11th International Conference on Nanosciences & Nanotechnologies (NN14)
8-11 July 2014, Thessaloniki, Greece

Nickel-based magnetoliposomes for delivery of new potential antitumor compounds

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Liposomes entrapping magnetic nanoparticles (magnetoliposomes) are of large importance in drug delivery, as they can be guided and localized into the therapeutic site of interest by external magnetic field gradients and used in cancer treatment by hyperthermia. Magnetic nanoparticles of nickel core with silica shell and of nickel ferrite were prepared by coprecipitation method using different surfactants for templating or for growth control. The silica shell was obtained using a sol-gel process. These nanoparticles were either prepared in the presence of lipids, forming dry magnetoliposomes (DMLs), or entrapped in liposomes, originating aqueous magnetoliposomes (AMLs). Additionally, dry magnetoliposomes were also synthesized using a new route. The systems were characterized by Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD) and Dynamic Light Scattering (DLS), and generally uniform sizes below 150 nm were obtained. The non-specific interaction between the prepared magnetoliposomes and models of biological membranes was investigated, using Giant Unilamellar Vesicles (GUVs) as membrane models. Membrane fusion between the aqueous magnetoliposomes and the GUVs was confirmed by Förster Resonance Energy Transfer (FRET) using appropriate fluorescent probes. The magnetoliposomes prepared were able to encapsulate new potential antitumor thienopyridine derivatives, showing to be promising for drug delivery applications.

Acknowledgements: FCT and FEDER/COMPETE for Projects PEst-C/QUI/UI0686/2013, P-Est-C/FIS/UI0607/ /2013. n-STeP Project NORTE-07-0124-FEDER-000039 supported by the Region Operational Programme of the North of Portugal (ON.2). FCT and POPH/QREN/FSE for A.R.O.R. PhD grant (SFRH/BD/90949/2012).