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Effect of temperature on oxidative stress parameters and enzyme activity in tissues of Cape River crab (Potamanautes perlatus) following exposure to silver nanoparticles (AgNP)

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Abstract

Biomarkers of oxidative stress have been widely used in environmental assessments to evaluate the effects of exposure of aquatic organisms to contaminants from various anthropogenic sources. Silver nanoparticles (AgNP), the most produced NP worldwide and used in several consumer products, are known to produce oxidative stress in aquatic organisms. Similarly, temperature is also known to affect reactive oxygen species (ROS) by influencing the inputs of contaminants into the environment, as well as altering behavior, fate, and transport. Aquatic ecosystems are affected by both anthropogenic releases of contaminants and increased temperature. To test this hypothesis, the influence of AgNP and temperature in the response to multiple biomarkers of oxidative stress was studied in the gills and hepatopancreas of the Cape River crab Potamonautes perlatus. Responses were assessed through activities of antioxidant enzymes, including superoxide dismutase (SOD), catalase (CAT), and the nonenzymatic antioxidant glutathione S-transferase (GST). The response of the oxidative stress biomarkers analyzed was always higher in hepatopancreas than in gills. Elevated temperatures (28°C) induced oxidative stress by increasing SOD, CAT, and GST activities, particularly at 100 µg/ml AgNP. These data indicate that AgNP-mediated toxicity to P. perlatus is modulated by elevated temperatures, but this relationship is not linear. Co-effects of AgNP and temperature are reported for the first time in P. perlatus.