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Lipid-Chitosan Hybrid Nanoparticles for Controlled Delivery of Cisplatin

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Abstract : Lipid-polymer hybrid nanoparticles (LPHNP) are delivery systems for controlled drug delivery at tumor sites. The superior biocompatible properties of lipid and structural advantages of polymer can be obtained via this system for controlled drug delivery. In the present study, cisplatin-loaded lipid-chitosan hybrid nanoparticles were formulated by the single step ionic gelation method based on ionic interaction of positively charged chitosan and negatively charged lipid. Formulations with various chitosan to lipid ratio were investigated to obtain the optimal particle size, encapsulation efficiency, and controlled release pattern. Transmission electron microscope and dynamic light scattering analysis demonstrated a size range of 181-245 nm and a zeta potential range of 20-30 mV. Compatibility among the components and the stability of formulation were demonstrated with FTIR analysis and thermal studies, respectively. The therapeutic efficacy and cellular interaction of cisplatin-loaded LPHNP were investigated using in vitro cell-based assays in A2780/ADR ovarian carcinoma cell line. Additionally, the cisplatin loaded LPHNP exhibited a low toxicity profile in rats. The in-vivo pharmacokinetics study also proved a controlled delivery of cisplatin with enhanced mean residual time and half-life. Our studies suggested that the cisplatin-loaded LPHNP being a promising platform for controlled delivery of cisplatin in cancer therapy.

Keywords : cisplatin, lipid-polymer hybrid nanoparticle, chitosan, in vitro cell line study
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