

Effect of Phenanthrene on Antioxidant Enzyme Activities in Liver, Gill and Kidney of Olive Flounder, *Paralichthys olivaceus*

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In the attempt to define and measure the effects of pollutants on an aquatic ecosystem, biomarkers and bioindicators have attracted a great deal of interest. Under human influence polycyclic aromatic hydrocarbons are becoming ubiquitous in estuarine and coastal areas and are commonly found in the marine sediment, water and marine organism's tissues. Antioxidant enzyme activities are biosynthetic reactions in which the foreign compound is covalently linked to an endogenous molecule. Hence, antioxidant enzymes thus play a crucial role in maintaining cell homeostasis. In this study, we tried to elucidate the effect of waterborne phenanthrene (0.5, 1 or 2 μM) by chronic exposure on glutathione S transferase (GST), glutathione reductase (GR), glutathione peroxidase (GPx) and catalase (CAT) activities in gill, liver and kidney in flounder (*Paralichthys olivaceus*). At the end of each period (at 2, 4 weeks) fish were anesthetized and weighed. Livers, gill and kidney were isolated for cytosolic enzymes assay. Waterborne phenanthrene affected antioxidant enzymes and glutathione-mediated detoxification as enzyme defense system. Hepatic, gill and kidney GR as well as GST, and CAT activities were markedly elevated after two or four weeks of exposure. The time course of the induction of olive flounder liver, gill and kidney cytosolic GPx activity by waterborne phenanthrene ($\geq 1.0 \mu\text{M}$) showed a marked elevation at 2, 4 weeks. In case of hepatic GPx, 2.0 μM of phenanthrene induced remarkable increase. After 2 weeks of exposure, significantly higher hepatic cytosol CAT activity compared to a control group was observed in the phenanthrene-exposed groups (2.0 μM). Compared with the values found in the control group, the values were about two times higher for hepatic cytosol CAT activity in flounders exposed to 2.0 μM phenanthrene at 4 weeks. We can conclude that enzyme defense system is induced by phenanthrene because it causes significant increase in the activities of several antioxidant enzymes and glutathione-mediated detoxification enzyme in liver, gill and kidney tissues of *Paralichthys olivaceus*.