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Enhanced physical and cellular activities of polycaprolactone/alginate/PEO cell-laden hierarchical scaffolds for tissue engineering applications

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Biomedical scaffolds have been widely investigated because they are essential for support and promotion of cell adhesion, proliferation and differentiation in three-dimensional (3D) structures. An ideal scaffold should be highly porous to enable efficient nutrient and oxygen transfer and have a 3D structure that provides optimal micro-environmental conditions for the seeded cells to obtain homogeneous growth after along culture period. In this study, new hierarchical osteoblast-like cell (MG-63)-laden scaffolds consisting of micro-sized struts/inter-layered micro-nanofibres and cell-laden hydrogel struts with mechanically stable and biologically superior properties were introduced. Poly (ethylene oxide) (PEO) was used as a sacrificial component to generate pores within the cell-laden hydrogel struts to attain a homogeneous cell distribution and rapid cell growth in the scaffold interior. The alginate-based cell-laden struts with PEO induced fast/homogeneous cell release, in contrast to nonporous cell-laden struts. Various weight fractions (0.5, 1, 2, 3 and 3.5 wt%) of PEO were used, of which 2 wt% PEO in the cell-laden strut resulted in the most appropriate cell release and enhanced biological activities (cell proliferation and calcium deposition), compared to nonporous cell-laden struts.

Biography

Hyeongjin Lee is pursuing his PhD from 2011 to present in Bio-Mechatronic Engineering, SKKU, South Korea. He worked as a Scientist from 2012-2013 at Biomedical Engineering, Cornell University, USA. He did his MS in 2009-2011 in Mechanical Engineering, from Chosun University, South Korea, and BS from 2005-2009 in Mechanical Engineering from Chosun University, South Korea.

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