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The Effect of Cadmium on Sperm Quality and Fertilization of *Cyprinus carpio* L.

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ABSTRACT

The objective of the study was to determine the effect of cadmium on sperm quality and fertilization of *C. carpio* L. Sperm and eggs were collected by abdomen striping from the mature testis and ovary of *C. carpio* L. This study used one control and four treatment groups of variation on the cadmium concentration (0, 50, 100, 150, and 200 ppm) with eight replications. Sperm motility (mass motility, mass motility duration, and individual motility duration) and viability were measured after three to four seconds of incubation in the water. The percentage of fertility success was calculated by observing embryo development after the eggs were mixed with sperm and incubated in the water for 72 hours. The success of the fertilization process was indicated by a color change of the egg that darkens after successful fertilization, and white-milk if failed. The data were analyzed using analysis of variance (α = 0.05). The results of this study indicate that exposure of 50 ppm cadmium and control group shown success in term of sperm quality (motility and viability) and fertilization, but at 100 ppm or more decreased the sperm quality and fertilization rate. It can be concluded that cadmium exposure decreases sperm quality and fertility at 100 ppm or higher concentrations.

1. Introduction

Human activities in industry, agriculture or households have impacts on the increase of pollutants in aquatic ecosystems. The major pollutants from waste treatments are a heavy metal such as cadmium (Cd) and lead (Pb)(Mishra *et al*., 2006). Cadmium is a toxic heavy metal which is often used as the main or auxiliary material in the industry, among others nickel-cadmium battery industry (50-55%), pigment (18-20%), the coating material (8-12%), stabilizers and other synthetic materials (6-10%). Until the end of the 20th century, 45% of the total global pollution was Cd (Connell and Miller, 1995). Heavy metals exposure can disrupt physiological processes and give toxic effects to organisms (Patric, 2006).

Cell damage due to Cd exposure, among others are changes in sulfhydryl homeostasis and decreased antioxidant capacity by the inhibition of the enzyme and replacement of Zn and Se in metalloenzymes, thus reducing metabolic activity. These gave rise to the formation of reactive oxygen species (ROS) that produce oxidative stress in cells and cause damages such as lipid peroxidation, destruction of protein structure and function, and mutations in DNA (Valko *et al.*, 2006).

The toxicity of heavy metals affects water organisms such as fish and can indirectly affect the male reproductive organs that consume them. (Siu *et al*., 2009). Heavy metals were introduced to the fish body through absorption and accumulation from environment. These disrupted the structure and function of tissues and organs (Jezierska and iteska, 2001). Heavy metal pollution has been reported to