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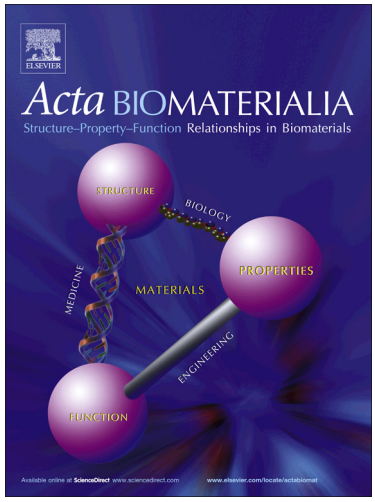

Full length article

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Binary Polyhydroxyalkanoate Systems for Soft Tissue Engineering

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Abstract

Progress in tissue engineering is dependent on the availability of suitable biomaterials. In an effort to overcome the brittleness of poly(3-hydroxybutyrate), P(3HB), a natural biodegradable polyester, and widen its biomedical applications, plasticising of P(3HB) with oligomeric substances of related structure has been studied. A biosynthesised medium-chain-length polyhydroxyalkanoate (mcl-PHA) copolymer, the plasticizer precursor, was obtained using vegetable waste frying oil as a sole carbon source. The mcl-PHA was transformed into an oligomeric derivative by acid hydrolysis. The plasticising effect of the oligomeric mcl-PHA on P(3HB) was studied via characterisation of thermal and mechanical properties of the blends in the course of ageing at ambient conditions. Addition of oligomeric mcl-PHA to P(3HB) resulted in softer and more flexible materials based entirely on PHAs. It was shown that the oligomeric mcl-PHA transformed highly crystalline P(3HB) into materials with a dominant amorphous phase when the content of oligomeric mcl-PHA exceeded 10wt%. *In vitro* biocompatibility studies of the new binary PHA materials showed high viability and proliferation of C2C12 myoblast cells. Thus, the proposed approach for P(3HB) plasticisation has the potential for the generation of more pliable biomaterials based on P(3HB) which can find application in unique soft tissue engineering applications where a balance between stiffness, tensile strength and