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Stem Cells Grow Heart Tissue in Lab; New technique described as a Band-Aid for damaged muscle

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THURSDAY, Oct. 15 (HealthDay News) -- Researchers report a major step toward the goal of literally rebuilding a broken heart -- creating a strip of working heart muscle in the laboratory by using a newly identified human cardiac master stem cell.

"This work moves us closer to heart stem cell therapy," said Dr. Kenneth Chien, director of the Massachusetts General Center for Cardiovascular Research, a member of the Harvard Stem Cell Institute and leader of a group reporting the work online Oct. 15 in *Science*.

That therapy, he said, would be "almost like slapping a Band-Aid on the heart."

One possibility is that a thin layer of muscle cells of the ventricles, the heart chambers that pump blood to the body, would be placed over the area of tissue damaged by a heart attack, where it would expand and grow into working heart muscle. Another is that the cells would be injected into the damaged area, with the hope that they would grow to form healthy new tissue.

"For doing this in animals, I anticipate being able to do some version of this in the coming year," Chien said. "Talking clinically, I believe that in five years or so the groundwork would be laid for very early clinical studies to deliver these cells to humans."

A key discovery was identifying the specific stem cells used to produce the strip of heart muscle, Chien said. Those cells were identified in humans just two months ago, the latest step in a series of discoveries, first in mice and then in humans, that, among other things, determined that a completely different stem cells gives rise to the left side of the heart, where most disease occurs, he said.

Once those cells were identified, a technique developed in the laboratory of Kevin Kit Parker, an associate professor of applied science at Harvard's School of Engineering and Applied Sciences, was used to grow the strip of heart muscle.

The cells are grown on a thin layer of polymer film, he said, with the same technology used to form the microelectronic components found in cell phones and other advanced gadgets.

"We squeeze the cells onto a circuit, and they reorganize themselves spontaneously to form a piece of cardiac tissue," Parker said. The dimensions of the piece of created heart

muscle tissue are controlled by limiting the space within which they are allowed to grow, he said.

"Then we can graft the tissue into the heart where ventricular muscle has died and restore contractibility in that area of the heart," he said.

Chien said that other questions would have to be answered before the stem cell technology could be put to medical use -- such as how to create an appropriate blood supply for the grafted heart muscle tissue.

"What we would like to do now is find new ways to deliver a heart patch that is three-dimensional," Chien said. His overall assessment was that "this is a first step toward moving from stem cell research in humans to cardiac regenerative medicine."

The Harvard report was called "a solid piece of scientific work" but hardly revolutionary by Dr. Eduardo Marban, director of the Cedars-Sinai Heart Institute in Los Angeles. "Its implications for clinical practice are limited," he said.

The Harvard researchers have simply added details to the well-established principle that embryonic stem cells differentiate into heart muscle cells, Marban said. He described the prediction of human trials within five years as "wildly optimistic."

Marban is leading a human trial of cardiac stem cell therapy in people who have suffered heart attacks. The study has enrolled 10 participants, with a goal of 30 getting treatment with stem cells that are obtained from their own bodies and injected into a coronary artery. First results of the study are expected in the second half of 2010, he said.

"The usual progression of these things is from in vitro [laboratory] work, then small animal models using human cells, then to larger animals, such as pigs," Marban said. "It took us five years to a first human trial, and that was a wildly aggressive schedule. Ten years for them would be a remarkable achievement."