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Effect of Lead Nitrate on the Haematological Parameters of *Channa punctatus*

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Abstract

The present investigation deals with effect of heavy metal lead nitrate on haematological parameters of Channa punctatus. Lead nitrate induced significant changes at sub-lethal concentration during short term and long term exposure in haematology. The results revealed a decrease in parameters like RBC, WBC and Hb at short term exposure while WBC increases during long term exposure.

Keywords : Lead nitrate, Haematology, *Channa punctatus.*

INTRODUCTION

Large amount of wastes generated through various industries are being dumped directly into the environment seriously impairing its natural processes. Fishes mostly live under a narrow range of environmental conditions and are one of the main inhabitants of aquatic systems. Thus they cannot escape from the ill effects of pollutants (Clarkson, 1998). Any change from normal condition results in stress (Wedemeyer, G. R., et al 1999). They are the good bioindicators of aquatic environment as they are sensitive to any change in a short time acute or long term chronic environment (Parashar and Banerjee, 2002). Non- degradable heavy metals are regarded as hazardous to the aquatic ecosystem for their environmental persistence and their ability for bio-accumulation.

The haematological parameters are useful not only in assessing the condition of fish under study but, also for the deteriorating water quality.The health of fishes can be assessed with the haemotological parameters. (Blaxhall P. C.,1972, Nair et. al 1984). According to James et al., (1996) the metal entering into fish system are slowly eliminated, hence the blood parameters get affected due to metal toxicity. According to Ashraj (2005) heavy metal contamination may have detrimental effects on the ecological balance of the environment and on a diversity of aquatic organisms.

Lead (Pb) is a heavy metal which is widely used in paint industry, electrical components, plastic chemicals and in various other things (Hodgson et al. 1984). Lead can be accumulated in the tissues of a wide variety of freshwater organisms as it is a cumulative toxicant (Simkiss and Mason, 1983). The heavy metal toxicity depends on duration of fish exposure, their concentrations and specific composition, (Vosyliene, et al., 2003). Therefore, in present study efforts have been made to investigate the toxic effect of lead nitrate on haematological parameters of *Channa punctatus*.

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The present study is concerned with short and long term exposure of lead nitrate on *Channa punctatus* for bioassay experiment using this fish as a test organism under controlled conditions and by taking precautions and procedure as given by APHA (1975).

MATERIALS AND METHODS

The fishes were collected from local fisherman in Hingoli, Maharashtra. They were acclimatized to laboratory conditions for 15 days prior to experimentation. Healthy medium sized fishes of about 25 – 30 cm in length and 40 – 50 gm in weight were selected for the investigation. The fish was brought to laboratory and then properly washed in tap water. They were then treated with 0.02% $KMnO_4$ and 0.004% formalin solution to remove any type of external infection. Before experimentation, only normal uninfected healthy fish were selected for experiment.

De-chlorinated tap water was maintained throughout the period and it was continuously aerated to support the oxygen content of water. The physicochemical parameters of water were maintained with pH 7.3, Dissolved oxygen 6.9 – 7.2 ppm, Total hardness 450 – 465 and temperature between 28 – 30° C.

The LC_{50} values of Lead nitrate were estimated by Finney (1964). The sub lethal concentration of toxicant selected was 1/5th dose of LC_{50} and were 96 hrs for short term and 30 days for long term exposure. Sub – lethal concentration of Lead nitrate at 96 hrs was 1.7 ppm. The fishes were divided into two groups, one control and other experimental groups. The blood sample was collected from the heart of fish and haematological parameters were determined. RBC and WBC count were made by using the improved Neubaur counting chamber. Hb was measured by Sahli's haemometer.

The values were expressed as millions per cubic millimeter for RBC and WBC and grams percentage for Hb. Each value was recorded on the basis of Mean $\pm$ SD of six individual observations.

RESULT AND DISCUSSION

Hymavathi and Rao (2000) have also been studied various hematological abnormalities in fish Channa punctatus exposed to lead

The results of the present investigation show that RBC was found to be decreased significantly during short term from 1.30 $\pm$ 0.32 to 1.10 $\pm$ 0.15. Similarly there was a decline in RBC for long term exposure from 1.30 $\pm$ 0.10 to 0.99 $\pm$ 0.62. Similar results were

shown by Johansson-Siobeck and Larsson 1979 in *Salmo gairdneri* and Haux and Larsson, 1982 in *Anguilla anguilla*. Acute exposure of *Colisa fasciatus, Oreochromis mossambicus* to sub-lethal concentrations of lead, copper and zinc has been shown to produce haemolytic anaemia due to lysis of erythrocytes with a decrease in Hb%, and erythrocytes (Soiveo and Nikinmaa, 1981; Sampath et al., 1998).Goel and Sharma (1987) also reported similar results with significant reduction of RBC and Hb% content in fishes exposed to different heavy metals.

In case of WBC there was a decline during short term exposure from 5.35 ± 0.47 to 4.63 ± 0.27 while there was a significant increase during long term exposure from 5.30± 0. 87 to 9.56 ± 0.39. Similar increase in the value of WBC was observed by Mehjbeen and Nazura (2012) Witeska (2005) also found the same result in common carp. The increased white blood cell count indicates damage due to infection of body tissues and severe physical stress. Similar findings were also noted in fish exposed to increased copper concentration Nath and Banerjee, (1995) and by Karuppasamy et al., (2005) in Channa punctatus on cadmium exposure

The Hb content decreased in both short term and long term exposure. It decreased from 12.64 ± 0.46 to 8.75 ± 0.13 during the short term exposure while in long term exposure it decreased from 12. 88 ± 0.69 to 8.32 ± 0.33. This result is in agreement with the reduction in RBC count in present study which may possibly due to the inhibition of aerobic glycolysis limiting synthesis of iron and hemoglobin in the fish (Joshi et al. 2002).Similar observations were also obtained by Goel and Sharma (1987). Das et al. (1987) explains that haemolysis may occurs due to toxicity ultimately leading to alteration in the selective permeability of the cell membrane .

Table 1: Concentration of different haematological parameters in *Channa punctatus* exposed to Lead nitrate

Parameters	Short term exposure (96 Hrs.)		Long term exposure (30 days)	
	Control	Treated	Control	Treated
RBC ($1x10^6$ mm^3)	1.30 ± 0.32	1.10 ± 0.15	1.30 ± 0.10	0.99 ± 0.62
WBC ($1x10^3$ mm^3)	5.35 ± 0.47	4.63 ± 0.27	5.30± 0. 87	9.56 ± 0.39
Hb (%)	12.64 ±0.46	8.75 ± 0.13	12. 88 ± 0.69	8.32 ± 0.33

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