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EFFECT OF SHORT TERM EXPOSURE TO UREA ON CAT FISH (*HETEROPNEUSTES FOSSILIS)* A LIGHT MICROSCOPIC STUDY OF THE GILLS.

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ABSTRACT

Extensive use of urea in croplands affects the life and sustainability of other living creatures like fishes, amphibian and reptiles etc directly or indirectly. Urea is a most commonly used nitrogenous fertilizer and this fertilizer affects the skin and respiratory organs like gills of cat fishes which are generally found in or near the drainage water of croplands. The affects were so profound that it can easily be studied under light microscope.

KEYWORDS: living creatures like fishes, amphibian and reptiles.

INTRODUCTION

Farmers distribute fertilizer extensively on croplands, pastures and orchards. These fertilizers are important to high-yield agriculture. It is assumed that one-third of the country's annual production of food and natural fiber is attributed to fertilizers. Their extensive use, however, creates some problems. The effluents from industry adversely affect the natural quality of water bodies. Drainage of agrochemicals from agricultural lands (Mishra et.al., 1994). Use of biocidal plant extracts for fish capture (Ojha et.al., 1989, Ojha and Singh, 1992), and also the presence of numerous pathogens. Contaminated water from such disturbed aquatic environments continuously ventilates the gills of fishes.

Urea (NH_2-CO-NH_2) is a commonly used nitrogenous fertilizer. It is readily soluble in water and may pass into various water bodies through irrigation water and surface runoff especially during rains.

MATERIALS AND METHODS

Live specimens of *H. fossilis* (average body weight 8.70 gm ± 5 gm) were collected from local fish market of Lumding. Healthy fishes were acclimatized in the laboratory for 7 days. Prior to experimentation the fishes were transferred to glass aquaria (1' x 1' x 1'). During this period fishes were fed with fish feed available in local market and the aquaria water were regularly analyzed regarding their physico-chemical characteristics.

Urea was procured from local agrochemical dealers. The 96 hrs LC_{50} was calculated by regression analysis was found to be 10 mg/ 8 liter. After exposing the fish for 96 hrs an exposed and control fishes were removed and gills were dissected out carefully from cold-anaesthetized fishes. The excised tissue was fixed in aqueous Bouin's fluids for 24 hrs. After processing, the gills were dehydrated in ascending concentrations of alcohol cleared in xylene and embedded in paraffin wax (mp 60-62^{0}C).

HISTOPATHOLOGICAL AND HISTOCHEMICAL PREPARATION

Paraffin sections (5-6 um) were subjected to haematoxylene-eosine stains. Some sections were stained with PAS (Periodic Acid Sciff's) and AB (Acian blue) for observing the histpathological alteration in gill structure.

OBSERVATION

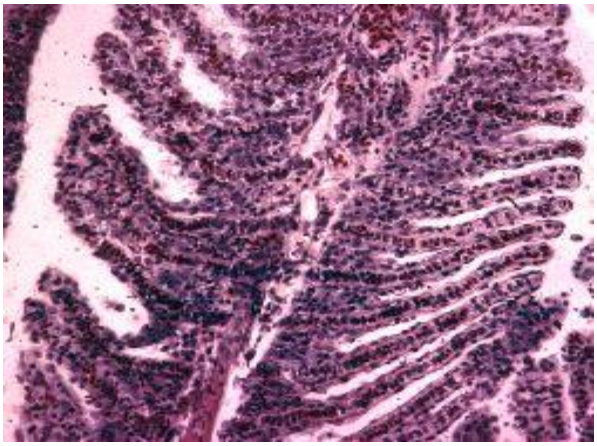
Control Gill

The light microscopy confirmed the well-known histological features of the gills. The thick tissue of the gill filaments is composed of mucous glands, taste buds and connective tissue. In sagittal section of the gill filaments are composed of mucous glands, taste buds and connective tissue (Fig.1). The gill filaments and the secondary lamellae appear as finger-shaped structure attached to the flat primary filament (Fig.2). As usual, the afferent artery supplies blood to lamellae of each filament through lamellar vessels and blood from them drained out via efferent lamellar vessels into efferent filament artery. The gill filaments epithelium is multileveled with numerous mucous glands (Fig.3). Cyto-chemical analysis of mucous glands revealed the presence of red and blue mucous glands by ABP/PAS technique (Fig.3).

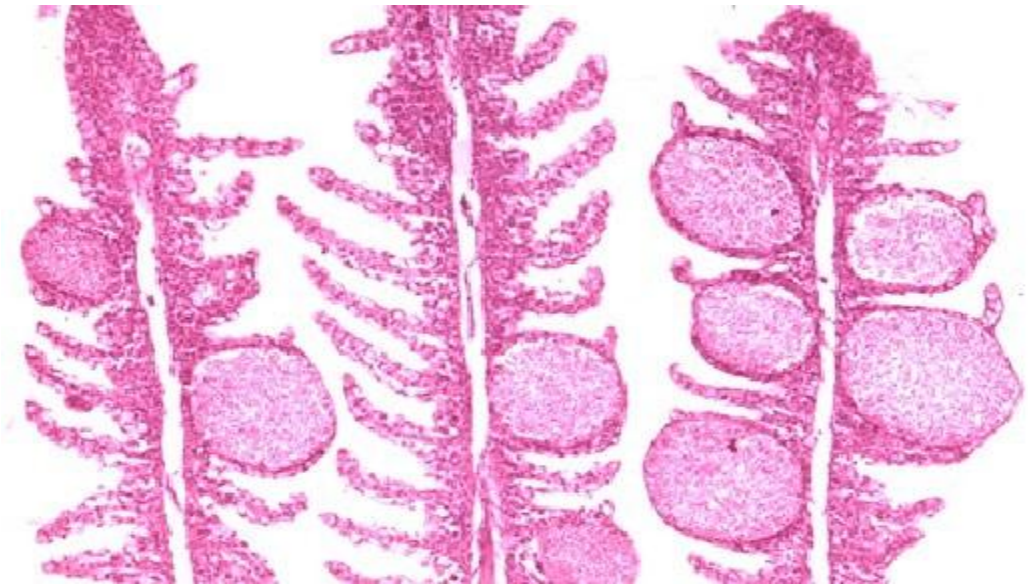
Experimental Gill

Gill of *H. fossilis* exposed to urea showed varying degree of alteration. After 96 hr of exposure the gill epithelium

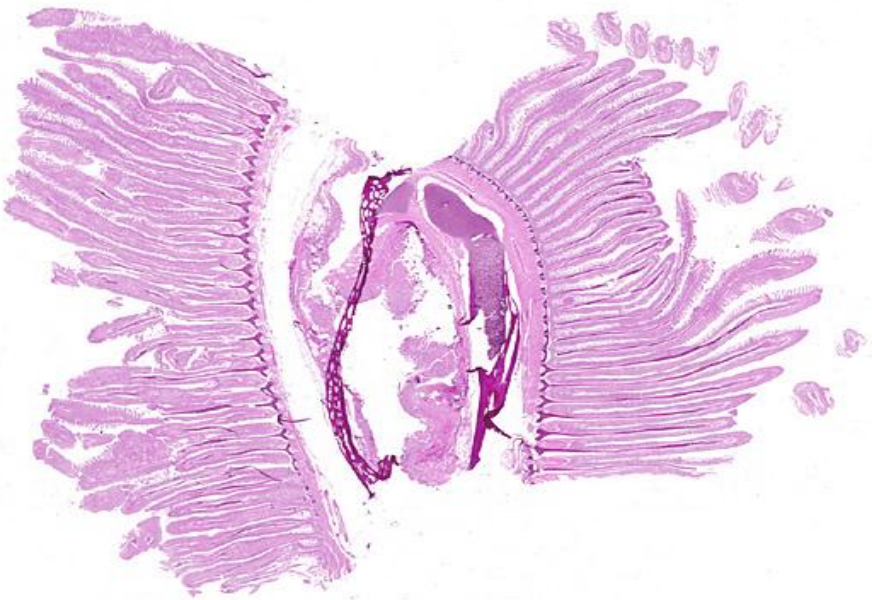
showed varying degree of hyperplasia, which was more pronounced in the filaments, particularly in the second lamella. This resulted in the fusion of many lamellae, markedly reducing the respiratory surface area (Fig.1). Mucous cells occurred abundantly, lamellae become swollen (Fig 2), sub-epithelial space, formed between the epithelium and the basal lamina appeared both in primary and secondary lamellae (Fig.3) and the space was filled with dislocated epithelial cells. Certain areas shoed total erosion of the secondary lamellae (Fig.3).



EFFECT OF UREA ON GILLS OF *H. FOSSILIS* *(LIGHT MICROSCOPIC STUDY)*



ICH OR WHITE SPOT ON THE GILL LAMELLAE AFTER 96 HRS OF EXPOSURE



WHITE SPOTS SHOWING ON THE GILLS SHOWS THE INFECTION CAUSED BY THE UREA EXPOSURE 96 HRS

DISCUSSION

Damage to the secondary lamellae as a result of urea exposure is potentially serious because of the possible effects on respiration. Huges and Morgan (1973) reviewed the general histopathological effect of pollutant on the secondary lamellae of fishes. Except a few major findings of the present study, similar types of findings have been observed by various workers in fertilizers and pesticides stressed fish gills, like Christie and Battle (1963), Baker (1969), Skidmore and Tovel (1972), Hart and Oglesby (1979), Adhikari (1993), Jha (1995), Maya Prasad (1994).

Regular ventilation of the gill in polluted waters containing urea. Regular ventilation of the gill in polluted waters irritably leads to changes in gill structure and function like, lifting of epithelial lining, necrosis, fusion, hypertrophy, hyperplasia as well as alteration in carbohydrate and protein distribution. Roy et.al., (1986) has reported similar observation due to Malathion exposure in the gills of Cirrhinus mrigala. Malat observed identical changes in gills induced by toxicants and other irritants.

Roy et.al., (1986) found decreased in the inter-lamellar space in the gills of Anabas in the response of sub-lethal dose of saponin. Jacobs et. Al., (1981) reported secondary lamellar fusion in rainbow trout. Similar fusion has been observed in the present study. According to Munshi and Singh (1990) the probable reason for the fusion of gill lamellae under the influence of certain initiation chemicals is due to dissociation and rearrange forming inter-lamellar bridges. The present study also explains the fusion of the gill lamellae in the similar manner. Identical changes have been observed by Adhikari (1993), which explains fusion of gill lamellae of H. fossilis leading to the formation of inter-lamellar bridge.

Lifting of the epithelium from the basement membrane of gill filament as have observed in the present investigation may be related to the inflammatory action (Christie and Battle 1963) of urea. The loss of secondary lamellae has also been observed. Similar observation has also been reported by Roy and Munshi (1991) in the gill of C. mrigala exposed to Malathion.

Fusion and loss of secondary lamellae may be because of an inherent response of the fish to reduce pollutant intake but in the process total respiratory surface area is decreased with decrease in Oxygen uptake (Singh and Munshi, 1990). Skidmore (1970) have also reported similar observation.

All the above factors reduce gas exchange efficiency of the gills and finally fish die of asphyxiation.

REFERENCES

1. Adhikari, Soma (1993): Histopathology of respiratory, digestive and reproductive organs of cat fish Heteropneustes fossilis exposed to certain commonly used pesticides. Ph.D. Thesis of Bhagalpur University.
2. Banerjee, B., Bhuyan G, Saha, N: Influence of environmental hypertonicity on the induction of ureogenesis and amino acid metabolism in air breathing walking cat fish (Clarias batrachus, Bloch). Indian j. Exp. Biol 2014; July 52(7): 728-738
3. Peterson S. and G. Goldspink. Some effect of prolonged starvation in the metabolism of red and white muscle. J. Biomed. and Life science, 1973; 146: 375-384.
4. Love R. M. 1970. The chemical biology of fishes. Academic Press, London, UK.
5. Maccarty N. Some blood parameters of a rainbow trout (Salmo gairdneir Riet) J. Fish Biol., 1973; 5: 1-8.
6. Larson K., K. Lawander. 1973. Comparative biochemistry and physiology A 44. 367-374 pp.
7. Gordon M. S. 1972. Animal physiology principle and adaptation. 2nd edition. Mc Milten, New York, USA.
8. Roy, (1988): Toxicity of anionic detergent, dodecyl benzene sodium sulphonate to a fresh water fish. Rita Rita.