

Scientific Session II (cont.)

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AMNIOTIC FLUID STEM CELLS IN A BIOENGINEERED SCAFFOLD: A NEW FRONTIER IN PATIENT SPECIFIC THERAPY FOR PREMATURE LUNG DISEASE

Eric D. Girard, MD¹, Camilo A. Moncada, PhD², Todd Jensen, MSc², Fan Zhang, MSc², Stephanie R. Davis, MS², Christine M. Finck, MD¹.

¹Connecticut Children's Medical Center, Hartford, CT, USA, ²University of Connecticut Health Center, Farmington, CT, USA.

Purpose:

Stem cells in a biomimetic engineered scaffold may be used as a potential model for tissue engineered transplants. We have previously published on a novel acellular immuno-privileged lung scaffold. We have been able to utilize patient specific amniotic fluid stem (AFS) cells and reconstitute this engineered lung scaffold. Within the scaffold, these AFS cells were differentiated into a distal airway cell phenotype. Orthotopic transplantation of these scaffolds is feasible providing a preliminary short term platform for translational research.

Methods:

All experiments were performed per IRB and IACUC approved protocols. AFS cells, obtained during third trimester amniocentesis, were manually isolated, cultured and characterized. 12 million cells were seeded into a perfusion-decellularized rat lung scaffold. These scaffolds were cultured in a bioreactor using small airway growth medium for fifteen days. The cells in the scaffold were characterized using immunofluorescence (IF) for distal lung markers thyroid transcription factor-1 (TTF1) and pro-surfactant C (SPC). An orthotopic left lung transplant of the scaffold was subsequently performed.

Results:

AFS cell characterization by fluorescence activated cell sorting and IF showed the presence of pluripotent and mesenchymal markers and lacked hematopoietic markers. The cells seeded into the scaffold were well distributed, viable, and appeared to reconstitute the epithelium. IF characterization demonstrated distal lung markers TTF1 and SPC. Orthotopic xenograft transplantation was a technical success.

Conclusion:

AFS cells are patient specific, accessible early in pregnancy, and yield pluripotent cells that can differentiate to distal alveolar cells in a biomimetic decellularized lung scaffold. These cells have high potential to be clinically translatable and functional outcomes of orthotopic transplanted lungs are actively being studied.