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The in vitro study of the toxicity and therapeutic effects of iron oxide nanoparticles with different core size

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Nanotechnology is a combination of science, engineering and technology in a nanoscale. This revolutionary technics is used in many fields of science and life [1,2]. Advances in nanotechnology resulted in the development of theranostic nanoparticles constituting the diagnostic and therapeutic agent in a single particles [3]. Such features are possessed, among others, by magnetite nanoparticles which serving as the contrast agents for MRI can be used in medical diagnostics. In turn, their interaction with the external magnetic field cause that they can be used as drug carries or agents for the local hyperthermia.
To introduce iron oxide nanoparticles (IONPs) into clinical practice their biocompatibility and potential mechanisms of toxicity are to be determined. The main objective of our study was the analysis of therapeutic potential and potential toxicities of IONPs based on different cellular models. The impact of PEG-coated magnetite NPs with three different core diameters (5, 10 and 30 nm), determined by TEM, on the normal and cancer cell lines was examined. The cytotoxicity of nanomaterials was assessed by MTT assay and trypan blue staining. Cell motility, intracellular ROS production and actin cytoskeleton rearrangements were also studied. For this purpose, fluorescence microscopy and time-lapse videomicroscopy were used. Moreover, the anomalies in the distribution and structure of biomolecules induced in cells by IONPs were examined and for this purpose Raman microspectroscopy was applied.
The obtained results showed changes in cell life parameters which depended on the IONPs core diameter, cell line, exposure time and dose. What is more, the fluorescence microscopy with TIRF module showed changes in cytoskeleton organization and cell morphology for some cell lines after the treatment with IONPs.

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