Mucoadhesive Acrylated Chitosan Nanoparticles for Drug Delivery

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The aim of this study was to investigate the effect of acrylate modification on the mucoadhesion of chitosan at the nanoscale. Nanoparticles were fabricated from acrylated chitosan (ACS) via ionic gelation with tripolyphosphate and were characterized in terms of size, zeta potential, stability, and nanoparticle yield. Chitosan (CS) nanoparticles, serving as a control, were fabricated using the same procedure. The mucoadhesion of the nanoparticles was evaluated using the flow-through method after different incubation periods. The retention percentages of ACS nanoparticles were found to be significantly higher than those of CS nanoparticles, for all studied time intervals. An additional indication for the higher mucoadhesion of ACS nanoparticles was obtained from the mucin particle method, in which mucin and nanoparticles are mixed at different ratios, and an increase in particle size was detected. NMR data verified the presence of free acrylate groups on the ACS nanoparticles. Thus, the improved mucoadhesion could be due to a Michael-type addition reaction between the nanoparticles and thiol groups present in mucin glycoprotein, in addition to entanglements and hydrogen bonding. Overall, ACS nanoparticles exhibit enhanced mucoadhesion properties as compared to CS nanoparticles and could be used as vehicles for drug delivery systems to provide improved drug absorption and bioavailability.