Optimization of Scaffold Based on Biopolymer Complexes

D. Bakoš, L. Kukolíková, S. Hanzelová and P. Alexy
Faculty of Chemical and Food Technology STU in Bratislava,
Radlinskeho 9, 812 37 Bratislava, Slovak Republic,
E-mail: dusan.bakos@stuba.sk

ABSTRACT

Polyelectrolyte complexes based on biopolymers represent an attractive class of polymer-based materials for preparation of biodegradable and biocompatible 3D membranes. These membranes are effectively used as scaffolds in tissue engineering for replacement of connective tissue. The complexity of polyelectrolyte systems and processing of the complex formation must be considered in designing the ultimate properties of the complex. From the point of view of polymer hydrogels, polyelectrolyte complexes belong to the category of physically crosslinked gels with the crosslinks of small but finite energy and/or of finite lifetime. Usually, chemical crosslinking has been widely used to increase the mechanical and biological stability of biomaterials. Biopolymers and their derivatives and complexes have been studied taking into consideration improving the wound-healing acceleration and cellular assistance for skin and cartilage recovery. The study is focused on biomaterials based on complexes associating chitosan and hyaluronan. The gel complex formation depends on conditions favourable to polyanion interactions held among components. Due to a complexity, the study is oriented to optimization and properties testing of the membrane based on polyelectrolytes complex chemically crosslinked with starch dialdehyde derivatives. The products being developed should satisfy several requirements as is good adhesion and cell growth, reproducibility in their three dimensions, large surface area for cell-polymer interactions, mechanical properties, and biodegradability.

Keywords: Polyelectrolyte complex, optimization, chitosan, hyaluronan, enzymatic degradation and mechanical properties

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