

Evidence of free radical and antioxidant activity in *Spirodela* exposed to metallic and metal oxide nanoparticles: potential for protein and lipid damage

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1. Introduction

The toxicity of engineered nanoparticles towards macro algae and higher aquatic plants has not been well studied [1]. This knowledge gap challenges the development of nano risk assessment towards water ecosystems. In this study, we investigated free radical activity and oxidation defence activity on *Spirodela* after exposure to ZnO and Ag ENPs over 96 hours (acute) and 14 days (chronic). Plant specimens were exposed to nanoparticles with concentrations ranging from 0.01-1000 mg/L, and thereafter the quantities of free radicals (H₂O₂, total ROS/RNS), antioxidant activity (catalase, superoxide dismutase, and total antioxidant capacity) were analyzed. Oxidative stress has been suggested as a significant route of toxicity induction by engineered nanomaterials (ENPs) to biological media [2].

2. Results

The response on sub-lethal endpoints varied – and was established as mainly concentration dependent – where 0% survival was observed after chronic exposure at 1 000 mg/L of Ag ENPs. The generation of free radicals after ENPs exposure was observed to be influenced by their; nominal concentration, aggregation and agglomeration processes as well as bioavailability of ionic species due to nanoparticles ageing. Enzymatic oxidation mechanisms (total antioxidant capacity, catalase and superoxide dismutase activity) varied as a function of ENPs concentration. The toxic effects reported indicated the potential for oxidative damage on DNA, lipids, fats and proteins.

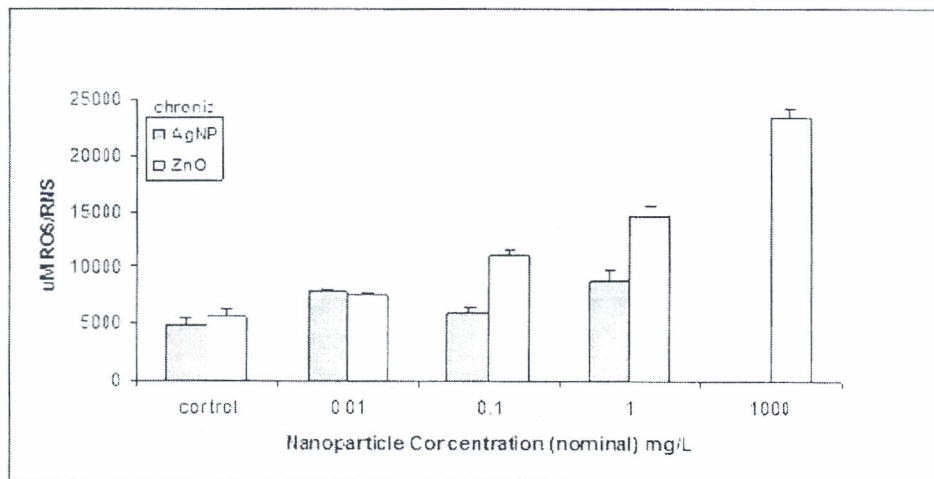
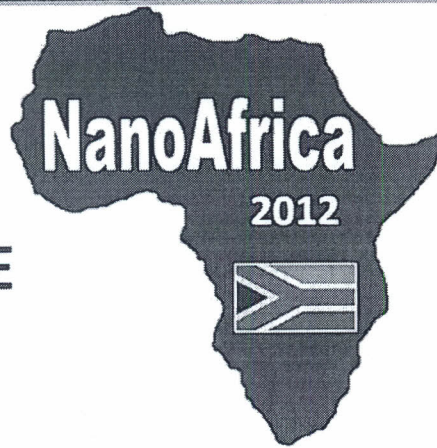


Figure 1: Amounts of reactive oxygen species (ROS) and reactive nitrogen species (RNS) in *Spirodela* exposed to ZnO and Ag nanoparticles over 14 days.

3. References

- [1] A. Kahru & H. Dubourguier. *Toxicology* 269 (2010) 105.
- [2] S. Tedesco, H. Doyle, J. Blasco, G. Redmond & D. Sheehan. *Aqua. Tox.* 100 (2010) 178.



PROGRAMME

ABSTRACTS

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