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Antioxidant activity stimulated by ultraviolet radiation in the nervous system of a crustacean

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Ultraviolet (UV) radiation can produce biological damage, principally oxidative stress, by increasing the production of reactive oxygen species (ROS). This study evaluated biochemical impairments related to the oxidative stress induced by UVA, UVB and UVA + UVB (Solar Simulator-SIM) in environmental doses, during five consecutive days of exposure, in the brain and eyestalk of the crab Ucides cordatus. We evaluated these regions by sampling on the 1st, 3rd and 5th days of UV exposure for lipid peroxidation (LPO), antioxidant capacity against the peroxyl radical (ACAP), and the activities of catalase (CAT), glutathione peroxidase (GPX) and glutathione-s-transferase (GST). Immunohistochemical and immunoblotting assays were performed for anti-activated-caspase 3 in the brains. After the first day of exposure, LPO increased in the eyestalks and brains of the UV-exposed animals; ACAP, CAT, GPX and GST also increased in the brains. On the third day, the LPO values in the eyestalk remained high in the UV-exposed groups, while ACAP decreased in the brain and eyestalk and CAT remained high in all irradiated groups in both regions. On the fifth day, LPO decreased in the eyestalk and brain of the UV-exposed groups. These results may have been a consequence of the ADS activity, since CAT was high in both regions, ACAP was high in the eyestalks of the SIM group, and GPX remained high in the eyestalks of the UVA and UVB groups. Immunohistochemical assays and immunoblotting showed that there was apoptosis in the brains of the UV-exposed crabs. In conclusion, environmental doses of UV can cause oxidative damage to the CNS cells, including apoptosis.

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Toxicity of citrate stabilized silver nanoparticles with different size and shape on *Pseudokirchneriella subcapitata* (Chlorophyta)

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The growing numbers of applications of silver nanoparticles (AgNP) in industrial and consumer products cause an increasing liberation of these particles in the ecosystems. The toxic effects and the environmental impacts are widely unknown. The use of droplet based microfluidic techniques can help to reveal the environmental risk of such effectors by the high resolved dose/response curves in two standarized media. To generate segments of about 500 nL volume, the aqueous phase consisting of the cultivation medium, the green algae, and the AgNP was injected into a flow of an immiscible carrier fluid by the help of a computer controlled syringe pump system. The accurate flow control of the fluids allows the generation of droplet sequences with gradually different and well defined droplet composition. The well established model organism for environmental pollution monitoring, *Pseudokirchneriella subcapitata* is used for the analysis of the growth inhibition effect of citrate stabilized AgNP with different sizes (d = 2.9 23.4 nm) and shapes. Since sodium citrate is non toxic for the investigated algae, we avoid toxic by effects of the stabilizer. The investigated AgNP show narrow size distributions and high stability, measured by zeta potential analyses, scanning electron microscope recordings, and ultraviolet visible spectrophotometry. Interestingly, the culture medium influences the toxicity on *P. subcapitata* of AgNP dramatically, compared to silver ions. Above this, we detected a strong dependence of the sizes of the particles and their toxicity. In contrast to results reported in the literature, this work demonstrate that the shape has no influence on the toxicity of AgNP.

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