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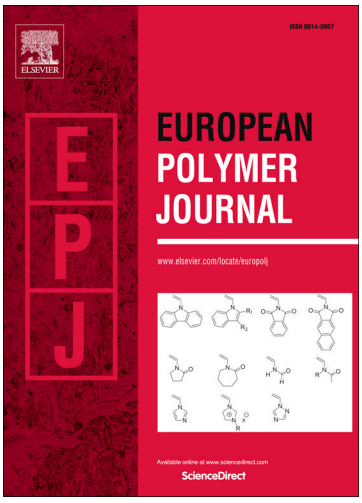

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Osteoconductive Layer-by-Layer Films of Poly(4-hydroxy-L-proline ester) (PHPE) and Tannic Acid

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Abstract

Orthopedic implants have shown major success in clinics after successful orthopedic surgeries. However, they are also associated with several drawbacks such as local and systemic immune reaction in the body and improper integration of the bone with the implants. Osteoconductivity is a property of orthopedic implants that promotes bone cell adhesion and bone tissue integration on implant surfaces. This study presents use of a biodegradable cationic polyester, poly(4-hydroxy-L-proline ester) (PHPE) together with Tannic Acid (TA) as building blocks in construction of layer-by-layer (LbL) films to impart osteoconductive properties to multilayer films. Water-soluble complexes of PHPE and TA (PHPE-TA) were prepared at pH 4 and then LbL deposited at the surface without using a polymer counterpart. Multilayers were then cross-linked using $NaIO_4$ to enhance their stability under physiological conditions. Potential of multilayers as an osteoconductive coating were assessed by i) osteoblast-like cell adhesion; ii) determination of collagen deposition by cells and iii) the determination of extracellular matrix (ECM) mineralization and the results were compared to control substrates, i.e. cell culture plate well surface and collagen-coated substrates. PHPE-TA multilayers were found to be adhesive for SaOS-2 osteoblast-like cells and promoted collagen-rich nodule formation and mineralization of the ECM without causing cytotoxicity.

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