

Application of multi-drug chemotherapy for cancer treatment using magnetic CoFe₂O₄ nanoparticles

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Nowadays, combination therapies are used for the treatment of cancer. Patients who used chemotherapy; as a commonly used therapy for cancer treatment; may encounter side effects like drug resistance. Although increasing the drug dosage led to enhancement of its therapeutic effect, some side effects like resistance of cancer cells and toxicity to normal cells will be intensified. However, considering many problems of chemotherapy, using a multidrug dosing strategy for cancer treatment increases the efficiency via synergism of used drugs and decreases drug resistance of cancerous cells. Here, we used a combination of multi-drug chemotherapy and photothermal therapy (PTT). We synthesized a pH-sensitive and heat-sensitive nanocomposite. The nanocomposite exhibited some features like fibrous spherical morphology, typical mesoporous structure, high specific surface area, narrow size distribution, excellent superparamagnetic features and good monodispersity. This nanocomposite, cobalt ferrite (CoFe₂O₄), has porosity and magnetic properties that can be used for identification in MRI ([1]). Doxorubicin hydrochloride could be easily loaded onto the CoFe₂O₄ nanoplateforms and released with pH stimuli. The mesoporous CoFe₂O₄ core acts as T₂-weighted magnetic resonance (MR) imaging probe, PTT agent ([2]). In this study, we loaded the drug DOX into these pores and coated it with chitosan-tp, then we added ZIF-8 layer around the synthesized NPs. ZIF-8; a Metal Organic Framework; is a carrier for the delivery of anti-cancer drugs and a PH stimulus([3]). After coating NPs by ZIF-8, we load another anti-cancer drug to ZIF-8 nanospheres. We used aptamers to target only cancer cells for this nanocarrier. The size of this nanocarrier was less than 100 nanometers after synthesis and was identified using FTIR, and drug loading was also investigated. The NPs drug delivery was investigated against HT-29 human colorectal adenocarcinoma cell line.

Keywords: Multi-drug chemotherapy, Cancer, CoFe₂O₄, Nanoparticle.

References

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