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Assessment of the effects in mussels (*Mytilus edulis*) chronically exposed to environmental realistic concentrations of nickel nanoparticles using a biomarker approach

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Abstract

Background: The presence of metallic nanoparticles (NP) in the aquatic environment is a cause for concern as they can have adverse effects on biota [1,2]. **Objective:** The purpose of this study was to evaluate the effect on mussels (*Mytilus edulis*) chronically exposed to environmentally realistic concentrations of nickel nanoparticles using oxidative stress and lipid peroxidation biomarkers. **Methods:** In this study, 60 individuals of *Mytilus edulis* were chronically (28 days) exposed in a semi-static test (100% of water renewal each two days) to three concentrations (0.05 mg/L, 0.5 mg/L, 5.0 mg/L) of nickel (Ni-NP), including a negative control. The activity of oxidative stress enzymes (Glutathione S-transferases - GSTs and Catalase-CAT) and the damage caused by lipid peroxidation (Thiobarbituric Acid Reactive Substances - TBARS) were subsequently assessed in the gills and digestive glands. Data was analysed using One-Way ANOVA (factor: concentration) and, if needed, by Dunnett test (to compare each exposed group to control). **Results:** Statistically significant differences were observed in the activity of catalase present in the digestive glands between the control group and the other exposed groups, both for the gills and the digestive gland. The highest catalase activity was observed in both cases in the control group. No statistically significant differences were observed in GST activity, either in the gills or in the digestive glands, between the different experimental groups. Mussels exposed to the highest levels of nickel showed higher concentrations of TBARS in the gills, differing statistically from the control group. However, in the digestive glands, the highest concentration was in the non-exposed group. **Conclusions:** Ni-NP have been shown to be potentially harmful to the mussels, as in most of the concentrations tested, they negatively influenced the antioxidant response, which suggests an alteration in the mussels' homeostasis that needs further investigation.

Keywords: environmental stressors; ecotoxicology; organism test; oxidative stress enzymes; lipid peroxidation

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