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Antimicrobially effective protein-loaded metal chelated chitosan composite

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Abstract

The immobilization of lysozyme onto a novel synthetic metal chelator composite based on chitosan/PAA-PMA (chitosan/acrylamide-maleic acid) and its effect on antimicrobial activity were the aim of the current study. The plain composite and the lysozyme immobilized composite were characterized according to scanning electron microscopy (SEM), Ultraviolet spectroscopy (UV), Fourier transform infrared (FT-IR), and X-ray diffraction (XRD) analysis. Furthermore, the activities of lysozyme and immobilized lysozyme were investigated, as well as their antimicrobial activity against *Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterococcus faecalis*, and *Staphylococcus aureus*, as well as their cytotoxic effects, which were both approximately greater than those of free lysozyme. The last step was cytotoxic studies on lysozyme, chitosan composite, and lysozyme-immobilized chitosan composite, which showed no cytotoxic effect. Several investigations have shown that metal chelators improve lysozyme's antibacterial action. Two carboxylic acids containing maleic acid were used as a metal chelator in this study. Lysozyme was immobilized from a side other than carboxylic acids, so that carboxylic acid groups, which are metal chelating groups, do not prevent synergy by competing with metal binding at neutral pH. This enhanced antimicrobial activity.

Keywords: antibacterial activity; chitosan; cytotoxic effect; lysozyme; metal-chelating

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