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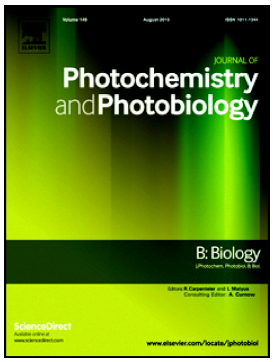

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Enhanced biological properties of biomimetic Apatite fabricated Polycaprolactone/Chitosan Nanofibrous bio-composite for Tendon and Ligament regeneration

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Abstract

The development of tailored nanofibrous scaffolds for tendon and ligament tissue engineering has been a goal of clinical research for current researchers. Here, we establish a formation of novel nanofibrous matrix with significant mechanical and biological properties by electro-spinning process. The fine fibrous morphology of the nanostructured hydroxyapatite (HAp) dispersed in the polycaprolactone/chitosan (HAp-PCL/CS) nanofibrous matrix was exhibited by microscopic (SEM and TEM) techniques. The favorable mechanical properties (load and modulus) were achieved. The load and modulus of the HAp-PCL/CS composite fibers was 250.1 N and 215.5 MPa, which is very similar to that of standard value of the human tendon and ligament tissues. The cellular responses and biocompatibility of HAp-PCL/CS nanofibrous scaffolds were investigated with human osteoblast (HOS) cells for tendon regeneration and examined the primary osteoblast mechanism by in vitro method. The morphological (FE-SEM and fluorescence) microscopic images clearly exhibited that HOS cells are well attached and flatted on the nanofibrous composites. The HAp dispersed PCL/CS nanofibrous scaffolds promoted higher adhesion and proliferation of HOS cells comparable to the nanofibrous scaffolds without HAp nanoparticles. The physic-chemical and biological properties of the synthesized nanofibrous