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Fabrication and characterization of β-tricalcium phosphate bone scaffold coated with κ-carrageenan and alginate natural polymers

Abstract

One scaffold with the complex characteristics is a challenging need, starting from the scaffold design stage until the transformation into in vivo stages. In this circumstance, the combination of bioceramics with polymers as coated scaffolds is gaining acceptance to enhance mechanical properties. Here, properties of porous B-tricalcium phosphate (B-TCP) scaffolds, coated with alginate and K-carrageenan, were investigated and compared with those of uncoated scaffolds. B-TCP scaffolds have been fabricated with 50 wt% and 60 wt% solid concentration using freeze-casting and replication methods. Natural polymers based on polysaccharides, K-carrageenan, and alginate solutions were used to coat and strengthen the B-TCP scaffold. The results suggest that the compressive strength of a coated B-TCP scaffold polymer is higher than an uncoated B-TCP scaffold, and that with 60 wt% solid concentration for both methods have the highest compressive strength. Alginate-coated B-TCP scaffolds exhibit slightly higher strength than K-carrageenan-coated scaffolds. For the cell viability test, no cell toxicity was found after 3 days of rabbit fibroblast cell culture. This study confirmed the importance of natural polymers phase in enhancing the scaffold strength while maintaining the interconnected pores size.