Abstract Title:

Targeted Investigation of Novel Human Umbilical Cord Mesenchymal Stem Cell Biomarkers of Bronchopulmonary Dysplasia in Preterm Infants

Presenter:
Raissa Fobi, MD
Bldg 56, Ste 600, ZOT 4490
Orange, CA 92868-3298
Phone: (714)456-6920
Email: rfobinge@uci.edu

Author:
Raissa Fobi Ngebi
Professional Title: MD
Organization / Affiliation: University of California Irvine
Mailing Address:
101 The City Drive
Bldg 56, Ste 600, ZOT 4490
Orange, CA 92868, US
Phone: 7144566920
Email: rfobinge@uci.edu

Co Author/Co-Investigator Names/Professional Title: Fayez Bany-Mohamed, MD; Cherry Uy MD; Muhammad Aslam, MD

Introduction: Bronchopulmonary dysplasia (BPD) is a chronic debilitating disease of preterm infants caused by oxygen toxicity, inflammation, and ventilator use leading to arrested alveolar development. Current therapies lack effectiveness and cause undesirable side effects. Our work utilizing bone-marrow derived mesenchymal stem cell (MSC) and their conditioned-media (MSC-CM) have shown protective effects in mouse BPD models. Analysis of the MSC-CM identified Osteopontin (Opn) and Macrophage colony stimulating factor 1 (Csf1), as key biomarkers leading to protection against BPD. We hypothesized that human umbilical cord mesenchymal stem cells (hUC-MSCs) have similar growth and differentiation potential as mouse bone-marrow derived MSCs. In addition, we hypothesized that like mouse MSCs, hUC-MSCs secrete biologically active factor(s) into their conditioned media which can account for their therapeutic efficacy in BPD. Our Objectives are to 1) isolate, culture, immunodeplete and differentiate hUC-MSCs. 2) To identify the active factor(s) / biomarkers secreted by hUC-MSCs into their conditioned media relevant to neonatal BPD, utilizing advanced proteomic analysis.

Methods: The hUC-MSCs were isolated according to published methods with minor modifications. Immunodepletion was performed with negative selection of CD34, CD45, CD11b, CD19, and HLA-DR cell markers and positive selection of CD105, CD90, CD44, and CD73 markers. Following this, the differentiation potential of these cells into osteocytes and adipocytes was assessed by selective propagation in specific differentiation media. hUC-MSC and mouse MSC confluent cultures were incubated in serum-free D-MEM media for 24 hours and the conditioned media from equal numbers of cells in each culture was obtained and concentrated 10-fold and analyzed for the identification of active factors via advanced proteomics.

Results: The hUC-MSCs were successfully isolated, propagated in culture, immunodepleted, and differentiated into osteocytes and adipocytes. We determined that the hUC-MSCs have similar growth and differentiation potential as mouse MSCs. In addition, hUC-MSC-CM proteomics analysis identified similar peptides and micro RNAs as was seen in the mouse MSC-CM including abundance of Opn and Csf1.

Conclusion: The hUC-MSCs secrete biologically active factors into their conditioned media like mouse bone-marrow derived MSCs and can serve as potential targeted therapy against BPD. Further studies are needed to test their therapeutic efficacy in vitro and in vivo.