

Magnetoliposomes based on magnetic/plasmonic nanoparticles loaded with new antitumor drugs for combined cancer therapy

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Cancer is one of the main public health problems and the World Health Organization (WHO) points it as the second leading cause of death in the world [1]. Stimulus-responsive nanosystems have been a promising approach to control the release and delivery of therapeutic agents to target sites. In this work, manganese ferrite nanoparticles were decorated with gold nanoparticles or covered with a gold shell. These magnetic/plasmonic nanostructures were entrapped in liposomes for application in dual cancer therapy [2], combining chemotherapy and photothermia. The magnetic/plasmonic nanoparticles were characterized by XRD, UV/Vis. absorption, HR-TEM and SQUID, exhibiting a superparamagnetic behavior at room temperature. The average size of the gold-decorated nanoparticles was 26.7 nm for MnFe₂O₄ with 5-7 nm gold nanospheres. The average size of the core/shell nanoparticles was 28.8 nm for the magnetic core and about 4 nm for the gold shell.

Two new promising antitumor drugs (tricyclic lactones), active against colorectal adenocarcinoma and non-small cell lung cancer, were loaded into these nanosystems with very high encapsulation efficiencies (over 98%). Assays on human tumor cell lines have shown that these nanocarriers do not release the antitumor drugs in the absence of irradiation. Furthermore, the nanosystems have no effect on the growth of primary (non-tumor) cells (with or without irradiation). Drug-loaded systems containing the core/shell magnetic/plasmonic nanoparticles efficiently inhibit tumor cell growth when irradiated with red light (article submitted), being suitable for a triggered release promoted by irradiation.

[1] Siegel, R. L.; Miller, K. D.; Jemal, A. (2019). Cancer statistics, 2019. CA: A Cancer Journal for Clinicians 69, 7-34 (2019) doi: 618 10.3322/caac.21551

[2] Rio, I. S. R.; Rodrigues, A. R. O.; Rodrigues, C.P.; Almeida, B. G.; Pires, A.; Pereira, A. M.; Araújo, J. P.; Castanheira, E. M. 718 S.; Coutinho, P. J. G. Development of novel magnetoliposomes containing nickel ferrite nanoparticles covered with gold 719 for applications in thermotherapy. Materials 13, 815 (2020) doi:10.3390/ma13040815

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