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RESEARCH PAPER

Effect of Sumithion on Serum Cholesterol Levels of Fish *Amphipnous cuchia*

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ABSTRACT

The toxic effect of organophosphorus pesticide sumithion caused hypercholesterolemia to fish A. cuchia at all concentrations and exposures. It was more marked at shorter concentrations and prolonged exposures as compared to shorter exposures and higher concentrations.
Keywords: Cholesterol, Fish, Mud-Eel and Sumithion.

INTRODUCTION

The most abundant steroid, in all animal tissues is cholesterol. Cholesterol is the likely precursor of adrenal cortical hormones, and coenzyme-A is known to participate in cholesterol formation, since its metabolism is controlled by adrenal cortex and indirectly by the pituitary. The two primary bile acids formed from cholesterol in most mammalian species are cholic and chenodeoxy cholic acids (Danielsson, 1963). The gonads and adrenals utilize cholesterol in the synthesis of hormones. In fishes, serum cholesterol levels are several times higher than in humans. Marine fishes have lower cholesterol levels than fresh water fishes (Grant and Mehrle, 1973; Freimane and Grundule, 1975).

A variety of chemicals and pollutants disturb the lipid metabolism of animals, resulting in diseases and toxic symptoms (De Bruin, 1976). In the present study, the serum cholesterol levels of fish *A. cuchia* were observed due to the toxic effect of pesticide sumithion and results are given.

MATERIALS AND METHODS

The fresh water fish *A. cuchia* were taken out from the pond, near Madiyaon, in the suburbs of Lucknow, in the month of June 2006.

These were brought to Haemotology Laboratory of Division of Toxicology, Central Drug Research Institute, Lucknow, in wide mouthed pots in natural mud. They were washed 5 times in tap water and treated with 2% $KMnO_4$ for removal of infections, parasites etc. Normal, healthy and uninfected fishes were transferred to glass aquaria and were acclimated for 72 hours. Earlier, the lethal concentrations for 80 to 100% fish, were determined for 24 to 144 hours (Singh, 1982) fishes were exposed to six different concentrations of the pesticide 24, 48, 72, 96, 120 and 144 hours). After definite intervals and exposures fishes were taken out. The blood was collected from the live fish by puncturing the caudal vein in clean dry test tubes.

The clotted blood was centrifuged at 3000 r.p.m. for 15 minutes and serum was separated in another test tube. For estimation of serum cholesterol, Zlatkis et al. (1953) method was followed.

OBSERVATIONS AND RESULTS

The results obtained on serum cholesterol levels of the fish, *A. cuchia* exposed to six different concentrations of the pesticide for 24 to 144 hours, are as follows.

It did observed that the fish did not tolerate higher concentrations of the pesticide and died after short intervals of exposure with low increases its cholesterol levels. The levels had increased at of lower exposure of low concentrations of the pesticide. Maximum level was found after longest exposure of 144 hours at lowest concentration of 3.75 mg/l, while the minimum found at 6.50 mg/l concentration, after 48 hours. The serum cholesterol values obtained after 72 hours at 6.50 mg/l, after 48 and 96 hours at 6.25 mg/l, after 96 and 120 hours at 5.00 mg/l, after 48, 72, 96 and 144 hours at 3.75 mg/l concentrations were statistically significant ($P > 0.05$), while the rest of the values were not significant ($p < 0.05$).

DISCUSSION

Hypercholesterolemia was observed due to the toxicity of sumithion in rainbow trout and it was due to cholinesterase inhibitions at neuroeffector sites in adrenal medulla which resulted in excess secretion of adrenaline (Perrier et al., 1972), while DDT caused pathological symptoms in liver, intestine and kidney of brown trout fry (King, 1962). Cantarow and Trumper (1965) found a direct relationship between hepatocellular damage and disease in cholesterol ester of blood plasma. Industrial pollutants caused elevation in serum Lipids of laboratory rats (Rozhaja et al 1979). Phosphorus chemicals degrade the environment frivolously (Van-Wazar, 1978). Increase in phosphorus contents in the body interfere with different metabolic pathways. In small quantities, it is utilised for promoting different activities and the excess is excreted in some form or the other. Inorganic phosphate just above the normal physiological range affected the metabolism of red cells in human's ATP and diphosphoglycerate levels were increased due to oral administrations of isotonic phosphate and it resulted in hyperphosphataemia in children (Brain and Card, 1972).

Phosphate stimulated parathyroid glands which resulted in increased serum phosphorus levels and decreased calcium levels in rats. Sumithion caused atresia of oocytes in *Garra mullya* (Pawar and Katdare 1983). The atresia of follicles may be due to inhibition of enzyme in steroidogenesis. A decrease in GSI was also observed. The present findings are supported by work of other workers, as the toxicity of sumithion evidently increased serum inorganic phosphorus levels of the mud-eel, *Amphipnous cuchia*. The behavioural changes seen in the mud eel, *Amphipnous cuchia* were well marked evidences on the toxic effects and discomforts felt by the fishes, which died when the dose became lethal. The fishes tried to ward off the toxic effects in the beginning and phosphorus levels increased, to the climax and then started falling until the fishes were exhausted and killed due to continued exposure to the toxic environment. Significant toxicity was observed due to agricultural fertilizers in fishes (Altnok and Capjub, 2007, Goel et al., 1982, Gopal et al., 1982, Singh, 1982, Naqvi, 1983, Abidi, Rehana, 1990, Abel, 1974, Hisar et al., 2004).

Carbon tetrachloride and DDT caused elevation in serum cholesterol levels of rats and rhesus monkeys (Valcazar; 1980; Agrawal et al 1980). The toxic effects of pesticide sumithion observed in the fish *A. cuchia* are well comparable with the works of other workers. Hypercholesterolemia observed at different concentrations give the clear idea of toxicity produced by the specific dose used for that period.

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REFERENCES

Abidi, Rehana, (1990). Effect of endosulfan on blood urea of *Channa punctatus* (Bloch). Nat. Acad. Sci. Letters, 13(2), 73-76.

Agrawal N., Sanyal, S. Khuller, G.K., Chakravarti, R.N. and Subramanyam, D. (1980). Indian J. Biochem. Biophys., 17, 242.

Altnok, I. and Capjub, E. (2007). Histopathology of rainbow trout exposed to sub lethal concentrations of methiocrab or endosulfan Toxicol. Pathol. 35, 405-410.

Abel. P. D. (1974). Toxicity of synthetic detergents to fish and aquatic invertebrates. J. Fish Biol. 6 : 279-298.

Brain, M.C. and Card, R.T. (1972). Effect of inorganic phosphate on red cell metabolism in vitro studies. Adv. Exp. Med, Biol. 28, 145-154.

Cantarow, A. and Trumper, M. (1965). Clinical Biocghemistry, 6th Edition, W.B. Saunders Co. Philadelphia.

Danielsson, H. (1963). Adv. Lipid Res., 1, 335.

De Bruin, A. (1976). Biochemical Toxicology of Environmental Agents, Elsevier North Holland, Biomedical Press, 687.

Grant, B.F. and Mehrle, P.M. (1973). J. Fish Res. BD Kan, 30, 31.

Goel, K.A. Tyagi, S.K. & Awasthi, A.R. (1982). Effect of Malathion on some haematological values in *Heteropneustes fossils*. Comp. Physical Ecol. 7: 259-261

Gopal, K. Khanna, R.N., Anand, M. & Gupta, G.S.D. (1982). Haematological changes in fresh water fish exposed to Endosulfan. Indust. Health 20: 157-159.

Hisar, S.A., Hisar, O. Yanik, T. and Aras, S.M. (2004). Inhibitory effects of ammonia and urea on gillcarbonic anhydrase enzyme activity of rainbow trout *Oncorhynchus mykiss*. Environ, Toxicol. & Pharma. 17, 125-128.

King, S.F. (1962). In environmental pollution by Pesticides, Ed. CA Edwards, Plerum Press, London.

Naqvi, M. S. (1983). Effect of Environment Pollution on Physiology of Fresh Water Fishes. Ph.D. thesis, University of Lucknow, Lucknow

Pawar, K.R. and Katdare. M. (1983). Effect of sumithion on the ovaries of fresh water fish *Garra mullya* (Sykes) Curr. Sci. 52. (16), 784-785.

Perrier, H., Perrier, C., Gudelfin, Y. and Grass, J. (1972). Comp Biochem. Physiol., 43, 341.

Rozhaja, D.A., Dermaku, S., Halili, F., Rizvanolii, S. and Berisha, A. (1979). Acta. Biol. Med. Exp, 4, 93.

Singh, R. K. (1982). Ecophysiological Studies on Some Fresh Water Fishes Ph. D. Thesis, University of Lucknow, Lucknow.

Van-Wazar, J.R. (1978). In Phosphorous in the environment. Its Chemistry and Bio-chemistry Ciba Foundation Symposium, 5 (New Series), 5-15.

Valcazar, A.A., Heerera, I. Munez, C.R. and Lucas, G.J. (1980). Arch. Pharmacol. Toxicol, 6, 750.

Zlatkis, A. Zak, B. and Boyle, A.J. (1953). J. Lab. Clin. Med., 41, 486.

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