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Ionic Crosslinked Biopolymer-Ceramic Beads for Bone Tissue Engineering

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Abstract

In several situation when bone integrity is prejudiced, advanced regenerative medicine approaches are involved in order to get a good result, being designed and applied synthetic tissue engineered architectures. This rapidly evolving interdisciplinary domain, tissue engineering, is centered on developing three-dimensional scaffolds, which can be prepared from ceramics, polymers or the combination between those two, resulting a complex material mimicking the composition of the natural bone. Among polymers, polysaccharides are a remarkable class, due to the inexhaustible source, great biocompatibility and versatility in terms of processability. Alginate and guar gum, included in this class have the ability to crosslink in the presence of Ca2+ ions, resulting easy to handle beads. Due to the similarity with human inorganic matter, calcium phosphates are used in orthopedy, frequently combined with polymers to overcome one of the main disadvantages of ceramics: brittleness, which negatively influences mechanical behavior. All these aspects being considered, the aim of the study was to obtain alginate–calcium phosphate beads with inclusion of carboxymethyl guar gum nanoparticles as scaffolds for bone tissue engineering and analyze them in terms of morphology and composition (Field Emission Scanning Electron Microscope and Energy-dispersive X-ray Spectrometer), chemical structure (Fourier Transform Infrared Spectrometer) and behavior in simulated body fluids.

Keywords: biopolymers, calcium phosphates, ionic crosslinking, tissue engineering

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