Magnetoliposomes based on manganese ferrite nanoparticles for guided transport of antitumor drugs

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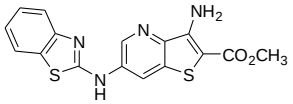
Guided transport of biologically active substances, most of them toxic and with systemic side effects, can focus the active molecules to specific sites in the human body and overcome systemic toxicity problems, allowing a lower drug dosage and a more efficient treatment. Magnetoliposomes (liposomes entrapping magnetic nanoparticles) are of large importance, as they can be used in guided transport of drugs by external magnetic field gradients and used in cancer treatment by hyperthermia [1,2].

In this work, manganese ferrite nanoparticles with size distribution of 46 ± 17 nm and superparamagnetic behavior were synthesized by coprecipitation method. These magnetic nanoparticles were either entrapped in liposomes, originating aqueous magnetoliposomes (AMLs), or covered with a lipid bilayer, forming solid magnetoliposomes (SMLs) (Fig. 1A). Membrane fusion between AMLs and SMLs and giant unilamellar vesicles (GUVs), used as models of cell membranes, was confirmed by FRET (Fig. 1B).

A promising fluorescent antitumor thienopyridine derivative [3], compound **1** (structure below), was successfully incorporated in both AMLs and SMLs, pointing to a promising application of these systems as nanocarriers for antitumor drugs.



Compound **1**

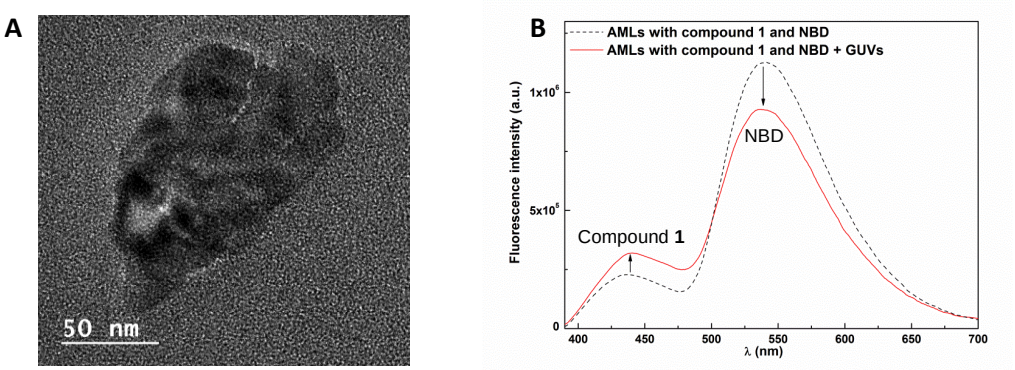


Figure 1 - A. TEM image of SMLs containing $MnFe_2O_4$ NPs. **B:** Fluorescence spectra of AMLs loaded with compound **1** and labeled with NBD-PE, before and after interaction with GUVs.

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