Journal of Fisheries and Aquaculture
ISSN: 0976–9927 & E-ISSN: 0976–9935, Vol. 2, Issue 1, 2011, PP-20-22
http://www.bioinfo.in/contents.php?id=68

HISTOPATHOLOGICAL EFFECT OF 1.2% LINDANE ON KIDNEYS OF MAJOR CARP *CATLA CATLA*

TRIPATHI M.[1], MISHRA R.P.[2], GIRDONIYA V.[1]
[1]Mata Gujri College, Jabalpur, MP India
[2]Bioscience Department, R.D.V.V. University, Jabalpur, MP India
*Corresponding author. E-mail: drmahimatripathi@yahoo.co.in

Received: April 15, 2011; Accepted: May 06, 2011

Abstract- This research deals with the study of histopathological changes induced in kidney of a teleost fish *Catla catla* due to lindane intoxication. For present studies healthy fish specimens were collected and treated with 1.2% lindane for 15 days and 30 days. Histological studies were made by sacrificing controlled fish, 15 days treated fish and 30 days treated fish and kidneys were removed by dissecting them. Kidneys were fixed in alcoholic bouins solution and proper microtome technique was applied for histological preparations and Haematoxyline/ Eosine were used for cellular differentiation. Our studies show various causes of renal dysfunction in the fish *Catla catla* due to toxic effects of lindane.
Key-word: Lindane, renal dysfunction, toxic effect.

Introduction

Organo chlorine compounds as most important insecticides are widely used to control insect pest population. These lipophillic compounds readily pass through cell membranes and alter the metabolic activities of cells cause damage to cells and disturb normal functions of the cells.

Studies on various organs of fishes affected by different pesticides are made by many researchers, and they found positive results regarding toxicity. The effect of increased use of chemical pesticides results in the excess inflow of toxic chemicals, mainly into the aquatic ecosystem [2, 3]. However, pesticide exposure causes severe alterations in the tissue biochemistry of fishes [4, 7, 9, 11]. In general, the toxic effects will be more when two or more toxicants act together in a synergistic manner [10]. The present study is aimed at understanding the effect of the widely used pesticide lindane in kidney of *Catla catla.* The fish is exposed to the pesticide lindane, a hlorinated hydrocarbon, for 15 and 30 days for fish toxicological studies. Lindane with a ratio of 1.2% of lindane and rest 98.80% of soap stone is used for this research work which is also used for the purpose of dusting to control insect pest population in fields, societies, poultry farms etc.

Material and Methods

Ten specimens of *Catla catla* measuring length of 10 to 12 c.m. 250 to 400 g.m. in body weight were collected from Narsingh talaab Narsinghpur in the month of October 2009. They were cultured in aquarium and acclimatized to laboratory conditions for 10 days and feed on fish food. On 11th day experiment were started with mixing 10 gm of 1.2% lindan in 10 litres of aquarium water in which fishes were kept.

At 16th day of this experiment, out of ten fishes, five fishes were removed from the water and scarified to remove kidney.Kidneys were removed and fixed in alcoholic bouins solution for 24 hours, usual microtomy technique was employed and Haematoxilin/Eosine were used for cellular differentiation. Rest five fishes were treated for 30 days and are sacrificed and kidneys were removed again are fixed in alcoholic bouins solution for 24 hours for microtomy. Likewise controlled fish were dissected and kidneys were fixed in alcoholic bouins solution for 24 hours. Then usual microtomy technique was applied for histological studies. Tissues were embedded in paraffin wax and blocks were prepared. The blocks were cut in ribbon of 4 microns thickness and are stained with haematoxilin and eosine.

Result and Discussion

Results show the normal cellular structure of the kidney obtained from the controlled fish. These structures mainly show the Chromaffin Cells (CC), Corpuscles of Stannous(CS), Proximal Tubules(PT), and Distal Tubule(DT) in first figure and Glomerulus(G) in the second figure.

The fish C. catla treated with lindan for 15 days shows many histopathological changes with Hypertrophied Corpuscle of Stannius(HCS), hypertrophied glomerulus(HG) (Fig. III) and Damaged Chromaffin Cells(DCS) (Fig.IV). which are the result of toxicity induced by linden.

Further studies shows histopathological changes in the kidney of the C.catla exposed to lindan for 30 days which includes Damaged Corpuscle of Stannius(DCS) (Fig. V), Highly enlarged Lumen of Tubule (HET),and Shrunken Glomerulus(SG) (Fig. VI).

Copyright © 2011, Bioinfo Publications

The head kidney in teleost is composed mostly of heamopoietic tissues or lymphoidal tissues, with only a few renal tubules dispersed in it.The interregnal and chromaffin cells are found diffused in the head kidney near post cardinal vein.The interregnal cells are more eosinophilic than the cells composing kidney tubules. They may be polygonal, spindle shaped, cuboidal or columnar having large round nucleus. Interrenal cells are responsible for the secretion of mineral corticoids effecting osmoregulation and glucocorticoids that influence blood sugar level. The corticoids play an important role in the regulation of water and electrolyte balance. They also play an important role in the metabolism of proteins and carbohydrates. Histological changes in interregnal tissues due to lindan toxicity may results in disturbances in osmoregulatory functions and it may also cause hypoglycemia and decrease in liver glycogen.

Chromaffin cells are found scattered in the head kidney in the region of post cardinal vein.They are generally uniform, rounded in appearance,with pale slightly basophilic cytoplasm.These are adrenaline producing cells.Any damage in them may results in disturbances in the production of adrenaline. Hormones produced by the chromaffin cells controls blood pressure, and concentrates pigment granules in melanophores.

A significant decrease was reported in the protein content of the liver and kidney in *L. rohita*, exposed to 20% active ingredient EC fenvalerate [1]. A similar decrease in the total and soluble protein content was observed with fenvalerate in fish [6, 9] and rat [5]. A decrease in protein profiles was also reported in several animals following pesticide stress [8]. Thus varying protein profiles in different animals probably depend on the structural configuration of various pyrethroids and also on differential tissue response.

Corpuscles of Stannius are small nodular bodies. Histologically, each corpuscle of Stannius is composed of parenchymal cells that are arranged in the form of follicles or irregular cords, separated by connective tissues, and surrounded by a fibrous capsule.In *C.catla* they are two in numbers and 2-5 m.m. in size.They are involved in calcium regulation and any structural change in them results in disturbances in the regulation of calcium, potassium and sodium level and may even results in death.

Enlargement of lumen of the tubules is the result of failure of rapid reabsorption of the filtrate, due to simultaneous damage in corpuscles of Stannius resulting in disturbances or failure of maintaining the acid-base balance. Finally lindan intoxication results in renal disfunction in teleost fish *Catla catla*.

References

[1] Annamani A.K. (1986) *Toxicity of Fenvalerate technical grade and 20% EC to Labeo rohita and Aplochelus panchax. M. Phil. Thesis, Acharya Nagarjuna University, Guntur, AndhraPradesh, India*.

[2] Baskaran P., Palanichamy S., Visalakshi S., Balasubramanian M.P. (1989) *Environ. Ecol*., 7: 463-465.

[3] Kalavathy K., Siva Kumar A.A., Chandran R. (2001) *J. Ecol. Res. Bioconserv*., 2 (1-2): 27-32.

[4] Kumar S., Singh M. (2000) *J. Exp. Zool., India*, 3(1): 83-88.

[5] Lakshmi Rajyam Ch (1989) *Evaluation of toxic effects of a synthetic pyrethroid fenvalerate in albino rat. Ph.D. thesis, S.V. University, Tirupati, India.*

[6] Malla Reddy P., Bashamohideen M.D. (1988) *Curr. Sci.,* 57: 211-212.

[7] Mathivanan R. (2004) *J. Ecotoxicol. Environ. Monit.*, 14:57-64.

[8] Pramoda Kumari J., Naidu B.P. (1987) *Environ. Ecol*., 5: 717-719.

[9] Radhaiah V. (1988) *Studies on the toxic impact of a pyrethroid insecticide fenvalerate on some metabolic aspects and histopathology of a fresh water teleost Tilapia mossambica (Peters). Ph.D. thesis, S.V. University, Tirupati, India*.

[10] Shrivastava S., Singh S. (2004) *J. Ecotoxicol. Environ. Monit*., 14: 119-122.

[11] Sujatha L.B. (2006) *Studies on the physiology, haematology and histopathology in the Indian major carp Catla catla (Hamilton) as influenced by individual and synergistic toxic effects of a pesticide and two metallic compounds. Ph.D. thesis, University of Madras*.

[12] Tilak K.S., Satyavardan K., Thathaji P.B. (2003) *J. Ecotoxicol. Environ. Monit*., 13: 261-270.

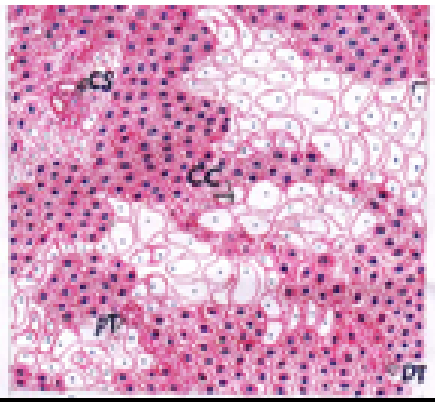

Fig.:1-Sagital section of kidney of controlled fish Catla catla showing corpuscles of Stannius(CS), chromaffin cells(CC), proximal tubule(PT), distal tubule(DT).

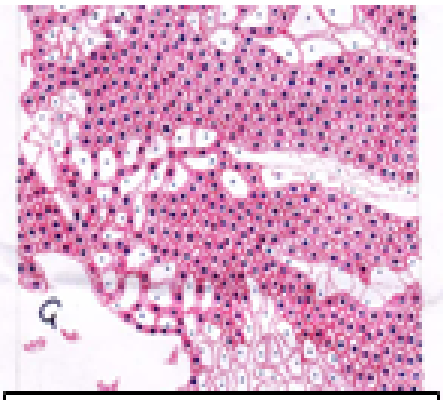

Fig.:2-Sagital section of kidney of the control fish Catla catla showing glomerulus(G).

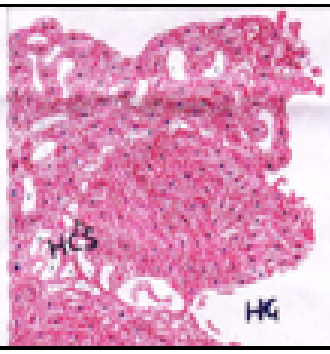

Fig.:3-Sagital section of kidney of the fish C.catla treated with lindane for 15 days showing hypertrophied corpuscles of stannous (HCS) and hypertrophied glomerulus(HG).

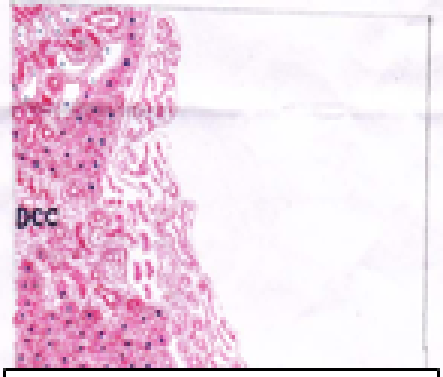

Fig.:4-Sagital section of the kidney of the fish C.catla treated with lindane for 15 days showing damaged chromaffin cells(DCC).

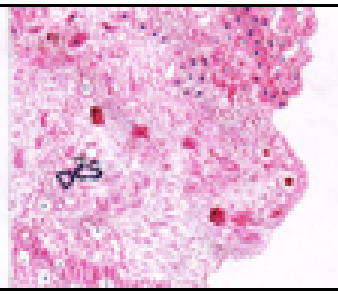

Fig.:5-Sagital section of kidney of the fish treated with lindane for 30 days showing damaged corpuscles of Stannius.

Fig.:6-Sagital section of the kidney of the fish C.catla treated with lindane for 30 days showing shrunken glomerulus and highly enlarged lumen of tubule

Copyright © 2011, Bioinfo Publications