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Development of pH Responsive Nanoparticles for Colon Targeted Drug Delivery System

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Abstract : The aim of the present work was to develop Paclitaxel loaded polyacrylamide grafted guar gum nanoparticles as pH responsive nanoparticle systems for targeting colon. The pH sensitive nanoparticles were prepared by modified ionotropic gelation technique. The prepared nanoparticles showed mean diameters in the range of 264±0.676 nm to 726±0.671nm, and a negative net charge 10.8 mV to 35.4mV. Fourier Transformed Infrared Spectroscopy (FT-IR) and Differential Scanning Calorimetry (DSC) studies suggested that there was no chemical interaction between drug and polymers. The encapsulation efficiency of the drug was found to be 40.92% to 48.14%. The suitability of the polyacrylamide grafted guar gum ERN's for the release of Paclitaxel was studied by in vitro release at pH 1.2 and 7.4. It was observed that, there was no significant amount of drug release at gastric pH and 97.63% of drug release at pH 7.4 was obtained for optimized formulation F3 at the end of 12 hrs. In vivo drug targeting performance for the prepared optimized formulation (F3) and pure drug Paclitaxel was evaluated by HPLC. It was observed that the polyacrylamide grafted guar gum can be used to prepare nanoparticles for targeting the drug to the colon. The release performance was greatly affected by the materials used in ERN's preparation, which allows maximum release at colon's pH. It may be concluded that polyacrylamide grafted guar gum nanoparticles loaded with paclitaxel have desirable release responsive to specific pH. Hence it is a unique approach for colonic delivery of drug having appropriate site specificity and feasibility and controlled release of drug.

Keywords : colon targeting, polyacrylamide grafted guar gum nanoparticles, paclitaxel, nanoparticles
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