

4th International Conference on **Tissue Science and Regenerative Medicine** July 27-29, 2015 Rome, Italy

Evaluation of alginate-gelatin microcapsules for 3D co-culture of hematopoietic and mesenchymal stemcells as a model of hematopoietic niche

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Hematopoietic stem cells (HSCs) need specific growth factors for self-renewing expansion. Mesenchymal stem cells (MSCs) can regulate the growth and differentiation of HSCs through the release of the soluble factors. We used alginate-gelatin based threedimensional (3D) microcapsules for the co-culture of HSCs with MSCs derived from umbilical cord (UC), to simulate the main components of the bone morrow niche, and the results were compared with non-encapsulated cells. Alginate-gelatin microcapsules with an average size of 600 µm were developed by means of an electrostatic inject device. HSCs were cultured in monoculture and co-culture with UC-MSCs in a 12-well plate both in microcapsules and in free cultures, without adding any growth factors. Cell numbers and activity of HSCs was assessed by hemocytometer cell counting method and MTT assay, respectively. Self- renewing HSCs was identified by flow cytometry method. The maintenance of the primitive CD34⁺ and CD45⁺ phenotype of HSCs were analyzed after 7 days of culture. Our results showed that HSCs could proliferate 2 folds in the microencapsulated co-culture condition. The percentage of CD34⁺ and CD45⁺ stem cells in the microcapsules with and without MSCs were 80% and 75%, respectively. This researchdemonstrated that alginate-gelatin microcapsules have a high potential for the co-culturing HSCs and MSCs to enrich HSCs for medical applications without using growth factors, although further investigations is needed in this regard.

Biography

Hamed Alizadeh Sardrood is now studying MSc in Chemical Engineering Faculty of Sahand University of Technology, Tabriz, Iran. He is working on his MSc thesis in tissue engineering and stem cell research lab with the title of: "Study on proliferation and differentiation of hematopoietic stem cells encapsulated in modified alginate microcapsules".

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