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Nanomaterials for Cancer Theragnosis: in silico, in vitro and in vivo.

Thursday 23 September 2021 15:10 (20 minutes)

Cancer is the second cause of death in Europe and is expected to increase due to the climate changes and population ageing. Early stage detection and effective treatments are keystones to reduce cancer mortality. Nanotechnological systems has been recently demonstrated that are able to perform localized treatment with improved efficiency and reduced side effects. Among the several types of nanomaterials, magnetic and plasmonic nanoparticles are widely used for magnetic hyperthermia and photothermal therapy, respectively, being emergent approaches for thermal treatment of cancer. Nevertheless, although very promising results have been obtained, none of them have yet become part of the standard cancer treatments since thorough challenges must be solved. The successful application of these physically stimulated therapies could be achieved by customization of the magnetic and plasmonic nanostructures shape-architecture, leading to enhanced performance [1, 2].
In this context, the present work shows the development of novel and multifunctional lipid nanoparticles for drug delivery combined with magnetic and near infra-red (NIR) hyperthermia. Superparamagnetic iron oxide and gold nanoparticles were encapsulated in the lipid nanoparticles and used for magnetic and NIR hyperthermia to increase the efficiency of chemotherapeutic compounds [3, 4]. Also results in the field of novel nanostructures for magneto-mechanically induced cell annihilation will be presented from the micromagnetic simulations of high-aspect-ratio magnetic nanowires and vortex nanodiscs, to their surface functionalization, cell internalization, biocompatibility and the preliminary results of in vivo experiments [5, 6].

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