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Preparation and characterization of prednisone and ciprofloxacin double layer-loaded chitosan nanoparticles for oral delivery

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Crohn's disease (CD) is a chronic inflammatory bowel disease that presents as discontinuous transmural inflammation in any portion of gastrointestinal tract. Currently, there is no cure for CD, drug treatment typically prioritizes reducing the inflammation that triggers the symptoms, improving long-term prognosis by limiting associated complications. The predominant form of treatment is a combination of anti-inflammatory and immune system suppresser drugs, in addition to antibiotics such as prednisone (PD) and ciprofloxacin (CPX). In this study, double-layered chitosan (Cs) nanoparticles (NPs) were formulated through crosslinking with tripolyphosphate (TPP) in the presence of PD and CPX via ionotropic gelation method. The physicochemical properties (size and zeta potential) of the nanoparticles were determined by dynamic light scattering, and morphology through scanning electron microscopy. Firstly, PD was encapsulated within the Cs nanoparticle matrix, with average sizes presenting at 150-200 nm, followed by secondary coating with CPX which gave rise to final nanoparticle sizes of 350-450 nm. The maximum drug encapsulation efficiency (EE %) for PD and CPX was 20% and 70%, respectively. EE% was found to be affected by the drug loading concentration, pH value and ratio of chitosan to TPP. The optimal ratio between chitosan and TPP is 3. Release studies on the optimum formulations showed that 30% of CPX released after 3 h on incubation in simulated gastric fluid (SFG, pH 1.2) followed by 60% after 20 h in simulated intestinal fluid (SIF, pH 6.8). The antibacterial activity of PD: CPX loaded NPs and native PD and CPX were assessed against *E. coli* and *S. aureus* via zone inhibition, minimum inhibitory concentration and minimum bactericidal concentration (MBC). The results showed that PD: CPX loaded Cs NPs could inhibit the growth of various bacteria tested. Live/dead staining flow cytometry was used as an alternative to traditional MBC assay to confirm the bactericidal nature of NPs.

Biography

Modan Wu is currently pursuing her PhD in Department of Physics at Dublin Institute of Technology, Ireland. Currently, she is working in the area of Nanotechnology with a focus on "Double encapsulation chitosan nanoparticle preparation, chitosan nanoparticle surface modification and antibacterial abilities".

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