In Vitro Degradation Study Of Novel Hec/Pva/Collagen Nanofibrous Scaffold for Skin Tissue Engineering Applications

Farah Hanani Zulkifli[a,], Fathima Shahitha Jahir Hussain[a], Mohammad Syaiful Bahari Abdull Rasad[b], Mashitah Mohd Yusoff[a]

[a] Faculty of Industrial Sciences & Technology, University Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

[b] Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Bandar Indera Mahkota Campus, Jalan Sultan Ahmad Shah, 25200 Kuantan, Pahang, Malaysia

ABSTRACT

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.

KEYWORDS: *In vitro* degradation; Hydroxyethyl cellulose; Collagen; Nanofibers scaffold; Tissue engineering

DOI: 10.1016/j.polymdegradstab.2014.10.017