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Preparation and characterization of porous chitosan/ tragacanthic acid hybrid scaffold with freeze-gelation method

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Background and Aims: Tissue engineering has provided a novel approach to recover physiological function by seeding cells onto scaffolds together with the growth factors and other proliferation and differentiation modulators. Therefore, preparation of porous scaffold with bio-adhesive and biocompatible materials is an important topic in biomaterial research. Among different fabrication techniques, freeze-gelation method is an energy and time effective method. It is easy to prepare and scale up without the need to special or expensive apparatus. In this technique, the porous structure is generated by freezing of a polymer solution, following either the solvent extraction by a non-solvent or the polymer gelation under the freezing condition. Tragacanthic acid is a baranched anionic polysaccharide derived from tragacanth gum consists of repeated galacturonic acid unites in the backbone, and galactose, fucose and xylose in the side chains. Chitosan, a well known cationic polysaccharide; containing D-glucosamine and N-acetyl-D-glucosamine has attracted much attention as biomaterial because of its biocompatibility and biodegradability.
Methods: a porous chitosan/tragacanthic acid scaffolds have been produced either by ionic interaction of tragacanthic acid and chitosan followed by extraction of water using ethanol as non-solvent or further gelation with 0.25% ethanol solution of ferric chloride at -20 °C. Ionic interaction of polymers and ferric cations were investigated by FTIR. Morphology of scaffolds was evaluated by SEM. Cytotoxicity, cell adhesion and proliferation were assayed on L929 mouse fibroblast.
Results: novel chitosan/tragacanthic acid porous scaffolds were synthesized by ionic interaction of polymers and freeze-gelation method. Scaffold composed 3% tragacanthic acid, 0.5% chitosan and 0.25% ferric chloride with porous size of ca. 300 µm shown the best swellability (300% water absorption) and proliferation.

Keywords: Tragacanthic acid; Chitosan; Freeze-gelation; Scaffold