June 22, 2020

Molecular Templates' Presentations at the American Association of Cancer Research (AACR) Annual Meeting 2020 Highlight Evolution of ETB Platform

Update Provided Phase I Study of MT-5111 in HER2-positive Cancers

Conference Call and Webcast to Discuss AACR Posters on June 25th at 10:30am Eastern Time

AUSTIN, Texas, June 22, 2020 (GLOBE NEWSWIRE) -- Molecular Templates, Inc. (Nasdaq: MTEM, "Molecular Templates," "MTEM" or the "Company"), a clinical-stage biopharmaceutical company focused on the discovery and development of the Company's proprietary targeted biologic therapeutics, engineered toxin bodies (ETBs), announced that four poster presentations featuring pre-clinical data on its pipeline programs are being presented at the American Association of Cancer Research (AACR) Virtual Annual Meeting 2020, being held June 22-24, 2020. Copies of the posters presented at AACR can be found in the Presentations section of Molecular Templates' website at http://ir.mtem.com/events-and-presentations/presentations. MTEM also announced an update on its ongoing Phase I study of MT-5111 in HER2-positive cancers.

Poster Title: *In Vivo Efficacy of a PD-L1 Targeted, Antigen Seeding Engineered Toxin Body*

Authors: Hilario J. Ramos, Brigitte Brieschke, Sara LeMar, Joseph D. Dekker, Aimee Iberg, Garrett L. Robinson, Asis Sarkar, Banmeet Anand, Melissa M. Singh, Jay Zhao, Jack P. Higgins, Erin K. Willert. Molecular Templates Inc., Austin, TX

MT-6402 is a unique agent designed to deplete tumor and repressive immune cells in the tumor microenvironment. It has multiple unique mechanisms of action that may provide greater potency than is seen with current PD-L1 antibodies. MT-6402 was shown to have potent in vitro activity against a variety of PD-L1+ tumor cells and results in tumor growth delay and survival benefits in NSCLC PDX in vivo model. MT-6402 can alter the immunophenotype of the tumor and allow for recognition by effector T cells. Non-human primate (NHP) data show that MT-6402 mediated PD-L1+ immune cell clearance can elicit highly potent monotherapy immune activation in a way that has not been seen previously in NHP models with checkpoint inhibitors. MT-6402 is slated for IND filing in 2H20.

Poster Title: *CTLA-4 Targeted Engineered Toxin Bodies Designed to Deplete Regulatory T Cells (Tregs)*

Authors: Aimee Iberg, Edith Acquaye-Seedah, Lilia A. Rabia, Garrett L. Robinson, Hilario J. Ramos, Joseph D. Dekker, Jay Zhao, Erin K. Willert. Molecular Templates Inc., Austin, TX

Tumor resident regulatory T cells (Tregs) are important mediators of an immunosuppressive tumor microenvironment (TME) promoting tumor immune evasion. The presence of Tregs, and a higher ratio of Tregs to effector T cells in the TME, are associated with poor prognosis. There is concern that antibodies to CTLA-4 are not sufficiently effective at clearing Tregs from the TME. ETBs are being developed to specifically target CTLA-4+ Tregs and clear them from the TME. Because CTLA-4-targeted ETBs preferentially affect Tregs versus CTLA-4+ CD8 T-cells, ETBs may also have a safer profile than CTLA-4 antibodies. In co-culture models CTLA-4 ETBs were shown to relieve Treg suppression of T-effector proliferation. Experiments in mice showed that CTLA-4 ETB 1 (as labeled on the AACR poster) displays a short serum half-life and is well tolerated in vivo. An IND for a CTLA-4 ETB is expected to be filed in 2021.

Poster Title: *Novel Engineered Toxin Bodies Targeting SLAMF7 (CS1)*

Authors: Aimee Iberg, Garrett L. Cornelison, Caleigh Howard, Garrett L. Robinson, Jay Zhao, Hilario J. Ramos, Erin K. Willert. Molecular Templates Inc., Austin, TX

SLAMF7 (CS1) is a clinically validated target of monoclonal antibody therapy for the treatment of multiple myeloma. The approved antibody-based therapeutic, elotuzumab, works indirectly by recruiting effector cells to the tumor but does not show single agent clinical activity. ETBs have the potential to deplete malignant cells by means of potent and direct cell kill through enzymatic ribosomal destruction. SLAMF7 ETBs were shown to be active alone and in the presence of elotuzumab. Epitopes distinct from elotuzumab are options for ETB engagement, allowing activity in the presence of elotuzumab. SLAMF7 ETBs combine with standard of care chemotherapy (IMiDs) and bortezomib in a positive manner in vitro. Lead selection is underway with the testing of various ETB scaffolds and additional binding domains targeting multiple SLAMF7 epitopes.

Poster Title: *CD45 Targeted Engineered Toxin Bodies Deplete Hematopoietic and Malignant Cells*

Authors: Aimee Iberg, Garrett L. Robinson, Sara LeMar, Joseph D. Dekker, Jay Zhao, Hilario J. Ramos, Melissa M. Singh, Erin K. Willert. Molecular Templates Inc., Austin, TX

CD45, the leucocyte common antigen, is a haemopoietic cell-specific tyrosine phosphatase. Targeted and potent ETBs with intrinsically short half-lives are being developed to specifically destroy CD45 expressing cells including malignant cells of B, T and myeloid lineage. A single agent, targeted conditioning method for bone marrow transplant (BMT), employing ETBs, has the potential to increase patient safety and eliminate genotoxic effects that are associated with existing conditioning regimens. Antibody discovery campaigns have the potential to direct ETBs to specific isoforms of CD45 for refinement of indications including various cancers and autoimmune diseases.

Update on Phase I study of MT-5111

MT-5111, a HER2 targeted ETB, is in an ongoing Phase 1 study that has two parts: Part 1 is dose escalation and Part 2 is dose expansion, which will begin when a maximum tolerated dose (MTD) or Recommended Phase 2 Dose (RP2D) is established in Part 1. To date, 10 subjects, with a median of 5 prior lines of therapy and a median of 2 prior HER2-targeting regimens, have been treated with MT-5111 (metastatic cholangiocarcinoma n=5, metastatic breast cancer n=4, metastatic gastro-esophageal junction carcinoma n=1). Thus far, no

dose limiting toxicities (DLTs) have been observed in any cohort and MT-5111 appears to be well tolerated, with no cardiotoxicity to date (cardiotoxicity is a known potential toxicity for HER2 targeted therapies).

Currently there are 4 subjects in total on treatment from the second (1 µg/kg/dose) and third cohorts (2 µg/kg/dose). No cardiac AEs or abnormalities in cardiac biomarkers have been noted thus far. Reported AEs that may be causally related among the 3 cohorts to date include the following: one instance of grade 1 chills, one instance of grade 1 hypophosphatemia, one instance of grade 1 nausea, and one instance of grade 2 AST elevation. The grade 2 AST elevation occurred in a subject in cohort 1 with disease progression in hepatic metastases; no causally related AST or ALT elevations have been noted in any other subjects to date. The ongoing subject from cohort 2 (45 y/o female with metastatic breast cancer) has stable disease (the subject only has evaluable disease but no measurable lesions per RECIST 1.1, and is classified as non-CR, non-PD per protocol) and remains on treatment, now in cycle 5. One subject in cohort 3 with metastatic breast cancer has had a follow-up CT scan at the end of cycle 2 and has stable disease. Six subjects have discontinued for disease progression and two subjects are too early to evaluate. Cohort 4 (3.0 µg/kg/dose) is anticipated to open shortly. Molecular Templates is encouraged by the safety profile to date in these heavily pretreated patients and expects to provide an update on results from the patients currently on treatment as well as higher dose cohorts from the dose escalation portion of the Phase 1 study (including doses that are predicted to be clinically active based on preclinical data) in 4Q20.

Conference Call and Webcast to Discuss AACR Posters

Molecular Templates will host a live webcast and conference call in Eric Poma, Ph.D., Molecular Templates' Chief Executive Officer and Scientific Officer, will provide an update on the Company's pipeline programs and discuss the four abstracts presented at AACR.

Thursday, June 25th at 10:30am Eastern Time

Domestic: *877-705-6003*
International: *201-493-6725*
Conference ID: *13704222*
Webcast: https://viavid.webcasts.com/starthere.jsp?ei=1322770&tp_key=655ccca2f4

The Molecular Templates management team will be available for a question and answer session at the conclusion of this call.

About Molecular Templates
Molecular Templates is 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 to create novel therapies with potent and differentiated mechanisms of action for cancer and other serious diseases.

Forward-Looking Statements
This press release contains forward-looking statements for purposes of the Private Securities Litigation Reform Act of 1995 (the "Act"). Molecular Templates disclaims any intent or obligation to update these forward-looking statements, and claims the protection of

the Act's Safe Harbor for forward-looking statements. All statements, other than statements of historical facts, included in this press release regarding strategy, future operations, future financial position, future revenue, projected expenses, prospects, plans and objectives of management are forward-looking statements. In addition, when or if used in this press release, the words "may," "could," "should," "anticipate," "believe," "estimate," "expect," "intend," "plan," "predict" and similar expressions and their variants, as they relate to Molecular Templates may identify forward-looking statements. Examples of such statements include, but are not limited to, statements relating to the Company's options with respect to the second and third tranche term loans.

Forward-looking statements are not guarantees of future performance and involve risks and uncertainties. Actual events or results may differ materially from those discussed in the forward-looking statements as a result of various factors including, but not limited to, the uncertainties inherent in the preclinical and clinical development process; whether the Company will achieve its expected milestones; risks from global pandemics including COVID-19; whether the Company's cash resources will be sufficient to fund its continuing operations for the periods and/or trials anticipated; the ability of the Company to protect its intellectual property rights; and legislative, regulatory, political and economic developments, as well as those risks identified under the heading "Risk Factors" in the Company's filings with the SEC. Any forward-looking statements contained in this press release speak only as of the date hereof, and the Company specifically disclaims any obligation to update any forward-looking statement, whether because of new information, future events or otherwise

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