



# Biological Heart Valves and Arteries for Children (20120236, Dr. Robert Tranquillo)

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## Engineered Heart Valves and Arteries for Children's Hearts

A method to create heart valves and arteries for use in patients who require narrow tubes for long-term implantation has been developed. The process begins by trapping fibroblasts from skin tissue in fibrin gel, and then molding, conditioning and decellularizing the gel. Decellularization leaves the extracellular matrix of the tissue, which can be modified into durable, small-diameter tubes for implantation. When surgically inserted, the tubes recellularize to take on the characteristics of surrounding tissue and assimilate to the cardiovascular structure. The tubes collapse at three anchor points, replicating valve function of natural arteries. The recellularization of the valves allows for the tube to grow as the patient matures, making them ideal for use in patients who have not fully developed into adulthood.

### Current Artificial Heart Valve too Large for Pediatric Cardiovascular Surgery

As the number of heart valve implant surgeries in America reaches 95,000 annual procedures, there is an increasing need for techniques aimed toward the grafting and repair of small diameter arteries. Current artificial heart valve implants use synthetic materials and cell sheets to create tubes for surgical grafting into the heart. These kinds of valves are not well suited for small-diameter tubes (<6mm) and cannot be used in procedures on infants or children. Completely biological grafts that create narrow diameter valves for arterial implants would revolutionize pediatric cardiovascular surgery.

### BENEFITS OF FULLY BIOLOGICAL HEART VALVES AND ARTERIES:

- Smaller diameter is optimal for use in younger patients
- Able to be grown in only 7 weeks
- Recellularization lets the tissue grow with the patient
- Has already been tested with favorable results

### Researchers

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[External Link](http://bme.umn.edu) (bme.umn.edu)

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### Publications

[\*Tissue engineering of acellular vascular grafts capable of somatic growth in young lambs\*](#)  
*Nature Communications*, 27 September 2016

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