ALGINATE-GRAFT-GELATIN COPOLYMERS FOR TISSUE ENGINEERING APPLICATIONS

G.-J. Graulus,[1] A. Mignon,[1] S. Van Vlierberghe[1] and P. Dubruel[1]

[1] Polymer Chemistry & Biomaterials Research Group, Department of Organic and Macromolecular Chemistry, Ghent University; Krijgslaan 281, building S4, B-9000 Ghent, Belgium

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Abstract

When it comes to failing or injured tissues and organs, patients often end up on waiting lists for tissue or even organ transplantation negatively affecting the patient's quality of life. The multidisciplinary research field of tissue engineering may offer more innovative ways to replace or ideally regenerate failing tissues and organs. A widely used material in this research field is gelatin because of its biocompatibility and interesting hydrogel forming properties. However, at body temperature gelatin's mechanical properties are greatly reduced due to the dissolution of the collagen-like triple helices.

With the aim to obtain materials that retain their mechanical properties at body temperature, we propose to combine sodium alginate and modified gelatin in the form of a graft copolymer to obtain a material that closely resembles the extracellular matrix. The obtained materials can be cross-linked via three distinct pathways including cation mediated, temperature mediated or via covalent bond formation after UV irradiation in the presence of a photo-initiator.

The current contribution covers the synthesis of the above mentioned alginate-graft-gelatin copolymers and the characterisation of the resulting hydrogels. The materials developed were highly hydrophilic, showing high gel fractions and satisfactory mechanical properties which were tunable by divalent cation addition. Moreover, *in vitro* biocompatibility assays indicated that cell adhesion and proliferation improved with increasing gelatin content. The present paper illustrates that the developed triple cross-linkable materials are suitable cell carriers, promising to be applied for biomedical purposes. Future work will focus on the processing of these copolymers into tailor-made, structural supports using a variety of 3D printing and two-photon polymerization techniques to ensure an architectural mimic of the natural extracellular matrix.

Geertjan.graulus@ugent.be

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