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CHROMIUM TOXICITY ON HISTOPATHOLOGICAL CHANGES IN THE GILL AND LIVER OF FRESH WATER EDIBLE FINGERLINGS OF FISH, *CYPRINUS CARPIO.*

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ABSTRACT

Fingerlings of fishes are very sensitive to a wide variety of toxicants in water and effects of metals. The toxicity of pollutants can be assessed by the extent of histopathological damage to the concentration of the pollutant. In the present study an attempt is made to the impact of aquatic and industrial effluent. Histological analysis of gill and liver revealed the significant morphological alterations such as gill and liver of fish, *Cyprinus carpio*. Since fishes are the chief sources of nutrition to many parts of the world and their inhabitations are not exceptional from the pollution point of view, the fresh water fish, *Cyprinus carpio* has been selected as a test species for the present investigation. Moreover fishes are vulnerable especially to the accumulation of abnormal levels of metals in their bodies. Hence, the present study is aimed to understand the mode of toxic action of metals on the non target field fishes like *Cyprinus carpio*, the metal chosen was Chromium. Fishes were brought from fisheries department, Tirupati, Chittoor district, Andhra Pradesh.

KEY WORDS; **Chromium, Gill, Liver, *Cyprinus carpio***

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INTRODUCTION

Fishes are comes into contact with multiple metal contaminants in the aquatic environment and biomagnifies the pollutants. Pollutants build up in the food chains are responsible for adverse effects in aquatic organisms. Gills are generally considered as good indicators of water quality and critical organs for respiratory, osmoregulatory and excretory functions. Liver is the major metabolic centre to detoxify the xenobiotics, it was also observed affected in the fish liver under Chromium exposure. Heavy metals accumulated in the tissues of fish that generate lead to environmental oxidative stress in fish. Effects of water pollution are not only devastating to people but also to animals. Polluted water is unsuitable for drinking, recreation, agriculture and industry. It diminishes the aesthetic quality of lakes and rivers. More seriously, contaminated water destroys aquatic life and reduces its reproductive ability. Eventually, it is a hazard to human health. Nobody can escape from the effects of water pollution.

MATERIALS AND METHODS

Fingerlings of fish, *Cyprinus carpio* average length of 7cm, weight 6±1gm were acclimatized for 10 days with water continuous aeration at 12hr light and 12 hr darkness. After acclimatization, fishes were divided into four groups each having ten fishes. First group considered as control. Remaining three groups exposed to chromium for duration 7days, 15days and 30 days. Water was changed on alternate days and fishes were fed with commercial fish fed.

RESULTS

(Please correct the sentence structure of this sentence.) The gills are exhibited a pathological changes the exposure of 7ppm chromium investigate the toxicity effect of 7days, 15days and 30days experimental fish resulted in degenerative changes in epithelial cells of respiratory lamellae and twisting of tips in secondary gill filaments were noticed. In few cases of fish exposed to chromium the gill showed moderate necrotic changes in inter lamellar epithelial cells. Twisting of gill filament tips, infiltration of cells in the primary axis and moderate changes were observed. Maximum degeneration of cytoplasm, nucleus and nuclear fragmentation, pushing of nuclear periphery, peripancreatic edema and the presence of vacuoles were observed in the chromium exposed fish liver.

DISCUSSION

The histopathology observed in the study correlated with other toxicological studies on gills of fresh water fingerlings of fish, *Cyprinus carpio*. The uptake of chemical in fish was reported be usually through the gills.

(Please correct the sentence structure of this sentence.) pathological changes are experimental fish resulted in degenerative changes in epithelial cells of respiratory lamellae and twisting of tips in secondary gill filaments were noticed. In few cases of fish exposed to chromium the gill showed moderate necrotic changes in inter lamellar epithelial cells. Twisting of gill filament tips, infiltration of cells in the primary axis and moderate changes were observed.

The gills of *Labeo rohitha* exposed tannery effluent revealed fusion and clumping of primary lamellae and epithelium [1], gills used as models for studies of environment impact such as xenobiotic agents [2], degenerative changes in the lamellae and edema were observed in the gills of fish exposed to heavy metals [3], fusion of secondary lamellae giving a club - shaped appearance of filaments [4], contraction and sloughing of respiratory epithelium in mercury exposed group of fish, *Channa punctatus* [5], sub lethal ammonia concentration of Nile tilapia ,*Oreochromis*

niloticus on gill tissues displayed hyperemia, fusion in secondary lamellae [6].

Toxicants intake or an adaptive response to pollutants and may be due to increased capillary permeability in gills [7], nucleus with degenerative changes in parenchyma cells with necrosis in *Cyprinus carpio* due to heavy metals [8], atrophy and fusion of gill filaments, disorganization and rupture in the secondary lamellae in gills of *Clarias gariepinus* exposed to lead [9], epithelial hyperplasia and fusion of adjacent lamellae of *Catla catla* exposed to lead [10], fusion of secondary lamellae was also observed in the gills of fish from stream polluted by industrial, domestic and agricultural waste [11], arsenic [12].

Liver is the major metabolic centre to detoxify the xenobiotics, it was also observed affected in the fish liver exposure to chromium. In the present investigation the experimental fish liver showed pycnotic nuclei, cytoplasm with nuclear degeneration, empty hepatocytes, cellular degeneration and damaged hepatocytes. These changes are more in 30 days exposure chromium fish better than the 15 and 7 days fish liver. Liver is a very important detoxification role of endogenous waste products as well as externally derived toxic chemicals or heavy metals.

Various histological and physiochemical changes in a fresh water fish, *Tilapia mossambicus* under sublethal concentrations of phosphomidon and heptachlor [13], degenerative and necrotic changes in white bass, *Lates calcarifer* exposed to cadmium [14], Vacuolar degeneration in the hepatocytes, focal area of necrosis and aggregations of inflammatory cells between the hepatocytes [15], degeneration and necrosis of the hepatocytes due to cumulative effect of heavy metals in the textile dyes [16], vacuoles filled with cellular debris, focal necrosis and a significant increase in chuffer cells in liver due to metal accumulation [17], degeneration of hepatocytes, vascular degeneration and congestion in vessel were the changes observed in liver of rainbow trout exposed to copper sulfate [18].

MICROPHOTOGRAPHS OF TISSUES

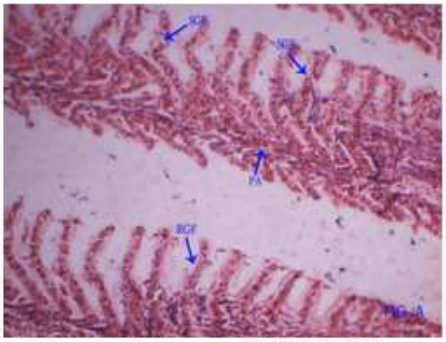

Figure. A - control gill (100X)
SGF - secondary gill filament
RGF - respiratory gill filament
PA - primary axis.

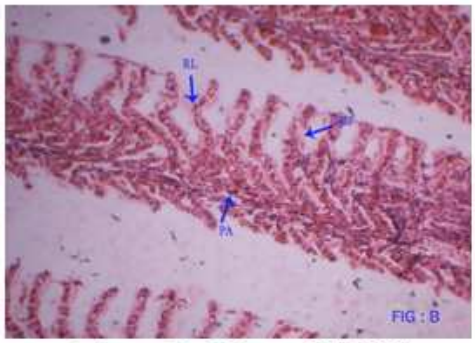

Figure. B - 7days gill (100X)
RL - respiratory lamellae

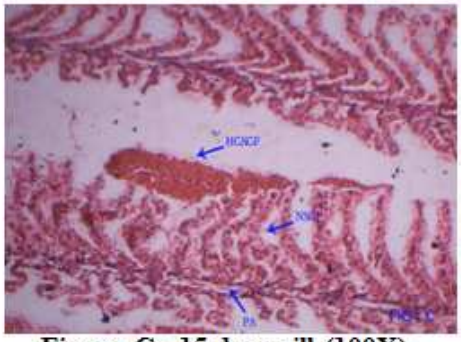

Figure. C - 15 days gill (100X)
HGSGF - hemorrhage in secondary gill filaments
NSGF - necrosis in secondary gill filaments

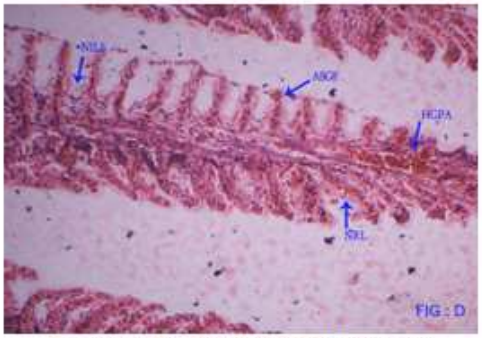

Figure. D - 30 days gill (100X)
NILS - necrosis in interlamellar space
ASGF - atrophy of secondary gill filaments
HGPA - hemorrhage in primary axis
NRL - necrosis in respiratory lamellae

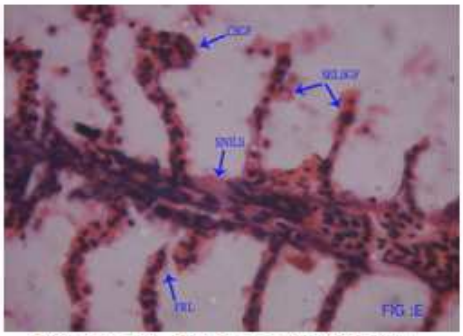

Figure. E - 30 days gill (400X)
CSGF - clubbing of secondary gill filaments,
SNILS - seviour necrosis in inter lamellar space
SELSGF - separation of epithelial layer in SGF
FRL - fragmentation of respiratory lamellae

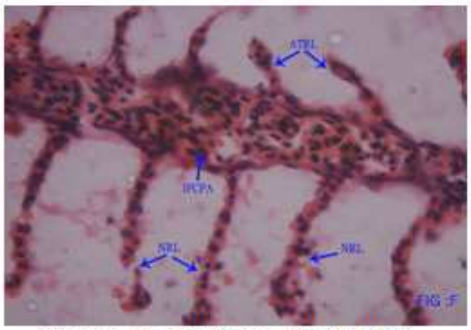

Figure. F - 30 days gill (400X)
NRL - necrosis in RL
ATRL - atrophy of RL
IFCPA - infiltration of cells in PA

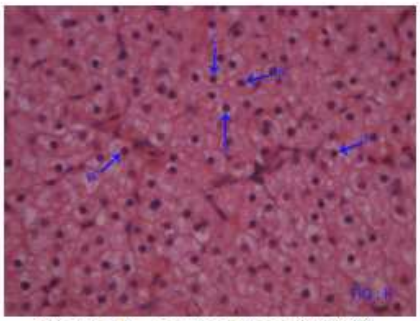

Figure. k -control liver (100X)
HC - hepatocytes
N - nucleus, C - cytoplasm

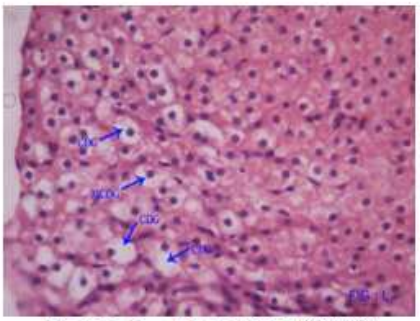

Figure. L - 7days liver (400X)
CDG - cytoplasmic degeneration
MCDG - mild cytoplasmic degeneration

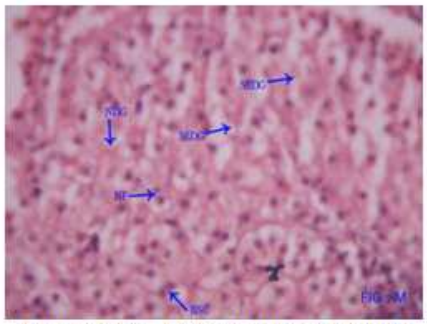

Figure. M - 15 days liver (400X)
SEDG - severe cytoplasmic degeneration
NDG - nuclear degeneration
BNC - binucleated condition
NF - nuclear fragmentation

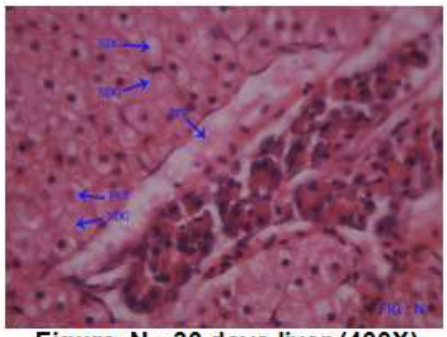

Figure. N - 30 days liver (400X)
PNP - pushing of nuclear periphery
NDG - nuclear degeneration

Conclusion

From the Environmental conservationist point of view, chemicals should be degraded at faster rate, otherwise problems like bio accumulation and bio magnification will arise, which makes the non target life less fit for better survival.

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