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Synthesis of an oral biopolymer platform for the delivery of paclitaxel

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ABSTRACT

Chemotherapy remains the primary form of treatment for cancer. Intravenous use of certain chemotherapeutic drugs have been linked to increased risk of morbidity associated with the risk of thrombosis and other debilitating side effects. The oral route of drug administration is the most convenient but has its own share of drawbacks. Low oral bioavailability and drug hydrophobicity, significantly affect the implementation of oral administration. In this research we discuss the synthesis of an oral biopolymeric platform for the delivery of paclitaxel (PTX). Poly (lactide-co-glycolide) (PLGA) and methoxy polyethylene glycol (mPEG) were used for the entrapment of the hydrophobic drug, PTX. The emulsion solvent evaporation method was used to load PTX into the hydrophobic core of the mPEG-PLGA copolymeric nanoparticles. The physiochemical properties of mPEG-PLGA formulation and the PTX loaded formulation were characterised and compared by FTIR, thermogravimetric analysis (TGA) and differential scanning calorimetry analysis (DSC) equipment. The size and morphology of the formulations were confirmed using zeta sizer and SEM, respectively. The mPEG-PLGA nanoparticles showed optimal particle characteristics and exhibited a PTX entrapment efficiency of 78.6 % and a drug loading efficiency of 3.74%. Ex vivo cytotoxicity studies were carried out on the A549 cells, a human lung adenocarcinoma cell line of alveolar epithelial origin. The PTX-loaded mPEG-PLGA nanoparticles showed significantly improved cytotoxicity in A549 cells when compared with PTX only.