A9

Semi-Interpenetrating Polymer Networks Composed of Silk Fibroin and Poloxamer Macromer for Wound Dressing Application

Mi-Kyong Yoo[1], Hae-Yong Kweon[2], Hyun-Chul Lee[3], Sung-Sik Park[3] and Chong-Su Cho[1]

[1]School of Agricultural Biotechnology, Seoul National University; [2]Department of Agricultural Biology, National Institute of Agriculture and Technology; [3]Department of Microbiology and Research Institute of Medical Sciences, Chonnam National University Medical School

Silk fibroin (SF) was designed to utilizea matrix for wound dressing by many researchers because of excellent biocompatibility of the SF. However, the SF sponge itself is brittle although its application to wound dressing requires sufficient mechanical strengths. Improvements in mechanical properties of SF have been sought by blending with other synthetic or natural polymers. In our system, poloxamer-407 macromer having an acrylated-terminated PEO derivative was chosen as blending material and crosslinked in the presence of SF to form semi-interpenetrating polymer networks(SIPNs), and then its potential as wound dressing material was assessed. The thermal and mechanical properties of the SIPNs hydrogels as well as their swelling behaviors were studied by DSC, compressive modulus measurement, and gravimetric method, respectively. The morphology and crystalline structure of these SIPNs hydrogels were also investigated by SEM and X-ray diffractometry, respectively. Its water vapor permeability and cytotoxicity were characterized, and then their effectiveness in burn wound healing using BALB/c mice in vivo was examined. Obtained SIPNs hydrogels were porous and their pores were well interconnected throughout the scaffold matrix. The melting temperature of poloxamer in the SIPNs decreased due to the prevention of crystallization by the incorporation of SF. The mechanical strength of SIPNs hydrogel was much higher than those of SF itself or SF/poloxamer blend and increased with the poloxamer content. The equilibrium water content of SF was remarkably increased by formation of SIPNs with poloxamer due to the hydrophilicity of poloxamer. The crystallity and morphology of SIPNs hydrogel were affected by SIPNs hydrogel composition. In vivo test, granulous tissue formation and wound contraction for SF/Poloxamer and DHEA-impregnated SF/Poloxamer wound dressing were faster than any other groups.