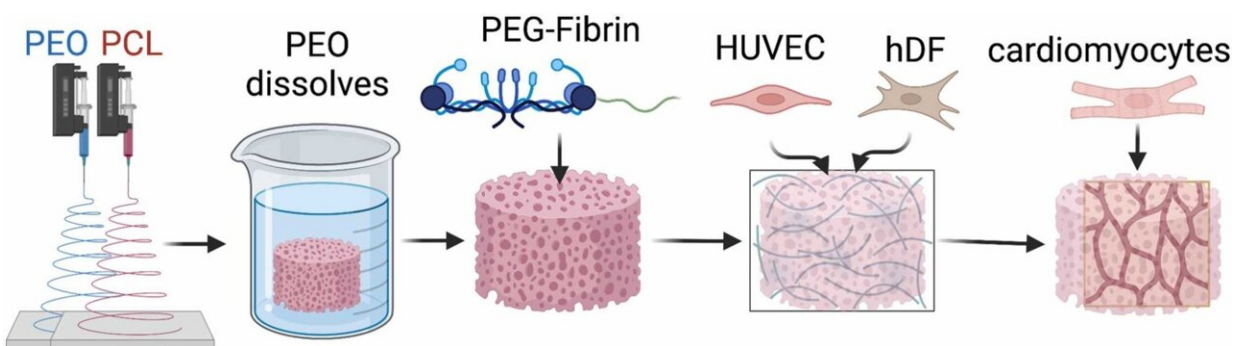


# Scientists create patch that may successfully treat congenital heart defects in infants and last a lifetime

November 27 2023



Credit: *Materials Today Communications* (2023). DOI: 10.1016/j.mtcomm.2023.107596

Using laboratory engineered tissue, scientists at the University of Colorado Anschutz Medical Campus have created a full-thickness, biodegradable patch that holds the promise of correcting congenital heart defects in infants, limiting invasive surgeries and outlasting current patches.

The [findings](#) were published this week in the journal *Materials Today Communications*.

"The ultimate goal is to make lab-grown heart [tissue](#) from a patient's

own cells that can be used to restructure the heart to correct for heart defects," said the study's senior author Jeffrey Jacot, Ph.D., associate professor of bioengineering at the University of Colorado School of Medicine.

About 10,000 babies are born with a complex congenital heart defect every year in this country, requiring surgery in the first year of life. Some of these operations require the implantation of a full-thickness heart patch. But the current materials used in the patch are non-living and non-degradable. They don't grow with the patient and often fail because they don't integrate with the heart.

Jacot said these surgeries are largely palliative, extending survival only until the next surgery.

But his lab's patch, called a tissue engineered myocardial patch, could survive the mechanical forces of the heart wall and integrate into the heart itself. Ideally, it would last for as long as the patient lives.

"The current patch materials available to pediatric heart surgeons are exclusively non-living and non-degradable, which often fail in their long-term therapeutic efficacy due to low compliance, an increased risk of thrombosis and intimal hyperplasia, and their inability to remodel and integrate with the heart," the study said.

Permanent fixes require biomaterials that are degradable but which also promote heart regeneration so that the patches are eventually replaced by healthy myocardium, the middle muscular layer of the heart and the thickest.

"Any patches that are not replaced by healthy tissue prior to their degradation will inevitably fail and lead to long-term complications," Jacot said.

The patch was created in the lab using a technique known as electrospinning, where electricity is applied to liquid solutions to create nanofibers used to make a scaffold (framework). The scaffold is then injected with living cells. This eventually becomes the patch.

"The scaffold was found to be mechanically sufficient for heart wall repair," Jacot said. "Vascular cells were able to infiltrate more than halfway through the scaffold in static culture within three weeks."

The patch requires more tests before it can be used in humans.

Jacot is optimistic that it will play a critical role in the future treatment of congenital [heart](#) defects and other cardiac conditions.

"This is the first successful demonstration of a very thick, porous electrospun [patch](#) specifically for cardiac tissue engineering," he said.

**More information:** Dillon K. Jarrell et al, An in vitro characterization of a PCL-fibrin scaffold for myocardial repair, *Materials Today Communications* (2023). [DOI: 10.1016/j.mtcomm.2023.107596](https://doi.org/10.1016/j.mtcomm.2023.107596)

Provided by CU Anschutz Medical Campus

Citation: Scientists create patch that may successfully treat congenital heart defects in infants and last a lifetime (2023, November 27) retrieved 28 April 2024 from <https://medicalxpress.com/news/2023-11-scientists-patch-successfully-congenital-heart.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--