

Delivering stem cells into heart muscle may enhance cardiac repair and reverse injury

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Delivering stem cell factor directly into damaged heart muscle after a heart attack may help repair and regenerate injured tissue, according to a study led by researchers from Icahn School of Medicine at Mount Sinai presented November 18 at the American Heart Association Scientific Sessions 2014 in Chicago, IL.

“Our discoveries offer insight into the power of stem cells to regenerate damaged muscle after a heart attack,” says lead study author Kenneth Fish, PhD, Director of the Cardiology Laboratory for Translational Research, Cardiovascular Research Center, Mount Sinai Heart, Icahn School of Medicine at Mount Sinai.

In the study, Mount Sinai researchers administered stem cell factor (SCF) by gene transfer shortly after inducing heart attacks in pre-clinical models directly into damaged heart tissue to test its regenerative repair response. A novel SCF gene transfer delivery system induced the recruitment and expansion of adult c-Kit positive (cKit+) cardiac stem cells to injury sites that reversed heart attack damage. In addition, the gene therapy improved cardiac function, decreased heart muscle cell death, increased regeneration of heart tissue blood vessels, and reduced the formation of heart tissue scarring.

“It is clear that the expression of the stem cell factor gene results in the generation of specific signals to neighboring cells in the damaged heart resulting in improved outcomes at the molecular, cellular, and organ level,” says Roger J. Hajjar, MD, senior study author and Director of the Cardiovascular Research Center at Mount Sinai. “Thus, while still in the early stages of investigation, there is evidence that recruiting this small group of stem cells to the heart could be the basis of novel therapies for halting the clinical deterioration in patients with advanced heart failure.”

cKit+ cells are a critical cardiac cytokine, or protein receptor, that bond to stem cell factors. They naturally increase after myocardial infarction and through cell proliferation are involved in cardiac repair.

According to researchers there has been a need for the development of interventional strategies for cardiomyopathy and preventing its progression to heart failure. Heart disease is the number one cause of death in the United States, with cardiomyopathy or an enlarged heart from heart attack or poor blood supply due to clogged arteries being the most common causes of the condition. In addition, cardiomyopathy causes a loss of cardiomyocyte cells that control heartbeat, and changes in heart shape, which lead to the heart’s decreased pumping efficiency.

“Our study shows our SCF gene transfer strategy can mobilize a promising adult stem cell type to the damaged region of the heart to improve cardiac pumping function and reduce myocardial infarction sizes

resulting in improved cardiac performance and potentially increase long-term survival and improve quality of life in patients at risk of progressing to heart failure,” says Dr. Fish.

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