Design and characterization of highly porous curcumin loaded freeze-dried wafers for wound healing

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Abstract

The goal of this research was to evaluate the beneficial effects of topical curcumin loaded freeze-dried wafers in wound healing. Curcumin wafers were fabricated by cross-linking of chitosan with beta glycerophosphate under magnetic stirring. Composite wafers were prepared by the addition of sodium hyaluronate. Wafers were fabricated by freeze-drying technique. The resulted wafers were examined by naked eye and their dimensions were measured using a caliper. % Drug content, in-vitro release and % water uptake tests were conducted to characterize the fabricated wafers. Porosity testing, compressive mechanical behavior, morphological examination using scanning electron microscopy, thermal behavior using differential scanning calorimetry and Fourier transform infrared spectroscopy were all carried out on the optimized cross-linked wafers followed by their microbiological assays and cytotoxicity studies. The results showed that the optimized wafers possessed high water uptake capabilities while entertaining very high porosity levels (86-89%). Microbiological assay revealed the superiority of the selected curcumin wafers versus free curcumin in bacterial growth inhibition against Staphylococcus epidermidis and Staphylococcus aureus (MRSA) bacteria. The anti-inflammatory effects of the selected curcumin wafers were evaluated against pro-inflammatory cytokines. The results suggested that they were significantly better than free curcumin in lowering cytokines levels. To conclude, the obtained findings revealed that curcumin wafers offered a promising solution in the field of wound healing.

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