

The effect of copper, zinc, mercury and cadmium on some sperm enzyme activities in the common carp (*Cyprinus carpio* L.)

Beata Sarosiek^{1,2}, *Marta Pietrusewicz*³, *Julita Radziwoniuk*³,
Jan Glogowski^{2,3}

²*Molecular Andrology Group, Institute of Animal Reproduction and Food Researches of Polish Academy of Science, Olsztyn;* ³*Department of Ichthyology, University of Warmia and Mazury, Olsztyn, Poland*

Received: 14 October 2008; accepted: 10 September 2009

SUMMARY

The objective of the study was to determine the effect of copper, zinc, cadmium and mercury ions (100, 10 and 1 mg/l) on the activity of some enzymes of carp spermatozoa. Acid phosphatase activity was proved to be relatively insensitive to zinc ions, while copper, mercury and cadmium ions effectively inhibited the activity of this enzyme. β -N-acetylglucosaminidase activity was sensitive only to mercury ions. Lactic dehydrogenase activity remained unaffected by heavy metals. Our results showed that, among the examined metals, mercury had the strongest inhibitory effect on enzymatic activities. *Reproductive Biology 2009 9 3: 295-301.*

Key words: acid phosphatase, β -N-acetylglucosaminidase, lactic dehydrogenase, spermatozoa, common carp

¹Corresponding author: Molecular Andrology Group, Institute of Animal Reproduction and Food Researches of Polish Academy of Science, Tuwima Str. 10, 10-747 Olsztyn, Poland; e-mail: piro-sia@pan.olsztyn.pl

INTRODUCTION

The toxicity of accumulated metals is determined not only by the type of metal, but also by the physical and chemical properties of water and the protective mechanisms of fish [12]. Owing to their bioaccumulation and non-degradability, heavy metals pose a serious pollution hazard to the aqueous environment. Fish exposed to metals are usually characterized by increased metal levels in the gonads. Gonadal levels of copper and zinc of *Catostomus commersoni* living in polluted lakes were higher than those in fish inhabiting unpolluted waters [8]. Cadmium caused deformation of the testicles and induced seasonal changes in the androgen level in brook trout [10]. In our preliminary study we observed a dose-dependent reduction of common carp sperm motility related to the concentration of heavy metal in the activation solution. This may be due to the sperm membrane disruption or inhibition of spermatozoa enzymes. In the present study we examined the effect of zinc, copper, cadmium and mercury on the activity of three sperm enzymes in order to evaluate the sensitivity of these proteins to heavy metal ion contamination. Enzyme activity may be an indicator of the toxicity of pesticides, heavy metals and other pollutants [9].

MATERIALS AND METHODS

Carp (body weight, bw, 5-7 kg, 5-6 year old) were maintained under ambient temperature in ponds of the Institute of Ichthyobiology and Aquaculture in Golysz, Poland. Before hormonal stimulation (May 2001), the fish were transferred from ponds to tanks with a water temperature of 20°C reached after seven days. Sperm production was stimulated with Ovopel (one pellet containing of 18-20 µg of GnRH analog and 8- 10 mg of metoclopramide per one kg of fish bw; Interfish Ltd, Hungary; [4]). Sperm was collected 24 h after hormonal stimulation. The abdomen of the fishes was wiped dry and semen was collected by stripping into beakers. Samples contaminated with excrement or urine were excluded

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