Thematic area of your work (Nanocomposites and nanomaterials)

ASSESSMENT OF IRON AND COPPER NANOPARTICLES ON IMMUNE SYSTEM

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Engineered nanomaterials also take on a variety of shapes including spheres, fibers, tubes, and rings. Intentional modification of nanoparticles (NP) and nanomaterials (NM) physico-chemical properties results in unique characteristics, including high conductivity, strength, durability, and chemical reactivity that are finding applications in many fields. Synthesis and widespread use of NP and NM not only opens up new prospects for humanity, but also brings with it new challenges that require investigation of their safety. Importantly, materials that are inert in bulk form may be toxic in nanosized form, arguing that all NM must be systematically evaluated for their toxic potential [1]. In assessing the toxicity of NP important place belongs to the investigation of their effect on the immune system, which provides protection and homeostasis of the organism.

The aim of this work was to study the influence of Fe and Cu NP on components of the immune system in in vitro and in vivo experiments.

We have investigated the influence of Fe NP (40 nm) and Cu NP (20 nm) which are synthesized in F.D. Ovcharenko Institute of Biocolloidal Chemistry on rat peritoneal macrophages and spleen cells by NBT-test [1], plasma proteins (albumin, immunoglobulin (IgG)) by MALDI-Tof mass spekrometry [2] after 1 and 24 hours of in vitro exposure and in vivo after itraperetonial injection to Wistar rats.

It is determined that Fe NP and Cu NP activated respiratory burst in macrophages in vitro and reduced their capacity after 1 and 24 hours exposure. Incubation of rat spleen cells with Fe NP for 1 h caused stimulation the ability to oxygen activating, whereas for 24 h - its suppression. Cu NPs produced discordant effect on splenocytes depending on the dose and duration of exposure. As a result of NP Fe and Cu showed different activity in relation to plasma proteins. After incubation with IgG Fe NP in all concentrations observed changes the mass of a molecule and its fragments, whereas Cu NPs only a lot of H–chain. Measuring the mass spectra of albumin after incubation with Fe NPs at a concentration of 0.1 mg/ml showed increase the mass of the protein molecule as compared with the

control, while the Cu NP were received clear spectrum, which may indicate the deposition of protein bass. Lower concentrations of metal NPs (0.01 and 0.001 mg /ml) was not significantly affected. Throught 1 h after administration of metal NPs in rats was found inhibition of oxygen activating ability macrophages and splenocytes, and 24 h – to improve it. In the serum of experimental rats identified increase immune complexes, which may indicate the formation of protein aggregates, which can formed after interaction of NPs with IgG and other proteins. Therefore, analyzing the data obtained, it can be concluded that the stimulation of NP Fe and Cu oxidative stress in immune cells can have positive (increased bactericidal capacity) and negative (amplification of lipid peroxidation) effects. Effect of NP on plasma proteins may affect on their functional activity with subsequent effects.

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