**BACKGROUND**

- There are more than 100,000 heart valve surgeries in the USA per year
- **Goal:** to advance the current approach to heart valve replacement by using autologous stem cells
- **Target population:** individuals with congenital heart valve disease (CHVD) or heart valve malformations

**CONCLUSION**

- Eliminate the need for mechanical or animal xenograft heart valve transplants
- Reduce the risk of rejection
- Increase durability
- Reduce multiple transplants as seen with mechanical valves

**Disadvantages:**

- Risk of rejection

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### EXPERIMENT

**In-vitro development**

- Isolation of cardiac stem cells and porcine valve interstitial cells (pVICs)
- Creation of 3D-scaffold of heart valve using polycaprolactone (PCL) and poly L-lactic acid (PLLA) blend
- Seeding of stem cell and pVICs onto 3D scaffold
- Complete cellular colonization, 15 days growth

**Testing the heart valve**

- Cell Proliferation/Colonization
- Mechanical & Structural
- Elasticity and Resistance to stress/strain
- Physiological performance

**In-vivo testing**

- Surgical implantation into heart
- Check for thrombosis, bleeding, calcification, and regurgitation
- Compare blood flow and valve function
- Testing longevity in sheep model

### TECHNIQUES

- Cell isolation and cell culture
- 3D stent created using 3D printer
- Create 3D scaffold via electrospinning
- Cell seeding using static and rotary dynamic seeding

- Immunofluorescence staining
- MTT Assay
- Tensile mechanical stress tests
- Pulse Duplicator System
- Doppler Echocardiogram

- Surgery to implant heart valve in mouse and sheep models

### REFERENCES