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Toxicity of nanoparticles on living organisms

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Abstract
In organisms, nanoparticles represent foreign elements with their own physicochemical properties, so they may interfere with the normal physiological mechanisms of the embryos, growing animals and adults. In embryos, NPs sometimes disrupt the development, bringing on malformations which can be lethal due to their small size, can easily penetrate across the cell membrane, avoiding defences mechanism. The chemical composition and physical properties of NPs can be cytotoxic. So NPs then migrate into the cell and reach organelles such as mitochondria, modifying the cell metabolism and provoking cell death, they can interfere with the cell membrane disrupting the membrane functions such as ion transport or signal transduction. The positive electronic charges of NPs can destroy membrane lipid bilayers. Surface coating of NPs can also interfere with cell structure, in vivi and *In vitro* cultured animals tissues showed that Ag-NPs caused an oxidative stress characterised with well reactive molecules containing free oxygen radicles(reactive oxygen species or ROS), genotoxicity with DNA break or cell apoptosis. An inhibition of Na^+/K^+ ATPase depending on concentration indicated a default of osmoregulation. At the highest concentrations (100 μg/L). Ag-NPs induced a necrosis of gill lamellae and maximum percentage of individuals died. Ti O_2 - NPs provoked DNA damage with or without light.

Keywords: nanoparticles, development, ros, genotoxicity and cell apoptosis

Introduction
Nanoparticles like Ag-ZnO or CuO-NPs are frequently used as bactericides after releasing into wastes and environment, effect on non-target organisms also, these effects were observed in protozoa, nematodes, crustaceans, fish or cell cultures [4]. In animals, NPs are foreign elements they may interefere with the traditional physiological mechanisms of the emryos and growing animals. In embryos, they are generated by both geological and biological processes. Even when toxic, numerous organisms can adapt and evolve in environment rich in natural NPs [1]. Since many years NPs are produced by industries and utilized in agriculture, electronics, medicine, pharmacy and cosmetology [2]. Studies have done in USA and 000europe showed that 1Ag-NPs, Ti O_2-NPs and Zn O-NPs from sewage treatment is toxic for aquatic organisms [3]. Effects were different from that obtained inhalation [5, 6]. Consequently Kahru and Dubourguier proposed several ways to systemize this study field [7], identify the foremost harmful effects of NPs on the sensitive biological groups [8]. Ecotoxicological information so as to gauge the risks considering the NPs type like Ni O_2- NPs, Zn O – Nps, CuO - NPs, Ag-NPs single wall nanotubes(SWNTS) or single walled carbon nanotubes(SWCNT- NTs), multiwall nanotubes(MWCNTs) and C60 fullerenes experiment in significant organisms like bacteria, algae, yeast, protozoa, nematodes earthworms, crustaceans, fish, amphibians and mammals [9]. The preparation of NP samples from the cytotoxic effects [10]. The toxicity of NPs are conducted in mice and rats which exihibit similarities to humans

Methodology
Many study materials on the toxicity of NPs are collected from different research sources like internet and research journals. Referred and reviewed in vitro and in vivo toxicological evaluations of NPs in animals like mice, rats and zebra fish or generally animals. The impact of NPs on the male and feminine reproductive systems and zebra fishes embryonic development are discussed, hence Toxicity of Nanoparticles on animal studied, analysed and examined.

Result
In vertebrates like human cells and invertebrate animals toxic effects of TiO2 os associated with the the formation of free radicles with water within the presence of sun light. These particles can also reach organs like bone marrow, lymphnodes, spleen, heart and genetic material like DNA. It has been shown that NPs can provoke inflammation antioxidant activities, oxidative stress and modification of mitochondrial distribution. NP - mediated toxicity may be a major focus of the many studies regarding the employment of NPs which induce toxicity by increasing intracellular reactive oxygen species (ROS), NP induced ROS alters the homeostatic redox state of the host.
Cytotoxic effects were induced by the smallest NPS (25 and 40 nm) composed to largest ones (80 nm). Ag-NPs measuring 7. 5 nm originated the emafication of adult rat with decreasing of its moving activity. Morphological effects could provoke neurons injuries, medications of the activity of the activity of some glial cells. The consequences of Au-NPs (5 and 15 nm) are examined on a culture of mouse fibroblasts. NPs penetrated into fibroblasts where they remained stocked.
Young salmons were exposed to Ag-NPs commercial suspensions and ready ones with $AgNO_3$ reduced with $NaBH_4$. Gills of fish accumulated Ag-NPs which affect the respiratory process. An inhibition of Na^+/K^+ ATPase betting on concentration indicated a default of osmoregulation. At the very

best concentrations (100 µg/L), Ag-NPs induced a necrosis of gill lamellae and 73% of people died.

The effects of Zn O-NPs were investigated on invitro cultures of hepatocytes strains coming from human and fish. These NPs aggregated, which strongly contributed to the toxicity on fish cells. In human cells, the toxicity caused by the dissolved salts released by NPs.

A comparative study performed on in vivo Zebra fish and in of vitro culture tumoral human hepatocytes Huh 7 showed that the Ag-NPs(120 nm in diameter) penetrated into the hepatocytes inducing an oxidative stress characterized with the presence of ROS and endoplasmic reticulum(ER) disruption. In *Daphania magna*, $AgNo_3$ mainly affected the reproduction and 20 nm Ag-NPs affected growth.

Discussion

This size of nanoparticles provides them with physical and chemical properties different from materials usually found in environment [7, 8]. Since several years NPs are produced by industries and employed in agriculture, electronics, medicine, pharmacy, cosmetology [2]. Studies meted out in USA and Europe showed that Ag-NPs, TiO_2-NPs, and Zn O-NPs from sewage treatment could also be toxic for aquatic organisms [3] whereas the present study showed NP particles are toxic to the organisms. NPs can migrate into the cell and reach organelles like mitochondria, modifying the cell metabolism and provoking necrobiosis. The chemical composition and physical properties of NPs is cytotoxic. Positive electric charges of NPs can destroy membrane lipid bilayers. Surface coating of NPs also can interfere with cell structure [11]. The study showed that NPs might be toxic to bacteria, algae, invertebrates, and fish species, moreover as mammals this is very much correlated with other work [1]. Studies concerning mammals, like mouse, or bony fishes, like the zebra fish, showed that nanoparticles exerted harmful effects on the reproduction and embryonic development [11, 12]. Some experiments using in vivo and in vitro cultured animal tissues showed that Ag-NPs caused an oxidative stress characterized with well reactive molecules containing free oxygen radicals (reactive oxygen species or ROS), genotoxicity with DNA break, or cell apoptosis [13] were also analysed. Studies regarding the environmental impact of engineered nanoparticles (ENPs) are hampered by the dearth of tools to localize and quantify them in water, sediments, soils, and organisms. Using scintillation counting and autoradiography, 4 nm Co-NPs constituting a nano powder (59 m2/g) were detected in spermatogenic cells, cocoons, and blood [14]. Nanoparticles like Ag, ZnO-, or Cu O-NPs are frequently used as bactericides.

Conclusion

Nanoparticles are harmful to organisms living in the soil, fresh water or marine water such as fishes, invertebrate, amphibians and mammals,

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