

The Regional Comparison of the Influence on Cadmium in the Olive Flounder (*Paralichthys olivaceus*) Eggs and Larvae

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Introduction

Application of standard guide through the efforts of different laboratories is widely accepted worldwide. The battery of toxicity tests on aquatic organisms is available to decide the concentration of contaminant and to predict the hazardous effect of xenobiotics in representative methods. Generally, various kinds of authorized methods either in early toxicity examination (ASTM, USEPA and OECD) or the chronic toxicity test (USEPA) of toxicants are used abroad based on fishes; as bio-indicator species. But, especially Korea according to its actual circumstances always prefer acute toxicity tests due to the lack of standard methods and meager number of representative fish species. Therefore, it is difficult to forecast the sublethal effects of contaminant in short duration of examination. Trace elements, such as cadmium, are hazardous for fish, even if present in extremely low concentrations. Most studies on the toxicity of heavy metals have been carried out with fingerlings and adult fish. Since, developing fish embryos and larvae are highly sensitive to toxicants and therefore, often used in standard toxicity evaluations (Connell et al., 1999). The main purpose of the present study was to investigate the effects of metal according to the regional differences of habitate containing different concentration of cadmium in sensitivity; hatching rate, eggs and larvae survival rate and malformed rate of developing embryos and larvae of flounder (*Paralichthys olivaceus*). The study demonstrates the usefulness of toxic effects of cadmium on early life stages of fish, as well as the applicability of flounder as standard species to serve

additional information to predict the effects of metals on other wildlife species. Eggs of bio-indicator species i.e. flounder collected from three areas of Korean peninsula: Cheju, Yeosu and Chungnam

Materials and Methods

Fertilized eggs were obtained from the hatcheries located in Jeju-Do, Yeosu and Chungnam. Fifty eggs of each sample were kept in Petri dishes containing cadmium solutions of 0, 10, 20, 40, 80 and 160 $\mu\text{g L}^{-1}$ duplicately. Fertilization took place in the laboratory. All the experiments were done with distilled water. Temperature was maintained at 23°C and oxygen at 80% saturation. Embryonic development was monitored continuously and mortality was recorded. After hatching, the number of deformities and dead hatch were counted and filmed by a phototelescope. Student's *t*-test was applied.

Results and discussion

The survival rates of the eggs and larvae were highest in the control (above 90%). While the decreasing of these stages observed in cadmium treated groups, respectively and were significantly lower below 50% in groups containing more than 40 and 20 $\mu\text{g L}^{-1}$, respectively. No discrepancy in the hatching abilities of fertilized eggs collected from different regions. Diminished tendency followed same pattern in respect to the increasing concentration of cadmium. Hatching success significantly diminished in the exposure groups at concentration $> 10 \mu\text{g L}^{-1}$ compared to control. The deformities including fin malformation and spinal curvatures reveal the effect of cadmium on embryonic development. Regional difference of the malformation rate was not noted, but eggs were highly sensitive than larvae. Our result corroborated with the findings of Witeska et al. (1995) and Noor et al. (1986), who reported the reason for the sensitivity of eggs is due to protective role of the chorion. Other accumulation studies using waterborne exposures of 10 mg L^{-1} Cd demonstrated 10~30 fold more Cd accumulation in egg than larvae, but most of it (60~90%) remains bound to the chorion (Nakagawa and Ishio, 1988). Therefore olive flounder were found to be adequate models for measuring toxicological effects although eggs bought from different areas.

References

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