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A STUDY ON THE TOXICITY OF CHROMIUM ON THE HISTOPATHOLOGICAL CHANGES IN GILL AND LIVER OF FRESH WATER FISH LABEO ROHITA FINGERLINGS

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ABSTRACT

The present study is aimed to assessing the toxicity of the heavy metal chromium on the histology of *labeo rohita* fingerlings was studied. The fingerlings were exposed for 10,20 and 30 days in 10% sublethal concentration of 96 hrs Lc5o of chromium (3.5ppm). During this period fishes were fed with artificially prepared food (on the 10th, 20th, 30th day fishes) were taken out, sacrificed and the tissues of gill and liver were excised out. The Gill exposed to sub lethal concentration of chromium showed mild histological study during 10 days, of exposure. After 30 days fusion of gill lamellae, hypertrophy and degeneration of epithelium is prominent. Liver lesions consisted of vacuolation, degeneration of hepatocytes and degeneration of cell boundaries of hepatocytes. These result showed that the degree of distortion of the gill concentration of the metals was found to be dose and time dependent.

KEYWORDS

Chromium, *Labeo rohita* Fingerlings, Histopathology, Gill and Liver.

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INTRODUCTON

Fish is an excellent source of protein in human diet. The unique feature which differentiates fish food with other animals protein source is the presence of omega fatty acids. It is also good for heart and helps to control diabetes by improving insulin (Lee and Reasner CA 2000[1] and Lenos *et al.,* 2005)[2] India is primarily an agro based country with more than 60-70% of population dependent on Aquaculture, 30% of its agricultural production is lost owing to pest infestation application of pesticides in India. Contributed 3% of the total world's consumption and is increasing at the rate of 2.5% per annum (Bhadbhade *et al.,* 2002)[3] one of the most

economically exploited fishes 1955. Histopathological studies reveal the impact of toxicants on fish as functions. Histopathological analysis appears to be a very sensitive parameter such as the gills, muscles, liver and kidney (Dutta, 1996)[4]. Fishes are relatively sensitive to changes in their surrounding environment including pollution may be evident on a tissue level before significant changes can be identified in fish external appearance (Nikalje *et al.,* 2012[5], Harrison *et al.,* 2000)[6]. Toxic heavy metals are continuously release, to the aquatic bodies because of rapid industrialization metals toxicology and ability to accumulate in living organisms (Javed, 2005[7], Hayat *et al.,* 2007)[8]. Heavy metals are most injurious to fish these pollutants have not only depleted the fish stock but also threatens the human health by incorporating into food chain (Pip 1995)[9]. Liver is a principal organ of detoxification in vertebrates particularly in fishes. It is the potential site for lipid deposition in these animals (freeman Hc. 1983)[10]. Fish physiology and morphological changes in gill (Almonsoori, 2006)[11]. The gills which participate in many important functions in the fish, such as respiration, osmoregulation and excretion. The water quality considered the primary target of the contaminants. (Camarga M. M and C. B Martioez, 2007)[12]. Histopathological changes are used as biomarkers to evaluate, the overall health of fish exposed to contaminants Nordberg G (2002)[13]. Histopathology of fish liver could therefore serve as a model for studying the interactions between stress factors which include bio-toxins, parasites, infectious germs, physicochemical parameters and pollutants (Brusle andAnadon 1996)[14].

MATERIAL AND METHODS

Source of fish

Fingerlings of Labeo Rohita Hamilton collected from government fish farm at Tirupati, Chittoor district, Andhra Pradesh, were brought and acclimatized to the laboratory conditions.

Acclimatization

Fingerlings of fish were collected from local fishery departments as for the piscicultura procedure and were kept in plastic troughs for a week with sufficient aeration and dechlorinated water to acclimatize them to Laboratory fingerlings of labeo rohita acclimatize to laboratory conditions. They were previously washed with 1% kmno4. The water was renewed every 24hrs. The Lc50 of potassium dichromate for 96 hrs was found out by using probit method (Finney, 1971)[15]. Toxicity tests were conducted to be 3.5 PPM, for histological studies. Labeo Rohita for a period of 10, 20 30 days. The gill arches and liver were dissected out and fixed in Bouin's fluid. The tissues were embedded in paraffin (58^0 C) and section at 64 µ thickness. The sections were stained with haematoxylin and eosin (Gurr 1959)[16]. The stained slides were examined for histopathological changes and were photomicrograph.

Experimental design

Fingerlings of Labeo Rohita were procured from the Government fishery department near Manchineella Gunta, Tirupati in Chittoor district, Andhra Pradesh, India and were brought to laboratory in polythene bags filled with oxygen. The fingerlings were carefully released in to the fish fingerlings (fish troughs were washed to avoid fungal contamination and then sundried). The fishes were fed twice at 9.00 hrs and 16 hrs daily according to body weight.

RESULTS AND DISCUSSION

In control fish the secondary gill lamellae (SGL) appeared as finger like structures. The SGL was thin and slender and attached on either side of the Primary gill lamellae (PGL). The secondary gill lamellae are highly vascularised and surrounded by a thin layer of epithelial cells (Figure No.1). The overall observed results in the present investigation indicates that marked histopathological changes have been found in the gill and liver of fish *Labeo rohita* under sublethal concentration of chromium in chromic exposure fusion and shortening lamellae, hypertrophy, degeneration of epithelium and necrosis were found in the gills of chromium treated *Labeo rohita* (Figure No.2-3) higher degree hypertrophy and fusion of gill lamellae were prominent in the gills of fish. Exposed to 30 days (Hemalatha and Banerjee 1977[17], Gupta and Kumar 2006)[18]. In the present study hypertrophy and

degeneration of secondary lamellae were apparent *Labeo rohita* exposed to Chromium (Figure No.4) Liver of fish responsible for digestion, filtration and storage of glycogen. The liver also produced many enzymes that stored in the gallbladder. The liver functions to store food energy. The normal liver is made up of mass of hepatocytes with large number of sinus blood (Figure No.5). The fish exposed to the sublethal concentration of chromium showed vaculation, loose arrangement of hepatic cells histolysis and degeneration boundaries (Figure No.6-8). The damage as more serve and progressive after 30 days exposure. Histological changes in the liver of fishes have been extensively reported (Athikesavan *et al.,* 2006)[19]. The result of the present observations in *Labeo Rohita* exposed to chromium were in arrangement with those of the earlier workers especially in the vacuolization and necrosis and shrinkage of nuclei were also apparent in the present study in chromium treated *Labeo Rohita.*

The development of necrosis congestion of hepatic blood vessels and vacuolization in chromium treated Labeo Rohita were mainly due to large scale accumulation of these metals in liver. Liver is the vital organ for detoxification of unwanted and toxic substances. Histopathological evaluation of *Labeo rohita* exposed to chromium revealed bulging of tip of gill lamellae, disturbance in the arrangement of the pillar cells shrinkage of epithelial cells and collapsed blood capillaries in the primary gill lamellae, disintegrated pillar cells, atrophy of secondary gill lamellae and cell necrosis (prabhakar 2012)[20].

Figure No.1: Control Fish gill

A. EGL – Erosion of Secondary Lamellae

B. B. FSL – Fusion of Secondary Lamellae

Figure No.2: 10% SLC of Chromium treated fish gill

10 days.

A. EGL – Erosion of Secondary Lamellae

B. FSL – Fusion of Secondary Lamellae

Figure No.3: 10% SLC of Chromium treated fish gill

after 20 days

A. DE – Degeneration of Epithelium, H – Hypertrophy

B. FSL- Fusion of Secondary Lamellae

Figure No.4: 10% SLC of Chromium treated fish gill

After 30 days.

A. DE – Degeneration of Epithelium, Ht - Hypertrophy

B. FSL – Fusion of Secondary Lamellae

Figure No.5: Control fish liver

A.NH – Normal hepatocytes,

B. BS – Blood Sinus

Figure No.6: 10% SLC of Chromium treated fish Liver after 10 days.

A. DH – Degeneration of hepatocytes,

B. V - Vacuolization.

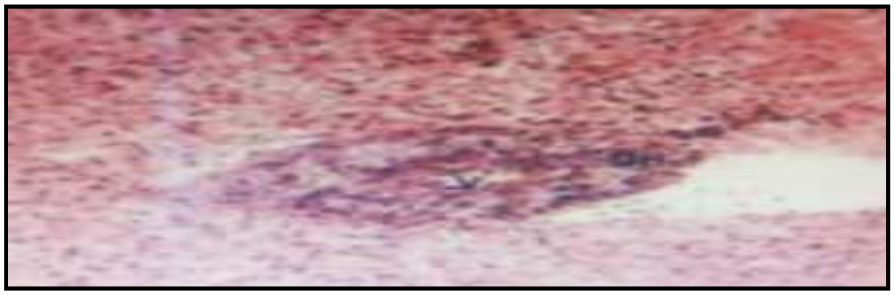

Figure No.7: 10% SLC of Chromium treated fish Liver after

A. V – Vacuolization

B. DCB – Disintegration of Cell Boundaries

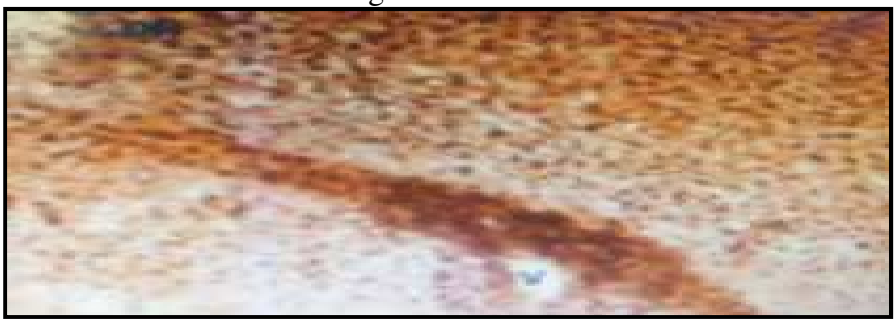

Figure No.8: 10% SLC of Chromium treated Fish Liver after 20 days

30 Days.

A. DH – Degeneration of Hepatocytes

B. V - Vacuolization

CONCLUSION

The result in the present study showed that the exposure of Rohu to chromium caused pathology in their organs such as gill and liver. They were associated with the exposure period. Histological variations in Rohu under the toxicity of heavy metal chromium can be used as a sensitive method to monitor the Aquatic pollutions.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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