Development of pH-sensitive magnetoliposomes containing shape anisotropic magnetic nanoparticles for applications in dual cancer therapy

Ana Rita F. Pacheco, Elisabete M. S. Castanheira and Ana Rita O. Rodrigues

Physics Centre of Minho and Porto Universities (CF-UM-UP) and LaPMET Associate Laboratory, University of Minho, Campus of Gualtar, 4710-057 Braga, Portugal

Magnetoliposomes are highly promising nanocarriers for application in dual cancer therapy. The combination of liposomes and magnetic nanoparticles in a single multifunctional nanosystem enables guiding the nanoparticles to the tumor site, ensuring a local temperature increase (hyperthermia) and triggering drug release (chemotherapy) while reducing cytotoxic effects. The development of nanoparticles with anisotropic shape (for its improved magnetic properties) and pH-sensitive liposomes with a triggered release of antineoplastic agents results in a safe therapeutic approach, alternative to the conventional therapy [1].

In this work, anisotropic magnetic nanoparticles of mixed calcium/magnesium ferrite were synthesized and characterized. These nanoparticles were encapsulated in pH-sensitive liposomes loaded with doxorubicin, and the resulting nanosystems were characterized by DLS. Fluorescence emission assays were performed to elucidate the structural characterization and study the release profile of doxorubicin at different pH values and promising results were obtained for application in combined cancer therapy.

Keywords: Anisotropic shape nanoparticles, superparamagnetism, magnetoliposomes, pH sensitivity, dual cancer therapy.

Acknowledgements: FCT under Strategic funding of CF-UM-UP (UIDB/04650/2020).

References:

[1] Cardoso BD, Rodrigues ARO, Bañobre-López M, Almeida BG, Amorim CO, Amaral VS, Coutinho PJG, Castanheira EMS. Magnetoliposomes based on shape anisotropic calcium/magnesium ferrite nanoparticles as nanocarriers for doxorubicin. *Pharmaceutics*, 2021: 13(8), 1248.