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Exposure of scorpionfish (*Scorpaena guttata)* to cadmium: effects of acute and chronic exposures on the cytosolic distribution of cadmium, copper, and zinc

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ABSTRACT

Scorpionfish were exposed to sublethal levels of cadmium in seawater (0.1 to 20 mg/l) for 4 and 8 wk. Cytosols from liver, kidney, intestine and gill tissues from these fish were analyzed by Sephadex G-75 chromatography to determine the effects of chronic Cd exposure on detoxication by a medium-molecular-weight (3,000-20,000) metallothionein-containing (MT) pool and the potential for toxicity to enzymes in a high-molecular-weight (>20,000) enzyme-containing (ENZ) pool.

Examination of ENZ- and MT-Cd values from these chronic exposures revealed patterns different from those resulting from acute (4-day) exposure to similar or higher concentrations in a previous study (Brown et al., 1984). The relative order of sensitivity of tissues t oCd after chronic exposure was intestine > gill > kidney = liver, whereas the kidney was most affected after acute exposure. Further, while acute exposures appeared to result in an MT saturation-dependent 'spillover' of Cd into the ENZ pool, chronic exposures appeared to involve an equilibrium-dependent exchange of Cd between the ENZ and MT pools. Chronic exposure to 20 mg Cd/l resulted in much higher MT-Cd and lower ENZ-Cd values than acute exposure to 25 mg Cd/l in all tissues examined, indicating more resistance to Cd toxicity after Chronic exposure. Increases in MT-Zn were often correlated with increases in MT-Cd. Significant correlations (positive and negative) were occasionally found between the ENZ-Cd and the ENZ-Cu and -Zn values.

We conclude that biological impact cannot be predicted from whole tissue bioaccumulation data since much different amounts of Cd may be detoxication and toxicity measurements also cannot predict such impacts unless the most sensitive tissue is examined.

Key words: Cadmium; Detoxicification; Metallothionein; Scorpionfish