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Abstract

Composite Coatings Based on PLGA for Topical Treatment †

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Different medical devices containing biologically active principles for cutaneous wound healing have been developed over time. Our aim was to propose new composite coatings based on poly(lactic-co-glycolic acid) (PLGA) embedded with ibuprofen (IBUP) as a potential device for topical application in wound healing.

PLGA-IBUP (2:1 and 10:1 wt. %) materials were obtained by combining dip coating and drop cast methods. IBUP release under dynamic biological simulated conditions (up to 30 days) was performed using a multichannel bioreactor and subsequent spectrophotometric analysis (265 and 274 nm absorption bands). Structural modifications of composite coatings were evaluated using scanning electron microscopy (SEM). Cell proliferation assay and fluorescence microscopy were used to investigate the viability and morphology of the human THP-1 cell line grown on polymeric coatings embedded with IBUP.

Mass losses of the composite coatings tested under a dynamic regime revealed a progressive increase in the degradation of the PLGA-IBUP structures after 30 days, with a mass loss of approximately 15%.

The SEM investigation revealed a slow and gradual degradation of copolymer and release of the therapeutic agent during the first 10 days. After 15 days, much larger swelling formations were present, with a severe degradation of the coating for the last evaluation interval (30 days). Cytotoxic effect was not observed for neither of the tested coatings on differentiated THP-1 cells grown for 24 h or 72 h as compared with the coverslip (control). The cells exhibited a typical round shape, similar to undifferentiated monocytes morphology when cultivated on either coverslips or PLGA-coated substrates. When the cells were grown on the PLGA-IBUP (2:1) or (10:1) samples, an increase in cell adhesion was observed as an adaptation of cells to surface characteristics. Morphological modifications induced by composite materials were not associated with an inflammatory response (absence of TNF-α release).

The physical, chemical, and biological characteristics of PLGA-IBUP composite coatings revealed their potential as medical devices to be used for topical treatment of skin injures.

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