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Effects of Mw and trimethyl derivation on virus delivery of chitosan nanoparticles

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Background and Aims: In this study effects of chitosan (CS) Mw, and its trimethyl derivation (TMC) on loading efficiency, physicochemical properties and in-vitro delivery profile of CS nanoparticles containing foot and mouth disease virus (FMDv) were investigated.
Methods: FMDv, was entrapped within CS nanoparticles by an ionic gelation technique. Nanoparticles for particle size, zeta potential, morphological shape, loading capacity and in-vitro delivery were evaluated.
Results: In order to find the appropriate conditions for the incorporation of FMDv within the CS and TMC nanoparticles it was first evaluated the influence of CS:TPP ratios and effect of CS Mw on FMDv loading level. The results obtained show that, irrespective of the formulation conditions, the size of the particles varies between 221.9 and 389.2 nm (with a PDI range of 0.25- 0.45), zeta potential between +3.2 and +12.95 mV. All formulations showed a great capacity for viruses encapsulation (loading efficacy 80%-97%).
Conclusions: Characterization of nanoparticles shows that irrespective of formulation conditions, all of the particles have a positive potential, high loading efficiency and the distribution particle size between 221.9-389.2 nm. This study shows that, the derivafication of CS molecules with trimethyl cause to decrease loading capacity of CS nanoparticles. It seems that trimethyl groups preventing electrostatic bounds between CS molecules and FMDv's surface proteins. The kinetic of in-vitro release from CS nanoparticles indicated that the rate of FMDv release was dependent to CS Mw decrease with increase CS Mw.

Keywords: Chitosan; TMC; FMDv; Nanoparticle; Delivery