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In vitro degradation study of novel HEC/PVA/collagen nanofibrous scaffold for skin tissue engineering applications (Article)

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Abstract

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The aim of this study was focused on the degradation behavior of electrospun (hydroxyethyl cellulose/poly(vinyl) alcohol) HEC/PVA and HEC/PVA/collagen nanofibrous scaffolds, as a potential substrates for skin tissue engineering in two biologically related media: phosphate buffered solution (PBS) and Dulbecco's modified Eagle's medium (DMEM) for 12 weeks incubation period. The scaffolds were characterized at different degradation times by a series of analysis including pH changes of solutions, weight loss, swelling ratio, SEM, ATR-FTIR, DSC, TGA and mechanical properties. The results indicated that HEC/PVA/collagen scaffolds were exhibited slower degradation rate in both medium as compared to HEC/PVA blend nanofibers. All fibers displayed uneven and rough surfaces towards the final week of incubation in both PBS and DMEM solution. As degradation time increased, there were little changes in the chemical structure as determined by FTIR spectra while thermal studies revealed that the melting temperatures and crystallinity of scaffolds were slightly shifted to a lower value. Both HEC/PVA and HEC/PVA/collagen fibers showed significant decrease in Young's modulus and tensile stress over 12 weeks degradation. These results show that these nanofibrous scaffold demonstrate degradation behavior that meets the requirement as potential degradable biomaterials for dermal replacement.

Author keywords

Collagen Hydroxyethyl cellulose In vitro degradation Nanofibers scaffold Tissue engineering

Indexed keywords

Engineering controlled terms: Biodegradation Biological materials Biomechanics Blending Collagen Degradation Elastic moduli Fourier transform infrared spectroscopy Mechanical properties Nanofibers Photodegradation Tissue Tissue engineering