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Biocompatibility of collagen-polysaccharide based hydrogels for cell encapsulation

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Introduction: Cell encapsulation in a hydrogel that plays the role of extracellular matrix (ECM) requires a cyto compatible hydrogelation process without the use of harsh chemical agents. Collagen, the main protein of the ECM represents an ideal micro-medium in which cells can be encapsulated given the natural RGD sequence that mediates cell adhesion and the ability to form hydrogels in physiological conditions.In our study, we have tested the cyto compatibility of a collagen based hydrogel with mechanical properties improved by cross-linking with functionalized polysaccharides.

Methods: The biocompatibility of the hydrogels based on collagen cross-linked with partial oxidized gellan was tested by determining the viability of the cells using MTT method. Adipose stem cell proliferation within the hydrogels was evaluated with Alamar Blue test. The morphology of encapsulated cells and hydrogel structure were observed by SEM after critical point drying. The degradability of the hydrogels was tested in the presence of collagenase by ninhydrin assay.

Results: MTT tests after 24, 48 and 72 hours revealed viability above 97% compared with control wells. Cells proliferated within the hydrogels as shown by an increase in metabolic activity. Hydrogels present a fibrillar structure with cells integrated and adhered to the fibrils. The presence of gellan as a cross-linker stabilized the hydrogel which degraded slower than the un-crosslinked collagen.

Conclusions: We have obtained a cyto compatible collagen-based hydrogel by using functionalized polysaccharides as a structural component and also as a cross-linker. The hydrogels allow cell encapsulation without affecting the viability and cell proliferation and are more stable to enzymatic degradation.

Biography

Alina Gabriela Rusu is a PhD student in Chemistry from Technical University "Gheorghe Asachi" of Iasi, Faculty of Chemical Engineering and Environmental Protection and Member in the Center for Training and Research in Tissue Engineering and Regenerative Medicine from University of Medicine and Pharmacy "Grigore T. Popa" of Iasi. In December 2014, she obtained a Doctoral Scholarship in the POSDRU Program159/1.5/S/133652 at "Alexandru Ioan Cuza" University of Iasi. She completed her MSc degree in Prosthetics Bioengineering in 2012. Her research studies are focused on developing and characterization of novel scaffolds based on functionalized chitosan with potential applications in medicine.

Andreea Luca is a PhD student at the Technical University "Georghe Asachi" from Iasi, Department of Natural and Synthetic polymers. She has graduated the Faculty of Medical Bioengineering from the University of Medicine and Pharmacy "Grigore T. Popa" and received her Master Degree in Molecular Genetics at the University "Alexandru I. Cuza", Faculty of Biology. Her research is focused on the use of hydrogels as scaffolds for cell encapsulation.

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