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Manufacture of smart nanoliposomes for targeted drug delivery in cancer nanotherapy using Mozafari method

M R Mozafari
Monash University, Australia

Nanoliposomes or nanoscale bilayer lipid vesicles are one of the most applied bioactive delivery technologies. They have many advantages over conventional dosage forms including the potential to enhance the bioavailability of the drug and provide drug targeting. Targeted delivery of therapeutic agents has received considerable attention due to its significant role in improving therapeutic efficacy and reducing side effects. 5-fluorouracil (5FU) is an anticancer drug with short half-life and high side effects that limit its clinical applications. Consequently, cancer treatment using 5FU can benefit significantly employing nanoliposome technology. This entry aims to present our recent findings on the evaluation of anticancer potential of folate and tumor associated carbohydrate antigens (TACA)-targeted nanoliposomal 5FU on different carcinoma cells. Nanoliposomes and PEGylated nanoliposomes (ca. 95-130 nm) were prepared by Mozafari method, without employing potentially toxic solvents, detergents or harsh treatments such as homogenization or sonication at 40-60 deg. C and less than 1000 rpm turbulence. Drug encapsulation efficiencies between ca. 55% to 70% were obtained. Nanoliposomal formulations were thoroughly characterized for their surface chemistry, particle size, zeta potential, PDI, encapsulation efficiency, stability and release profiles. The effect of the smart nanoliposomes on the induction of apoptosis and cell cycle arrest was studied by flow cytometry. Anticancer activity was evaluated by the Neutral Red and MTT assays. The cytotoxicity of the formulations against cultured cells was significantly increased compared to the controls. Flow cytometry and annexin-V analysis indicated that smart nanoliposomes encapsulating 5FU effectively induced apoptosis and cell-cycle arrest in the cultured cells. Overall, research findings indicated that smart nanoliposomes are promising formulations for targeted drug delivery to tumor cells.

dr.m.r.mozafari@gmail.com