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Mercury Induced Histopathological Changes in the Testis of the Freshwater Fish, *Rasbora dandia*

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Abstract: ***Aquatic ecosystems are under the constant threat of pollutants released by various anthropogenic activities. Xenobiotic metals like mercury often disrupt normal physiology and homeostasis of organisms. In the present study, reproductively mature freshwater fish, Rasbora dandia were exposed to sublethal concentration of 10 ppb of mercury for 30 days period. Histopathological changes in the testis induced by the mercury are studied. Gonadosomatic index (GSI) of the test fishes is affected by mercury exposure in the present study. Severe deterioration was observed by 30 days of mercury exposure. Other histopathological changes like reduced spermatozoa and proliferation of interstitial tissue are also appeared. The present study implies that chronic mercury exposure induces testis damage in fishes leading to impaired reproductive success.***

Keywords: Histopathology, Mercury, Testis, Gonadosomatic index, *Rasbora dandia*

1. Introduction

Aquatic ecosystems are under the constant threat of pollutants released by various anthropogenic activities. Among aquatic pollutants, mercury is very hazardous as it is highly toxic as well as persistent. Global mercury emissions have natural as well as anthropogenic sources. Human activities make a large contribution to the atmospheric pools of mercury by releasing over 2300 tonnes each year into the atmosphere. Coal combustion is the largest source contributing almost half of the total release (Pacyna et al., 2010).

Mercury is a toxic metal with no known biological role. Properties of bioaccumulation and biomagnification make mercury more hazardous. Xenobiotic metals like mercury often disrupt normal physiology and homeostasis of organisms. One of the most sensitive chronic or sublethal effects of pollutants is on the reproduction (Sprague et al., 1971). Even at low concentration, mercury may affect fish populations through impairment of physiological processes like reproduction (Crump and Trudeau, 2009).

According to Weiner (2013), extend of issues of mercury in fish and wildlife are underestimated and has a scope of substantive scientific discovery. Kidd and Batchelar (2012) pointed out that it is not understood how chronic mercury exposure affects the reproductive success of wild fish. Understandings on modes of action of toxicants make the prediction of their effects as pollutants more accurate (Sprague et al., 1971). Most of the literature regarding the effects of pollutants on the reproduction of fishes is limited to a few teleost fishes like *Clarias batrachus, Channa punctatus, Colisa fasciatus, Heteropneustes fossilis, and Sarotherodon mossambicus* (Pandey, 2000). The present study is our attempt to evaluate the histopathological changes in the testis of native fish *Rasbora dandia*, induced by mercury.

2. Materials and Methods

2.1 Test Organism

R. dandia were collected from freshwater bodies of Thrissur, Kerala. These fishes were transported to the laboratory carefully and acclimatized to the laboratory conditions. Fishes with length between 5.5 to 7 cm length and 1.5 – 4.5 gm were selected and 10 fishes were kept in each aquarium. Fishes were fed daily by standard fish feed.

2.2 Determination of LC_{50}

Mercuric chloride was used as a source of the mercury. To calculate lethal concentration, fishes were exposed to 80, 100, 120, 140 and 160 ppb of mercury. Number of mortality in each aquarium is recorded on every 12 hours for a period of 96 hours. From this reading, LC_{50} value was found out using probit analysis. 96 hours LC_{50} concentration of mercury was found to be 133.3 ppb of Hg.

2.3 Exposure Procedure

Experimental fishes were exposed to sublethal concentration of 10 ppm of mercury for 30 days. Test solutions are renewed every 24 hours and fed with standard fish feed. Fishes were anaesthetised and scarified on every 10 days time interval during the experiment.

2.4 Histological Preparation

Testes were dissected out and placed in 10% formalin for fixation. They were dehydrated in ethanol and cleared in xylene. Specimens were then infiltrated with paraffin wax and embedded in paraffin blocks. 1-3 μm sections were taken using rotary microtome and stained using haematoxylin and eosin.