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

FORM S-8
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 or organization)

94-3409596
(I.R.S. Employer
Identification Number)

9301 Amberglen Blvd, Suite 100
Austin, Texas 78729
(512) 869-1555
(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

2009 Stock Plan, as amended
2014 Equity Incentive Plan, as amended
Amended and Restated 2004 Employee Stock Purchase Plan
(Full Title of the Plan)

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)

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

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 Accelerated filer
Non-accelerated filer (Do not check if a smaller reporting company) Smaller reporting company
Emerging growth company

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

CALCULATION OF REGISTRATION FEE

Title 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, par value \$0.001 per share	2,323,711 shares	(2)	(2)	(2)

- (1) Pursuant to Rule 416(a) under the Securities Act of 1933, as amended (the "Securities Act"), this registration statement shall also cover any additional shares of the Registrant's common stock, par value \$0.001 per share (the "Common Stock") that become issuable under the 2009 Stock Plan, as amended (the "2009 Plan"), the 2014 Equity Incentive Plan, as amended (the "2014 Plan") and the Amended and Restated 2004 Employee Stock Purchase Plan (the "2004 ESPP") by reason of any stock dividend, stock split, recapitalization or similar transaction effected without the Registrant's receipt of consideration which would increase the number of outstanding shares of Common Stock.
- (2) Estimated solely for the purpose of calculating the amount of the registration fee pursuant to Rule 457(h) and Rule 457(c) promulgated under the Securities Act. The offering price per share and the aggregate offering price (a) for outstanding options granted under the 2009 Plan are based upon the weighted-average exercise price of such outstanding options, (b) for shares reserved for future issuance under the 2014 Plan and for shares available under the 2004 ESPP are based on the average of the high and the low price of Registrant's Common Stock as reported on The Nasdaq Capital Market on October 13, 2017. The chart below details the calculations of the registration fee:

Securities	Number of Shares	Offering Price Per Share	Aggregate Offering Price
Shares issuable upon the exercise of outstanding options granted under the 2009 Plan	950,985	\$ 0.93(2)(a)	\$ 884,416.05
Shares reserved for future grant under the 2014 Plan	1,363,636	\$ 9.87(2)(b)	\$ 13,459,087.32
Shares available under the 2004 ESPP	9,090	\$ 9.87(2)(b)	\$ 89,718.30
Proposed Maximum Aggregate Offering Price			\$ 14,433,221.67
Registration Fee			\$ 1,796.94

EXPLANATORY NOTE

On August 1, 2017, Molecular Templates, Inc., formerly known as Threshold Pharmaceuticals, Inc. (the “Registrant,” “we,” “us” or “our”), completed its business combination with Molecular Templates OpCo, Inc. (formerly known as Molecular Templates, Inc.), a privately held Delaware corporation (“Molecular Templates OpCo”), in accordance with the terms of an Agreement and Plan of Merger and Reorganization, dated as of March 16, 2017 (the “Merger Agreement”). Pursuant to the Merger Agreement, we formed a wholly owned subsidiary that merged with and into Molecular Templates OpCo, with Molecular Templates OpCo surviving the merger and becoming our wholly owned subsidiary (the “Merger”). Pursuant to the Merger Agreement, each option to purchase shares of Molecular Templates OpCo common stock that was outstanding and unexercised immediately prior to the effective time of the Merger under the Molecular Templates 2009 Stock Plan, as amended (the “2009 Plan”), whether or not vested, was converted into and became an option to purchase shares of Registrant’s Common Stock and the Registrant assumed the 2009 Plan. The issuance of the shares of our Common Stock to the former stockholders of Molecular Templates OpCo was registered with the SEC on a Registration Statement on Form S-4 (Reg. No. 333-217993).

In addition, this Registration Statement on Form S-8 is being filed for the purpose of registering an additional 1,363,636 shares of Registrant’s Common Stock issuable under the Threshold 2014 Equity Incentive Plan (the “2014 Plan”), as approved by the Board of Directors and the stockholders of the Registrant as an amendment to the 2014 Plan.

In addition, this Registration Statement on Form S-8 is being filed for the purpose of registering an additional 9,090 shares was authorized for issuance under the 2004 Employee Stock Purchase Plan pursuant to the automatic annual increase set forth in Section 2 of the 2004 ESPP.

PART I

INFORMATION REQUIRED IN THE SECTION 10(a) PROSPECTUS

In accordance with the instructional Note to Part I of Form S-8 as promulgated by the Securities and Exchange Commission (the “Commission”), the information specified by Part I of Form S-8 has been omitted from this Registration Statement on Form S-8 for offers of Common Stock pursuant to the 2009 Plan and the 2014 Plan. The documents containing the information specified in Part I will be delivered to the participants in the 2009 Plan and the 2014 Plan covered by this Registration Statement as required by Rule 428(b)(1) under the Securities Act.

PART II

INFORMATION REQUIRED IN THE REGISTRATION STATEMENT

In this registration statement, Molecular Templates, Inc. is sometimes referred to as “Registrant,” “we,” “us” or “our.”

Item 3. Incorporation of Documents by Reference.

The following documents filed by the Registrant with the SEC are incorporated herein by reference:

- (a) our Annual Report on Form 10-K for the year ended December 31, 2016 filed with the SEC on March 27, 2017, as amended by Amendment No. 1 on Form 10-K/A filed with the SEC on April 28, 2017;
- (b) our Quarterly Reports on Form 10-Q for the quarter ended March 31, 2017, filed with the SEC on May 15, 2017, and for the quarter ended June 30, 2017, filed with the SEC on July 31, 2017;

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- (c) our Current Reports on Form 8-K as filed with the SEC on March 17, 2017, March 29, 2017, March 30, 2017, June 2, 2017, June 22, 2017, July 20, 2017, August 1, 2017, August 7, 2017, October 13, 2017 and October 17, 2017 (other than any portions thereof deemed furnished and not filed); and
 - (d) the description of our Common Stock contained in the registration statement on Form 8-A registering our Common Stock under Section 12(b) of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), which was filed with the SEC on August 9, 2006, including any amendments or reports filed for the purpose of updating such description.

All reports and other documents filed by the Registrant after the date hereof pursuant to Sections 13(a), 13(c), 14 and 15(d) of the Exchange Act (other than Current Reports furnished under Item 2.02 or Item 7.01 of Form 8-K and exhibits furnished on such form that relate to such items), prior to the filing of a post-effective amendment which indicates that all securities offered hereby have been sold or which deregisters all securities then remaining unsold, shall be deemed to be incorporated by reference herein and to be part hereof from the date of filing of such reports and documents. Any statement contained in a document incorporated or deemed to be incorporated by reference herein shall be deemed to be modified or superseded for the purposes of this registration statement to the extent that a statement contained herein or in any other subsequently filed document which also is or is deemed to be incorporated by reference herein modifies or supersedes such statement. Any statement so modified or superseded shall not be deemed, except as so modified or superseded, to constitute a part of this registration statement.

Item 4. Description of Securities.

Not applicable.

Item 5. Interests of Named Experts and Counsel.

None.

Item 6. Indemnification of Directors and Officers.

Section 102 of the General Corporation Law of the State of Delaware (the “Delaware General Corporation Law”) 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 Delaware General Corporation Law authorizes a court to award, or a corporation’s board of directors to grant, indemnity to directors and officers in terms sufficiently broad to permit such indemnification under certain circumstances for liabilities, including reimbursement for expenses incurred, arising under the Securities Act.

Section 145 of the Delaware General Corporation Law states:

(a) A corporation shall have power to indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative (other than an action by or in the right of the corporation) by reason of the fact that the person is or was a director, officer, employee or agent of the corporation, or is or was serving at the request of the corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise, against expenses (including attorneys’ fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by the person in connection with such action, suit or proceeding if the person acted in good faith and in a manner the person reasonably believed to be in or not opposed to the best interests of the corporation, and, with respect to any criminal action or proceeding, had no reasonable cause to believe the person’s conduct was unlawful. The termination of any action, suit or proceeding by judgment, order, settlement, conviction, or upon a plea of nolo contendere or its equivalent, shall not, of itself, create a presumption that the person did not act in good faith and in a manner which the person reasonably believed to be in or not opposed to the best interests of the corporation, and, with respect to any criminal action or proceeding, had reasonable cause to believe that the person’s conduct was unlawful.

(b) A corporation shall have power to indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action or suit by or in the right of the corporation to procure a judgment in its favor by reason of the fact that the person is or was a director, officer, employee or agent of the corporation, or is or was serving at the request of the corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise against expenses (including attorneys' fees) actually and reasonably incurred by the person in connection with the defense or settlement of such action or suit if the person acted in good faith and in a manner the person reasonably believed to be in or not opposed to the best interests of the corporation and except that no indemnification shall be made in respect of 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 the court in which such action or suit was brought shall determine upon application that, despite the adjudication of liability but in view of all 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.

(c) To the extent that a present or former director or officer of a corporation has been successful on the merits or otherwise in defense of any action, suit or proceeding referred to in subsections (a) and (b) of this section, or in defense of any claim, issue or matter therein, such person shall be indemnified against expenses (including attorneys' fees) actually and reasonably incurred by such person in connection therewith.

(d) Any indemnification under subsections (a) and (b) of this section (unless ordered by a court) shall be made by the corporation only as authorized in the specific case upon a determination that indemnification of the present or former director, officer, employee or agent is proper in the circumstances because the person has met the applicable standard of conduct set forth in subsections (a) and (b) of this section. Such determination shall be made, with respect to a person who is a director or officer of the corporation at the time of such determination:

- (1) By a majority vote of the directors who are not parties to such action, suit or proceeding, even though less than a quorum; or
- (2) By a committee of such directors designated by majority vote of such directors, even though less than a quorum; or
- (3) If there are no such directors, or if such directors so direct, by independent legal counsel in a written opinion; or
- (4) By the stockholders.

(e) Expenses (including attorneys' fees) incurred by an officer or director of the corporation in defending any civil, criminal, administrative or investigative action, suit or proceeding may be paid by the corporation in advance of the final disposition of such action, suit or proceeding upon receipt of an undertaking by or on behalf of such director or officer to repay such amount if it shall ultimately be determined that such person is not entitled to be indemnified by the corporation as authorized in this section. Such expenses (including attorneys' fees) incurred by former directors and officers or other employees and agents of the corporation or by persons serving at the request of the corporation as directors, officers, employees or agents of another corporation, partnership, joint venture, trust or other enterprise may be so paid upon such terms and conditions, if any, as the corporation deems appropriate.

(f) The indemnification and advancement of expenses provided by, or granted pursuant to, the other subsections of this section shall not be deemed exclusive of any other rights to which those seeking indemnification or advancement of expenses may be entitled under any bylaw, agreement, vote of stockholders or disinterested directors or otherwise, both as to action in such person's official capacity and as to action in another capacity while holding such office. A right to indemnification or to advancement of expenses arising under a provision of the certificate of incorporation or a bylaw shall not be eliminated or impaired by an amendment to the certificate of

incorporation or the bylaws after the occurrence of the act or omission that is the subject of the civil, criminal, administrative or investigative action, suit or proceeding for which indemnification or advancement of expenses is sought, unless the provision in effect at the time of such act or omission explicitly authorizes such elimination or impairment after such action or omission has occurred.

(g) A corporation shall have power to purchase and maintain insurance on behalf of any person who is or was a director, officer, employee or agent of the corporation, or is or was serving at the request of the corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise against any liability asserted against such person and incurred by such person in any such capacity, or arising out of such person's status as such, whether or not the corporation would have the power to indemnify such person against such liability under this section.

(h) For purposes of this section, references to "the corporation" shall include, in addition to the resulting corporation, any constituent corporation (including any constituent of a constituent) absorbed in a consolidation or merger which, if its separate existence had continued, would have had power and authority to indemnify its directors, officers, and employees or agents, so that any person who is or was a director, officer, employee or agent of such constituent corporation, or is or was serving at the request of such constituent corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise, shall stand in the same position under this section with respect to the resulting or surviving corporation as such person would have with respect to such constituent corporation if its separate existence had continued.

(i) For purposes of this section, references to "other enterprises" shall include employee benefit plans; references to "fines" shall include any excise taxes assessed on a person with respect to any employee benefit plan; and references to "serving at the request of the corporation" shall include any service as a director, officer, employee or agent of the corporation which imposes duties on, or involves services by, such director, officer, employee or agent with respect to an employee benefit plan, its participants or beneficiaries; and a person who acted in good faith and in a manner such person reasonably believed to be in the interest of the participants and beneficiaries of an employee benefit plan shall be deemed to have acted in a manner "not opposed to the best interests of the corporation" as referred to in this section.

(j) The indemnification and advancement of expenses provided by, or granted pursuant to, this section shall, unless otherwise provided when authorized or ratified, continue as to a person who has ceased to be a director, officer, employee or agent and shall inure to the benefit of the heirs, executors and administrators of such a person.

(k) The Court of Chancery is hereby vested with exclusive jurisdiction to hear and determine all actions for advancement of expenses or indemnification brought under this section or under any bylaw, agreement, vote of stockholders or disinterested directors, or otherwise. The Court of Chancery may summarily determine a corporation's obligation to advance expenses (including attorneys' fees).

As permitted by Delaware law, our amended and restated certificate of incorporation limits or eliminates the personal liability of our directors to the maximum extent permitted by Delaware law.

Our amended and restated bylaws provide for indemnification of our directors and executive officers to the maximum extent permitted by the Delaware General Corporation Law.

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 7. Exemption from Registration Claimed.

Not applicable.

Item 8. Exhibits.

Exhibit Number	Item
4.1	<u>Amended and Restated Certificate of Incorporation of the Registrant, as subsequently amended (incorporated by reference to Exhibit 3.1 to the Registrant's Annual Report on Form 10-K filed with the Securities and Exchange Commission on March 6, 2014).</u>
4.2	<u>Certificate of Amendment of Amended and Restated Certificate of Incorporation of the Registrant, dated August 1, 2017 (incorporated by reference to Exhibit 3.1 to the Registrant's Current Report on Form 8-K filed with the Securities and Exchange Commission on August 1, 2017).</u>
4.3	<u>Certificate of Amendment of Amended and Restated Certificate of Incorporation of the Registrant, dated August 1, 2017 (incorporated by reference to Exhibit 3.1 to the Registrant's Current Report on Form 8-K filed with the Securities and Exchange Commission on August 7, 2017).</u>
4.4	<u>Amended and Restated Bylaws of the Registrant (incorporated by reference to Exhibit 3.2 to the Registrant's Quarterly Report on Form 10-Q filed with the Securities and Exchange Commission on November 7, 2016).</u>
4.5	<u>Amended and Restated 2004 Employee Stock Purchase Plan (incorporated by reference to Exhibit 99.2 to the Registrant's Registration Statement on Form S-8 (File No. 333-164865) filed on February 11, 2010)</u>
4.6(A)	<u>Molecular Templates 2009 Stock Plan, as amended on March 9, 2010, September 14, 2010, March 28, 2011, August 22, 2012 and September 19, 2013 (incorporated by reference to Exhibit 10.34 to the Registrant's Registration Statement on Form S-4 filed with the Securities and Exchange Commission on May 15, 2017).</u>
4.6(B)	<u>Form of Stock Option Grant Notice and Stock Option Agreement under the Molecular Templates 2009 Stock Plan, as amended (incorporated by reference to Exhibit 10.40 to the Registrant's Registration Statement on Form S-4 filed with the Securities and Exchange Commission on May 15, 2017).</u>
4.7(A)	<u>2014 Equity Incentive Plan (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K filed with the Securities and Exchange Commission on October 13, 2017).</u>
4.7(B)	<u>Form of Stock Option Grant Notice and Option Agreement for employees under the 2014 Equity Incentive Plan (incorporated by reference to Exhibit 10.2 to the Registrant's Current Report on Form 8-K (File No. 001-32979) filed with the Securities and Exchange Commission on May 21, 2014).</u>
4.7(C)	<u>Form of Stock Option Grant Notice and Option Agreement for non-employee directors under the 2014 Equity Incentive Plan (incorporated by reference to Exhibit 10.3 to the Registrant's Current Report on Form 8-K (File No. 001-32979) filed with the Securities and Exchange Commission on May 21, 2014).</u>
5.1*	<u>Opinion of Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.</u>
23.1*	<u>Consent of Ernst & Young LLP, independent registered public accounting firm, regarding financial statements in the Registrant's Annual Report on Form 10-K filed on March 27, 2017.</u>
23.2*	<u>Consent of BDO USA, LLP, independent registered public accounting firm, regarding financial statements in the Registrant's Current Report on Form 8-K/A filed on October 17, 2017.</u>
23.3*	<u>Consent of Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C. (contained in Exhibit 5.1 hereto).</u>
24.1*	<u>Powers of Attorney (included in the signature page of this registration statement).</u>

* Filed herewith.

Item 9. Undertakings.

The undersigned Registrant hereby undertakes:

- (1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:
 - (i) To include any prospectus required by Section 10(a)(3) of the Securities Act;
 - (ii) To reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Securities and Exchange 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 (1)(i) and (1)(ii) do not apply if the registration statement is on Form S-8 and the information required to be included in a post-effective amendment by those paragraphs is contained in reports filed with or furnished to the SEC by the Registrant pursuant to section 13 or 15(d) of the Exchange Act that are incorporated by reference in the registration statement.

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

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

The undersigned Registrant hereby undertakes that, for purposes of determining any liability under the Securities Act, each filing of the Registrant's annual report pursuant to Section 13(a) or Section 15(d) of the Exchange Act (and, where applicable, each filing of an employee benefit plan's annual report pursuant to Section 15(d) of the Exchange Act) 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.

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

Signatures

Pursuant to the requirements of the Securities Act of 1933, as amended, the Registrant has duly caused this Registration Statement on Form S-8 to be signed on its behalf by the undersigned, thereunto duly authorized, in Austin, State of Texas, on October 18, 2017.

MOLECULAR TEMPLATES, INC.

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

Eric E. Poma, Ph.D.

Chief Executive Officer and Chief Scientific Officer

Power of Attorney

Each person whose signature appears below hereby constitutes and appoints Eric E. Poma, Ph.D. and Jason S. Kim, and each of them, acting individually, as his true and lawful attorneys-in-fact and agents, with full power of substitution and resubstitution, for him and in his name, place and stead, in any and all capacities, to sign any and all amendments to this Registration Statement (including post-effective amendments and registration statements filed pursuant to Rule 462) to this registration statement, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto each said attorney-in-fact and agent, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that each said attorney-in-fact and agent or his substitutes or substitute, may lawfully do or cause to be done by virtue hereof.

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

<u>Name</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Eric E. Poma, Ph.D.</u> Eric E. Poma, Ph.D.	Chief Executive Officer and Chief Scientific Officer (Principal Executive Officer) and Director	October 18, 2017
<u>/s/ Jason S. Kim</u> Jason S. Kim	President and Chief Operating Officer and Acting Chief Financial Officer (Principal Financial and Accounting Officer)	October 18, 2017
<u>/s/ Harold E. Selick, Ph.D.</u> Harold E. Selick, Ph.D.	Director	October 18, 2017
<u>/s/ Michael Broxson</u> Michael Broxson	Director	October 18, 2017
<u>/s/ David Hirsch, MD, Ph.D.</u> David Hirsch, MD, Ph.D.	Director	October 18, 2017
<u>/s/ David Hoffmann</u> David Hoffmann	Director	October 18, 2017
<u>/s/ Kevin Lalande</u> Kevin Lalande	Director	October 18, 2017
<u>/s/ Scott Morenstein</u> Scott Morenstein	Director	October 18, 2017

MINTZ LEVIN

One Financial Center
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617-542-6000
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October 18, 2017

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

Re: Registration Statement on Form S-8; 2,323,711 shares of Common Stock of Molecular Templates, Inc., par value \$0.001 per share

Ladies and Gentlemen:

We have acted as counsel to Molecular Templates, Inc., a Delaware corporation (the "Company"), in connection with the preparation and filing with the Securities and Exchange Commission (the "Commission") of a Registration Statement on Form S-8 (the "Registration Statement"), pursuant to which the company is registering the issuance under the Securities Act of 1933, as amended (the "Securities Act"), of an aggregate of 2,323,711 shares (the "Shares") of the Company's common stock, par value \$0.001 per share, that may be issued pursuant to the Company's 2009 Stock Plan, as amended (the "2009 Plan"), 2014 Equity Incentive Plan, as amended (the "2014 Plan") and Amended and Restated 2004 Employee Stock Purchase Plan (the "2004 ESSP" and together with the 2009 Plan and the 2014 Plan, the "Plans"). This opinion is being rendered in connection with the filing of the Registration Statement with the Commission. All capitalized terms used herein and not otherwise defined shall have the respective meanings given to them in the Registration Statement.

As the counsel to the Company in connection with the Registration Statement, we have examined the actions taken by the Company in connection with the authorization of the issuance of the Shares, and such documents as we have deemed necessary to render this opinion. 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. As to questions of fact material to this opinion, we have relied upon certificates or comparable documents of public officials and of officers and representatives of the Company. In addition, we have assumed that the Company will receive any required consideration in accordance with the terms of the Plan.

Our opinion is limited to the General Corporation Law of the State of Delaware (the "DGCL"), 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 of any foreign jurisdiction.

Based upon and subject to the foregoing, it is our opinion that the Shares, when issued and delivered in accordance with the terms of the Plan, will be validly issued, fully paid and non-assessable.

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

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

BOSTON | LONDON | LOS ANGELES | NEW YORK | SAN DIEGO | SAN FRANCISCO | STAMFORD | WASHINGTON

October 18, 2017

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

Very truly yours,

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

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

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in the Registration Statements (Form S-8) pertaining to the Amended and Restated 2004 Employee Stock Purchase Plan, 2009 Stock Plan, as amended, and 2014 Equity Incentive Plan, as amended, of Molecular Templates, Inc. of our report dated March 27, 2017, with respect to the consolidated financial statements of Molecular Templates, Inc. (formerly known as Threshold Pharmaceuticals, Inc.) included in its Annual Report (Form 10-K) for the year ended December 31, 2016, filed with the Securities and Exchange Commission.

/s/ Ernst & Young LLP

Austin, Texas
October 17, 2017

Consent of Independent Registered Public Accounting Firm

Molecular Templates, Inc.
Austin, Texas

We hereby consent to the incorporation by reference in the Prospectus constituting a part of this Registration Statement on Form S-8 of our report dated February 22, 2017, relating to the financial statements of Molecular Templates, Inc., appearing in the current report on Form 8-K/A filed by Molecular Templates, Inc., (f/k/a Threshold Pharmaceuticals, Inc.) on October 17, 2017. Our report contains an explanatory paragraph regarding the Company's ability to continue as a going concern.

/s/ BDO USA, LLP

Austin, Texas

October 17, 2017

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