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# HISTOPATHOLOGICAL CHANGES IN GALLBLADDER OF A TELEOST FISH *Catla catla* TREATED WITH 1.2% LINDANE

**TRIPATHI M.[1]*, MISHRA R.P.[2] AND GIRDONIYA V.[1]**

[1]Mata Gujri College, Jabalpur-482 004, MP, India.
[2]Bioscience Department, R.D.V.V. University, Saraswati Vihar, Pachpedi, Jabalpur-482 001, MP, India.
*Corresponding Author: Email- drmahimatripathi@yahoo.co.in

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**Abstract-** This research deals with the study of histo-pathological changes induced in the gallbladder of the fish Catla catla, due to lindane, a persistent environmental contaminant intoxication.

For present work healthy specimens of the fish Catla catla were collected from the nearby river Narmada and acclimatized at laboratory conditions for 10 days and then treated with 1.2% of lindane for 30 days. Histological preparations were made by sacrificing controlled fish and 30 days treated fishes. Fishes were dissected and organs were removed and fixed in alcoholic bouins solution for 24 hours and proper microtomy technique was employed. Eosine and hematoxylene were used for cellular differentiation. These studies show many histopathological changes in gallbladder of the fish. Crystallization of bile and deformities in the normal structures of epithelial lining and muscular layer are the main toxic effects significantly noticed in this organ.

**Key words-** Toxic effect, gallbladder, lindane, crystallization.

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## Introduction

Lindane is an organochlorine compound and is highly lipophillic in nature and have tendency to accumulate in soil and in tissues of various organs affecting them adversely by changing their biochemical composition and altering physiological functions.

In present studies technical grade of lindan is used containing 1.2% of lindan and 98.80% of soap stone. It is used in fields, forms, and in residential areas for the control of insect pest population. This organo- chlorine compound is mainly used as pesticides in the field of agriculture for the control of insect pests, but due its excessive use and misuse it also affects non target animals. In rainy seasons wash off from fields reaches to the nearest water resources used for the culture of fish. Here it acts as toxicant to the fishes by causing adverse effect on internal organs by damaging them or by altering their normal functioning.

Pesticides exposure causes sever alterations in the tissues biochemistry [4-6,10].

The chemical stability of these compounds, their high lipophillic nature, and toxicity to man and other animals [1], has attracted the mind of government and researchers to be concerned with their presence in the environment.

Studies concerning the effects of organochlorine compounds on fishes have their own importance in relation with the factors increasing ecological problems and toxicity in organisms.

The fish *Catla catla* choosen for these study is a teleost fish, belonging to the order-cypriniforms, division-cyprini and family-cyprinidae. This is one of the major carps cultivated in most parts of the country.

## Normal anatomy

Gallbladder is a pear shaped sac like structure for bile storage. It is a storage vessel for liver bile. It acts as a reservoir for holding bile on its way from the liver to the intestine. Its size depends on the volume of bile. Wall of the gallbladder is normally 1-2 mm thick. It plays an important role in digestion [8,9].

There are a few studies which suggest that bile serves similar functions in fishes. Several studies identified micro-droplets of lipid in midgut epithelium of fishes and re-absorption of water in gall bladder of fishes as in mammals. The presence of green mucus in the lumen of the atrophied gut of spawning salmon suggested bile is continuously produced in fishes. There appears to be no studies in contraction or other mechanisms controlling the release of bile during digestion from gall bladder of fish.

Bile serves a number of functions, as it (a) helps in emulsification and absorption of lipids/fats, (b) neutralizes hydrochloric acid from stomach (and so prevents possible ulceration of the intestine) and (c) ensures that absorbed toxins are returned to the intestine for excretion. The size and fullness of the gall bladder is indicative of feeding status in fish. A large, distended bladder indicates that the fish has not eaten for some time whilst an empty flaccid bladder indicates that the fish has recently eaten a meal. Bile is excreted from the bladder to the intestine via the bile duct [8,9].

**Normal Histology**

It shows mucosa, submucosa and muscularis layer [8,9].

**Mucosa:** variable branching folds, more prominent if gallbladder not distended.

**Surface Epithelium:** composed of single layer of uniform, tall columnar cells with basal nuclei, indistinct nucleoli, pale cytoplasm due to sulfomucins; also pencil cells (small, darkly staining columnar cells), inconspicuous basal epithelial cells, T lymphocytes; no goblet cells, myoepithelial cells or melanocytes; neck region has tubuloalveolar mucus glands that secrete sulfo-, sialo- and neutral mucin and contain neuroendocrine cells; true glands are not present outside the neck.

**Muscular layer:** circular, longitudinal and oblique smooth muscle fibers without distinct layers, resembles muscularis mucosa; adjacent to lamina propria without an intervening submucosa [8,9].

The present study therefore undertaken to describe the histo pathological changes in gallbladder of the fish Catla catla, and their effects on normal functioning of organ.

**Materials and Methods**

Healthy specimens of the fish Catla caltla measuring length of 10-12 c.m. and body weight 250-400 g.m. were collected and acclimatized to laboratory conditions for 10 days and feeds on fish food. On eleventh day experiment were started with mixing 10 g.m. of 1.2% lindane in10 liters of water contained in an aquarium. Fishes kept in this solution of water and 1.2% lindane for 30 days. At thirty first day fishes were sacrificed to remove gallbladder by dissecting them.

Removed organs were fixed in alcoholic bouins solution for 24 hours and then washed in 70% alcohol for complete removal of picric acid.

Usual microtomy techniques were employed for histological preparations. Eosine and hematoxyline were used for cellular differentiation.

**Result and Discussion**

Organochlorines are some potential group of chemicals used to control agriculture pests and mosquitoes [2,7]. The pesticides applied for this purpose eventually get accumulated in various organ systems in aquatic animals and causes sever Histopathological alterations as toxic effects in the concerned organs [5].

The aquatic organisms like fish are able to accumulate several fold higher concentration of pesticide residues than the surrounding water [3].

Fig. 1 shows the normal histological structures of gall bladder constitutes muscular layer, submucosa, muscular folds, lamina propria, epithelium constituted of columnar epithelial cells, and the central part of gall bladder the lumen (10x).

The changes after treatment with pesticide are evidence for crystallization of bile in the lumen of the gall bladder. This may be due to excess loss of water (45x) as clear in Fig. 2.

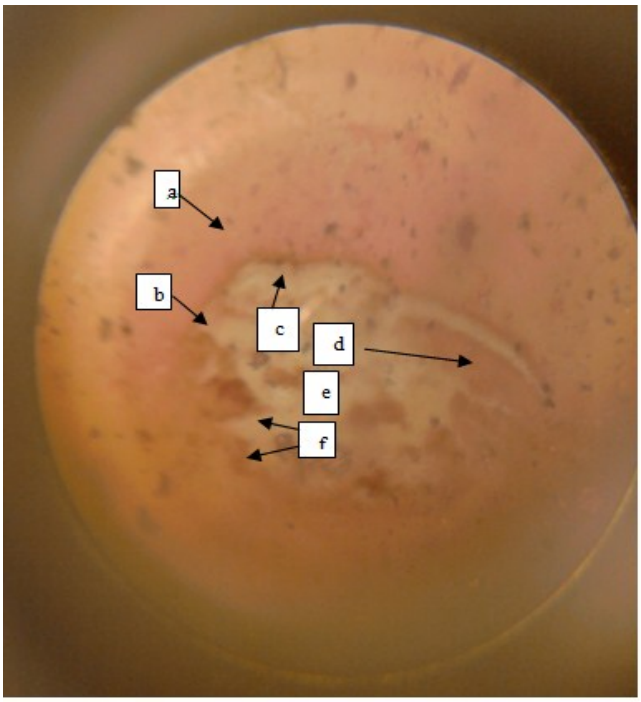


**Fig. 1-** Normal Histological Structures of Gall Bladder
*a- Muscular Layer, b- Sub-mucosa, c- Epithelium, d- Lamina Propria, e- Lumen, f- Mucosal Folds*

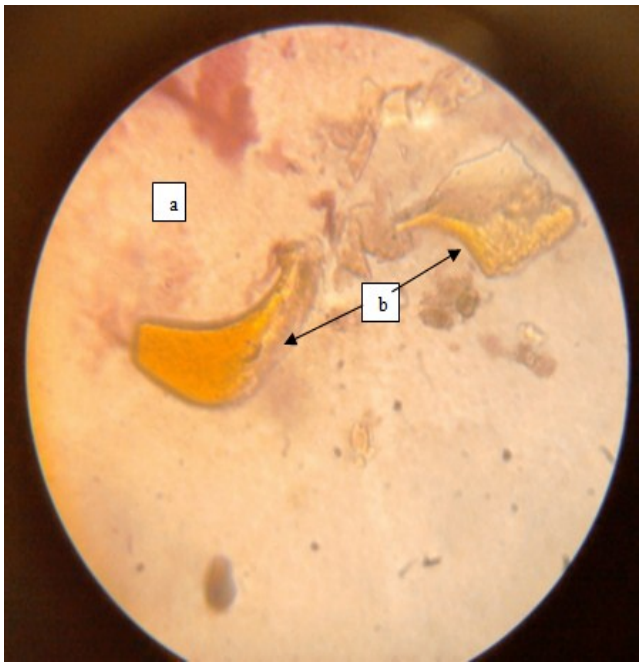


**Fig. 2-** Crystallization of Bile in the Lumen
*a- Lumen, b- Bile Crystals*

Fig. 3 shows the deformities in the normal structures of epithelial line, muscular layer, and mucosal folds. Columnar epithelial cells get destroyed at many places due to lindane intoxication. In the same way mucosal folds also destroyed and deformities in the muscular layer appear due to destruction of smooth muscle cells (45x).

Destruction of smooth muscle cells of muscular layer in high power microscope was noticed as clear in Fig. 4.

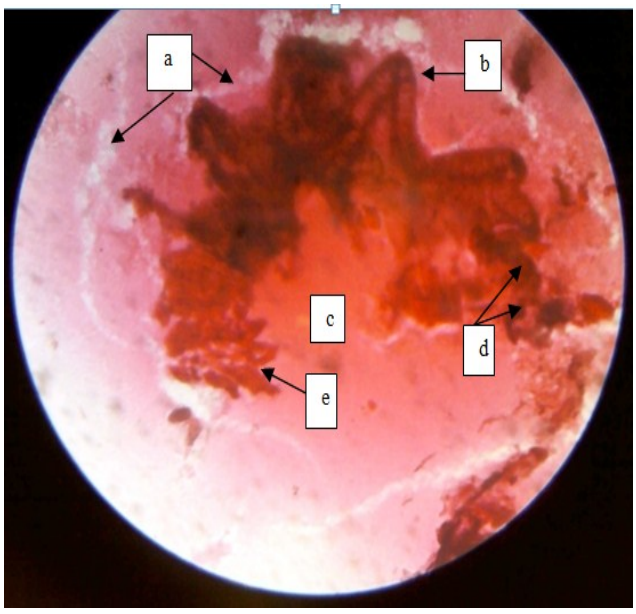


**Fig. 3-** Deformities in Epithelial Line, Muscular Layers, and Mucosa Fold's

*a- Deformities in muscular layer, b- Epithelium, c- Lumen, d- Destroyed Mucosal Folds, e- Destroyed Epithelium*

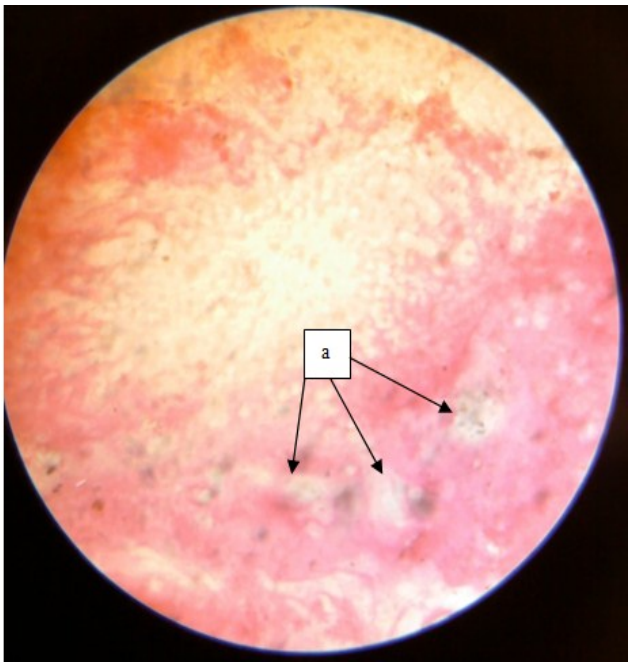


**Fig. 4-** Destruction of Smooth Muscle Cells of Muscular Layer

*a- Destructed smooth muscle cells*

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