Reinforcement of hydroxyethyl cellulose / poly (vinyl alcohol) with cellulose nanocrystal as a bone tissue engineering scaffold

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ABSTRACT
In this present work, a porous three-dimensional (3D) scaffold of HEC/PVA and HEC/PVA/CNC were successfully fabricated by freeze-drying technique. HEC (5 wt%) and PVA (15 wt%) were dissolved and blended at a ratio of 50:50 and incorporated with CNC (3 wt%) as nanofillers to obtain a highly porous scaffolds. The morphology, chemical and thermal properties of scaffolds were characterized by SEM, ATR-FTIR, and TGA. Meanwhile, cytotoxicity studies on both porous scaffold biomaterials were carried out by utilizing human fetal osteoblast (hFOB) cells using MTT assays. Incorporated HEC/PVA with CNC were exhibited superior functionality which resulted in decreasing average pore size from ~54.1 µm to ~33.4 µm. There were slightly changes in the chemical structure as determined by FTIR spectra. Thermal studies revealed that the melting temperatures of HEC/PVA/CNC scaffold were slightly shifted to a higher value. It was observed that hFOB cells were able to attach and spread on both scaffolds and supported the cell adhesion and proliferation. Due to its biocompatible and biodegradable properties, these newly developed highly porous scaffolds may provide a promising alternative scaffolding matrix for bone tissue engineering regeneration.

KEYWORDS
Biomaterials; Bone tissue engineering; Cellulose nanocrystal; Freeze-dry; Scaffold

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