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Bioengineering

Laboratory-grown Heart Tissue for Correction of Congenital Heart Defects

Jeffrey Jacot, Ph.D., in conjunction with his collaborators, engineer reparative heart tissue using stem cells found in amniotic fluid grown on novel biomaterials. As associate professor of bioengineering at the University of Colorado at Denver, Dr. Jacot works alongside surgeons, clinicians, radiologists and biologists to understand the clinical needs in congenital heart defect management and repair, analyze the mechanical and biological processes in heart tissue development, and develop novel biomaterials for tissue-engineered heart muscle. Dr. Jacot received a B.S. in Chemical Engineering from the University of Colorado at Boulder in 1994, followed by six years of industry experience in the design and development of devices for heart surgeries. He received a Ph.D. in Biomedical Engineering from Boston University in 2005. Following postdoctoral work in the Cardiac Mechanics Research Group at the University of California, San Diego, he joined Rice University in 2008 and the University of Colorado at Denver in 2016. Dr. Jacot has received one of the National Science Foundation's prestigious CAREER awards, an NIH R01, the Rice Institute for Biosciences and Bioengineering Medical Innovations Award, the Young Innovators in Biomedical Engineering Award from Emory/Georgia Tech, and grants from the National Science Foundation, the National Institutes of Health, the American Heart Association, the Virginia and L.E. Simmons Family Foundation, and the John S. Dunn foundation.

Abstract: Congenital heart defects are the most common noninfectious cause of death in infants in the US. Repair of many heart defects includes the surgical placement of an acellular patch, and these non-conductive and non-contractile patches are associated with the development of arrhythmias and increased long-term risk of sudden cardiac death. Our laboratory is developing living, contractile heart tissue made from a child's own stem cells for use in repair of heart defects. Because these functional patches enhance heart function, they can be used in areas critical to heart function, and could lead to the development of a total bioartificial heart.