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Antioxidant enzyme activities of infantile and adult female rats after neonatal administration of poly(ethylene glycol)-block-poly(lactic acid) nanoparticles

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In recent years, the interest in nanotechnology in medicine involves mainly prevention, diagnostics and treatment of human diseases such as cancer. Nanoparticles (NPs) are able to target the drug delivery into the exact place of the body, to protect drugs from degradation in gastrointestinal tract, as well as to carry slightly water soluble drugs. Despite the increasing popularity of nanomedicine, application of NPs has been limited due to their potential toxicity. It is known they can induce production of reactive oxygen species, leading to an oxidative stress. Our goal was to evaluate the effect of the polymeric NP, poly(ethylene glycol)-block-poly(lactic acid) (PEG-b-PLA) on the activity of selected antioxidant enzymes of the organism in two different life stages. Female Wistar rats were neonatally administered intraperitoneally with PEG-b-PLA NPs [20 mg/kg of b.w. (PEG20) or 40 (PEG40) mg/kg of b.w.] from postnatal day 4 (PND4) to PND7. We determined activities of catalase, glutathione peroxidase (GPx) and Superoxide Dismutase (SOD) in hemolysates of infantile (sacrificed on PND17) and adult (sacrificed after PND176) female rats. In adult vehicle-treated animals (controls), a significant decrease in catalase activity was observed, but, on the other hand, a significant increase in GPx and SOD activity compared to infantile controls was confirmed. In the hemolysates of infantile rats, both doses of PEG-b-PLA NPs after neonatal administration increased catalase, Gpx as well as SOD activities compared to controls. Surprisingly, in adult rats, the activities of Gpx and SOD decreased significantly after neonatal administration of both doses of PEG-b-PLA NPs. Obtained data indicate a possible age-related association between the activities of antioxidant enzymes and neonatal PEG-b-PLA NPs administration in female rats. Therefore, further investigation is necessary to clarify the mechanism of NPs effect and to evaluate their impact on the organism.

Biography

Monika Dvorakova has her expertise in evaluation of oxidative stress in different free radical diseases. Recently, her attention has been devoted to studying the potential risk of metal and metal-oxide nanoparticles used for biomedical application with focus on the NP influence on the oxidative status.

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