Calcium Phosphates-based Biomaterials with Sr- and Zn-Dopants for Osteochondral Tissue Engineering

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Abstract

The repair and regeneration of osteochondral (OC) defects has been increasing owing the high number of trauma related injuries or osteoarthritis. Although current clinical options are effective for the treatment of OC defects, advanced therapeutic options that simultaneously preserve the native tissue structure and address a proper regeneration of bone and cartilage defects are therefore fundamental, namely in respect to neurovascular regeneration in large defects. The main purpose for OC tissue engineering is to recreate a biomimetic and monolithic scaffold consisting of a cartilaginous layer and an underlying osseous layer, for regeneration of cartilage and bone, respectively, involving different combinations of materials, morphologies and properties in both parts of the scaffolds[1]. This study aims to develop scaffolds composed of biopolymers (silk fibroin) and calcium phosphates incorporating different ions (e.g. Sr, Zn), for the simultaneous regeneration of cartilage and bone. These scaffolds present great bioresorbability and osteointegration, and high mechanical strength[2]. In particular, Sr and Zn plays vital roles in the formation, growth, and repair of bone, thus it can promote osteogenesis and angiogenesis[3]. Besides, these elements can lend controlled degradation and increase the mechanical strength of the new materials. Porous composite scaffolds with distinct cartilage and bone sides were produced through solvent casting and particulate-leaching technique, followed by freeze-drying. The scaffolds presented macroporosity highly interconnected and microporosity with sizes around 500 µm, and 1-10 µm, respectively. Current studies are on-going to evaluate the scaffolds *in vitro* degradation and ions release profiles, and mechanical properties.

References:

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