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"Biochemistry and Interdisciplinarity: Transcending the Limits of Field"

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In vivo toxicity of naked and coated CeO_2 nanoparticles

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The use of nanomaterials in various commercial products and industrial processes has increased. Although the application of nanoparticles has great importance, some of them can be risky to human health and the environment. Cerium oxide nanoparticles CeO_2 have been extensively investigated due to the excellent oxygen storage capacities on the basis of the redox transition between Ce^{3+} and Ce^{4+} and formation of oxygen vacancies on their surface. The effect of CeO_2 on individual organisms and the ecosystem in general are not sufficiently explored.

In this research we used CeO_2, naked and coated with three different carbohydrates (glucose, pullulan or levan), to studytheir effectin three different model systems. We analyzed bioluminescence in gram-negative bacterium *Vibrio fischeri*, and acute toxicity incrustacean *Daphnia magna* and zebrafish *Danio rerio*. In all experiments the concentration of CeO_2 nanoparticles was 200 mg/L. For all used types of nanoparticles, we observed bioluminescence inhibitionof around 20%. The mortality rate oftreated *D. magna* was 6.7% for glucose coated CeO_2, 9.2% for naked and pullulan coated CeO_2 and 18.2% for levan coated CeO_2. Despite the adherence of nanoparticles aggregates to the outer surface of the chorion, no acute toxicity was observed for zebrafish embryos during the first 72 h post fertilization. We also did not observe increased level of abnormalities among treated embryos during the first 72 h post fertilization.

In this study, no toxic effects of CeO_2 nanoparticles were observed, but the extent of uptake of nanoparticles remains to be investigated. The effect of chronic exposure to CeO_2 should also be analyzed.

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