

OXIDATIVE DAMAGE TO BIOLOGICAL MACROMOLECULES IN HUMAN BONE MARROW MESENCHYMAL STROMAL CELLS LABELED WITH VARIOUS TYPES OF IRON OXIDE NANOPARTICLES

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Abstract

The biological effects of several superparamagnetic iron oxide nanoparticles (SPIONs) varying in their surface coating were tested using human bone marrow mesenchymal stromal cells from two donors - hBMSCs-1 and hBMSCs-2. The measurements were performed at two intervals - after 72 h exposure to the nanoparticles and after an additional 72 h cell growth without nanoparticles. The dose of SPIONs used (15.4 microg Fe/ml) was selected as being sufficient for in vivo cell tracking using magnetic resonance imaging (MRI). Concerning cell viability and cell death, only the hBMSCs-2 seemed to be sensitive to the action of SPIONs. However, an increase of oxidative injury to lipids, proteins and DNA as a consequence of exposure to SPIONs was detected in cells from both donors. Particularly the levels of lipid peroxidation were high and increased further with time, regardless of the type of nanoparticle. Lowering intracellular label concentrations and authenticating oxidative stress levels using in vivo experiments are required to ensure the safety of SPIONs for biomedical applications.

Keywords: Iron oxide nanoparticles, Oxidative damage, Human bone marrow mesenchymal stromal cells

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