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Research article

Chemical synthesis and characterization of chitosan/silver nanocomposites films and their potential antibacterial activity

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Abstract

This study provides the optimum preparation parameters for functional chitosan silver nanocomposite (CSN) films with promising antibacterial efficacy though prepared with very low silver nitrate ($AgNO_3$) concentration. Chitosan nano-silver composites were fabricated by *In-situ* chemical method utilizing the reducing ability of sodium borohydride ($NaBH_4$) and afterward casted into films. Utilization of response surface methodology, NCSS, and SigmaPlot for the optimization of CSN and their predicted antibacterial efficacy assessment of the selected bacterial strains (standard and clinical) was the essential part of the study. The cumulative silver ions released from the CSN films was examined by AAS and was found pH dependent. The developed nanocomposite films exhibited strong antibacterial activity against ATCC strains of Gram-positive *Staphylococcus aureus*, Gram-negative bacteria (*Pseudomonas aeruginosa*) and clinically isolated strains of MRSA. The antibacterial activity CSN films were compared with three commercially available dressings (Aquacel Ag®, Bactigras®, and Kaltostat®) and Quench cream. Statistical analysis of the results indicated that the developed CSN films were equally or even more effective than commercial products. Thus the fabricated CSN films may act as a potential candidate to overcome the emerging antibiotic resistance particularly in hospital-acquired skin infections caused by MRSA.

Keywords: Chitosan, Silver nanoparticles, Nanocomposite.

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