

Histological Study of Changes in Kidney of *Clarias batrachus* Exposed to Cypermethrin

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ABSTRACT

Agricultural insecticides are used widely to control insect pests. These insecticides enter the aquatic environment through agricultural run off. This study was conducted to assess the histopathological damage of kidney in *Clarias batrachus* after the exposure to cypermethrin. 25 fishes were selected and divided into five groups. Four groups are treated and one is controlled. Treated groups are exposed to sublethal concentration of 0.07 micro liter of cypermethrin for 1, 5, 10 and 15 days respectively. Kidney of fish were removed and examined epithelial cells of renal tubule were degenerated, glomerular capillaries dilated. The result showed that kidney degeneration was proportional to exposure periods and concentration of cypermethrin.

Keywords: Cypermethrin, *Clarias batrachus*, kidney, Histopathology

INTRODUCTION

The Asian Catfish *Clarias batrachus* is found in south east Asia and Indian sub-continent. Variety of human activity such as industrial, agricultural and domestic brought many changes in the aquatic eco system. Agricultural run off laden with excess fertilizer and pesticides, industrial effluents with toxic substances and sewage waste pollute our water. One of the major pollutant of water is the pesticide. The term pesticides includes insecticides, fungicides, herbicides, rodenticides etc. The organophosphate, organochlorine and pyrethroid pesticide are used to control agricultural pest as well as parasite in fishes. Toxicity of these pesticides pose higher threat to non-target organism and alter the reproduction, growth and habitat behavior pattern (1) Cypermethrin (Cy) a synthetic pyrethroid insecticide has contact and stomach Action property. The walking cat fish *Clarias batrachus* is a species of fresh water air breathing cat fish. When pesticide like cypermethrin enter into body of fish damage the metabolism leading to physiological, pathological and bio-chemical disorders. The effect of cypermethrin on the histopathology of kidney of *Clarias batrachus* is greater because kidney serve as a major route of excretion of these xenobiotics (2)

MATERIALS AND METHODS

Fresh water fishes *Clarias batrachus* were collected from the hatchery and brought to laboratory into polythene bags filled with water and immediately given 0.05% potassium permanganate treatment for two minute for disinfecting them. After that the fishes transferred to the plastic tanks of 100 liters capacity and fed with pellets. Fishes were acclimatized for two weeks under natural photoperiods and an average temperature of 25°C

Experimental chemical: Cypermethrin

HISTOLOGY

25 fishes were selected and divided into five groups 1, 2, 3, 4 and 5. Groups first controlled and group 2, 3, 4 and 5 were exposed to sublethal concentration of cypermethrin 1, 5, 10 and 15 days respectively. Fishes were dissected carefully and kidney were removed and fixed in Bouin's fluids for 24 hours and then processed for microtomy. The section were cut and stained in hematoxylin and eosine. The slides were examined under light microscope to observe histopathological effects.

RESULT

Function of kidney in fish is osmotic regulation of water and salt and excretion of nitrogenous waste. Kidney is one of the first organs which is affected by contaminants in water (3). LC 50 is one of the most important parameters for evaluating the toxic effects of pollutants (4). In normal kidney, the glomerular tissue was closely arranged with renal tubules including distal and collecting tubules and intact interstitial cells. The distal segment was lined with large, relatively clear columnar epithelial cells with central nuclei. After one day exposure to cypermethrin, some mild changes were observed. After five days of exposure, shrinkage of glomerulus was seen due to which space increased between glomerulus and

Bowman's capsule. In some tubules, diameter of lumen is increased and nuclei of epithelial cells become pyknotic. After 10 days of exposure, tubular lumen was widened, degenerative changes in tubular epithelium became enormous, vacuolization was observed. These changes become severe after 15 days of treatment. Damage to blood vessels, pyknosis, and shrunken glomerulus were observed. Histopathological changes in kidney at the level of glomerulus and tubular epithelium after exposure to pesticides have been reported by many workers (5). Cypermethrin exposure induced abnormalities in kidney initiated with disruption of tubular organization. Hypertrophy of the cells and the presence of small granules in the cytoplasm (6)

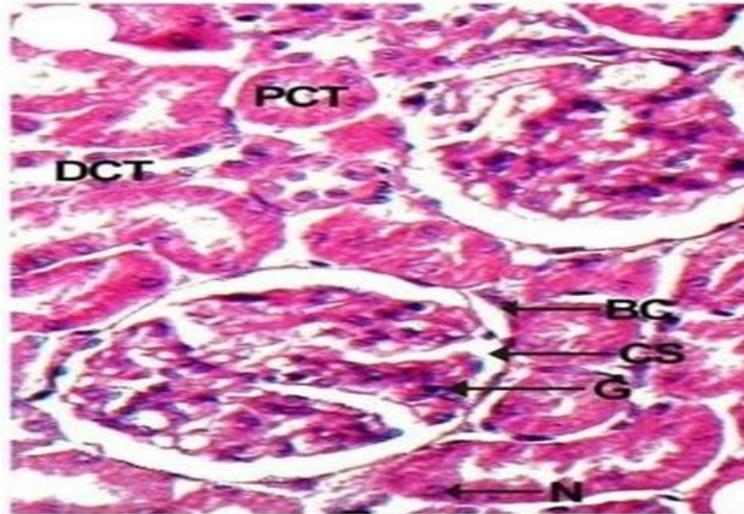


Fig: 1 Micrograph of control kidney (H/E \times 400) showing normal structure of Glomerulus (G), Bowman's capsule (BC), Capsular space (CS), Proximal Convoluted Tubule (PCT), Distal Convoluted Tubule (DCT), Nucleus (N).

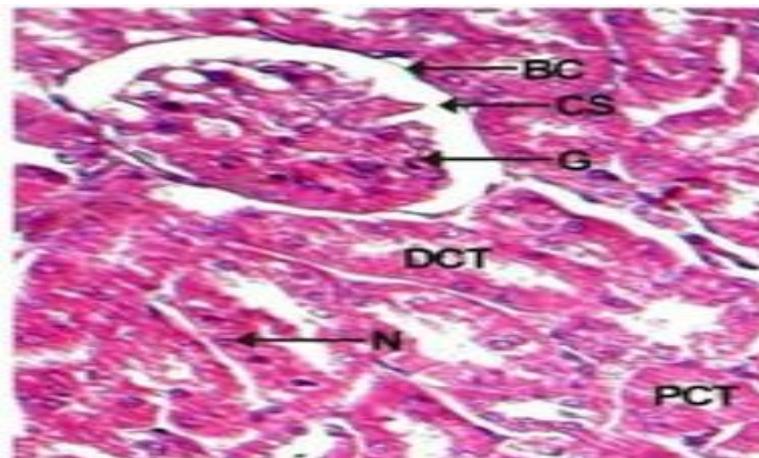


Fig 2:- Micrograph of kidney after 1 day showing mild damage in Glomerulus (G), Bowman's capsule (BC), Capsular space (CS), Proximal Convoluted Tubule (PCT) and Distal Convoluted Tubule (DCT).

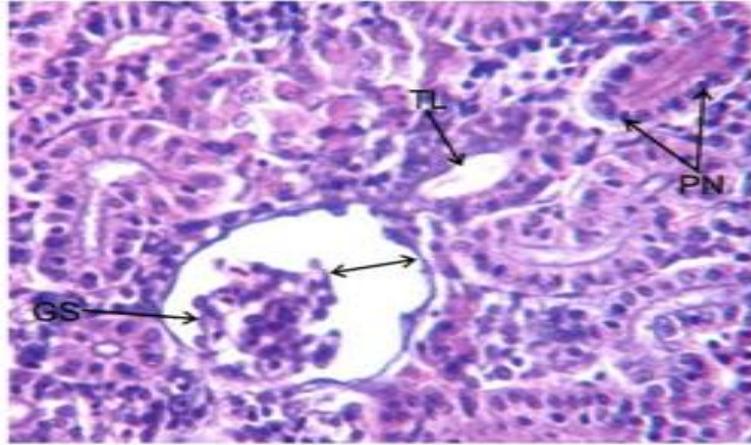


Fig 3:- Micrograph of kidney after 5 days showing Glomerular shrinkage (GS), increase in space between glomerulus and bowman's capsule (↔), increased tubular lumen (TL), Pycnotic nuclei (PN) and relatively intact tubule.

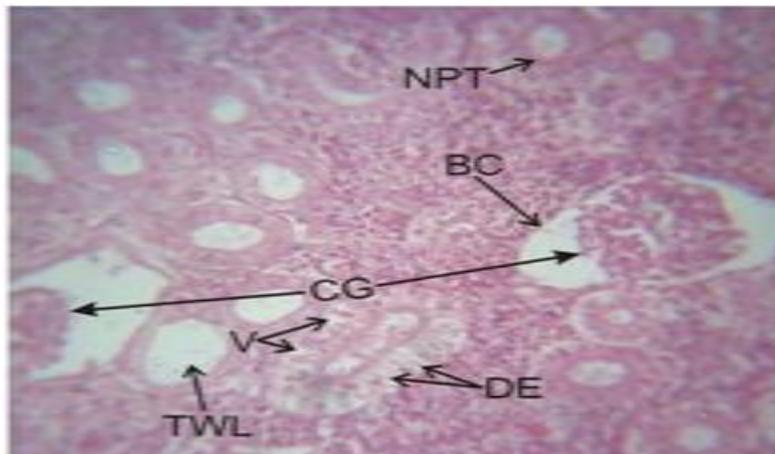


Fig 4:- Micrograph of kidney after 10 days showing collapsing glomeruli (CG), Necrotic proximal tubules (NPT), Tubules with widened lumen (TWL), Degenerating tubules (DT), Vacuolized (V) and indistinct necrotic cells.

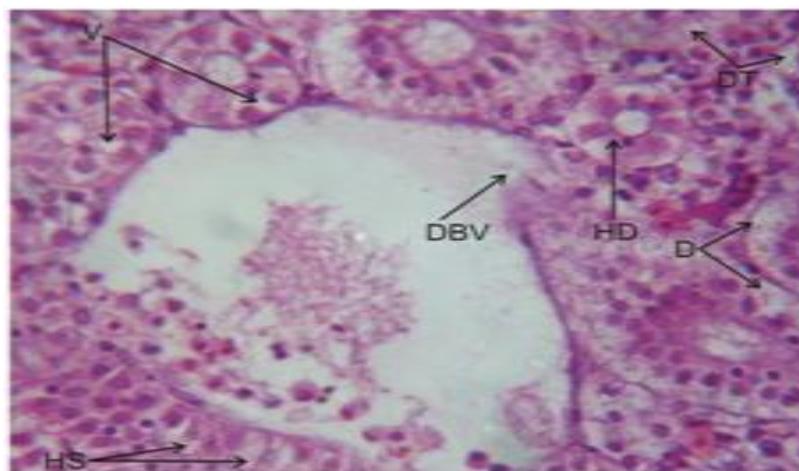


Fig 5:- Micrograph of kidney after 15 days showing Disorganized Tubules (DT), Hydropic swelling (HS), Vacuolization (V), Hyaline degeneration of tubular epithelium (HD), Desquamation (D) and Damaged blood vessels (DBV)

CONCLUSION

Chronic exposure of cypermethrin causes glomerular shrinkage , increase in space between glomerulus and bowmanns capsule ,degenerative tubules, desquamation and damaged blood vessles.

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