Evaluation of oxidative stress level induced by Si/SiO2

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Introduction. Quantum dots (QDs) are semiconductor nanoparticles that exhibit unique optical and spectroscopic properties, resulting in high intensity fluorescence, increased photostability, and high luminescence. Si / SiO2 QDs synthesized by laser ablation that have a core-shell structure with a crystalline silicon core surrounded by an amorphous silicon dioxide shell and sizes ranging from 6 to 8 nm. The purpose of this study was to evaluate in vivo the degree of oxidative stress generated at the liver level following administration of Si / SiO2 QDs.

Materials and methods. Silicon QDs toxicity was investigated by injection into the codified vein of these Si / SiO2 QDs in Swiss mice, being tested in 3 different concentrations (1, 10 and 100 mg QDs / kg body weight). After 24 hours of nanoparticle administration, the mice were sacrificed and liver tissue was sampling. From the total protein extracts, were measured the specific activities of the antioxidant enzymes (superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPX), glutathione reductase (Gred), glutathione S-transferase (GST), glucose 6-phosphate dehydrogenase (G6PDH), as well as reduced glutathione (GSH) and malonaldehyde (MDA) concentration, the results have been reported to mice injected with phisiological serum.

Results. The analyzes showed that the first two concentrations of tested nanoparticles (1 and 10 mg QDs / kg body) did not induce liver toxicity, the values being obtained nearby the control. Regarding the highest dose (100 mg QDs / kg body weight), 30% decrease in CAT activity, 22% G6PDH activity, 15% GST activity, and 20% GPX and GSH concentration

Conclusions. The determinations performed demonstrate the lack of toxicity of Si / SiO2 QDs to concentrations of 10 mg/kg body, not affecting the redox balance at the liver. The results of this study shows experimental evidences with high importance to the study of in vivo use of materials based of quantum dots in various medical fields.