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Preparation, characterization and *in vitro* evaluation of docetaxel loaded solid lipid nanoparticles

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Background and Aims: Docetaxel is an anticancer drug in taxol class. It is the product of paclitaxel modification and has higher potency in inhibiting microtubule depolimerization at G2/M phase. Docetaxel can be used in treatment of different cancers like breast, prostate, colorectal and ovary. Delivery of this drug using solid lipid nanoparticles (SLN) can produce higher efficacy and lower side effects. In this study, SLNs containing Docetaxel (SLN-DTX) were prepared by microemulsion, high pressure homogenizing and probe sonication techniques. Lipid phase was contained Compritol 888 ATO, Precirol ATO 5 and also H-SPC as lipophilic co-surfactant. Poloxamer 188 was used as surfactant in aqueous phase. Mean size and zeta potential of these nanoparticles were determined. Complementary studies were done by DSC (Differential Scanning Calorimetry) and TEM(Transmission Electron Microscopy) techniques. Cytotoxicity of SLN-DTX was evaluated on colorectal (C-26) and malignant melanoma (A-375) cell lines and compared with Taxotere® using MTT assay. Mean size of SLN prepared by probe sonication method was around 200 nm with PDI (Polydispersity Index) of 0.2. These nanoparticles had zeta potential of -18 mV. Encapsulation efficiency of prepared SLNs was more than 98%. SLN-DTX caused 100% and 99.9% viability decrease in C-26 and A-375 cells after 48 and 72 h, respectively. SLN-DTX showed higher efficacy than Taxotere®. SLN-DTX, prepared in the present study, is potential for IV administration because of its particle size, PDI and high encapsulation efficacy. By the reason that the efficacy of SLN-DTX was better than Taxotere® in in vitro tests, it is expected that, SLN-DTX can show more significant anticancer activity compared to Taxotere®, in in vivo studies.

Keywords: Docetaxel; Taxotere®; Solid lipid nanoparticles (SLNs); Cytotoxicity