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Preparation and Characterization of Crosslinked Chitosan Microspheres Impregnated with the Drug Ketoprofen

Douglas de Jesus Martins* and Denise de Oliveira Silva

Instituto de Química, Universidade de São Paulo, São Paulo, Brazil; e-mail: ddjm@iq.usp.br.

* Corresponding author.

Abstract – The purpose of this study was to prepare a material of ketoprofen-impregnated chitosan microspheres. Chitosan was cross-linked with glutaraldehyde and then microspheres were kept in contact with the drug ketoprofen to give an amorphous material of ketoprofen interacting with chitosan.

Recently a considerable interest in developing controlled or sustained drug delivery systems based on biopolymers has been emerged. Microspheres of polymers which are biodegradable to non-toxic products are good candidates for oral sustained release.

The purpose of this study was to investigate a method to promote interaction between ketoprofen (Hketop), a non-steroidal antiinflammatory drug (NSAID), and the chitosan biopolymer.

Chitosan microspheres have been prepared by co-acervation method and then crosslinked with glutaraldehyde (GA). Chitosan was dissolved in acetic acid 3% (m/v) and subsequently poured into a 2.0 mol L⁻¹ NaOH solution through a peristaltic pump. Gelled microspheres were kept in contact with a 0.1% (m/v) GA solution for 72 h, at room temperature, and after washed with water. Ketoprofen was dissolved in ethanol and resulting solution was maintained in contact with the cross-linked chitosan microspheres for 96 h at room temperature. The resulting material was washed with water and then dried at 40 °C for 6 h.

FTIR vibrational spectra data show that pure chitosan exhibits the O-H stretching characteristic band at 3430 cm⁻¹ and the N-H stretching bendings at 2875 cm⁻¹ and 1654 cm⁻¹, respectively. A band observed at 1663 cm⁻¹ after crosslinking of chitosan with GA indicates the formation of the (C=N) imine group. Ketoprofen shows the $\nu_s(\text{C}=\text{O})$ stretching band at 1697 cm⁻¹ that disappears after interaction with chitosan indicating that maybe the drug is present as deprotonated form in the material. The X-rays diffractogram of ketoprofen-impregnated microspheres of chitosan is typical of amorphous solid. Thermal behavior of the material is contrasting to that of cross-linked chitosan.

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