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Enhanced response of tamoxifen towards the cancer cells using a combination of chemotherapy and photothermal ablation induced by lentinan-functionalizeded multi-walled carbon nanotubes

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Abstract: A lentinan (LEN) functionalized multi-walled carbon nanotubes (MWCNTs) drug delivery system, using tamoxifen (TAM) as a model anticancer agent, was developed by a simple non-covalent approach. This developed system (MWCNTs-TAM-LEN) possessed good stability, water dispersibility and extraordinary photothermal properties. It was demonstrated by the in vitro experiments that MWCNTs-TAM-LEN had enhanced cellular uptake, antitumor activity and cell apoptosis on Mcf-7 cells in comparison with TAM and MWCNTs-TAM. The cell inhibition rate and apoptosis rate of Mcf-7 cells treated by MWCNTs-TAM-LEN with near-infrared (NIR) were 67.1% and 66.5% higher than that of equivalent concentration of TAM with NIR irradiation treatment, respectively. The enhanced antitumor efficacy of MWCNTs-TAM-LEN was realized via the synergistic function of chemotherapy and photothermal ablation under NIR laser irradiation.

Keywords: carbon nanotubes; lentinan; chemo-photothermal combination therapy

1. Introduction

In recent years, a wide variety of drug carriers, such as liposomes[1, 2], polymeric micelles[3, 4], inorganic nanoparticles[5, 6] and carbon nanotubes (CNTs)[7, 8], are popularly used to control and target drug delivery[9]. Among them, CNTs have attracted particular interest due to their unique