate to reflect the relative fault of the indemnified party and the indemnifying party, as well as any other relevant equitable considerations. No person guilty of fraudulent misrepresentation within the meaning of Section 11(f) of the Securities Act shall be entitled to contribution from any person not guilty of such fraudulent misrepresentation. In no event shall the contribution obligation of a holder of Registrable Securities be greater in amount than the dollar amount of the proceeds (net of all expenses paid by such holder in connection with any claim relating to this Section 6 and the amount of any damages such holder has otherwise been required to pay by reason of such untrue or alleged untrue statement or omission or alleged omission) received by it upon the sale of the Registrable Securities giving rise to such contribution obligation.

(e) Unless otherwise superseded by an underwriting agreement entered into in connection with the underwritten public offering, the obligations of the Company and Selling Stockholders under this Subsection 4 shall survive the completion of any offering of Registrable Securities in a registration under this Agreement, and otherwise shall survive the termination of this Agreement.

5. Miscellaneous.

(a) Amendments and Waivers. This Agreement may be amended, and any term hereof may be waived, only by a writing signed by the Company and the Required Holders.

(b) Notices. Any notice or other communication required or permitted to be delivered to any party under this Agreement will be in writing and will be deemed properly delivered, given and received: (a) if sent on a business day by email before 11:59 p.m. (recipient's time), when transmitted and (b) if sent by email on a day other than a business day, or if sent by email after 11:59 p.m. (recipient's time), on the business day following the date when transmitted, in each case to the address set forth beneath the name of such party on the signature pages attached hereto.

(c) Assignments and Transfers by Selling Stockholders. The provisions of this Agreement shall be binding upon and inure to the benefit of the Selling Stockholders. A Selling Stockholder may transfer or assign, in whole or from time to time in part, to one or more persons its rights hereunder in connection with the transfer of Registrable Securities by such Selling Stockholder to such person, provided that such Selling Stockholder complies with all laws applicable thereto and provides written notice of assignment to the Company promptly after such assignment is effected.

(d) Benefits of the Agreement. The terms and conditions of this Agreement shall inure to the benefit of and be binding upon the respective permitted successors and assigns of the Parties. Nothing in this Agreement, express or implied, is intended to confer upon any party other than the Parties or their respective successors and assigns any rights, remedies, obligations, or liabilities under or by reason of this Agreement, except as expressly provided in this Agreement.

(e) Counterparts; Faxes. This Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. This Agreement may also be executed via facsimile, which shall be deemed an original.

(f) Titles and Subtitles. The titles and subtitles used in this Agreement are used for convenience only and are not to be considered in construing or interpreting this Agreement.

(g) Severability. Any provision of this Agreement that is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceability without invalidating the remaining provisions hereof but shall be interpreted as if it were written so as to be enforceable to the maximum extent permitted by applicable law, and any such prohibition or unenforceability in any jurisdiction shall not invalidate or render unenforceable such provision in any other jurisdiction. To the extent permitted by applicable law, the Parties hereby waive any provision of law which renders any provisions hereof prohibited or unenforceable in any respect.

(h) Further Assurances. The Parties shall execute and deliver all such further instruments and documents and take all such other actions as may reasonably be required to carry out the transactions contemplated hereby and to evidence the fulfillment of the agreements herein contained.

(i) Entire Agreement. This Agreement is intended by the Parties as a final expression of their agreement and intended to be a complete and exclusive statement of the agreement and understanding of the Parties in respect of the subject matter contained herein. This Agreement supersedes all prior agreements and understandings among the Parties with respect to such subject matter.

(j) Governing Law; Consent to Jurisdiction; Waiver of Jury Trial. This Agreement shall be governed by, and construed in accordance with, the internal laws of the State of Delaware without regard to the choice of law principles thereof. Each of the Parties irrevocably submits to the exclusive jurisdiction of the courts of the Delaware Court of Chancery and any state appellate court therefrom within the State of Delaware Court of Chancery and any state appellate court therefrom within the State of Delaware (or, if the Delaware Court of Chancery declines to accept jurisdiction over a particular matter, any state or federal court within the State of Delaware) for the purpose of any suit, action, proceeding or judgment relating to or arising out of this Agreement and the transactions contemplated hereby. Service of process in connection with any such suit, action or proceeding may be served on

each Party anywhere in the world by the same methods as are specified for the giving of notices under this Agreement. Each of the Parties irrevocably consents to the jurisdiction of any such court in any such suit, action or proceeding and to the laying of venue in such court. Each Party irrevocably waives any objection to the laying of venue of any such suit, action or proceeding brought in such courts and irrevocably waives any claim that any such suit, action or proceeding brought in any such court has been brought in an inconvenient forum. EACH OF THE PARTIES WAIVES ANY RIGHT TO REQUEST A TRIAL BY JURY IN ANY LITIGATION WITH RESPECT TO THIS AGREEMENT AND REPRESENTS THAT COUNSEL HAS BEEN CONSULTED SPECIFICALLY AS TO THIS WAIVER.

[Signature page follows]

IN WITNESS WHEREOF, the Parties have executed this Registration Rights Agreement as of the date first above written.

The Company:

MOLECULAR TEMPLATES, INC.

By: /s/ Eric E. Poma

Name: Eric E. Poma

Its: Chief Executive Officer

Email Address:

[Signature Page to Registration Rights Agreement]

IN WITNESS WHEREOF, the Parties have executed this Registration Rights Agreement as of the date first above written.

Selling Stockholder:

SANTÉ HEALTH VENTURES ANNEX FUND, L.P.

By: SHV Annex Services, LP
Its: General Partner

By: SHV Management Services, LLC
Its: General Partner

By: /s/ Kevin Lalande
Name: Kevin Lalande
Title: Managing Member

Email Address:

Selling Stockholder:

SANTÉ HEALTH VENTURES I, L.P.

By: SHV Management Services, LP
Its: General Partner

By: SHV Management Services, LLC
Its: General Partner

By: /s/ Kevin Lalande
Name: Kevin Lalande
Title: Managing Member

Email Address:

Selling Stockholder:

SHV MANAGEMENT SERVICES, LP

By: SHV Management Services, LLC
Its: General Partner

By: /s/ Kevin Lalande
Name: Kevin Lalande
Title: Managing Member

Email Address:

[Signature Page to Registration Rights Agreement]

IN WITNESS WHEREOF, the Parties have executed this Registration Rights Agreement as of the date first above written.

Selling Stockholder:

LONGITUDE VENTURE PARTNERS III, L.P.

By: Longitude Capital Partners, LLC

Its: General Partner

By: /s/ Patrick Enright

Name: Patrick Enright

Its: Managing Director

Email Address:

[Signature Page to Registration Rights Agreement]

IN WITNESS WHEREOF, the Parties have executed this Registration Rights Agreement as of the date first above written.

Selling Stockholder:

CDK ASSOCIATES L.L.C.

By: Caxton Corporation
Its: Manager

By: /s/ Karen Cross
Name: Karen Cross
Its: Vice President and Controller

Email Address:

[Signature Page to Registration Rights Agreement]

Annex 1

<u>Selling Stockholder Name</u>	<u>Shares to be Registered for Resale</u>
SANTÉ HEALTH VENTURES ANNEX FUND, L.P.	855,010
SANTÉ HEALTH VENTURES I, L.P.	6,558,678
SHV MANAGEMENT SERVICES, LP	50,000
LONGITUDE VENTURE PARTNERS III, L.P.	937,500
CDK ASSOCIATES L.L.C.	1,039,204



One Financial Center
Boston, MA 02111
617 542 6000
mintz.com

June 4, 2020

Molecular Templates, Inc.
9301 Amberglen Blvd, Suite 100
Austin, Texas 78729

Ladies and Gentlemen:

We have acted as counsel to Molecular Templates, Inc., a Delaware corporation (the "Company"), in connection with the preparation and filing by the Company of a Registration Statement on Form S-3 (as amended, the "Registration Statement") under the Securities Act of 1933, as amended (the "Securities Act") with the Securities and Exchange Commission (the "Commission"). The Registration Statement relates to the registration for resale by the selling stockholders named in the Registration Statement (the "Selling Stockholders") of up to an aggregate of 9,440,392 shares (the "Shares") of the Company's common stock, \$0.001 par value per share ("Common Stock"). This opinion is being rendered in connection with the filing of the Registration Statement with the Commission.

In connection with this opinion, we have examined the Company's Amended and Restated Certificate of Incorporation and Amended and Restated Bylaws, each as restated and/or amended to date and 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.

Our opinion is limited to the General Corporation 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 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 Shares are 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.

BOSTON LONDON LOS ANGELES NEW YORK SAN DIEGO SAN FRANCISCO WASHINGTON

MINTZ, LEVIN, COHN, FERRIS, GLOVSKY AND POPEO, P.C.



We understand that you wish to file this opinion with the Commission as an exhibit to the Registration Statement in accordance with the requirements of Item 601(b)(5) of Regulation S-K promulgated under the Securities Act and to reference the firm's name under the caption "Legal Matters" in the prospectus which forms part of the Registration Statement, and we hereby consent thereto. In giving this consent, we do not admit that we are within the category of persons whose consent is required under Section 7 of the Securities Act or the rules and regulations of the Commission promulgated thereunder.

Very truly yours,

/s/ Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.

Consent of Independent Registered Public Accounting Firm

We consent to the reference to our firm under the caption “Experts” in the Registration Statement (Form S-3) and related Prospectus of Molecular Templates, Inc. for the registration of up to 9,440,392 shares of its common stock and to the incorporation by reference therein of our reports dated March 13, 2020, with respect to the consolidated financial statements of Molecular Templates, Inc., and the effectiveness of internal control over financial reporting of Molecular Templates, Inc., included in its Annual Report (Form 10-K) for the year ended December 31, 2019, filed with the Securities and Exchange Commission.

/s/ Ernst & Young LLP

Austin, Texas

June 4, 2020