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Induction of hepatic regeneration in an experimental model using hepatocyte differentiated MSCs

Taghrid Gaafar

Cairo University, Egypt

Background and Objectives: Scaffolds are three-dimensional (3D) matrices that provide support for cells to attach, proliferate, and differentiate, facilitating extracellular matrix formation. The study aimed to examine the differentiation potential of Mesenchymal stem cells (MSCs) into hepatocytes in 2D and 3D culture systems to improve their in vitro differentiation, and test their functionality in vivo.

Methods: MSCs were generated from umbilical cord blood. Hepatogenic differentiation was induced on 2D and 3D cultures and characterized by morphology, scanning electron microscopy, immunocytochemistry and Gene expression. Albumin and α -1 antitrypsin (AAT) in culture supernatants were measured. Differentiated Cells were administered IV into a murine model of carbon tetra (CCL4) induced liver cirrhosis which were divided into 3 groups, a) Pathological control group, b) and c) Groups treated with hepatogenic differentiated MSCs cultured on 2D and 3D culture system respectively. After 12 weeks of injection, liver pathology was examined.

Results: The hepatogenic differentiated MSCs stained positively for albumin, alpha fetoprotein (AFP), Heppar1, cytokeratin7, 18, and OV6 with more mature cells, hexagonal in shape with central nuclei forming large sheets in groups in 3D culture system. AAT secretion and Indocyanine green uptake were significantly increased

in 3D system. In experimental model, MSC-3D treated group exhibited maximal restoration of liver architecture with absent septal fibrosis and marked improvement of ALT, AST.

Conclusions: Both 3D and 2D culture system are effective in functional hepatogenic differentiation from MSCs. In vivo hepatogenic differentiation is more effective on 3D scaffold, with better functional recovery.

Biography

Roberta Di Pietro got the degree in Medicine cum Laude in 1985 and the Specialization in Sports Medicine cum Laude in 1988, University of Chieti, Italy. She worked as a Visiting Scientist at the Biochemistry Department, AFRC, Cambridge, UK; at the Pathology Department, USUHS, Bethesda, USA, and at the Institute of Human Virology, University of Maryland, Baltimore, USA. She got the position of Full Professor of Histology and Embryology at the University of Chieti since 2005. She joined the Editorial Board of Current Pharmaceutical Design as an Executive Guest Editor and, recently, the Editorial Academy of the International Journal of Oncology as an Honorary Member. She was recognized as a Registered Referee for Archives of Ophthalmological Reviews and Reproductive Biology and Endocrinology. She is now author of 200 scientific publications plus international e-book chapters, editorials, Italian textbooks and 1 Italian patent.

r.dipietro@unich.it