ISSN: 2347-5129
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.352
IJFAS 2016; 4(4): 216-218

www.fisheriesjournal.com
Received: 28-05-2016
Accepted: 29-06-2016

Shivani Sharma
Department of Zoology and Applied Aquaculture, Barkatullah University, Bhopal, Madhya Pradesh, India.

Sadhna Tamot
Sadhu Vaswani College, Bairagarh Madhya Pradesh, India.

Vipin Vyas
Department of Biosciences, Barkatullah University, Bhopal Madhya Pradesh, India.

Correspondence
Shivani Sharma
Department of Zoology and Applied Aquaculture, Barkatullah University, Bhopal Madhya Pradesh, India.

Histopathological effect of lead nitrate on the gills of freshwater fish, *Channa striatus*

Shivani Sharma, Sadhna Tamot and Vipin Vyas

Abstract
The present study was carried out to investigate the effect of lead nitrate on the gills of fresh water fish, *Channa striatus*. Fish were exposed to sub-lethal concentration of lead nitrate (28 mg/l) over a period of 30, 60 and 90 days. The lesions observed in the gills included severe loosening of cartilaginous core, deshaped gill lamellae and ruptured gill epithelium. Simultaneously, cartilaginous core showed damage and distraction whereas the distal portion of gill lamellae showed broadening which resulted in maximum histopathological changes. Swollen gill lamellae, shortening of tips, necrosis in gill lamellae and damaged gill lamellae were also observed. The results of the present study clearly indicate that chronic exposure to lead nitrate caused adverse effects on the gills of *C. striatus*.

Keywords: Lead nitrate, *Channa striatus*, Histopathology, Gills

1. Introduction
Aquatic environment is mainly polluted due to the pollutants discharged from the industries and due to the growth of human population. Even at sublethal concentrations, the pollutants change the chemical composition thereby affecting natural aquatic ecosystem which are manifested as changes in biochemical processes in aquatic organisms. Environmental pollutants such as metals create severe risks to many aquatic organisms thereby affecting genetic, physiological, biochemical and behavioural parameters [1]. Nowadays, heavy metal pollution has become a major global issue, which causes detrimental effects to aquatic life as well as human health and it has received a substantial attention of the scientists all over the world.
Among the heavy metals, lead is a major aquatic pollutant in many parts of the world. The natural waters are persistently being polluted by lead due to increased anthropogenic activities and industrial utilization [2]. Lead is a ubiquitous metal in the environment and is toxic to aquatic organisms. Major sources of this toxicant include mining, smelting, coal burning, cement manufacturing, storage batteries, paints and use in gasoline [3]. In the midst of aquatic habitants, fish are most sensitive that can be used to monitor the health of aquatic ecosystems having tendency to accumulate variety of xenobiotics through different mechanisms. Therefore, the present study was carried with the aim to investigate the histopathological alterations in the gills of *Channa striatus*.

2. Materials and Methods
Live *Channa striatus* (length 20-25 cm and weight 50-60 gm) were collected for experimental study from different fish markets of Bhopal, Madhya Pradesh. They were acclimatized in the laboratory conditions for a period of 15 days prior to the start of experiment. Fishes were divided in two groups having 10 fish in each aquarium. The first group was kept as control and was maintained in normal water without any treatment while the second group was exposed to 28 mg/l of lead nitrate. Exposure concentration was decided on the basis of 96 hrs LC_{50} value of lead nitrate which was observed to be 284.32 mg/l. Water of each aquarium was changed on every alternate day to maintain the desired concentration of lead nitrate throughout the experiment duration of 90 days.
At the end of experimental period, gills of the controlled and treated fishes were removed aseptically and preserved in aqueous Bouin's fixative for 48 to 72 hours. Preserved tissues were washed under tap water, dehydrated in graded series of ethanol and embedded in paraffin blocks. They were cut at 5-6 μm thickness by using rotatory microtome and stained routinely with haematoxylin and eosin (H & E) for histopathological examination.

3. Results

Fishes exposed to 28 mg/l of lead nitrate during 30, 60 and 90 days showed considerable degree of alterations in the gills. At 30 days exposure, loosening of epithelial lining of cartilaginous core, necrosis, rupture of gill epithelium and deshaped gill lamellae were reported (Fig. 1 & 2). Histological studies in the gills of fishes showed damage in cartilaginous core, swollen gill lamellae, shortening of tips of gill lamellae, necrosis and damaged gill lamellae at the end of 60 days (Fig. 3 & 4). Further exposure for 90 days resulted in maximum histopatholgical alterations in parallel with duration. Cartilaginous core showed severe damage and distraction whereas damage and necrosis were observed in gill lamellae (Fig. 5 & 6).

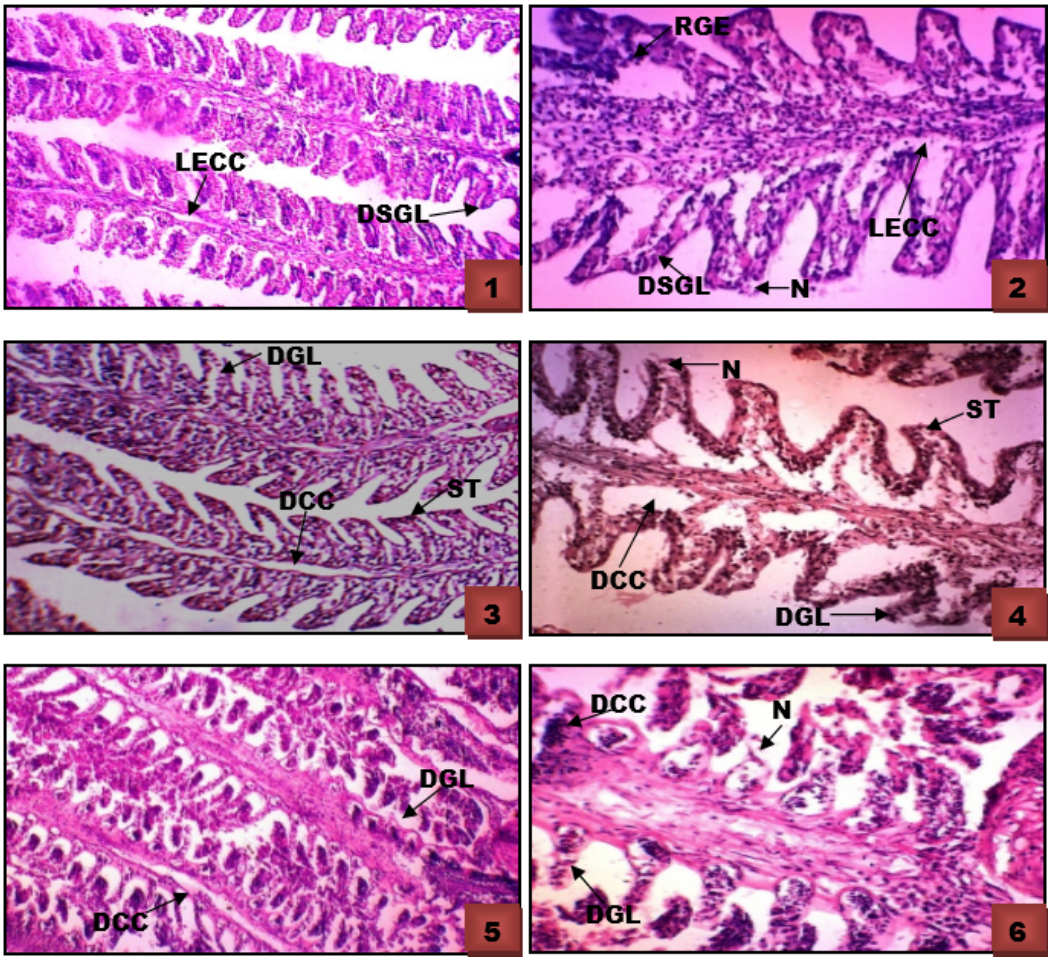

Fig 1: Gill tissue exposed to 28 mg/l of lead nitrate for 30 days showing loosening of epithelial lining of cartilaginous core (LECC) and deshaped gill lamellae (DSGL) X 100. **Fig 2:** Gill tissue exposed to 28 mg/l of lead nitrate for 30 days showing loosening of epithelial lining of cartilaginous core (LECC), deshaped gill lamellae (DSGL), rupture of gill epithelium (RGE) and necrosis (N) X 400. **Fig 3:** Gill tissue exposed to 28 mg/l of lead nitrate for 60 days showing damaged cartilaginous core (DCC), damaged gill lamellae (DGL) and shortening of tips (ST) X 100. **Fig 4:** Gill tissue exposed to 28 mg/l of lead nitrate for 60 days showing damaged cartilaginous core (DCC), damaged gill lamellae (DGL), shortening of tips (ST) and necrosis (N) X 400. **Fig 5:** Gill tissue exposed to 28 mg/l of lead nitrate for 90 days showing damaged cartilaginous core (DCC) and damaged gill lamellae (DGL) X 100. **Fig 6:** Gill tissue exposed to 28 mg/l of lead nitrate for 90 days showing damaged cartilaginous core (DCC), damaged gill lamellae (DGL) and necrosis (N) X 400.

4. Discussion

The present study revealed that lead nitrate effect the normal structure of gills and showed many structural and degenerative changes. Severity of the lesions was duration dependent. Under present investigation, it has been observed that the gills of fishes exposed to 28 mg/l lead nitrate for 30, 60 and 90 days showed several marked histological alterations like loosening of epithelial layer of cartilaginous core, damaged cartilaginous core, deshaped and damaged gill lamellae, shortening of the tips of gill lamellae, necrosis, swollen gill lamellae and ruptured gill epithelium. The present observation gets support from the work of several authors [4-7].

[8] studied the histological changes induced by lead nitrate in the gills of grass carp, (*Ctenopharyngodon idella*) for a period of 48hrs. They observed clubbing and fusion of secondary lamellae, separation of epithelial layer, necrosis, fusion of adjacent lamellar epithelium, hyperplasia and destruction of epithelial cells. [9] also investigated histological alterations in the gills of *Clarias batrachus* exposed to 10 and 15mg/l lead nitrate for 30 days and revealed that the exposure of lead nitrate in fish *Clarias batrachus* causes changes like lifting of epithelial linings from the surfaces of secondary lamellae, hypertrophy, degeneration of lamellar epithelium, hyperplasia of epithelial cells and curling at the tips of gill lamellae. [10] observed the histopathological changes in gills of neotropical fish caged in an urban stream. Their finding is characterized by hyperplasia, lifting of lamellar epithelium, lamellar fusion, hypertrophy of the respiratory epithelium and aneurism in the gills.

5. Acknowledgement
The authors are thankful to Head, Department of Zoology and Applied Aquaculture, Barkatullah University, Bhopal (M.P) India, for providing necessary laboratory facilities to carry out the present work successfully.

6. References

1. Scott GR, Sloman KA. The effects of environmental pollutants on complex fish behaviour: integrating behavioural and physiological indicators of toxicity. Aquat Toxicol 2004; 68(4):369-392.
2. Chandravaty V, Reddy SLN. Lead nitrate exposure changes in carbohydrates metabolism of fresh water fish. J Environ Biol. 1996; 17(1):75-79.
3. Ramesh M, Saravanan M, Kavitha C. Hormonal responses of the fish, *Cyprinus carpio*, to environmental lead exposure. African J Biotech. 2009; 8(17):4154-4158.
4. Mallatt J. Fish gill structural changes induced by toxicants and other irritants: a statistical review. Canadian J Fish. 1985; 42(4):630-648.
5. Mobarak MYS, Sharaf MM. Lead acetate-induced histopathological changes in the gills and digestive system of silver sailfin molly (*Poecilia latipinna*). Int J Zool Res. 2011; 7(1):1-18.
6. Moitra S, Bhattacharjee R, Sen NS. Histopathological changes in the gills of air breathing teleost *Clarias batrachus* Linn exposed to endosulfan. Asian J Exp Sci. 2012; 26(1):23-26.
7. Sheriff MA, Mohideen AKS, Altaff K. Lead induced toxicity on the gills of the Indian major carp: *Labeo rohita* (Hamilton). Int. J Res Fish Aquacul. 2012; 2(3):38-40.
8. Abdul-Hassan JK, Hashim ES. Histological changes induced by lead nitrates in the gills of grass carp, *Ctenopharyngodon idelia* (Val.) juveniles. Bas J Vet Res. 2009; 8(1):1-10.
9. Khan HA, Sikadar-Bar M, Kamlesh B, Ahmad WA, Ahmed P. Lead nitrate induced histopathological changes in the gills of the African catfish *Clarias batrachus*, J Applied Sci Res. 2011; 7(7):1087-1092.
10. Camargo MMP, Martinez CBR. Histopathology of gills, kidney and liver of a Neotropical fish caged in an urban stream. Neotrop Ichthyol. 2007; 5(3):327-336.