

Growth of keratinocytes on porous films of poly(3-hydroxybutyrate) and poly(4-hydroxybutyrate) blended with hyaluronic acid and chitosan.

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[Details](#)



Abstract

The objective of this study was to develop novel absorbable films suitable for use as a tissue-engineering scaffold for keratinocytes as a therapy for replacement of damaged skin. Poly(4-hydroxybutyrate) (P(4HB)) and poly (3-hydroxybutyrate) (P(3HB)) were blended with small amounts of the polysaccharides hyaluronic acid (HA), chitosan (CH), pectin and alginic acid, and were solution cast to produce porous films. The resulting composites had favorable mechanical properties, and these films were compared with two commercially available implantable films made of poly(L-lactide-co-D,L-lactide) (PLA copolymer) and HA benzyl ester. Tensile testing demonstrated that a high level of flexibility of P(4HB) was retained in the P(4HB)-polysaccharide composite films, whereas the P(3HB) film and its polysaccharide composites were stiffer and more brittle. The proliferation kinetics of adherent HaCaT keratinocytes on the films was examined in vitro. The porous surface of the P(4HB) and P(3HB) films blended with HA or CH promoted the growth of keratinocytes significantly. The order of maximum cell numbers on these films was

P(4HB)/HA > P(4HB)/CH > P(3HB)/HA > P(3HB)/CH > P(3HB)/pectin > P(3HB)/alginic acid. Scanning electron microscopy and confocal laser scanning microscopy revealed differences in cell growth. Cells formed clusters on P(3HB) and its composites, while the cells grew as a confluent layer on P(4HB) and its composites. HaCaT cells formed large numbers of filaments only on P(4HB) films, indicating the excellent biocompatibility of this material. For the nonporous PHB films, the proliferation rate of cells was found to increase with decreasing hydrophobicity in the order: P(4HB) > P(3HB)/P(4HB) blend > P(3HB).

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