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Biocompatible scaffolds based on natural polymers for regenerative medicine

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Abstract

The chitosan and gelatine are commonly used biopolymers for the tissue engineering applications. In the previous methods for the cryogels synthesis, multistep preparation methods using toxic cross-linking agents such as glutaraldehyde are reported. Here, we present a two-step preparation method of gelatin macroporous cryogels and one-step preparation method of chitosan or gelatin cryogels. The physico-chemical properties of obtained scaffolds were characterised using FTIR, zeta potential, SEM and laser confocal microscopy. Non-toxic and biodegradable cross-linking agents such as oxidised dextran and 1,1,3,3-tetramethoxypropane are utilized. The one-step chitosan cryogels had degradation degree ~2 times higher compared to the cryogels prepared with a two-step method i.e. reduced by borohydride. Scaffolds cross-linked by glutaraldehyde had about 40% viability, whereas nine various compositions of cryogels showed significantly higher viability (~80%) of fibroblast cells *in vitro*. The cryogels were obtained without using the harmful compounds and therefore can be used straightforward as biocompatible and biodegradable scaffolds for the cell culturing purposes and other biomedical applications.

Keywords: *natural polymers, cryogels, chitosan, 1,1,3,3-tetramethoxypropane*

1. Introduction