miRagen Announces Major Changes to Company's Strategy

December 11, 2019

- *Expecting topline data in Q3 2020 from truncated Phase 2 SOLAR clinical trial of cobomarsen in CTCL*
- *Pursuing guidance from FDA on a clinical development plan for cobomarsen in ATLL; anticipate meeting in Q2 2020*
- *Focusing future pipeline efforts primarily on the development of MRG-229 for the treatment of IPF; preclinical data expected in Q2 2020*
- *Announces interim data from a Phase 2 clinical trial of remlarsen in keloid scars*
- *Announces additional reduction in work force as part of strategic shift and cost realignment*
- *Announces the departure of Paul Rubin, M.D., Executive Vice President of R&D and transition plan promoting Diana Escolar, M.D. to the position of Chief Medical Officer*
- *Extends anticipated cash runway into Q4 2020*
- *Entered into a $20 million firm commitment common stock purchase agreement with Aspire Capital Fund, LLC, including an initial sale of $1.0 million in common stock*
- *Management to host conference call today at 5:00 p.m. ET*

BOULDER, Colo., Dec. 11, 2019 (GLOBE NEWSWIRE) -- miRagen Therapeutics, Inc. (NASDAQ: MGEN), a clinical-stage biopharmaceutical company developing proprietary RNA-targeted therapies with a specific focus on microRNAs, today announced a series of strategic changes across its business that are intended to reallocate its existing capital to deliver important milestones in 2020. These changes include a revised development strategy aimed at delivering data in 2020 from a modified Phase 2 SOLAR clinical trial of cobomarsen in cutaneous T-cell lymphoma (CTCL), consulting with the U.S. Food and Drug Administration (FDA) to define a development path for cobomarsen in adult T-cell leukemia/lymphoma (ATLL), and focusing future pipeline development efforts primarily on MRG-229, a novel second generation miR-29 mimic and potential treatment in patients with idiopathic pulmonary fibrosis (IPF).

Together with its updated development strategy, the Company is streamlining operations and reallocating its existing resources, which includes a workforce reduction that will impact approximately 18 employees. After changes to the SOLAR clinical trial and the reduction in workforce, the Company believes its cash and cash equivalents will now be sufficient to fund its operations into the fourth quarter of 2020.

"We are executing on a strategy to streamline our operations which we believe will allow us to focus our development efforts and deliver important milestones in 2020," stated William S. Marshall, Ph.D., President and Chief Executive Officer of miRagen. "Delivering controlled data in CTCL and gaining clarity on the development path for cobomarsen in ATLL are important aspects in support of our belief that cobomarsen has the potential to be a broad-based therapy for the treatment of cancer patients with elevated levels of miR-155," concluded Dr. Marshall.

"We have also been encouraged by the preclinical data we have generated with our next generation microRNA-29 mimic, MRG-229, and will primarily focus our pipeline development efforts and allocation of future capital on advancing MRG-229. We believe that the preclinical data we have collected demonstrate that MRG-229 has the potential for superior efficacy in treating patients with IPF, a fibrotic disease with high unmet medical need. If effective, MRG-229 possesses a mechanism of action that we believe could be particularly valuable for patients with this deadly disease."

Cobomarsen Update

The Company announced today that it will stop the enrollment of new patients in its Phase 2 clinical trial of cobomarsen, SOLAR, effective as of the end of the 2019. Patients enrolled in the trial at that time will continue to be evaluated for safety and clinical response. The Company initially planned to enroll up to 126 patients and now expects to enroll approximately 30 patients. Despite the reduction in patient enrollment, the Company believes that evaluation of data from this set of patients can provide important evidence regarding the safety and efficacy of cobomarsen for the treatment of CTCL in a shorter period of time and require fewer resources. The Company also believes that obtaining controlled clinical data from this cohort of patients may allow for a better assessment of the clinical potential of cobomarsen as compared to data from our Phase 1 trial. The Company intends for this controlled clinical data to form the basis of determining what additional clinical investigation of cobomarsen in CTCL is warranted, if any, and what would be required to potentially obtain regulatory approval. Topline data from this amended trial is expected to be announced in the third quarter of 2020.

In addition to CTCL, miRagen is also evaluating cobomarsen in a Phase 1 basket trial of other cancers where the disease process appears to be correlated with an increase in miR-155 levels, ATLL, diffuse large B-cell lymphoma, and chronic lymphocytic leukemia. In this clinical trial, the Company believes that cobomarsen has demonstrated promising interim results in several ATLL patients. Based on these interim results, the Company is announcing today that it is focusing its cobomarsen expansion indication efforts on ATLL and will request a meeting with the FDA to explore a potential expedited development pathway for cobomarsen in ATLL. The Company expects to have a meeting with the FDA in the second quarter of 2020.

microRNA-29 Mimics

The Company is developing miR-29 mimics or replacements for miR-29, a microRNA that is found at abnormally low levels in a number of pathological fibrotic conditions. The Company's lead microRNA-29 mimics are remlarsen and MRG-229. Remlarsen is the Company's most advanced product candidate in fibrosis, which is currently being evaluated in a Phase 2 clinical trial assessing its safety, tolerability, and activity in the potential prevention or reduction of keloid formation in patients with a history of keloid scars, a form of pathological scarring. Today, the Company reported interim data from this clinical trial, which suggests that remlarsen was generally safe and well tolerated, treatment had no negative effect on healing reported and initial volume reductions in treated keloids compared to placebo in a subset of patients were observed. Based on this data, the Company has decided

to continue its analysis of patient data at the one-year primary endpoint of the clinical trial. With this data, the Company may seek a collaboration partner for the future development of remlarsen.

In addition, based on preclinical data with MRG-229, the Company announced that its pipeline development efforts and allocation of future capital will be primarily focused on the development of MRG-229 for IPF. The Company believes that the efficacy and safety profile of MRG-229 positions it as a potentially differentiated approach to the treatment of IPF. miRagen expects to report additional preclinical-safety and -efficacy data during the first half of 2020. This program is supported by a grant in collaboration with the National Institutes of Health and Yale University.

Cost Restructuring Plan

The Company is executing on a plan to streamline its operations, which it expects will result in the reduction of approximately 18 employees over the next seven months. The reductions are primarily in positions relating to research and development and corresponding project, general and administrative support. miRagen estimates that it will incur approximately $0.7 million in restructuring charges primarily for severance and other related costs for the employees impacted by the reduction in force over the next seven months. In addition, the Company plans to enter into severance and retention bonus agreements with its remaining workforce.

The Company also announced today that Paul Rubin, M.D., Executive Vice President of R&D, is leaving the Company effective December 31, 2019 to spend more time with his family. Dr. Rubin remains excited about the potential of the Company's technology and will continue to provide guidance and advice to miRagen through a consulting arrangement. "Paul has made significant contributions to miRagen on multiple levels," said William S. Marshall, Ph.D. "He has led our research and development efforts for the last three years resulting in important advances in our clinical and preclinical pipeline with the goal of helping to serve patients around the world. We wish Paul the best in his future endeavors and appreciate the ability to continue to seek advice and guidance in the future."

With the departure of Dr. Rubin, the Company has named Diana Escolar, M.D. as Chief Medical Officer. Dr. Escolar joined the Company in January 2018 and has served as miRagen's Senior Vice President of Clinical Sciences. Dr. Escolar has helped to lead the clinical development strategies and implement the Company's clinical programs over the last two years. "We are pleased that Diana will continue to lead our clinical sciences efforts and expand her role as the Chief Medical Officer," Marshall continued. "She is a dynamic physician scientist with strong capabilities in clinical development, especially in the rare disease setting."

Common Stock Purchase Agreement

On December 11, 2019, the Company signed a $20 million common stock purchase agreement (Purchase Agreement) with Aspire Capital Fund, LLC (Aspire Capital). Immediately following the execution of the Purchase Agreement, Aspire Capital purchased 1,598,465 shares of common stock at a price of $0.6256 per share. miRagen has the right to sell up to the remaining $19.0 million of its common stock to Aspire Capital over a 30-month period, at prices based on a formula linked to current market prices at or around the time of each sale. The Company also issued 959,079 shares of common stock to Aspire Capital in consideration for entering into the Purchase Agreement. Aspire Capital has the obligation to purchase common stock from miRagen in amounts and based on timing determined by miRagen in its sole discretion, subject to certain limits. The Purchase Agreement does not contain any restrictions on the use of the proceeds, financial or other covenants or restrictions. The Company expects to use proceeds from the sale of common stock under the Purchase Agreement to advance the development of MRG-229, as well as general corporate purposes including business development initiatives.

This press release does not constitute an offer to sell or a solicitation of an offer to buy the securities in this offering, nor will there be any sale of these securities in any jurisdiction in which such offer, solicitation or sale are unlawful prior to registration or qualification under securities laws of any such jurisdiction.

Conference Call Information

miRagen will host a conference call today at 5:00 p.m. ET to discuss its focused development strategy, cost reduction measures and upcoming milestones in 2020. Participants may access the call by dialing 877-407-0789 in the U.S. or 201-689-8562 the U.S. and providing the conference ID number: 13697446. The call will also be webcast and can be accessed from the Investors and Media section of miRagen's website at www.miragen.com. A replay of this conference call will be available on miRagen's website approximately one hour after the event.

About miRagen Therapeutics

miRagen Therapeutics, Inc. is a clinical-stage biopharmaceutical company discovering and developing proprietary RNA-targeted therapies with a specific focus on microRNAs and their role in diseases where there is a high unmet medical need. miRagen has three clinical stage product candidates, cobomarsen, remlarsen, and MRG-110. miRagen is developing cobomarsen for the treatment of patients with certain cancers, including cutaneous T-cell lymphoma and adult T-cell leukemia/lymphoma. Cobomarsen, is an inhibitor of microRNA-155, which is found at abnormally high levels in malignant cells of several blood cancers. miRagen is also developing remlarsen and MRG-229, which are product candidates for the treatment of patients with pathological fibrosis. These product candidates are replacements for microRNA-29, which is found at abnormally low levels in a number of pathological fibrotic conditions, including cutaneous, cardiac, renal, hepatic, pulmonary and ocular fibrosis, as well as in systemic sclerosis. MRG-110, an inhibitor of microRNA-92, is miRagen's product candidate for the treatment of heart failure and other ischemic disease. For more information, please visit www.miragen.com. For information on clinical trials please visit www.clinicaltrials.gov.

Note Regarding Forward-Looking Statements

This press release may contain forward-looking statements that involve substantial risks and uncertainties for purposes of the safe harbor provided by the Private Securities Litigation Reform Act of 1995. All statements contained in this press release other than statements of historical fact, including statements regarding miRagen's strategy, anticipated clinical development milestones, future operations, future financial position, future revenue, projected expenses, prospects, plans and objectives of management or the expected features of or potential indications for miRagen's product candidates are forward-looking statements. The words "believe," "may," "will," "estimate," "continue," "anticipate," "intend," "plan," "expect," "predict," "potential," "opportunity," "goals," or "should," and similar expressions are intended to identify forward-looking statements. Such statements are based on management's current expectations and involve risks and uncertainties. Actual results and performance could differ materially from those projected in the forward-looking statements as a result of many factors, including, without limitation: that miRagen has incurred losses since its inception, and anticipates that it will continue to incur significant losses for the foreseeable future; future financing activities may cause miRagen to restrict its operations or require it to relinquish rights; miRagen may fail to demonstrate safety and efficacy of its product candidates; miRagen's product

candidates are unproven and may never lead to marketable products; miRagen's product candidates are based on a relatively novel technology, which makes it difficult to predict the time and cost of development and of subsequently obtaining regulatory approval, if at all; miRagen's product candidates may cause undesirable side effects or have other properties that could delay or prevent the regulatory approval; and the results of miRagen's clinical trials to date are not sufficient to show safety and efficacy of miRagen's product candidates and may not be indicative of future clinical trial results.

miRagen has based these forward-looking statements largely on its current expectations and projections about future events and trends. These forward-looking statements are subject to a number of risks, uncertainties and assumptions, including those described under the heading "Risk Factors" in miRagen's Annual Report on Form 10-K and subsequent periodic reports filed with the Securities and Exchange Commission. Moreover, miRagen operates in a very competitive and rapidly changing environment. New risks emerge from time to time.

It is not possible for its management to predict all risks, nor can it assess the impact of all factors on its business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements it may make. In light of these risks, uncertainties and assumptions, the future events and trends discussed in this press release may not occur and actual results could differ materially and adversely from those anticipated or implied in the forward-looking statements. miRagen undertakes no obligation to revise or publicly release the results of any revision to such forward-looking statements, except as required by law. Given these risks and uncertainties, readers are cautioned not to place undue reliance on such forward-looking statements. All forward-looking statements are qualified in their entirety by this cautionary statement.

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