

Magnetic attraction of stem cells creates more potent treatment for heart attack

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Researchers at the Cedars-Sinai Heart Institute have found in animals that infusing cardiac-derived stem cells with micro-size particles of iron and then using a magnet to guide those stem cells to the area of the heart damaged in a heart attack boosts the heart's retention of those cells and could increase the therapeutic benefit of stem cell therapy for heart disease.

The study is published today online by *Circulation Research*, a scientific journal of the American Heart Association. The study also will appear in the journal's May 28th printed edition.

"Stem cell therapies show great promise as a treatment for heart injuries, but 24 hours after infusion, we found that less than 10 percent of the [stem cells](#) remain in the injured area," said Eduardo Marbán, M.D., director of the Cedars-Sinai Heart Institute. "Once injected into a patient's artery, many stem cells are lost due to the combination of tissue blood flow, which can wash out stem cells, and cardiac contraction, which can squeeze out stem cells. We needed to find a way to guide more of the cells directly to the area of the heart that we want to heal."

Marbán's team, including Ke Cheng, Ph.D. and other researchers, then began a new animal investigation, loading cardiac stem cells with micro-size iron particles. The iron-loaded cells were then injected into rats with a heart attack. When a toy magnet was placed externally above the heart and close to the damaged heart muscle, the stem cells clustered at the site of injury, retention of cells in the heart tripled, and the injected cells

went on to heal the heart more effectively.

"Tissue viability is enhanced and heart function is greater with magnetic targeting," said Marbán, who holds the Mark Siegel Family Foundation Chair at the Cedars-Sinai Heart Institute and directs Cedars-Sinai's Board of Governors Heart Stem Cell Center. "This remarkably simple method could easily be coupled with current stem cell treatments to enhance their effectiveness."

In the future, this finding in the animal model may build on the ongoing, groundbreaking clinical trial led by Raj Makkar, M.D., director of interventional cardiology for the Cedars-Sinai Heart Institute. In the clinical trial, which is based on Marbán's research, heart attack patients undergo two minimally-invasive procedures in an effort to repair and re-grow healthy muscle in a heart injured by a [heart attack](#). First, a biopsy of each patient's own heart tissue is used to grow specialized heart stem cells. About a month later, the multiplied stem cells are then injected back into the patient's heart via a coronary artery.

The two-step procedure was completed on the first patient in June 2009. Complete results are expected in early-2011.

Recently, Marbán received a \$5.5 million grant from the California Institute for Regenerative Medicine to continue developing cardiac stem cell therapies.

The Cedars-Sinai Heart Institute is internationally recognized for outstanding heart care built on decades of innovation and leading-edge research. From cardiac imaging and advanced diagnostics to surgical repair of complex heart problems to the training of the heart specialists of tomorrow and research that is deepening medical knowledge and practice, the Cedars-Sinai Heart Institute is known around the world for excellence and innovations.

Marbán invented the methods used to grow and expand stem cells from heart biopsies. Marbán filed patents regarding those innovations which are licensed by Capricor, Inc. Marbán and his wife, Linda Marban, Ph.D. are both founders of Capricor, Inc. Dr. Eduardo Marban serves on its Board of Directors, and owns equity in the company. Dr. Linda Marban serves as a consultant to Capricor.

More information: To read the complete study, visit www.circres.ahajournals.org

Provided by Cedars-Sinai Medical Center

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