OR-20 CANCER CELL TARGETING AND SPECIFIC DELIVERY OF SILVER NANOPARTICLES BY PROTEIN FUNCTIONALIZED MESOPOROUS SILICA-BASED NANOCARRIERS

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Por indicación de los autores se incluye únicamente el resumen presentado en la XXI Reunión

Nanotechnology keeps gaining interest in the biomedical field due to the wide variety of nanomaterials-based applications in diagnostics and therapeutics. Specially, mesoporous silica nanoparticles (MSNs) are considered promising nanocarriers for controlled and stimulus-responsive drug delivery [1]. One of the most attractive properties of this material is their silanol rich surface, which can be easily functionalized with organic structures such as proteins or DNA. In cancer disease, the overexpression of endogenous transferrin receptor (TfR) is a potential marker of tumoral cell population [2-3], which makes it a good candidate target for the design of cell specific drug delivery nanosystems [4]. It is well-known that silver nanoparticles (AgNPs) have an efficient and broad-spectrum antibacterial activity and, recently, they are also receiving considerable attention as potential anticancer therapeutic agents [5]. However, AgNPs tend to aggregate and its administration could also provoke cytotoxic effects on healthy cells [6]. Immobilization of AgNPs in a supporting matrix together with transferrin as a cancer cell targeting ligand, would avoid AgNPs aggregation while maintaining the possibility of its delivery in a cell specific manner.

For this reason, the aim of this study has been the design, synthesis and in vitro evaluation of a hybrid nanosystem consisting of metallic AgNPs well dispersed on MSNPs and externally functionalized with transferrin for cancer cell targeting.

We have synthesized fluorescent MSNs through a base-catalyzed sol-gel process in the presence of a structure directing agent. We have covalently attached transferrin (targeting ligand) or BSA (control) onto the external surface of MSNs, followed by incorporation of AgNPs by reduction of a silver ion precursor ($AgNO_3$). We optimized this process using different amounts of silver ion precursor and reducing agents. We characterized the nanomaterials by elemental analyses, X-ray diffraction, N_2 adsorption, DLS and zeta-potential measurements, and scanning and transmission electron microscopy. Then, we evaluated the potential of the synthesized nanosystems in vitro by bioanalytical strategies (cell viability and flow cytometry assays) to estimate the efficiency of the targeting, the degree of cellular internalization and the potential anticancer effects of the delivered AgNPs in several cell lines: human keratinocytes (HaCaT), human epithelioid cervix carcinoma cells (HeLa) and human hepatocarcinoma cells (HepG2) [7].

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