OMICS Group Conferences
Accelerating Scientific Discovery
3rd World Congress on
Cell Science & Stem Cell Research
November 20- 22, 2013 DoubleTree by Hilton Baltimore-BWI Airport, USA

Pre-activation of human mesenchymal stem/stromal cells in 3D culture enhances their therapeutic potential

Joni H. Ylostalo
Texas A&M University Health Science Center, USA

Abstract

Human mesenchymal stem/stromal cells (MSC) have shown therapeutic benefits in pre-clinical animal models and in human clinical trials. Recent observations suggest that many of the benefits are attributed to the paracrine effects of the cells stemming from activation to express and secrete anti-inflammatory, immunomodulatory, and anti-cancer molecules. However, activation of MSC in vivo occurs after a delay, hence pre-activation of the cells before administration would permit a faster and potentially more beneficial therapeutic effect. In the current work 3D culture of MSC was evaluated for pre-activation and increased therapeutic potential of the cells. MSC cultured in hanging drops aggregated rapidly and coalesced into a single compact sphere consisting of small cells. Dramatic changes in the transcriptome of MSC were followed by secretion of therapeutically beneficial molecules, such as PGE2, TSG6, and STC1. The expression and secretion of these molecules was driven by caspase-dependent IL1 signaling in MSC spheres. Also, the expression of several anti-cancers molecules, such as TRAIL and IL24, were up-regulated in MSC spheres. In functional assays, MSC spheres demonstrated better anti-inflammatory and anti-cancer effects than monolayer cultures of the cells. MSC spheres, through secretion of PGE2, were able to change stimulated macrophages from a primarily pro-inflammatory M1 phenotype to a more anti-inflammatory M2 phenotype. Furthermore, MSC spheres had better anti-inflammatory effects in a mouse model of peritonitis, than standard preparations of the cells. The results suggested that 3D pre-activated MSC may be more effective than monolayer MSC in therapies for diseases characterized by inflammation and for some cancers.

Biography:

Joni H. Ylostalo received his PhD from Tulane University in Biomedical Sciences in 2008 studying human mesenchymal stem/stromal cells (MSC) at the Center for Gene Therapy. Dr. Ylostalo did his postdoctoral research at the Texas A&M Health Science Center Institute for Regenerative Medicine on translational studies of MSC. Since 2012, he has been serving as an Instructor at the Department of Internal Medicine while executing research on 3D pre-activation mechanisms of MSC at the Institute for Regenerative Medicine. Dr. Ylostalo has over 40 publications in various national and international journals and books concerning MSC, gene expression analysis, and protein biochemistry.