FOR RELEASE:
2 p.m. MT/4 p.m. ET
Wednesday, July 30, 2008

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- *Basic laboratory research suggests that a heart patch, when implanted may reverse both functional and structural changes that occur after a heart attack. Seperately, the patch improved only the functional elements after there was chronic heart failure.*
- *Researchers are pursuing use of the patch to deliver other cell types, such as cardiac stem cells or cells lining the inside of blood vessels.*
- *The fibroblast patch is being evaluated for use in humans in Phase I safety trials in patients undergoing coronary artery bypass surgery.*

**Abstract P171**

***American Heart Association meeting report***

# Patch may prevent heart failure after heart attack

KEYSTONE, Colo., July 30 — An implanted patch that delivers cells to damaged heart muscle may prevent heart failure after a heart attack, according to research presented at the American Heart Association's Basic Cardiovascular Sciences Conference 2008 – Heart Failure: Molecular Mechanisms and Therapeutic Targets.

Many people develop heart failure after tissue is damaged by a heart attack. This study examined a way to regrow heart muscle so its pumping action could be maintained or restored.

"The idea of supplying cells to help heart muscle regenerate is not new, but results have been disappointing," said Jordan J. Lancaster, B.S., lead author of the study and a predoctoral fellow at the Southern Arizona V.A. Medical Center in Tucson. "We thought that by providing a three-dimensional scaffolding system to provide a supportive milieu for cells to survive and grow into the heart tissue, we might get better results than with direct injection into the heart muscle."

The researchers tested a three-dimensional fibroblast construct (3DFC), a biologically active patch where connective tissue cells are already living, reproducing, and secreting growth factors, supported by a biodegradable mesh that eventually disappears. They used the construct for treating heart attack-induced heart failure in laboratory rats.

The subjects were divided into three groups, eight to 12 in each group. One group received no therapy, one had the 3DFC surgically applied to the damaged heart muscle immediately after heart attack (heart attack treatment group) and the third had the 3DFC implanted 3 weeks later (heart failure treatment group).

Compared with the untreated group, the heart attack treatment group improved significantly more than the heart failure treatment group in most measures. Findings with 3DFC treatment included:

- Left ventricular ejection fraction (a measure of the heart's pumping ability) increased 40 percent in the heart attack group and 21 percent in the heart failure group when compared to control.

- Systolic displacement of the damaged heart wall (an indicator that the heart muscle is dilating, a precursor to severe heart failure) decreased 64 percent in the heart attack group and 43 percent in the heart failure group.
- The size of the left ventricle (which increases as heart failure develops) decreased 19 percent in the heart attack treatment group and did not change in the heart failure treatment group.
- Blood flow to the heart muscle increased 37 percent in the heart attack group and 116 percent in the heart failure group.

"Our conclusion is that the patch, when implanted acutely reverses both functional and structural changes that occur after a heart attack," Lancaster said. "Separately, the patch improves only the functional elements after there is chronic heart failure. Ongoing studies are investigating the mechanisms of how this patch works."

An estimated 770,000 Americans will have a first heart attack and about 430,000 will have a recurrent attack this year, according to the American Heart Association.

After a heart attack, unaffected heart muscle stretches and works harder to make up for the area of damaged muscle. Unfortunately, this stretching often results in heart failure. The standard preventive treatment is medication such as ACE inhibitors and beta-blockers.

"The beauty behind this work is that the 3DFC gives cells something to adhere to and provides a real chance for new heart tissue to form and restore heart function," Lancaster said.

Researchers are now pursuing use of the patch to deliver other cell types, such as cardiac stem cells or cells lining the inside of blood vessels.

The fibroblast patch (Anginera, produced by Theregen, Inc., San Francisco, CA) is being evaluated for use in humans in Phase I safety trials in patients undergoing coronary artery bypass surgery.

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The American Heart Association partially funded the study. Other funding sources included the WARMER Foundation and the Arizona Biomedical Research Commission.

Disclosures for individual authors are available on the abstract.

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NR08-1092 (BCVS 08/Lancaster)

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***Note: Presentation is 5 p.m. MT/7 p.m. ET, July 30, 2008.***