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Research Paper

EFFECTS OF LEAD NITRATE ON THE HISTOLOGY OF LIVER OF FRESH WATER BREATHING TELEOST, *Mystus cavasius*

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Abstract

Lead nitrate is one of heavy metals that found in the environment and causes many adverse effects. In the present investigation the histopathological study was observed in the liver of *Mystus cavasius*, exposed to three sub lethal concentration of a lead nitrate after LC_{50} determination. The study revealed histopathological changes observed in the liver which include irregular hepatic cells, cytoplasm vacuolation reduced, hepatocytes degeneration, blood congestion etc. Liver observed microscopically showed increasing degrees of damage in the tissues in correlation with the concentration of lead nitrate. These observations are thus indicative of the toxic effects caused by this heavy metal lead nitrate at cellular/histological level in the organs of the fish *Mystus cavasius*.
Key words: Histology, Lead nitrate, Hepatocytes, Liver, *Mystus cavasius*.

INTRODUCTION

Heavy metals contamination of aquatic environment has drawn increasing attention as it may have devastating effects on the ecological balance of the recipient environment and a diversity of aquatic organisms. These metals tend to accumulate in organisms and have been found to have a variety of adverse effects on fishes. Higher concentrations of lead, cadmium and mercury were toxic to fishes [1]. Fishes are the inhabitants that cannot escape from the detrimental effects of these pollutants [18] and [4]. Fish readily absorb dissolved metals and may serve as indicators of the extent of pollution [14]. Lead nitrate is a non-essential metal and contemporary contaminant throughout the world. Moreover, lead nitrate is often used in varieties of industrial applications and products such as battery productions, chemicals, pigments and paints [2]. From bioaccumulation studies, the proportion of lead was significantly higher in different tissues of fish [19]. In heavy metal pollution, organs such as gills and liver have been identified as the storage sites [6]. Lead nitrate is a particular concern in this aspect because fish are able to bio-accumulate it in the body tissues due to reduce human food safety, especially protein source.

Hence, this study was undertaken to examine the effect of three different sublethal lead nitrate concentrations on histological aspects of liver of fresh water fish *Mystus cavasius.*

MATERIAL AND METHODS

The fresh water fish *Mystus cavasius* was bought from satpula fish market of jabalpur. On arrival in the laboratory, the fish were placed in large tank with aerated tap water. They were disinfected with 0.1% aqueous potassium permanganate ($KMnO_4$) solution for remove any dermal infection and kept for 10 days for acclimatization. During the period acclimatization they were fed with adventitious roots of pistia aquatic plant.

The heavy metal selected were lead nitrate of different concentration and duration. Pieces of liver were kept into the bouin's fluid for 24 hours for fixation. Tissues were processed for paraffin blocks and sectioned at 6-7 micron. Section stained with haematoxyline - eosin stains. Stained sections examined under compound microscope and micrograph taken where ever necessary.

RESULT

Histology of control liver: The liver is a solid glandular organ made up of rounded hepatic lobules in the form of branched columns, separated from one another by the connective tissue. Each hepatic lobules contains hepatic cells which are penetrated by fine network of connective tissue & sinusoid vessels called as hepatic capillaries. hepatic cells were polyhedral ,covered by very thin membrane Blood spaces of various size are present throughout the liver mass but generally a small gap is found in between the hepatic cells. The hepatocytes are arranged in radial manner around a central vein in inter connected lamina. Each hepatocytes contains a centrally located spherical nucleus. The cytoplasm is grandular taking deep heamatoxylin stain. pancreatic tissue are invested around the hepatic portal vein. Vacuoles were present in liver tissue.

Toxic Effect of lead nitrate on treated liver: After exposure to 25 mg L^{-1} lead nitrate for 10 days, space between heaptocytes was wider, due to disintegration of some hepatic cells. Large blood spaces were formed in the tissue mass. Apart from this, no major change was observed with 25 mg L^{-1} lead nitrate for 10 days. After 20 days exposure disintegration of hepatic cells was seen also evident by wider blood spaces. Vacuoles were more frequent and larger. After exposure to 28 mg L^{-1}, for 10 days the nucleus was either absent or shifted to the margins of the hepatic cells. Larger blood spaces were observed. After 20 days exposure the liver showed increased blood space with hemorrhage. Vacuoles were large and the nucleus was absent in the hepatic cells. When the fishes were exposed to 30 mg L^{-1} concentration of lead nitrate for 10 days, intrahepatic spaces were wider with frequent hemorrhage. After exposure for 20 days, liver showed wider intrahepatic spaces with haemorrhages and cells were shrinked and no nucleus was observed.

DISCUSSION

Histological alterations related to heavy metal toxicity in the liver of fish have been showing that the substances cause severe damage to the liver cells. Liver is an important organ of detoxification and biotransformation process and due to these reasons the hepatic cells are damaged severely. The present study focuses on histopathological investigations which have been proved to be a sensitive tool to detect direct toxic effects of chemical compounds within target organs of fish in laboratory

experiments. This study is aim to determining the liver of the *Mystus cavasius* to sublethal concentration of lead nitrate.

In the occurrence of the study after exposure lead nitrate concentration, spaces between heaptocytes was wider, due to disintegration of some hepatic cells. Liver showed wider intrahepatic spaces with haemorrhages and cells were shrinked. Similar observation [9] were reported due to exposure of lead acetate in liver of *oreochromis niloticus* such as the liver cells were degenerated the normal architecture of liver was markedly disorganized.

In the appearance of study after exposure lead nitrate concentration the nucleus was either absent or shifted to the margins of the hepatic cells. Further more similar observation [17] was observed slightly shifting of nucleus in the heatic cells in urea exposure clear atrophy was observed in the nucleus of hepatic cells. In cadmium intoxification prominent nuclear destruction was observed, multinucleated hepatic cells was observed in histological liver of *Mystusbleekeri* after endosulphan treatment. These finding were in agreement with the findings of [8] histopathological changes in the liver of silver salifin molly *poecilia latipinna* treated by lead acetate they were observed liver showed disarrangement of hepatic cord, shrinkage of hepatocytes also the presence of a hemorrhagic spot was detected in the hepatic parenchyma. The changes in the liver hepatocytes such as vacuolization, necrosis and nuclear condensation were also reported for copper [5] and chromium exposure [11].

Cooperated observation with the observation of [7] was also observed histological impact of lead on the liver of the Nile Tilapia *Oreochromis Niloticus* the treated group of fish showed a moderate to severe dystrophy in the form of hepatic necrosis was observed and the liver showed severe disorganization of the hepatic cord, damage cell membrane. Similar reports were observed by [15] they were reported that the effects of chronic lead nitrate intoxication in the liver of a freshwater teleost, *channa punctatus* the results show that considerable degenerative changes are produced in the histological structure of liver, the damage is in the form of liver cord disarray, necrosis, inflammation of portal areas, hardening of connective tissue. [17] revealed that the large blood spaces were formed with the hepatic mass and large blood spaces were filled with blood corpuscles but the blood vessels showed clumping of blood cells due to effect of cadmium. we were also noticed in histopatholgy of liver of *Mystus bleekeri* large blood spaces were formed in the tissue mass, the liver showed increased blood space with haemorrhage.

Cooperated observation was found by [16] histopathological finding of liver of the yellow *Mystus (Hemibagrus filamentus*) observed damage endothelial cells of blood vessels in liver tissue. [15] reported that histopathological studies on the effects of chronic lead nitrate intoxication in the digestive system of a freshwater teleost, *channa punctatus.* The results show that considerable degenerative changes are produced in the histological structure of liver the damage is in the form of septa formation around blood vessels.

In the present finding of liver tissue the vacuoles were more frequent and larger. This findings is agreement with the findings of [3] it shows complete disintegration marked necrosis with hyper vacuolization is observed in *Cirrhinus mrigala* after the exposure of lead nitrate [13] reported cytoplasmic vacuolization in liver of *Puntius sophore* after treated with lead nitrate [10] investigate that the adverse effects of lead acetate on liver of tilapia, liver showed vacuolar degeneration. Cooperated observation was found by [16] histopathological finding of liver of the yellow *Mystus Hemibagrus filamentus* they showed vacuolar degeneration in the hepatic cells. Further more [9] similar

observation were noticed due to exposure of lead acetate histopathological changes in liver of *oreochromis niloticus* such as, large clear vacuoles were found among hepatocytes.

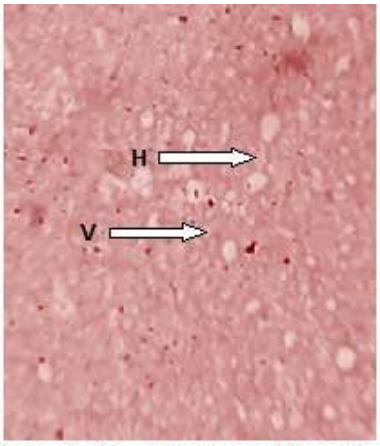

Fig1: T.S. histopathology of untreated liver *Mystus cavasius*

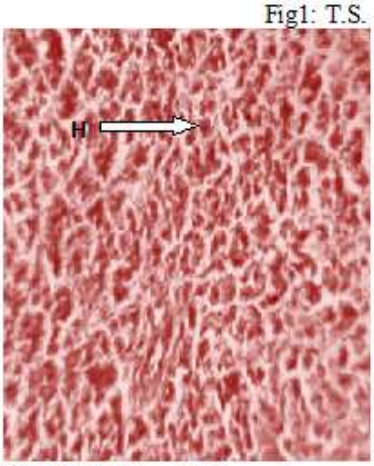

Fig2: T.S. histopathology of treated liver *Mystus cavasius* after 10 days exposure to 25mg/1 lead nitrate

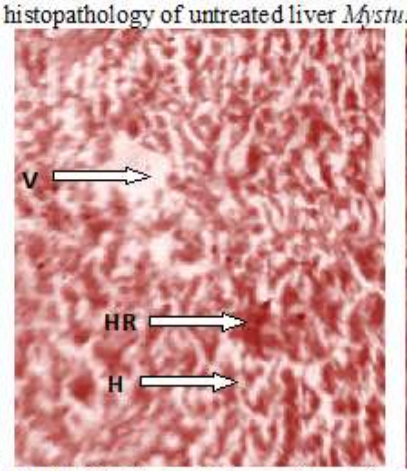

Fig3 T.S. histopathology of treated liver *Mystus cavasius* after 10 days exposure to 28mg/1 lead nitrate.

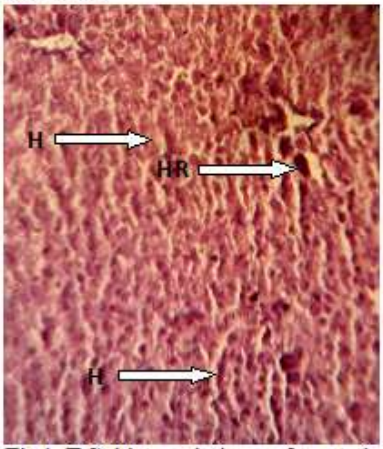

Fig4: T.S. histopathology of treated liver *Mystus cavasius* after 10 days exposure to 30mg/1 lead nitrate.

Slides were stained with Hematoxylin and eosin staining, X400 (V=Vacuole, H=hepatic cell, HR =Haemorrhage)

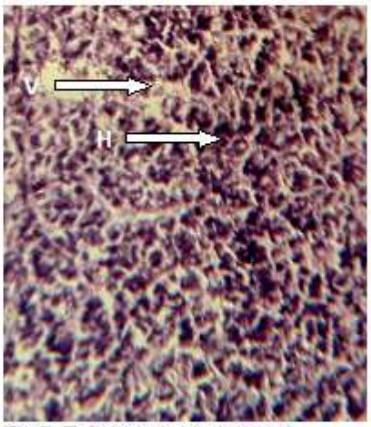

Fig5 :T.S. histopathology of treated liver *Mystus cavasius* after 20 days exposure to 25mg/1 lead nitrate.

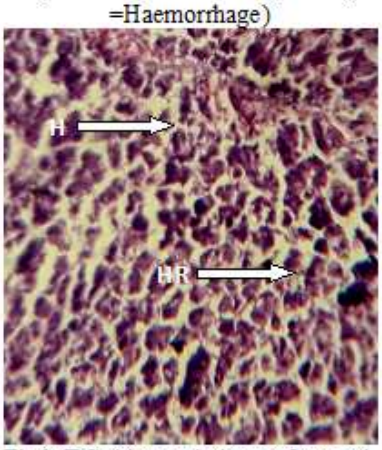

Fig6 :T.S. histopathology of treated liver *Mystus cavasius* after 20 days exposure to 28mg/1 lead nitrate.

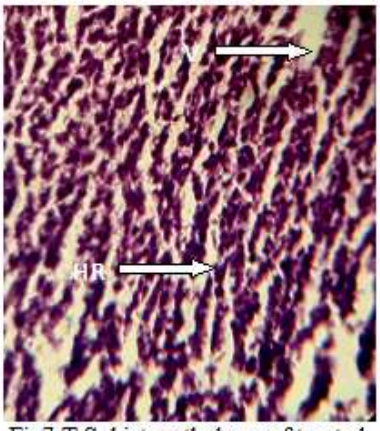

Fig7:T.S. histopathology of treated liver *Mystus cavasius* after 20 days exposure to 30mg/1 lead nitrate.

Slides were stained with Hematoxylin and eosin staining, X400(V=Vacuole, H=hepatic cell, HR =Haemorrhage)

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