Nanotechnology to Aid in Correction of Heart Defects

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### Previous Status Quo

Current approaches to correcting heart defects require multiple surgeries and have complications due to inactive polymer patches.

### New Insights

By adding single walled carbon nanotubes to heart patches, we improved heart cell electrical communication, and through use of liquid crystal elastomers, we can stretch developing patches.

### Project Details

- Amniotic fluid contains a population of multi-potent stem cells that can be rapidly expanded, differentiate into multiple cell types, and can be used to vascularize an implantable matrix.
- Cell alignment, stretch conditioning, and scaffold resistance to contraction all affect cardiomyocyte maturation, force generation, and electrophysiology. Liquid crystal elastomer scaffolds are a controllable and scalable method of controlling these parameters.
- A heart patch incorporating CNT demonstrated improved conduction velocity and is feasible as a full thickness defect myocardial patch.

### Challenges

Need *in vivo* testing of any toxicity and clearing of carbon nanotubes.

### Next Steps

Plans to test heart patches in a rat model. Next steps are a large animal model and clinical trials.

NorTex Nano Cluster