TOXICITY OF SILICA COATED IRON OXIDE NANOPARTICLES ON SHSY5Y NEURONAL CELLS

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Abstract

Iron oxide nanoparticles (IONPs) are promising neuroimaging and molecular cargo agents across neurovascular barriers. However, little is known on the accumulation and biocompatibility of such particles in brain cells. Thus, the main objective of this work was to investigate the toxic effects of silica-coated IONPs on human SHSY5Y neuronal cells. IONPs suspension was characterized for average hydrodynamic size, size distribution and zeta potential by dynamic light scattering in complete and incomplete (serum-free) cell culture media. A battery of assays was then performed to evaluate their toxicity using four treatment concentrations (10-200 µg/ml) and two exposure times (3 and 24 h); these conditions were selected based on previous viability assays results. Although IONPs were effectively internalized by the cells, they did not induce phosphorylation of the H2AX histone at any time, concentration or media tested, indicating they do not cause DNA double strand breaks. Furthermore, negative results were obtained in apoptosis evaluation at both 3 h treatments, but significant increases in the apoptosis rates were observed at the highest concentrations after 24 h of exposure to the IONPs. Although results obtained suggest that these nanoparticles are biocompatible at low concentrations, further studies on this matter are necessary to assess their possible genotoxic potential in neuronal cells. Results obtained in this work contribute to increase the knowledge on hazardous doses, which is essential to create regulations which guarantee a safe use of IONPs in their biomedical applications.

Keywords: Iron oxide nanoparticles, cellular uptake, apoptosis, H2AX, SHSY5Y neuroblastoma cells

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