Paclitaxel encapsulated magnetoliposomes as drug carrier and magnetic hyperthermia device

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Abstract

In this work, we prepared magnetoliposomes with different concentrations of magnetic nanoparticles and investigated the possibility of using the corresponding formulation for cancer treatment. Then we choose the best formulation based on magnetoliposome and used to prepare paclitaxel encapsulated magnetoliposomes. The possibility of using the corresponding formulation for controlled drug release and cancer treatment by taking advantage of its hyperthermic behavior was investigated.
Magnetic nanoparticle was synthesized by co-precipitation of ferrous and ferric salts in alkali medium of ammonium hydroxide and functionalized with citric acid to obtain a ferrofluid. The ferrofluid was used to prepare a series of magnetoliposomes containing different concentrations of magnetic nanoparticle. The amount of encapsulated magnetic nanoparticles was determined based on ferrous ion by using *o*-phenanthroline and phospholipid concentration of samples was determined following the method colorimetric assay. Magnetic nanoparticle encapsulation efficiency was dependent on the initial amount of ferrofluid present at the encapsulation stage and to the best formulation we found 66%. We choose this formulation to study physical-chemical properties and to encapsulate paclitaxe. Encapsulation efficiency of the drug was also evaluated in presence of different magnetic nanoparticle concentration. At very high concentrations there is a reduction in the amount of encapsulated drug, but this reduction is not significant. The mean size and distribution of the particle size were determined by dynamic light scattering and Zeta Potential was measured. All magneliposomes formulations, presented mean size values of about 150 nm and a polydispersivity index of > 0.2, thus having acceptable characteristics for systemic administration. The magnetoliposome showed stability in water for was at least one weak that was examined using UV-vis spectrophotometer and dynamic light scattering (DLS). Magnetic heating under an applied magnetic field was investigated for different magnetic field intensity and the magnetolipossome investigated showed temperature variation appropriate to cancer treatments.

References

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Figures

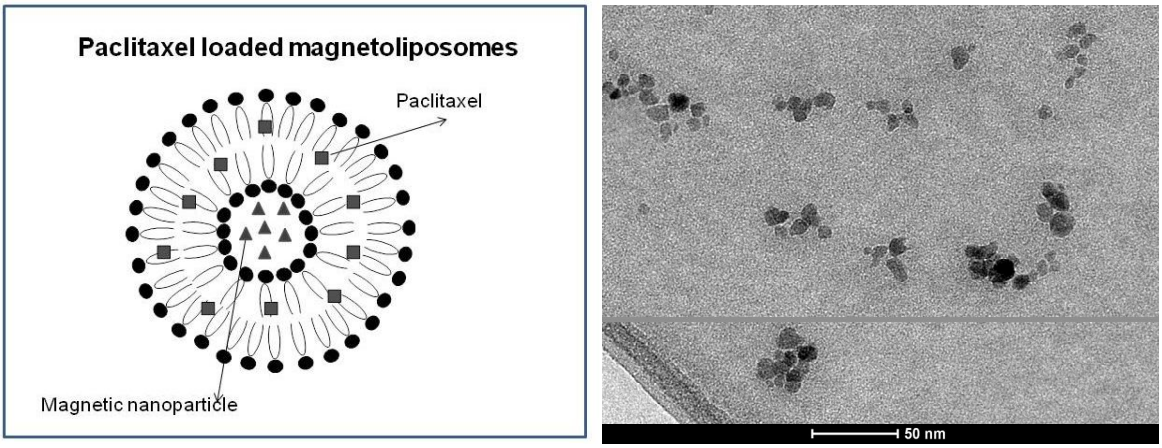

Figure 1: (a) Representation of paclitaxel loaded magnetoliposome; (b) Transmission electron microscopic (TEM) picture of magnetic nanoparticles.

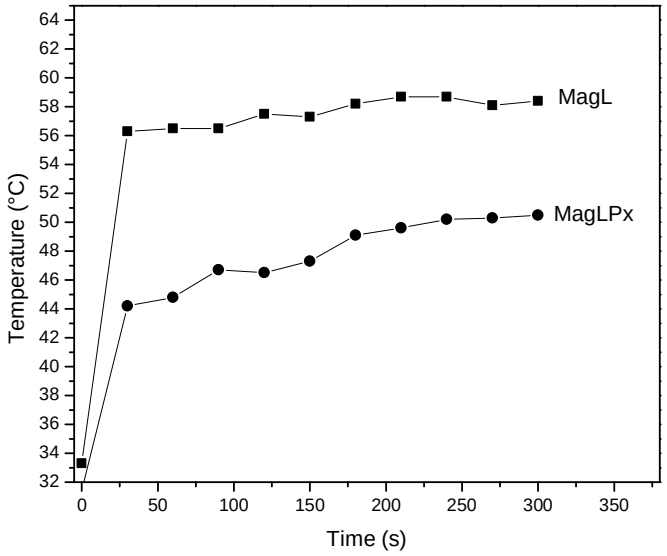

Figure 2: Magnetic hyperthermia studies for magnetoliposomes (MagL) and paclitaxel encapsulated magnetoliposomes (MagLPX).