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The differentiation potential of human cord blood unrestricted somatic stem cells into hepatocyte-like cells on 3-dimensional nanofibres

Zeinab Demerdash, Manal Kamel, Hanan El Baz, Tagrid Gaafar, Dina Abdelhady, Olfat Hamam, Faten Mahmoud, Salwa Mohamad, Heba Khalil, Shaimaa Attia and **Tamer Taha**
Theodor Bilharz Research Institute, Egypt

Background: Unrestricted somatic stem cells (USSCS), earlier progenitors of cord blood mesenchymal stem cells, hold great promise for liver tissue engineering. Scaffolds are three-dimensional (3D) matrices that provide the initial structural support for cells to attach, proliferate, and differentiate, facilitating the formation of an extracellular matrix (ECM). In vitro culture of USSCs on nano-fibrous scaffold could initiate and enhance their differentiation potential into heptocytes – like cells.

Aim of the work: In this study we induced the differentiation of USSCs into hepatocytes in two- and three-dimensional (2D and 3D) culture systems. The effect of nanofibrous scaffold (3D) on their differentiation potentiality was evaluated. The more promising culture system is to be adopted in the in vitro- hepatic differentiation of USSCs, to improve their future application in cell-based therapies in patients with chronic liver diseases.

Materials and Methods: USSCs were isolated from human cord blood, propagated and characterized. Hepatogenic differentiation of USSCs was performed on both 2D and 3D culture systems. Differentiation potentiality of both systems was evaluated using, indocyanin green (ICG) cellular uptake method, periodic acid Schiff (PAS) staining method, immunohisochemistry analysis for albumin and alpha fetoprotein (AFP), scanning electron microscopy (SEM), and ELISA for albumin and alpha 1 antitrypsin secretion.

Results: SEM showed adherence of cells in the nanofiber scaffold during hepatogenic differentiation. Differentiated hepatocyte-like cells were more abundant, more mature and hexagonal in shape in the 3D culture system. Both systems were positive for ICG uptake, PAS, albumin and AFP staining. Albumin secretion was significantly higher in 3D culture system while alpha1antitrypsin secretion increased equally in both 3D and 2D cultures.

Conclusion: *In vitro* differentiation of USSCs on nanofibrous scaffold, before their use in liver regeneration, could be superior to conventional 2D cultures.

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Biography

Zeinab Demerdash has completed her MD in 1990 from Cairo Medical School, Egypt, in Clinical Pathology, fine specialty Immunology. She is now a Professor in Immunology at Theodor Bilharz Research Institute, Cairo Egypt. She is specialized in monoclonal antibody production and stem cell research especially cord blood mesenchymal stem cells and their clinical applications. She has more than 30 publications in reputed journals.

zeinabdem@hotmail.com