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Histological changes in different tissues of fresh water fish *catla catla* of sirpur lake and bilawali tank of Indore

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Abstract

In order to evaluate the negative impacts of cadmium chloride on the aquatic environment, studies on the absorption and accumulation of heavy metals by fish have been conducted. Since measuring environmental toxicity is a challenging and complex procedure, the metrics used to quantify it are quantitative and generally simple. But for the continual monitoring of such toxicity levels in water for sustainable management of aquatic resources, such as bilawali and sirpur for freshwater fisheries, long-term research would be required. Analysis of the water's physico-chemical and biological composition were used to determine its quality. Studies have been done on the function of fish as markers of fresh water metal pollution.The goal of the current study was to evaluate the histological changes due to cadmium chloride toxicity in major carp (*Catla catla*) .

Keyword-*Fresh water bodies, heavy metals pollution, cadmium chloride, edible fish, catlacatla, accumulation, histology.*

INTRODUCTION-

Cadmium contamination in aquatic ecosystem is increasing due to various Industrial and agricultural activities is worldwide environmental problem due to high solubility of cadmium in water. cadmium is easily accumulated in plant parts causing contamination of food chain ending with human. This metal is considered as potentially toxic and possesses a serious risk for human health when it enters the food chain.

Cadmium is one of the heavy metal toxicants is widely used in Nickel -cadmium batteries, manufacturing metal and Mining industry, dentistry etc because of its non-corrosive nature. Cadmium is also associated with electroplating and metal finishing Metallurgy and paints and dye industries .Long term overuse of phosphorus fertilizers , lime and agrochemicals in agricultural fields increase hazardous trace element in

soil because it contains contaminations like fluorine and cd. once soil is elevated with cd it easily reach the water resource.

Fish absorb these heavy metals through the consumption of food that contains suspended particulates, a continuous Ion exchange mechanism that transports dissolved metal through lipophilic membranes like the gills, and dissolved metal adsorption on tissue and membrane surfaces.The amount of heavy metals that accumulate in fish varies according to the kind of heavy metal, the type of fish, and other environmental factors including salinity, pH, hardness, and temperature.Ecological needs, size and age of individuals their life cycle and feeding habits and season of capture will also affect the accumulation. Hardness is one of the most important factor that affect fish physiology and metal accumulation. Heavy metal produce many alteration in tissues of affected fishes and render them unable to eat. Heavy metal in fishes absorb in Gills ,skin and digestive tract in fish and then transported by blood to either storage point such as bone or to the Liver for transportation.

STUDY AREA –

In the Indore-Dhar Road, there is a lake called Sirpur Lake. The lake and its protected territory around it cover 3.6 square kilometres .Early in the 20th century, the Indore State Holkar family built Sirpur Lake. By India's independence and the separation of the royal families, religious buildings began cropping up everywhere around the lake, and as time went on, the area around it was extended upon by the residents. The ecosystem of the lake was nearly devastated by illegal activities including rubbish disposal, fishing, poaching, and cow grazing.

The BilawaliTalab (Tank) is located on Khandwa Road, southwest of Indore .Talab's catchment area is 290 acres (1.17 square kilometers) In the past, the talab supplied water to the textile industry. Today, the talab serves a specific area's needs for its numerous applications, including drinking, fish cultivation, etc.

Material methods-

Histological study- The gill, liver, and muscle of each group of fish were removed during dissection. They were fixed by FAA (Formalin, Acetic acid, alcohol). Tetrahydrofuran was used for clearing after alcohol dehydration to prepare the fixed tissues. Transverse and longitudinal serial slices of 5-8 thickness were obtained after they had been immersed in paraffin wax. Haemotoxylin and Eosin was used to stain the tissue slices (HE). The portions underwent two ten-minute long xylene changes to deparaffinize them. The hydrated sections were then distinguished in acid alcohol by simply dipping, stained with hemotoxylin for five minutes, and rinsed in running water for five minutes. The portions were simply dipped in Eosin after dehydrating them.and the extra stain removed by immersing for 30 seconds in 90 percent alcohol, followed

by 5 minutes in absolute alcohol. The dehydrated sections were then blotted once more, cleaned in two changes of xylene over periods of ten and fifteen minutes, and then further blotted and mounted in DPX . After being viewed under a labomed lx-400 microscope, the tissues were microphotographed.

Results-

Histological analysis in fish tissues (bilawali tank)-

Gills -

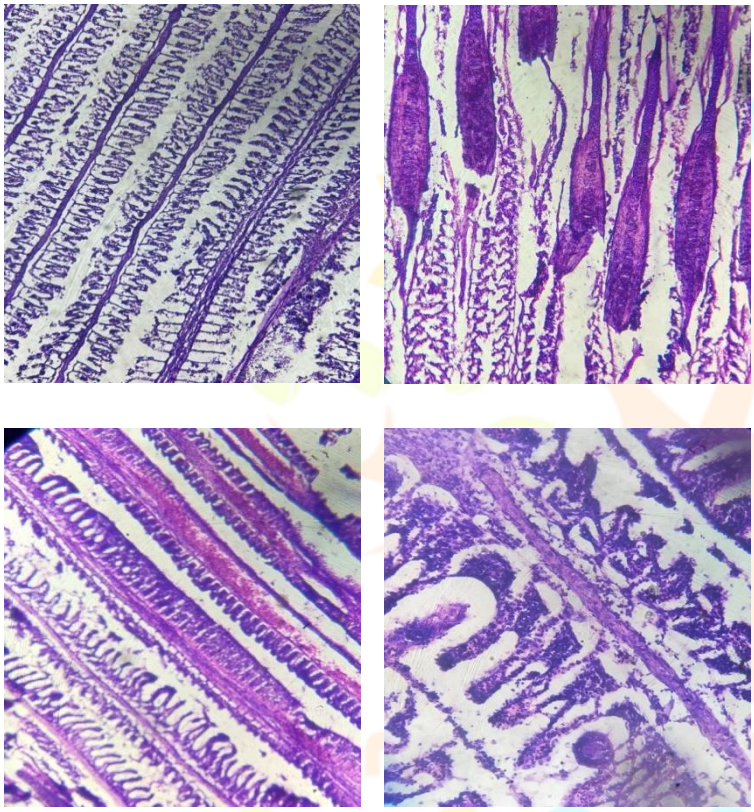
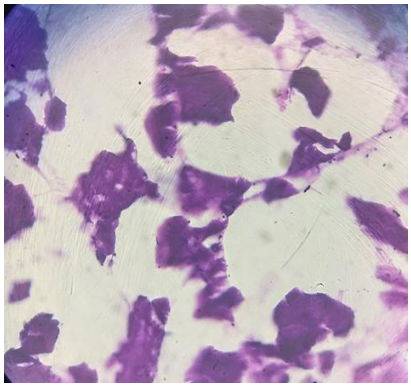
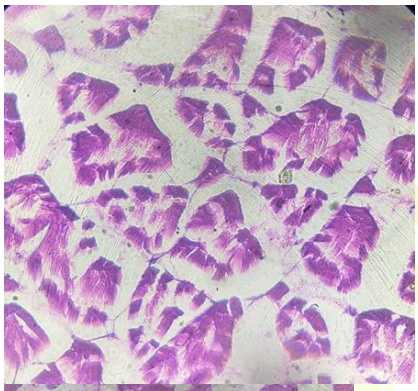
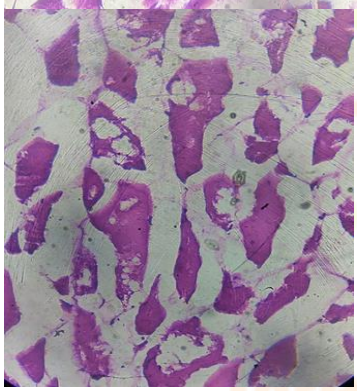


Fig : T.S of Gills of *Catla catla*

Muscles-







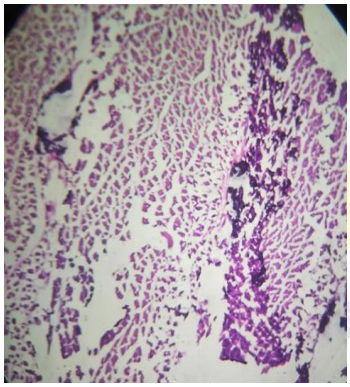


Fig : T.S of Muscles of *Catla catla*

Liver –

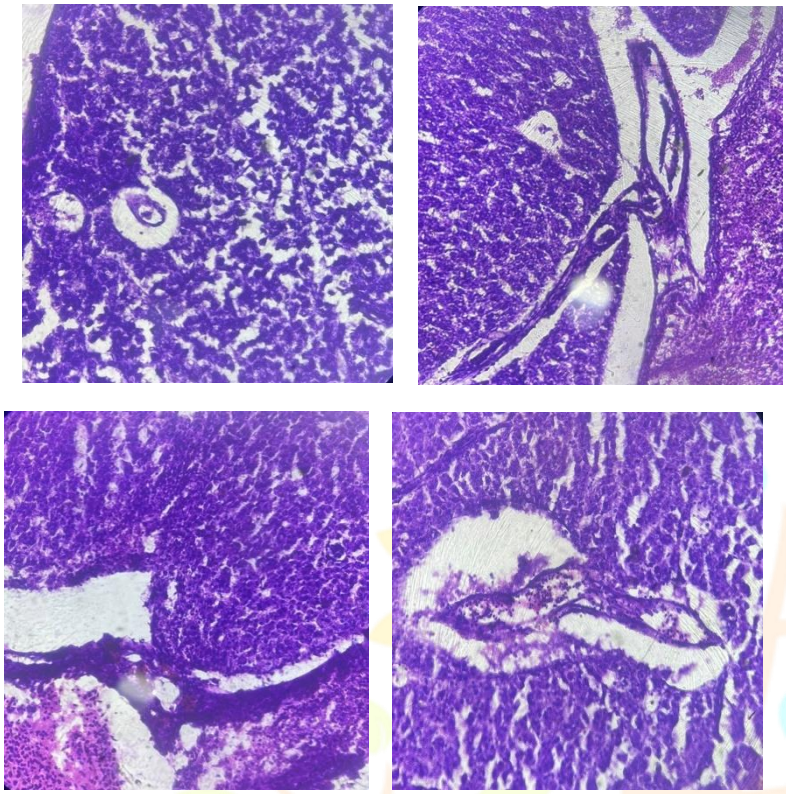


Fig : T.S of liver of *Catla catla*

Histological analysis in fish tissues(sirpur tank)-

Gills-

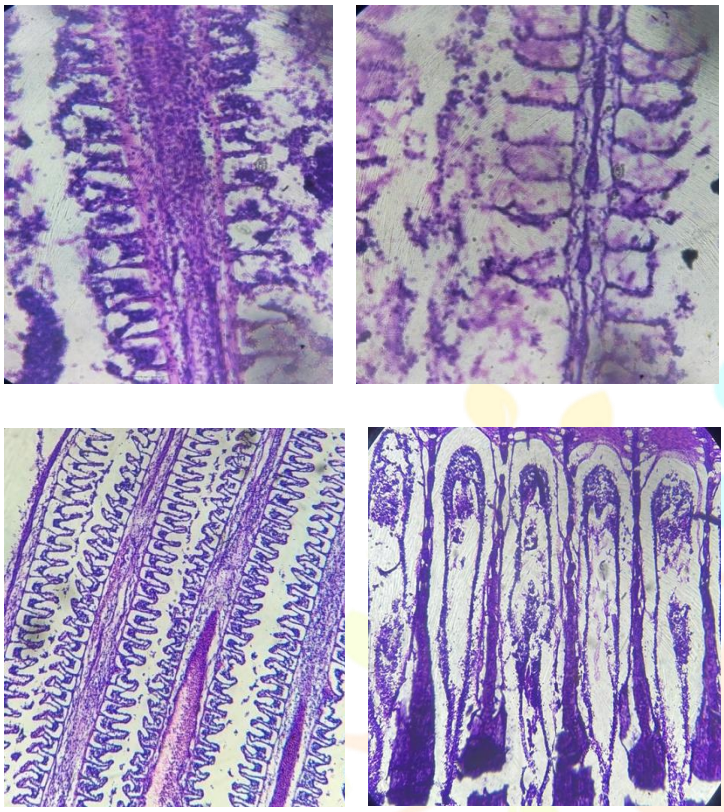


Fig : T.S of Gills of *Catla catla*

Muscles-

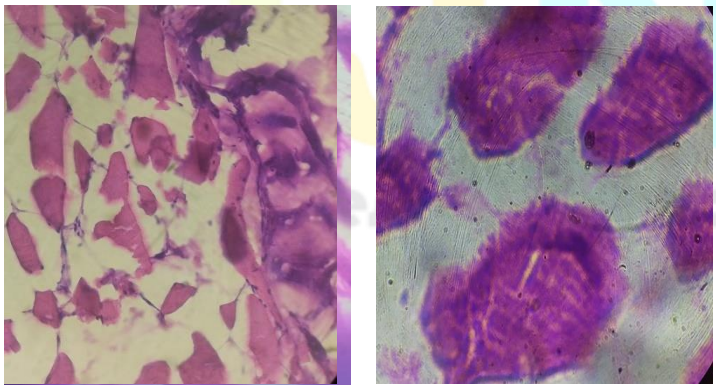


Fig : T.S of Muscles of *Catla catla*

Liver-

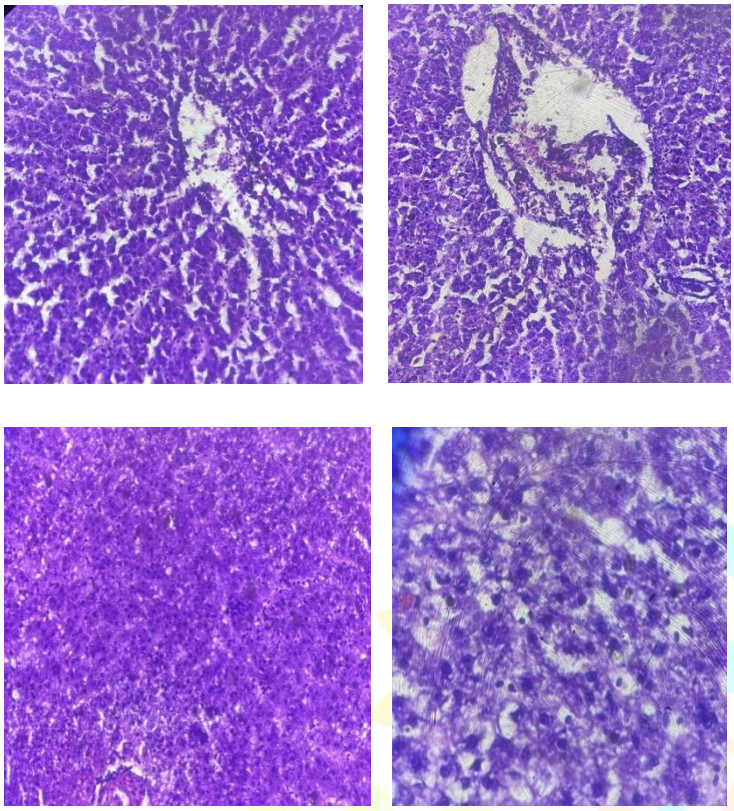


Fig : T.S of liver of *Catla catla*

Discussion –

We can affirm from this study that the freshwater edible fish Catlacatla serves as a biological indicator organism to scale the degree of pollution in Indore's Bilawali and Sirpur ponds.Strong evidence existed for a relationship between the levels of heavy metals in various fish tissues and those in the contaminated areas' surface waters.

In experimental specimens, the structure of the gills, liver, and muscles changed in a number of ways.Gills are immediately exposed to pollution since they are frequently in touch with water. Several samples showed secondary lamellae fusing together as well as inflammatory cell infiltration and hypertrophy. lamellae were shown to dilate and curl in the secondary gill lamella.

It is seen that the primary gill lamellae enlarge, the epithelium rises, and the secondary gill lamellae merge. Around the axis of the main and secondary lamellae, the gill epitheliums displayed necrosis, expansion of the gill filament, and clogging of the respiratory lamellae. Lamellar epithelium hyperplasia were observed.there is muscular tissue injury along with muscle atrophy ,exhibiting necrosis and loss to muscular tissues. Hyaline degeneration and muscle splitting were seen. lesions that are less compact were observed .Displaying oedema in the muscular tissue and injury to the muscle tissues.tissue degradation with intra-myofibril space. With internal edoema, vacuolar degeneration, atrophy, and a localised region of necrosis, the muscular bundle thickens and separates inbilawali tank. Hepatic tissue damage accompanied with sinusoid dilatation (SD) and necrosis , hepatocyte vacuolization and consequent damage to liver tissues is seen .Degeneration of hepatocytes and an increase in mitochondria are observed in histological slide in sirpurlake .

This study shows that the bioaccumulation of a certain heavy metal has reached an alarming level in Indore's fresh water aquatic systems (bilawali tank and sirpur lake). Therefore, stringent laws should be put in place to manage industrial waste coming from point sources. Detoxification techniques are therefore necessary to restore the health of economically significant fish in a stressful environment. In order to avoid the exploitation of precious water resources, monitor their water quality, and restore them for the benefit of society and the environment, monitoring programmes need to be periodically initiated. In order to prevent epidemics like those that occurred in Japan owing to the ingestion of fish and fisheries products contaminated with heavy metals, food authorities should screen fish before they are consumed by people.

Conclusion-

Understanding the metal content in native species is crucial for managing the environment, determining whether or not these species are consumed by humans, and identifying the best biomonitor species. In order to build a local environmental monitoring network utilising freshwater fish as bioindicator species to assess the trends of cadmium chloride bioaccumulation in freshwater ecosystem, several native species of catla-catla freshwater fish were chosen for the current study.

These results will be useful in evaluating environmental monitoring and formulating measures to reduce the sustainable and environment effects of pollution that are amplified in fresh water, aquatic life in particular, fish, and indirectly, human populations.

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