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Small molecules that makes stem cells into heart cells

San Diego, Calif., August 13, 2015 –Researchers at the Human BioMolecular Research Institute, the Sanford-Burnham-Prebys Medical Discovery Institute (Sanford-Burnham-Prebys), and ChemRegen, Inc. have created a small molecule that convert stem cells to heart cells. Published online on August 13th in *Bioorganic and Medicinal Chemistry*, the team describes how they synthesized and tested a novel class of 1,5-disubstituted benzimidazoles that can be used to generate unlimited numbers of new heart cells from stem cells.

"Because heart disease is the leading cause of death in this country we need to effectively replace lost heart muscle cells—called cardiomyocytes" said Mark Mercola, Ph.D., Director of Sanford-Burnham-Preby's Muscle Development and Regeneration Program. "Using a small molecule to create new heart muscle cells from stem cells is very appealing."

Small molecule regenerative medicines

To find a synthetic molecule that might one day lead to a drug therapy to regenerate heart cells, a team of medicinal chemists at the Human BioMolecular Research Institute led by John Cashman, Ph.D., refined a "hit" compound, obtained from a screening campaign of a diverse set of chemical structures, using dynamic medicinal chemistry. Through this research, the team obtained several compounds with improved potency and drug-like properties. When the small molecule was added to stem cells, it resulted in cardiomyocyte formation. "These compounds can be used to facilitate mobilization of various pathways in stem cells that lead to cardiomyocyte formation." explained Karl Okolotowicz, Ph.D., researcher and lead author of the paper in Cashman's lab.

Scientific information

Stem cells are important because they do novel things, including: 1) they self-renew, producing more stem cells, and 2) they differentiate, becoming other, more specialized cell types. To obtain a large number of a certain cell type, such as heart cells, the hard part is figuring out the cellular signals that direct them to become the desired cell type.

The researchers discovered that a novel class of 1,5-disubstituted benzimidazoles, when added to mouse embryonic stem cells, induced cardiomyocyte formation. Although the detailed site and mechanism of action is still unknown, the results show the stem cells differentiate into heart cells. T study shows the promise of small molecules to direct stem cell lineage commitment, to stimulate signaling pathways and to develop compounds for the stimulation of stem cells to repair damaged heart tissue.

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Media contacts: To arrange on-site, phone, or Skype interviews with the researchers involved in this study, please contact John Cashman at (858) 458-9305 / JCashman@hbri.org or Susan Gammon at (858) 795-5343 / sgammon@sbpdiscovery.org.

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The study was co-authored by Karl J Okolotowicz, Human BioMolecular Research Institute and ChemRegen Inc.; Paul J Bushway, Sanford Burnham Prebys Medical Discovery Institute and University of California, San Diego; Marion Lanier, Human BioMolecular Research Institute and ChemRegen Inc.; Cynthia Gilley, Human BioMolecular Research Institute; Mark Mercola, Sanford Burnham Prebys Medical Discovery Institute, University of California, San Diego and ChemRegen Inc., and John Cashman, Human BioMolecular Research Institute and ChemRegen Inc.

About Human BioMolecular Research Institute

The Human BioMolecular Research Institute is a non-profit research institute conducting basic research focused on unlocking biological and chemical principles related to diseases of the human brain, cardiovascular disease and cancer. The Institute conducts fundamental studies of central nervous system disorders, heart disease and cancer including stem cell approaches and translates findings into new drug development to address human illness. In addition, the institute promotes scientific learning through community service and public access by disseminating information and sharing research with collaborators, colleagues and the public. For more information, visit us at www.HBRI.org.

About Sanford Burnham Prebys Medical Discovery Institute
Sanford Burnham Prebys Medical Discovery Institute is dedicated to discovering the fundamental molecular causes of disease and devising the innovative therapies of tomorrow. The Institute consistently ranks among the top five organizations worldwide for its scientific impact in the fields of biology and biochemistry (defined by citations per publication) and currently ranks third in the nation in NIH funding among all laboratory-based non-profit research institutes. SBPMDI utilizes a unique, collaborative approach to medical research and has established major research programs in cancer, neurodegeneration, diabetes, and infectious, inflammatory, and childhood diseases. The Institute is especially known for its world-class capabilities in stem cell research and drug discovery technologies. SBPMDI is a U.S.-based, non-profit public benefit corporation, with operations in San Diego (La Jolla), California and Orlando (Lake Nona), Florida. For more information, news, and events, please visit us at http://www.sbpdiscovery.org.

About ChemRegen, Inc.
ChemRegen, Inc., is a for-profit company doing research directed at identifying small molecules for use in addressing human diseases. The approach is to develop regenerative medicines to work in conjunction with human embryonic stem cells to cure major human diseases including heart disease, cancer and other diseases. For more information, visit www.ChemRegen.com.