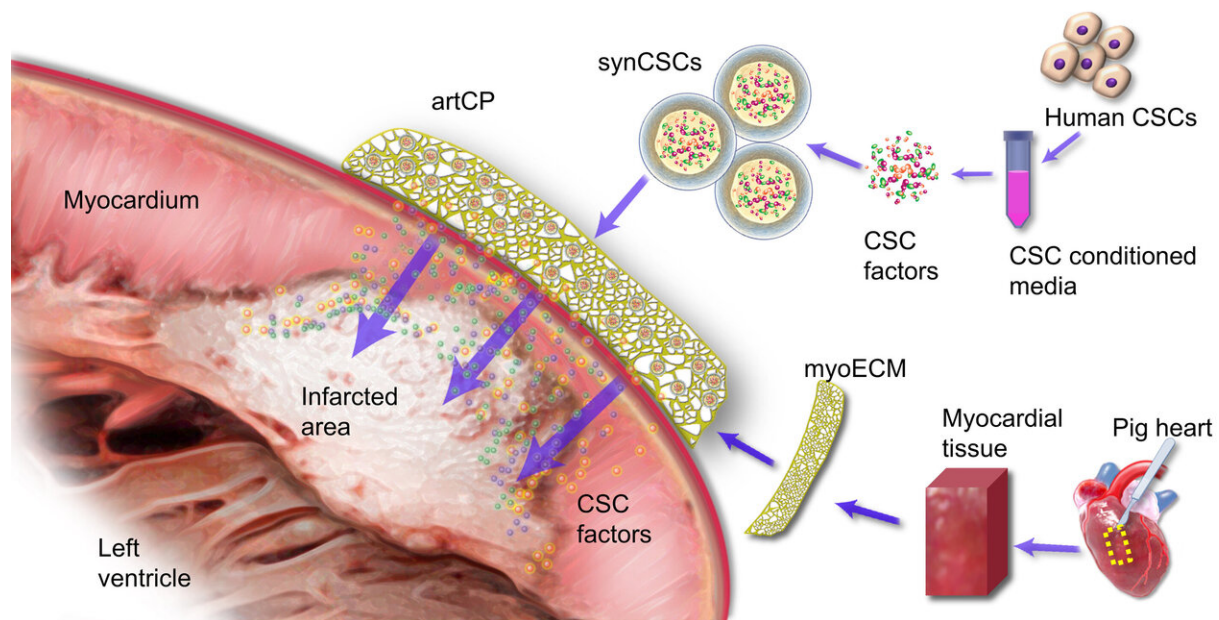


Off-the-shelf artificial cardiac patch repairs heart attack damage in rats, pigs

April 8 2020, by Tracey Peake



A schematic showing the fabrication of the acellular cardiac patch. Credit: K. Huang et al., Science Translational Medicine (2020)

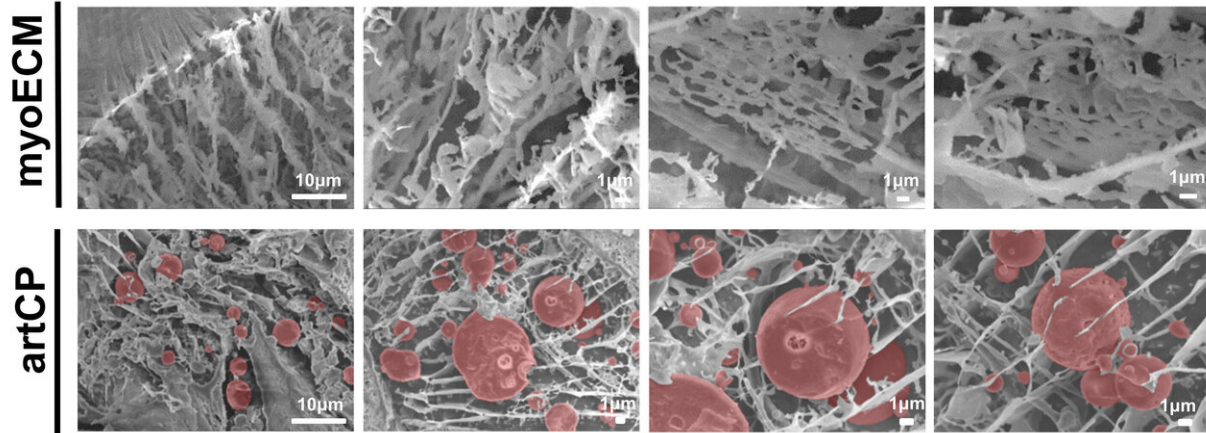
Researchers from North Carolina State University have developed an "off-the-shelf" artificial cardiac patch that can deliver cardiac cell-derived healing factors directly to the site of heart attack injury. In a rat model of heart attack, the freezable, cell-free patch improved recovery. The researchers also found similar effects in a pilot study involving a pig model of heart attack.

Cardiac patches are being studied as a promising future option for delivering cell therapy directly to the site of heart attack injury. However, current cardiac patches are fragile, costly, time-consuming to prepare and, since they use live cellular material, increase risks of tumor formation and arrhythmia.

"We have developed an artificial cardiac patch that can potentially solve the problems associated with using live cells, yet still deliver effective cell therapy to the site of injury," says Ke Cheng, Randall B. Terry, Jr. Distinguished Professor in Regenerative Medicine at NC State's College of Veterinary Medicine and professor in the NC State/UNC Joint Department of Biomedical Engineering.

Cheng and colleagues from NC State and UNC-Chapel Hill built the patch by first creating a scaffolding matrix from decellularized pig cardiac tissue. Synthetic cardiac [stromal cells](#)—made of a biodegradable polymer containing cardiac stromal cell-derived repair factors—were embedded in the matrix. The resulting patch contained all of the therapeutics secreted by the cells, without live cells that could trigger a patient's [immune response](#).

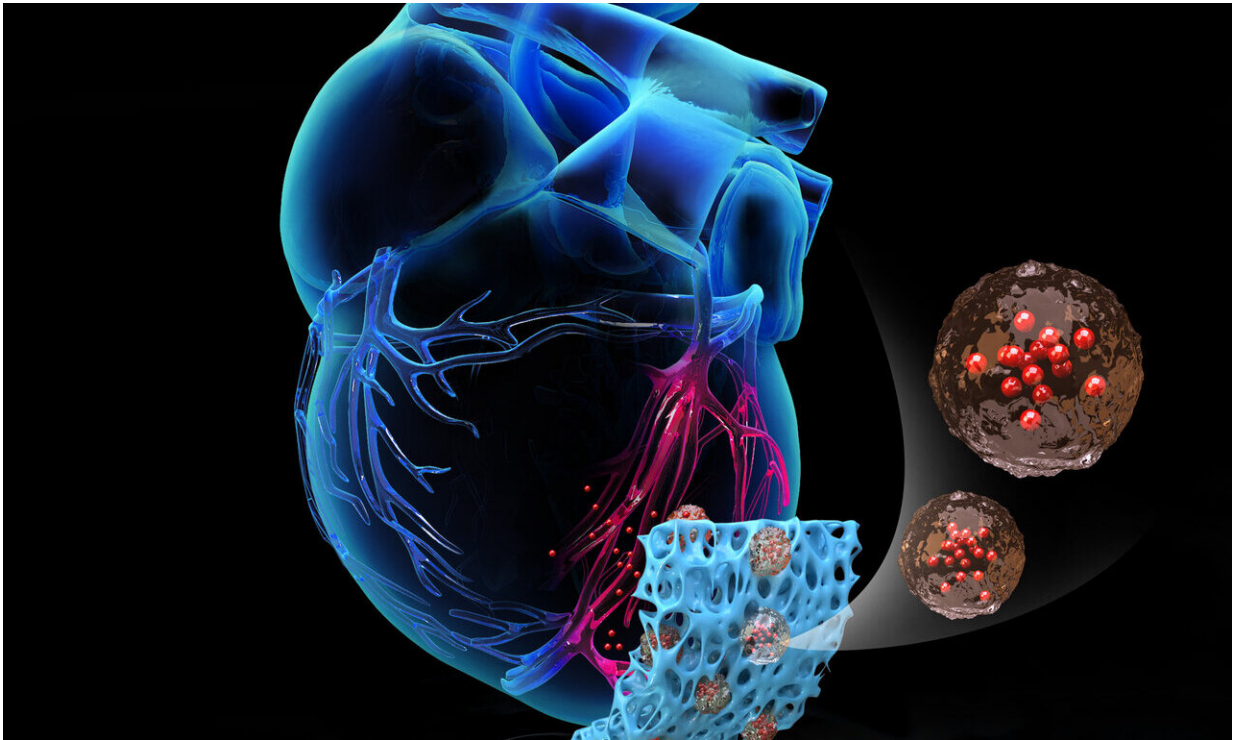
In a rat model of heart attack, treatment with the artificial cardiac patch resulted in ~50% improvement of cardiac function over a three-week period compared to non-treatment, as well as a ~30% reduction in scarring at the injury site.



Synthetic cardiac stromal cells (red) embedded in the cardiac patch. Credit: K. Huang et al., Science Translational Medicine (2020)

The researchers also conducted a seven-day [pilot study](#) of heart attack in a pig model, and saw ~30% reduction in scarring in some regions of the pig hearts, as well as stabilized heart function, compared to non-treatment.

Additional experiments demonstrated that artificial patches that had been frozen were equally potent to freshly created patches.



An artificial cardiac patch, made from pig heart matrix and loaded with stem cell factors, to promote cardiac repair after injury. Credit: Cheng Lab

"The patch can be frozen and safely stored for at least 30 days, and since there are no [live cells](#) involved, it will not trigger a patient's immune system to reject it," Cheng says. "It is a first step toward a truly off-the-shelf solution to cardiac [patch](#) therapy."

The research appears in *Science Translational Medicine*.

More information: K. Huang et al., "An off-the-shelf artificial cardiac patch improves cardiac repair after myocardial infarction in rats and pigs," *Science Translational Medicine* (2020).

stm.sciencemag.org/lookup/doi/10.1126/scitranslmed.aat9683

Provided by North Carolina State University

Citation: Off-the-shelf artificial cardiac patch repairs heart attack damage in rats, pigs (2020, April 8) retrieved 2 May 2024 from <https://medicalxpress.com/news/2020-04-off-the-shelf-artificial-cardiac-patch-heart.html>

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