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Protective effects of Dissolved Organic Matter (DOM) in short-term exposure ofSerrasalmus rhombeus, to metals in Rio Negro river water

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Effects of acute exposures of copper (Cu, 5 and 10 µM) and cadmium (Cd, 0.1 and 1 M) on ion fluxes, gill morphology and antioxidant defenses of piranhas (Serrasalmus rhombeus) were assessed in DOM rich Rio Negro water and DOM poor INPA well water. Fish (N=62, 143±58g) were exposed to different treatments of Cu and Cd for three hours. Water samples were taken every hour for flux measurements, plasma and tissue samples were taken at the end of the exposure. Sodium and ammonia flux were most affected by Cu exposure, while chloride flux was more affected by Cd exposure. There was no evidence for DOM induced protection when looking at ion fluxes but it did protect plamsa osmolarity in Cu exposed fish. All other tested biomarkers showed a stronger response to Cd compared to Cu, especially in fishes exposed in DOM poor INPA water. Piranhas exhibited a significant increase on SOD and GST activity, high levels of LPO and severe changes on gills tissues when exposed to 1 M Cd. These findings indicate that piranha can immediately trigger defense mechanisms depending on the type of xenobiotic. In addition, the natural characteristics of water were of utmost importance for the protection of the organism, since only minor damages occurred in fishes exposed in Rio Negro water. This is likely caused by the greater organic matter and suspended particles content in Rio Negro water, which can bind or compete with divalent metal ions and reduce bioavailability and in turn toxicity.

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