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NATURAL CURE OF HISTOARCHITECTURE IN HEPATOPANCREAS OF FRESHWATER GASTROPOD SNAIL, *BELLAMYA BENGALENSIS* (L.) AFTER HEAVY METAL STRESS

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ABSTRACT

Bellamya bengalensis was exposed to $LC_{50/10}$ concentrations of mercuric chloride for different periods of time for a histological study. The effects of $LC_{50/10}$ concentrations of mercuric chloride on histology of hepatopancreas have been documented. The histopathological alterations examined are disintegration of basement membrane due to damaged epithelial cells, disruption of hepatic tubules, and increase in internal luminar area, occurrence of cell debris in between the tissue at 0.109 ppm $HgCl_2$ for 7 days. After 7 days snails exposed in chronic concentration of heavy metal salt, $HgCl_2$ were alloweded in normal water for natural cure upto 7 days. The histoarchitecture of hepatopancreas was shows better change decrease in internal luminar area,damaged epithelium shows recovery.This study indicates fresh water snails possesses ability to recover itself naturally.

KEYWORDS: *Bellamya bengalensis*, mercuric chloride, Hepatopancreas, histoarchetecture.

INTRODUCTION

The pollution of aquatic environment with heavy metal has been a worldwide problem during the recent years because they are indestructible and most of them have a toxic effect on organisms (Mac Farlane and Burchette, 2000). Mercury is a concern because it is absorbed easily into the food chain. The harmful methylmercury form of mercury readily crosses biological membranes and can accumulate to harmful concentrations in the exposed organism and become increasingly concentrated up the food chain. Aquatic organisms absorb the pollutants directly from water and indirectly from food chains. Some of the toxic effects of heavy metals on aquatic invertebrates These consequences can affect on geological, hydrological and finally on biological cycles (Khayatzadeh and Abbasi, 2010).

Mercury is naturally occurring elements that originatesince geological resources, but eagerly distributes into the air, water, soil, and biomass of the environment (Berry and Ralston, 2008). There are some heavy metals and mercury (Hg) is one of the most toxic heavy metals in our environment including the lithosphere, hydrosphere, atmosphere and biosphere (Barbosa *et al*, 2001). Histopathological studies are also useful in evaluating the pollution potential of heavy metals, since trace amount of these chemicals which do not bring animal mortality over a given period, were capable of producing considerable organ damage.

Digestive gland was most important routes of entry for toxicants, thus hepatopancreas was selected as the targeted organs in this study. Hepatopancreas is central metabolic organ involved in extracellular and intracellular food digestion, secretion of digestive enzymes, in storage of lipids and glycogen, as well as in detoxification (Marigomez *et al*, 2002; Hamed et al, 2007). Accordingly, hepatopancreas is target organs in excretion of xenobiotics and highly recommended for physiological and toxicological studies (Otldil and ayaz, 2020). Structural changes within hepatopancreas are visible in blind-ending tubules, encircled by thin layer of connective tissue, which consist of single layer epithelium with two cell types, digestive and basophilic cells (Lobo A., 2019)

The reports available though indicate an imbalance in metabolic homoeostasis of animals exposed to mercury, studies on histoarchetecture in hepatopancreas of snails B.bengalensis. As the prime recipients of mercury contaminated effluents are freshwater bodies and the gastropod snails severly affected. After heavy metal stress fresh water gastropod snails become disturb due to toxicity of mercry chloride and damaged hepatopancreatic histoarchetecture ,but after snails

allowed for natural cure in normal water shows better change in histoarchetecture of hepatopancreas. Overall study support to natural cure ability occurs in snails.

MATERIALS AND METHODS

B.bengalensis is the fresh water gastropod snails occurring abundantly in Suki dam at garbardi, Dist-Jalgaon of Maharashtra. A total of 40 snails were collected and divided into 2 groups of 20 each. The A group kept as control group of snails while the other B group was exposed to 0.109 ppm $HgCl_2$ concentration upto 7 days. After 7 days snails from group B was alloweded in normal water for self cure naturally such groups known as group C. The gastropods of groups A, B and C were dissected and hepatopancres were removed and fixed in Bouin's fluid for 24 hours;washed and dehydrated in alcohol grades, cleared in toluene and embedded in paraffin wax (58-60^{0}c). Serial sections of 5 u thickness were cut and stained with Mallory's triple stain. The stained sections were examined under light microscope for histopathological impact of heavy metal salts. The damaged hepatic lobules were divided according to their degree of damage into approximately 25%, 50%, 75%, and 100% damaged lobules. Hepatopancreas of snails from all groups of control and exposed were screened and data is presented and compared.

OBSERVATION AND RESULTS

The toxicity of heavy metals in the body of the organism leads to the formation histological lesions in the organs. Acute exposure of *Bellamya bengalensis* to mercuric chloride causes severe histological lesions in the hepatopancreas as compared to control group of snails. Mercury contents in *Bellamya bengalensis* after exposure to 0.109 ppm of mercuric chloride and allow in normal water for self cure naturally has been sumarised in fig.A,B and C.

Histological structure of hepatopancreas

Histological study shows two types of cells in hepatic lobules, the typical liver cells or digestive cells (columnar epithelial cells) and secretory cells. Both rest on basement membrane. The lumen present inside the lobules. The lobules of the gland are bound together by the thin connective tissue layer as shown in fig. A.

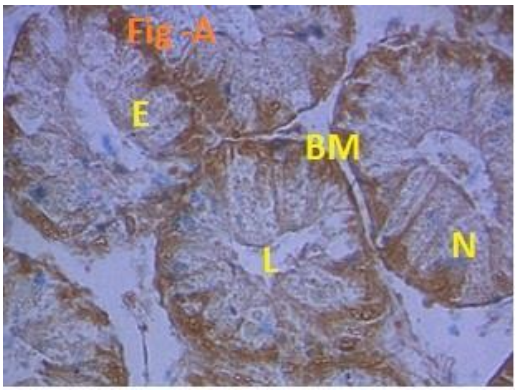

Fig. A - T.S. of the hepatopancreas of *B. bengalensis* of the control.

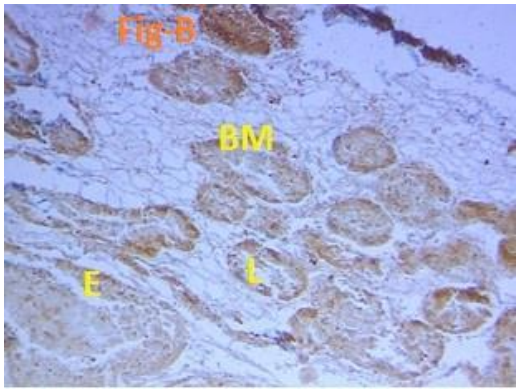

Fig. B- T.S.of hepatopancreas of snails After 7 days chronic treatment.

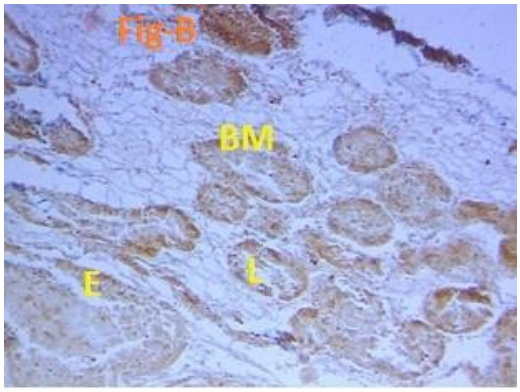

Fig. T.S.of hepatopancreas of snails allowed cure naturally in normal water.

The deformity in the histoarchitecture of hepatopancreas due to heavy metal stress definitely reflect in it's metabolic activity. The histological changes in the hepatopancreas of *Bellamya bengalensis* exposed to chronic concentration, 0.109 ppm up to 7 days and after 7 days snails alloweded in normal water for self cure naturally show in fig. B and fig.C.

After mercuric chloride exposure, the lobules of hepatopancreas showed swelling. There was a rupture of basement membrance, separation of epithelium from the

basement membrane, swelling of columnar epithelial cells and secretory cells, necrosis and vaculolization of cells, increase in the size of lumen, loss of cytoplasm and degeneration of nucleus of cells showed clearly in fig-B. But those snails alloweded for natural cure in normal water after 7 days treatment. After 7 days those snails allowded cure naturally in normal water showed fast recovery in histoarchitecture of hepatopancreas due to decrease the metal stress, showed that decrease the size of lumen,decrease the swelling of epithelial and secretory cells.overall very good good cure result is occures in hepatopancreas of snails In the present study the progressive degenerative changes observed in the histology of the organs of snails exposed to the chronic concentration of mercuric chloride are direct indications of the severity of metal stress on animals. The histological cure observed in hepatopancreas those snails alloweded cure naturally in normal water.

DISCUSSION

The alterations observed in histo-architecture in the various tissues are tissue specific and time dependent.When *Channa punctatus* was exposed to mercuric chloride for a prolonged span of 30 days profound histological changes in the liver were observed which induced necrosis, vacuolation and degeneration of hepatocytes (Sastry and Gupta, 1978).Usha (1989) observed that the fish, *Tilapia mossambica*,on exposure to calcium chloride for of 30 days, the proximal tubules of the kidney were first to be affected and the tubular cells showed vascular degeneration. Gardner and Yevich (1970) observed that heavy metal cadmium toxicity results into impairment of respiration and extra-renal functions in the gills of estuarine teleost fish, *Fundulus heteroclitus* due to degenerative changes in respiratory epithelium such as atrophy and necrosis of secondary lamellae.

The histological techniques are the promising area of research in aquatic toxicology as it gives the real picture of the effects imposed and the involvement of the xenobiotics in either disturbing or destroying the vital organs of living organisms. Many workers have reported the degenerative changes in selected tissues of the animals in response to pollution by various toxicants (Shaikh, *et al.*, 2010; Andhale, *et al.*, 2011). Victor *et al.* (1990) observed histopathological changes in the hepatopancreas of *P. hydrodromous* in response to cythion resulting in reduction in the height of tubular epithelium, enlargement of lumen, vacuolation and atrophy. The histopathological changes indicated that the animals were not able to digest and store food properly.

The lack of nutrientsresulted in atrophy of hepatopancreas. These degenerative changes result in the impairment of physico-metabolic processes ofmussels. Break of DNA strands in hepatopancreas of mussels exposed to resin acids was reported by Gravato et al. (2005).

CONCLUSION

The present work proposes to investigate the effect of mercuric chloride on the survival, growth, and healthy life of snails. Here the effort is being made on the changes occurring in the hepatopancreas of snails by the addition of mercuric chloride which is highly toxic for snails as well as the animal eating on them. The various tropic levels of food chain are affected by the consumption of mercury directly or indirectly.But incase snails get chance to give normal water ,better changes means cure is occurs in histoarchitecture was damaged due to heavy metal stress.

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