

In Vitro Photodynamic Cancer Therapy with Ultra-high Drug Loaded ZnO Hollow Carriers

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Development of novel, multimodal therapeutic nanocarriers for ultra-high medicine loading holds paramount promises in cancer treatment. Herein, we demonstrate that acid-decomposable ZnO hollow microspheres (ZHM) complexed with daunorubicin (DNR) as a model anticancer drug can be adopted for effective combined chemo-photodynamic cancer therapy. Moreover, ZnO nanorods (ZNR) loaded with DNR was also studied as a comparative material. A remarkable enhanced drug loading capacity was featured by ZHM (~91%), much higher than ZNR. The release of drug from the nanocomplex was pH-dependent and an acidic condition enhanced the drug release rate. In vitro studies showed an increased ZHM-DNR complex uptake by human alveolar adenocarcinoma (A549) cells and the complexes is mainly accumulated in lysosomes and promotes continual drug release and successfully destruct cancer cell. In presence of UV irradiation, the nanocomplex anticancer activity was significantly increased, demonstrated by MTT assay, flow cytometry, apoptosis assay, nuclear DAPI staining, etc. This study suggests ZHM for an efficient multimodal chemotherapeutic agent.