

Chemically Modified Chitosan Derivatives with Ameliorated Properties Appropriate for Drug Delivery

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Abstract : Polysaccharides are polymeric materials derived from nature. They are extensively used in pharmaceutical technology due to their low cost, their ready availability and their low toxicity. Chitosan is the product derived from the deacetylation of chitin usually obtained from arthropods. It is a linear polysaccharide which is composed of repeated units of N-deacetylated amino groups and some N-acetylated groups residues. Due to its excellent biological properties, it is an attractive natural polymer. It is biocompatible with low toxicity and complete biodegradability. Although it has excellent properties, the chemical modification of its structure results in new derivatives with ameliorated and more improved properties compared to the initial polymer. This is the exact purpose of the present study in which chitosan was modified with three different monomers, namely trans-aconitic acid, succinic anhydride and 2-hydroxyethyl acrylate. In chitosan's modification with trans aconitic acid, EDC was utilized as an activator of the carboxylic groups of the monomer, and then a coupling reaction with the amino groups took place. Succinic anhydride reacted with chitosan through a ring opening reaction while 2-hydroxyethyl acrylate reacted through the addition of chitosan's amino group to the double bond of the monomer. Through FTIR and NMR measurements the success of each reaction was confirmed, and the new structures of the derivatives were verified. X-ray diffraction was utilized in order to examine the effect of the modifications in chitosan's crystallinity. Finally, swelling tests were conducted in order to assess the improved ability of the new polymeric materials to absorb water. Our results support the successful modification of chitosan's macromolecular chains in all three reactions. Furthermore, the new derivatives appear to be amorphous concerning their crystallinity and have great ability in absorbing water.

Keywords : chitosan, derivatives, modification, polysaccharide

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