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# Development of a Wound Dressing Material Based on Microbial Polyhydroxybutyrate Electrospun Microfibers Containing Curcumin

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**Abstract :** The wound healing process can be accelerated and improved by the action of antioxidants such as curcumin (Cur) over the tissues; however, the efficacy of curcumin used through the digestive system is not enough to exploit its benefits. Electrospinning presents an alternative to carry curcumin directly to the wounds, and polyhydroxybutyrate (PHB) is proposed as the matrix to load curcumin owing to its biodegradable and biocompatible properties. PHB is among 150 types of Polyhydroxyalkanoates (PHAs) identified, it is a natural thermoplastic polyester produced by microbial fermentation obtained from microorganisms. The proposed objective is to develop electrospun bacterial PHB-based microfibers containing curcumin for possible biomedical applications. Commercial PHB was solved in Chloroform: Dimethylformamide (4:1) to a final concentration of 7% m/V. Curcumin was added to the polymeric solution at 1%, and 7% m/m regarding PHB. The electrospinning equipment (NEU-BM, China) with a rotary collector was used to obtain Cur-PHB fibers at different voltages and flow rate of the polymeric solution considering a distance of 20 cm from the needle to the collector. Scanning electron microscopy (SEM) was used to determine the diameter and morphology of the obtained fibers. Thermal stability was obtained from Thermogravimetric (TGA) analysis, and Fourier Transform Infrared Spectroscopy (FT-IR) was carried out in order to study the chemical bonds and interactions. A preliminary curcumin release to Phosphate Buffer Saline (PBS) pH = 7.4 was obtained in vitro and measured by spectrophotometry. PHB fibers presented an intact chemical composition regarding the original condition (dust) according to FTIR spectra, the diameter fluctuates between 0.761 ± 0.123 and 2.157 ± 0.882 µm, with different qualities according to their morphology. The best fibers in terms of quality and diameter resulted in sample 2 and sample 6, obtained at 0-10kV and 0.5 mL/hr, and 0-10kV and 1.5 mL/hr, respectively. The melting temperature resulted near 178 °C, according to the bibliography. The crystallinity of fibers decreases while curcumin concentration increases for the studied interval. The curcumin release reaches near 14% at 37 °C at 54h in PBS adjusted to a quasi-Fickian Diffusion. We conclude that it is possible to load curcumin in PHB to obtain continuous, homogeneous, and solvent-free microfibers by electrospinning. Between 0% and 7% of curcumin, the crystallinity of fibers decreases as the concentration of curcumin increases. Thus, curcumin enhances the flexibility of the obtained material. HPLC should be used in further analysis of curcumin release.

**Keywords :** antioxidant, curcumin, polyhydroxybutyrate, wound healing
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