IN VITRO STUDIES OF THE MAGNETICALLY-GUIDED ANTIPROLIFERATIVE ACTIVITY OF SUPERPARAMAGNETIC NANOPARTICLES FORMULATED WITH PACLITAXEL

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Commonly the key players in anticancer therapies and, more specifically, antineoplastic drugs display poor water solubility and slow dissolution rates. As a consequence they present low bioavailability, poor tissue distribution and unfavorable pharmacokinetic profiles, limiting their use. To overcome these barriers and improve efficacy, various drug formulations and delivery strategies have been developed. For example, nanoparticles can be used as drug delivery vehicles and current research is encouraging. However, the intra-tumoral diffusion of functionalized nanovehicles remains to be achieved. In the present study, the anticancer drug paclitaxel was loaded into superparamagnetic nanoparticles and characterized. Novel in vitro experiments based on one or two layers of cells revealed important information about the conditions required to achieve efficient drug intra-tumoral diffusion, using these superparamagnetic nanovehicles, once they have been localized by external magnetic fields. These studies indicated that ultralow concentrations of paclitaxel (i.e., tenths of ng/µl) significantly reduce the viability of neoplastic cells when they are delivered with control using these nanovectors. Moreover, we showed that a discontinuous application of a magnetic field promotes the localization of the nanoparticles in a targeted region and favors the subsequent dissemination of the nanoparticles between cellular layers.

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