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Evaluation of alginate-gelatin microcapsule for expansion of a model suspendable stem cell

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One of the most important cell-based therapies is using suspendable stem cells such as hematopoietic stem cells (HSCs). Proper methods are needed for the adequate expansion of HSCs in order to use in clinical applications. In this project expansion of hematopoietic cell line (U937) as a model of the suspendable cell was investigated in alginate-gelatin microcapsules. The microcapsules can provide the cells a three dimensional microenvironment as well as protection from shear stress particularly in bioreactors. U937 cells were encapsulated in alginate-gelatin at a density of 2.5 million cell.ml⁻¹ with an average size of 600 μ m which were developed by means of an electrostatic inject device. Cell numbers and activity of U937 was assessed by hemocytometer cell counting method and MTT assay respectively. The results showed U937 cells expanded 23 folds in static culture (T-flask) after 7 days. In free cell culture, however, the cells showed a 14-fold increase in cell number. Indeed the encapsulated cells were cultured in a bubble column bioreactor with an aeration of 0.1 vvm at 21% and 5% O₂. The result of this bioreactor showed with decreasing O₂ from 21% to 5%, the cells increased 2 folds in the microcapsules, indicating the importance of process parameters such as oxygen concentration and tension on the cell behavior. These results demonstrated that alginate-gelatin microcapsules can be considered as a proper microenvironment for proliferation of suspension cells, although more optimization for dynamic systems is required.

Biography

Sorour Nemati is now studying MSc in Chemical Engineering Faculty of Sahand University of Technology, Tabriz, Iran. She is working on her MSc thesis in Tissue Engineering and Stem Cell Research Lab with the title of "Study on proliferation and differentiation of hematopoietic stem cells in bubble column bioreactor. She has published one paper in 10th Royan International Congress on Stem Cell Biology and Technology.

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