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Fluoride Induced Biochemical Changes In Cyprinus Carpio

Suryawanshi V. D., Gaur S. R., Kharate D. S.
Department of Zoology, Sant Ramdas Arts, Commerce & Science College Ghansawangi, Ghansawangi, Maharashtra, India

ABSTRACT

Fluoride ions are directly toxic to aquatic life and accumulate in the tissues where absorption rates exceed excretion rates. In the present investigation, the toxicity of fluoride to fresh water fish, *Cyprinus carpio* was evaluated after exposure to Lethal & Sub-lethal concentrations of naturally occurring fluoride water (4.285 F mg/ L) for 96h. Changes in biochemical parameters of Muscle, Liver, & Kidney were recorded. There is significant depletion of Lipid, Carbohydrate & Total protein in all the tissues, at both the concentrations.

Keywords: Fluoride, Biochemical Parameter

I. INTRODUCTION

Fluoride is widely distributed in the environment. It occurs most abundantly in ores, such as fluorspar (CaF_2), phosphate and silicate minerals, such as fluroapatite [CaF_2. $3Ca_2(PO4)_2$]; and in topaz [$AL_2SiO_4(F, OH)_2$]. It is also present in lesser amounts in most igneous (210 to 1000 ppm) and sedimentary (180 to 940 ppm) rocks. Normal mineral soils average 200 to 300 ppm fluoride. Generally, sandy soils contain less than average amounts of fluoride while heavier soils contain more. Fluoride is a normal constituent of natural waters. The fluoride content of surface water depends on the water source and the amount of precipitation. Sources of excess fluoride intake for animals are diverse and mainly include drinking water; soil rich in soluble fluoride may also be responsible for fluorosis in grazing animals, particularly when growing vegetation is small and scanty. Toxicity arising due to airborne fluoride is rare and oral intake remains the major route of excess fluoride uptake. The effects of fluoride in drinking water on animals are analogous to the effects on man (McKee and Wolf, 1963). Fluoride accumulates in bone rather than soft tissues, leading to tooth damage and bone lesions. Hence the present investigation was undertaken to evaluate the toxic effects of fluoride on certain biochemical parameters in different tissues of fresh water fish, *Cyprinus carpio.*

II. METHODS AND MATERIAL

Cyprinus carpio, weighing about 250 gm., were collected from a nursery pond at Sawargaon in Umri Tahsil of Nanded district at a distance of about 50 km. from Nanded. The animals were brought to the laboratory and

were acclimatized to lab condition for four days. They were fed with rice cake and groundnut cake. The fluoride water was obtained from bore well in nearby area and tested in Public Health Lab. for fluoride concentration. The reports indicate that, the bore water contained 4.285 mg/lit, while the permissible limit is 0.5 to 1.5 ppm. /lit (WHO, 1994). The people who consume this water show typical symptoms of fluoride toxicity. Similarly, the livestock maintained by the inhabitants show fluoride toxicity. Majority of the residents have tooth decay, mottling of teeth, bent bones and general weakness. Water collected from these areas was diluted hundred times while some water was kept undiluted. The experimental animals were divided in ten groups each containing ten animals and were exposed to undiluted fluoride water, for study of LC_{50s} Mortality was reached on fourth day. The behavioural changes during four days of exposure were noted. All the fish were sacrificed for sampling. The muscle, liver & kidney were pooled for biochemical estimations. Total proteins were estimated by the method of Biuret (1951).Total Fats were estimated by using Ethanol-ether method (Folch *et al.,* 1957), while glucose was estimated by using Anthrone Method (Oser, 1965) as represented in graph.

III. RESULTS AND DISCUSSION

Biochemical parameters	Tissues	Control	Lethal conc. of fluoride	Sub lethal conc. of fluoride
Total protein	Muscle	0.46± 0.11	0.1±0.01 P<0.001	0.19 ±0.08 P>0.001
	Liver	0.27 ±0.013	0.07 P<0.001	0.18 ±0.009 NS
	Kidney	0.18 ±0.009	0.26 P<0.01	0.18 ±0.009
Carbohydrates	Muscle	0.16 ±0.08	0.04 P>0.001	0.15 NS
	Liver	0.21 ±0.14	0.03 P>0.001	0.12 ±0.06 P>0.05
	Kidney	0.19 ±0.11	0.03 P>0.05	0.08 ±0.03 P>0.05
Lipids	Muscle	0.16 ±0.07	0.02 P>0.01	0.04 ±0.002 P>0.05
	Liver	0.04 ±0.002	0.02 P>0.01	0.01 P>0.01
	Kidney	0.04 ±0.002	0.02 ±0.001 P>0.05	0.02 ±0.001 P>0.05

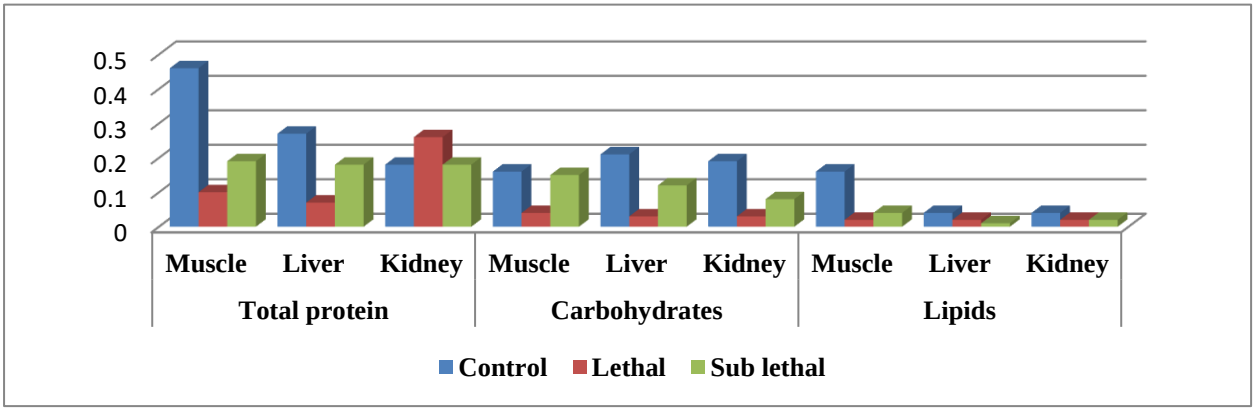
Table no.1

Showing the Effects of fluoride on different biochemical parameters of freshwater fish, *Cyprinus carpio* at 96h, in 100mg/wet. Wt of tissues, the values are expressed in mean of 6 observation ±SD, Significant at 0.05 &0.01

Total protein: Fish were exposed in lethal concentrations of fluoride water after 96h, showed highly significant decreases in total protein content muscle & liver (P<0.001),significant. While significant increase (P<0.01) was observed in kidney. In sub lethal exposure, after 96h, total protein content in muscle decreased significantly (P>0.001), but decreases in total protein content of liver was insignificant. No alteration was found in kidney.

Carbohydrates: In lethal the carbohydrate content was highly decrease significant (P>0.001) in muscle & liver. In the kidney carbohydrate content was also significantly reduced (P>0.05). In the sub lethal concentration the carbohydrate content in muscle decreased insignificantly, while in liver & kidney, it was decreased significantly (P>0.05), after 96h.

Total Lipid: In the muscle & liver the total lipid content was significantly decreased (P>0.01) after 96h in lethal concentrations. In sub lethal it was significantly decreases (P>0.05) & (P>0.01) in total lipid content of muscle and liver. Total lipid content of kidney also decreased significantly (P>0.05) (Graph No- 1).The results is summarised in table and graph



The decreased biochemical composition in different tissue due to fluoride intoxication *Cyprinus carpio* as observed here is similar to the observation of (Gupta, 2003) with *Channa punctatus* after exposed to fluoride for 90 days. This decrease may be due to the blocking of the metabolism of amino acid, thereby preventing cells from synthesizing protein. In fact, studies have shown that fluoride inhibits protein synthesis (Chinoy, 1994) and interferes with amino acid metabolisms (Pandit, 1940). Another possible reason for depletion of protein may be its conversion in to glucose (Srivastava, 2002) or utilization of protein in the form of mucoprotein which is eliminated in the form of mucus by the fish to combat toxic stress. Several studies have revealed that fluorides inhibit many glycolytic enzymes (Camargo, 2003).The decline in sugar content of liver & muscle suggest enhanced conversion of glycogen to glucose to meet an increased energy requirement under stress conditions. Kasturi and Chandran (1977) have also made a similar observation in their study with *Mystus gulio* exposed to lead. Radhaiah *et al* (1987) observed decreased carbohydrates content in heptachlor intoxicated fish, *Tilapia mossambica* and stated related it to rapid utilization of carbohydrates by the tissue possibly to overcome the pesticides induced stress. Koundinya and Ramamurthy (1979) reported hyperglycaemia accomplished by a decrease in the levels of glycogen in liver and muscle of fish.

The decreased lipid content may be due to the inhibition of lipid synthesis by Fluoride as well as increased utilization of stored lipids as a source of energy to conduct regular metabolic function. Fluoride is a well-known enzyme inhibitor like against lipase, phosphatase, & esterase. It interferes with fatty acid oxidation (Batenburg, 1972) and also inhibits the enzymes acetyl Co-A synthetase involved in fatty acid oxidation. Singh

et al (1985), also have found decreased lipid content in the liver of rabbits treated with fluoride. Thus depletion of lipid content may be due to inhibition of these enzymes.

IV.REFERENCES

[1] . Batenburg JJ, Vanden Bergh SG. (1972).The mechanism of inhibition by fluoride of mitochondrial fatty acid oxidation. Biochim Biophys Acta 1972; 280:495-505

[2] . Chinoy NJ, Barot VV, Mathews M, Barot JM, Purohit RM, Ghodasara NG, et al. (1994). Fluoride toxicity studies in Mehsana District, North Gujarat. J Environ Biol 1994; 15(3); 1963-70.

[3] . Camargo, J. A. (2003). Fluoride toxicity to aquatic organisms: A review, Chemosphere. 50(3): 251-64

[4] . Gupta R. (2003). Pathophysiological consequences to fresh water fish channa Puntatus induced by Fluoride PhD dissertation. Lucknow: University of Lucknow: 2003

[5] . Koundinya, P.R. and Ramamurthy, (1979). Effects of Organo Phosphate Pesticides Sumithion (Fenitrothion) on some aspects of Carbohydrates Metabolism in a Fresh Water Fish Sarotherodon (Filpia) Mossambica (Peters). (Switz.) 35, 1632

[6] . Kasturi, J . and Chandran , M.R. (1977). Sub- lethal effects of lead on feeding energetic, growth performance, biochemical composition and accumulation of the estuarine catfish, Mystus galio (Hamilton). J. Environ Biol. 18 (1): 95-101

[7] . McKee, J. E. and H. W. Wolf. (1963).Water Quality Criteria. 2nd Edition. State Water Quality Control Board, Resource Agency of Calif. Public. No. 3-A. Sacramento, Calif.

[8] . Pandit CG, Narayana RD. Endemic fluorosis in south India: (1940). Experimental production of chronic fluorine intoxication in Monkey (Macaca radiata). Ind J Med Res 1940; 28:559-74

[9] . Radhaiah, V.,Giriraja, M., Raok, J., (1987). Changes in selected biochemical parameter in the kidney and blood of the fish Tilapia mossambica (peters) exposed to heptachlor, Bulletin of Environmental Contamination Toxicology. 39, 1006-1011.

[10] . Srivastava N, Kaushik N, Gupta P.(2002).Zinc induced changes in the liver and muscle of fish Channa punctatus (Bioch). J Ecophysiol Occup Hlth 2002;2:197-204.

[11] . Singh J.P , Shashi ,Thaper SP.(1985). Effect of fluoride on total lipid, cholesterol and triglyceride levels in liver of albino rabbits. Fluoride 1985 ; 18: 146-9

[12] . WHO. (1994). Fluoride and oral health: Report of WHO expert committee on oral health status and fluoride use. Geneva, Switzerland: World Health Organization.