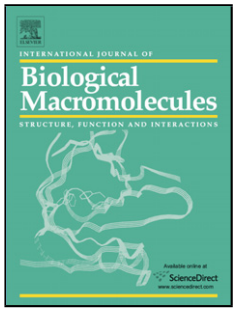

Title: Osteoinductive silk fibroin/titanium dioxide/hydroxyapatite hybrid scaffold for bone tissue engineering

Author: Jung-Ho Kim Dong-Kyu Kim MD Ok Joo Lee Hyung Woo Ju Jung Min Lee Bo Mi Moon Hyun Jung Park Dong Wook Kim Joon Ho Lee MD Chan Hum Park MD

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ABSTRACT

The present study demonstrated the fabrication that incorporation of titanium isopropoxide (TiO_2) and hydroxyapatite (HA) nanoparticles into the silk fibroin (SF) scaffolds. In this process, we prepared TiO_2 nanoparticles using sol-gel synthesis and the porous structure was developed by salt-leaching process. Homogeneous distribution of TiO_2 and HA nanoparticles were confirmed by images of VP-FE-SEM and those equipped with energy dispersive X-ray spectrometer. Structural characteristics of the porous SF/TiO_2/HA hybrid scaffold were also determined using FTIR analysis and X-ray diffractometer. In this study, the porous SF/TiO_2/HA hybrid scaffold showed similar porosity, enhanced mechanical property, but decreased water binding abilities, compared with the porous SF scaffold. For evaluation of the osteogenic differentiation of rat bone marrow mesenchymal stem cells, alkaline phosphatase activity and osteogenic gene expression were employed. Our results revealed that the porous SF/TiO_2/HA hybrid scaffold had improved osteoinductivity compared with the porous SF scaffold. These results suggest that the osteogenic property as well as mechanical property of the porous SF/TiO_2/HA hybrid scaffold could be better than the porous SF scaffold. Therefore, the porous SF/TiO_2/HA hybrid scaffold may be a good promising biomaterial for bone tissue engineering application.

Key word: Silk fibroin, titanium isopropoxide, hydroxyapatite, bone, scaffold, tissue engineering.