Biodegradable Chitosan-Silver Hydrogel as a Delivery Mechanism for Cyclic Lipopeptide-4

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Over 50% of the chronic infections in hospital settings are linked to biofilm formations, placing wounded individuals at high risk for medical complications. Due to the increase in antibiotic resistance, new drugs have been introduced to combat biofilm formation. More specifically, cyclic lipopeptide-4 (CLP-4), has shown to be effective against multiresistant gram-positive bacteria. However, due to its nonpolar nature, it is incompatible with traditional modes of drug delivery and remains unutilized in the biomedical field. The objective of this study was to establish a localized topical drug delivery system for CLP-4 using biodegradable chitosan-silver hydrogels that can be utilized as a novel drug delivery system for nonpolar drugs. This study determined a correlation between the quantity of silver nitrate used to synthesize the hydrogels (0.1w%, 0.2w%, and 0.3w% silver nitrate) with the hydrogels' ability to absorb liquids, specifically, water and ethylene glycol (CLP-4 solvents), surface pore morphology, and chemical properties via a series of swelling tests, scanning electron microscopy, and Fourier-transform infrared spectroscopy. Results showed that gels synthesized with lower concentration of silver yield larger swelling ratios and are associated with larger surface pore sizes; the chemical functional groups in the hydrogels remain consistent regardless of silver concentration. Due to the biodegradable nature and low cost of the hydrogel, the results show promise for utilizing the hydrogel as a delivery system for CLP-4 antibiotics to improve wound healing in clinical settings.

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