Cell Encapsulation using Layer by Layer assembly of Polyelectrolytes

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Abstract

In cell encapsulation, a suitable environment is provided for cell growth, proliferation and differentiation. Alginate hydrogel is an ideal medium for encapsulating cells and facilitating the production of cartilage tissue due to its desirable properties. Also using Layer by layer assembly of polyelectrolytes on microcapsules could be an ordinary imitation of zonal organization of cartilage and force hypoxia to cells encapsulated. In this project, alginate and chitosan, which are structurally similar to glycosaminoglycans, were assembled layer by layer on alginate microcapsules containing mesenchymal stem cells. The formation of these nanolayers was checked using uv-vis absorption technique and the amount of water absorption of different samples was determined within a week. FESEM images showed that the microcapsules have a completely porous and interconnected structure and the cells were well entrapped inside them. The results of AO/PI staining revealed that the cells showed viability for 7 days. The results of alcian blue staining, antibody staining and the expression of genes demonstrated that cartilaginous differentiation has occurred completely in the S10 sample, which has maximum number of nanolayers. These results showed that the hypoxia applied due to the assembly of nanolayers has an effective role in the differentiation of mesenchymal stem cells into chondrocyte cells.

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