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Bactericide polymers obtained from nitrofurans and chitosan derivatives

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Abstract

Background: In this study, the synthesis and characterization of chitosan polymeric materials grafted with nitrofurans derivatives – furaciline and isofural in terms of antibacterial properties and prolongation of their action were performed.

Material and methods: Synthesis of chitosan analog polymers with maleic anhydride was performed, followed by grafting of nitrofurans derivatives using ethyl chloroformate. The chemical composition of the obtained polymers was confirmed by FT-IR spectroscopy. Antibacterial study has been performed on a wide range of Gram-positive and Gram-negative microorganisms.

Results: Chitosan derivatives with a content of 30 mol% of maleic anhydride were obtained. To the analogous polymer "chitosan maleinized" the medicinal products isofural or furaciline with the help of the ethyl chloroformate were functionalized. By comparative analysis of the IR spectra of the final products with the IR spectra of maleinized chitosan and furacilin or isofural was demonstrated the individual structure of the polymeric preparations "maleinized chitosan grafted with furacilin" / "maleinized chitosan grafted with isofural". The antibacterial substances, isofural and furaciline, among nitrofurans, being grafted with chitosan maleinized, keep their bactericidal activity in the limits of 75-300 µg/mL. The polymeric materials from chitosan maleate grafted with isofural or furacilin in a ratio of 70:30 have a prolonged antibacterial action (observation period 72 hours).

Conclusions: It has been found that isofural and furacilin, among nitrofurans, being grafted on chitosan polymeric material, retain their bactericidal activity and possess prolonged antibacterial action.

Key words: chitosan, furaciline, isofural, grafted copolymers, Gram-positive and Gram-negative microorganisms.

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