The Analysis of Chitosan in Reducing the Initial Burst Effect in Electrospun Nanofiber-Based Drug Delivery Systems (DDS)

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Drug delivery systems are vessels for the controlled release of a therapeutic agent. These systems show promising results for their administration in drugs related to cancer treatment, but the initial burst effect, in which a substantial portion of the drug is lost upon insertion, acts as a barrier in pervasive implementation. The initial burst effect has remained an unresolved challenge in the implementation of polymer-based drug delivery systems for the last 30 years, and the phenomenon can often deter the use of drug delivery systems altogether despite their potential in proper drug localization at the site of interest. DDS in cancer treatment is a practical alternative to traditional chemotherapy methods that tend to produce adverse side effects, have poor bioavailability, and are non-specific in targeting. Chitosan, a water-soluble linear polysaccharide derived from the deacetylation of chitin from shellfish, has gained prominence for its use in wound dressing due to its favorable biocompatibility. Using the electrospinning process, drug delivery systems were fabricated using PVA and liquid ibuprofen; half of the systems were coated in chitosan—based on its success in similar applications to control drug release rates—and all of the systems were placed into a buffer solution to begin the degradation process. In order to determine the efficacy of chitosan in inhibiting the initial release rate of the drug, the ibuprofen was stained blue and the sodium acetate solution was tested against an orange wavelength. The orange wavelength was administered using a colorimeter, which reported absorbance; a higher concentration of the colored solution absorbs more light (and transmits less) than a solution of lower concentration.

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