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## **WORLD'S FIRST HUMAN MYOBLAST TRANSFER INTO THE HEART**

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### **Text of abstract:**

Heart muscle degeneration associated with aging, cardiomyopathy, infarcts and congestive heart failure is the leading cause of debilitation and death in humans. Being terminally differentiated, cardiomyocytes do not divide significantly to regenerate the myocardium. Stem cells transplant posts ethical issues of abortion and technical uncertainties as to whether these pluripotent cells will absolutely differentiate into cardiomyocytes and not osteoblasts, chondrocytes or others. Myoblasts are myogenic cells similar to cardiomyocytes at early differentiation. Recent animal studies suggest that implanted myoblasts might be "differentiated" into cardiomyocytes within the heart milieu. We present the first successful endovascular transfer of human myoblasts into the porcine myocardium. Porcine hearts highly resemble those of humans and are more prompt to fibrillate upon minor injury.

Following IACAC guidelines. A 100-lb juvenile female pig was anesthetized. Access was obtained via the right femoral artery using cutdown technique. Catheter advance into the left ventricle through the aorta was guided with fluoroscopy followed by endomyocardial mapping with the electromagnetic NOGA system (Johnson & Johnson). Approximately  $1 \times 10^6$  human myoblasts were injected through a needle timed to protrude 6mm from the tip of the catheter into the myocardium. Twenty injections were made at different locations within 40 minutes, having volumes of 0, 1, 0.2, 0.3, 0.5, 1.0 ml, and cell concentration of  $100 \times 10^6$  /ml. Heart rate, electrocardiogram and temperature were continuously monitored. Other than transient short runs of ventricular ectopy, the pig remained in stable condition throughout the injection period. There was no significant change in the parameters monitored. Vital dye staining of the myoblasts before versus after the procedure showed no significant difference in cell viability. Furthermore, cell passage through the injection catheter showed less than 5% of cell death. At the completion of the procedure, the pig was sacrificed and the heart processed for histological examination. Transmyocardial perforation was not observed. Numerous prominent round and mononucleated human myoblasts were found widely and evenly distributed throughout the apex and the lateral wall of the pig left ventricle where the myoblasts were injected.

Conclusions: This study provides the first direct evidence demonstrating the feasibility and safety of endovascular delivery of human myoblast into the porcine heart using the NOGA catheter injection system. Considering about 2,600 donor hearts were available in 1999 to serve 7-million Americans that have heart attacks each year, we urge that research on human cardiac myoblast transfer be prioritized and expedited to prevent and treat heart dysfunction.

**Keywords:**