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ORIGINAL ARTICLE

Histopatholigical changes due to lead toxicity in gills of *P. ticto (hem).*

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ABSTRACT

Gill is a key organ for the direct action of pollutants in the aquatic environment. In the present study *P. ticto* was exposed with the sub lethal concentration of lead nitrate. The fishes were acclimatized and then exposed to the different concentration of lead nitrate. After the exposure, the histopathological changes in the gills were noted these changes showed the damages in tissue vacuole formation, lead deposition, shrinkage of lamella, fusion of tips of gill lamella and swelling of epithelial layer of gill.

Key Words: Histopathology, Toxicity, *P. ticto*, Lead nitrate.

1. INTRODUCTION

Heavy metals are generally water soluble, non-degradable, strongly bound to polypeptide and proteins. These metals are also very hard, strong, have very high boiling and melting points and are good conductors of heat and electricity. Elevated levels of lead in water arise principally from industrial discharges, high way run-off and weathering processes in area of natural lead mineralization. Lead is deposited from the atmosphere directly onto water surfaces. The pollution has entered in the environment through disposal of wastes and has entered in the organism through food chain [1]. Heavy metals pollute the water and disturb the whole aquatic ecosystem, hence they need exploration of different aspects of fish biology. Economical losses of fish farming are because of various water bound contaminants such as heavy metals, pesticides and sewage. These pollutants and eutrophication leading to adverse effects and cause of death of organisms in the aquatic system [2].

Heavy metals are being constantly discharged in the environment both from various human and natural activities viz. industrialization, vulcanization. Heavy metals are of greatest concern because after reaching the aquatic bodies they deteriorate the life sustaining quality of water and cause damage to both flora and fauna [3,4]. Lead, mercury and cadmium are of principal toxicological concern [5]. Pollution is an undesirable change in the physical, chemical or biological characteristics of land, air or water that show harmful effect on organisms [6]. Toxic impact brings about physiological, biochemical and pathological alterations in the organisms [7].

The LC50 values of zinc for the *Percocypris pingi* at 24 h, 48 h, 72 h and 96 h were 3.504 mg/L, 2.933 mg/L, 2.852 mg/L and 2.852 mg/L, respectively. But the LC50 values of copper at 24 h, 48 h, 72 h and 96 h were 1.730 mg/L, 1.389 mg/L, 1.340 mg/L and 1.340 mg/L, respectively [8]. The release of industrial, agricultural and domestic waste water into the aquatic environment cause pollution and fishes are often exposed with these metals. Especially in areas where the dilution effect is low and concentration is high [9,10]. Histological changes are providing an efficient and sensitive method to detect effects of contaminates in various tissues and organs of fish [11], Newton [12] worked on pollution of river of west Wales noticed that lead caused clogging and inflammation of gills and there was excess secretion of mucous due to lead toxicity. Bengeri and Patil [13] noticed the histopathological changes in the gill of *Puntis aurulius* due to lead toxicity.

2. MATERIAL AND METHODS

The living specimens of *P. ticto* were obtained from local ponds. Fishes were acclimatized to tube well water condition for a period of 15 days. No mortality occurred during this period. The fishes were washed with 0.1% $KMnO_4$ solution to obviate any normal infection, fishes were fed according to 1% body weight per day in the evening with dry shrimp powder. After acclimatization fishes were kept in different concentrations of lead nitrate. Methods of physicochemical analysis of water were followed as per description in APHA (1971). Paraffin sections of 5.0 to 8.0μ thickness were prepared for histopathological observations and were stained with double stain hematoxylin and eosin.

3. RESULTS AND DISCUSSION

Histopathological observations in gills are marked. The gills show an outer layer of ciliated epithelium which exchange gasses, through circulation of water. Any hazardous impact on gill is noticed by histological changes in its epithelial lining. In control sections the gills show normal structure of its epithelial lining Figure-1. At 1.0 ppm concentration deterioration in the epithelial cells takes place. The layer of epithelium shrinks and gills appear to be thin long filaments Figure-2. At 5.0 ppm concentration the swelling of the epithelial layer takes place. The free gills filament at certain points in get joined together at their tips Figure-3. This obstruct free movement of gill filaments. This concentration deposits of lead are clearly observed within the epithelial lining Figure-4. This brings obstruction in the blood vessel for blood circulation in the gills. At the base of gill filament vacuole is created Figure-4. These histopathological changes are not observed in control section. These observations show similarities will earlier workers such as Fast *et al*., [15] found out the contents of Hg, Zn, Cd and Pb in fish *Oncorhvnchus kisutch* and *O. tshwvtscha*. Hodson *et al*., [16] conducted experiments on size and growth of rainbow trout with lead intoxication and noted that growth rate was affected with toxicity of lead. Giordano *et al*., [17] noticed the concentration of Hg, Cd and Pb in mussels of fish. Lu *et al*., [18] studied mean lead levels in fish flesh as 0.01-0.16 mg/kg. Carpenter [19,20] observed that Pb mucous film was formed over the gill surface of fishes due to toxicity of lead nitrate. He suggested that it was the main cause of death accompanied by respiratory distress. Ellis [21] pointed out that breathing distress in fishes is due to clogging of gills and direct damage is caused by heavy metal ions. Newton [12] suggested that lead caused clogging and inflammation of gills. Shukla [22] found that opercular beats of treated fishes were more in higher concentration of lead, while in recovery beats become normal. Oost *et al*., [9] noticed deleterious effects of heavy metal toxicity in different organs of fishes including gills, kidneys, liver and skin. Parashar and Banerjee [23] studied toxic impact of lethal concentration of lead nitrate on the gills of air-breathing catfish *Heteropneustes fossilis* (Bloch)[23].

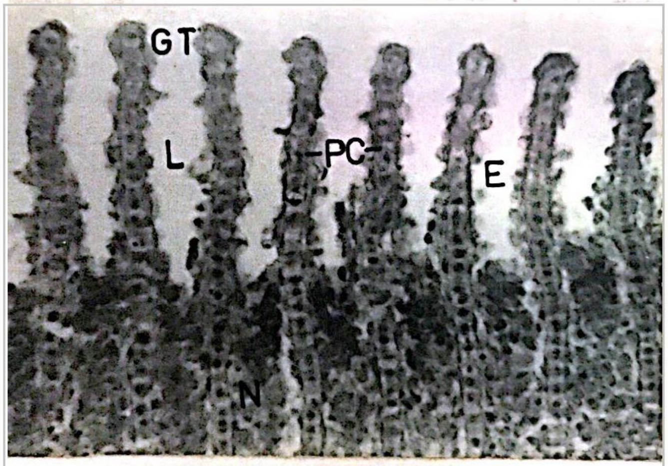

Fig. 1 400 X

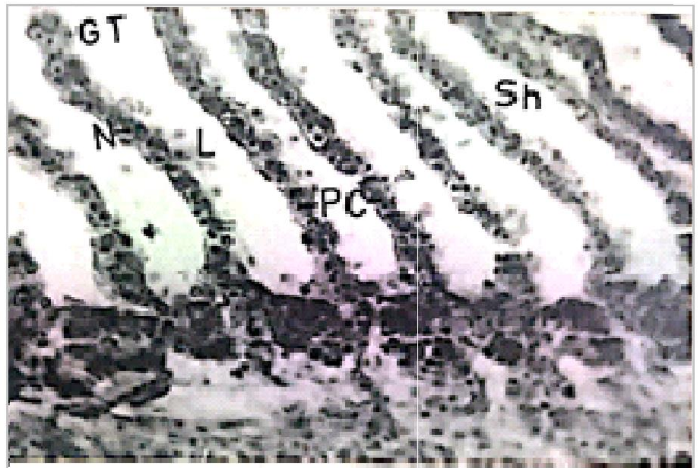

Fig. 2 400 X

Fig. 3 400 X

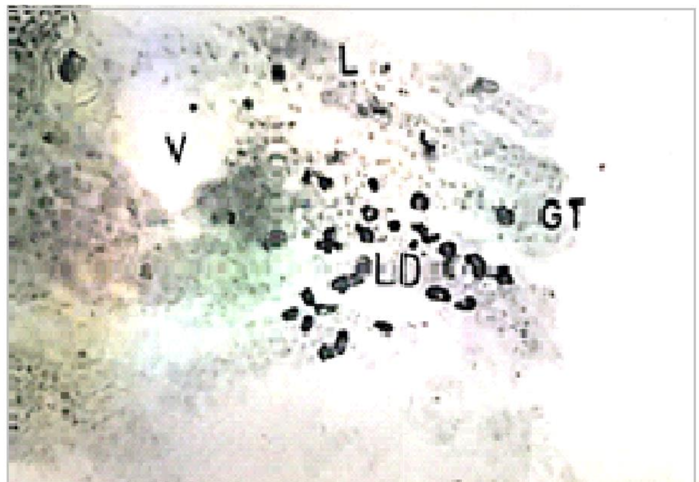

Fig. 4 400 X

Fig. 1. L.S. of gill of control fish, showing normal structure of gill lamella.
Fig. 2. L.S. of gill of fish at 1.0 ppm concentration, showing shrinkage of lamella.
Fig. 3. L.S. of gill at 5. 0 ppm concentration, showing fused tips of gill lamella, and swelling of epithelial layer.
Fig. 4. L.S. of gill at 5. 0 ppm concentration, showing deposition of lead in gill lamella with formation of vacuole.
Abbreviation - E – Epithelium, GT - Gill tips, L - Gill lamella, LD - Lead deposits, N – Nucleus, PC - Pilaster cells, Sh – Shrinkage, Sw – Swelling, V – Vacuole)

CONCLUSION

From the present study we can concluded that in control group the fish showed normal histoarchitecture of gills while treated fish is showed more notable changes in the gill architecture. The present study of histopathological effects of pollutants on the gills of *P. ticto* is an important basic effort leading to our understanding of the true impact of pollutants on the ecosystem because the fishes show many histopathological changes in gills after exposed to different concentration of lead nitrate.

Conflict of interest
No conflict of interest influenced in this research.

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