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EFFECT OF METHYLMERCURY POLLUTION ON METABOLISM OF *CHANNA PUNCTATUS* (BLOCH).

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ABSTRACT
Methylmercury which is organic form of mercury is toxic for aquatic ecosystem. Different biochemical and physiological abnormalities are assessed in fishes due to water pollution of methylmercury. Mercury carried in aquatic ecosystem becomes a part of food chain and creates problem for human beings as fish is rich protein food popularly consumed by society. In present investigation the fish *Channa punctatus* was exposed to different concentrations of methylmercury. Fishes were divided in five groups i.e.G1-G5.Experiment was carried for 45 days and 15 days recovery period. The effects on survival, behaviour, growth were studied weekly. The biochemical parameters as blood glucose, liver and muscle glycogen were estimated to find out the effect on carbohydrate metabolism.

KEY WORDS: Blood glucose level (BGL), Liver glycogen level (LGL), methylmercury chloride (mmc), muscle glycogen level (MGL).

INTRODUCTION

A review of the available literature reveals that most of the experiments on water pollution are concerned with bioassays test,only a limited number of report mercury pollution in fishes (Mckim,et al;1970, Phillips et al;1980). Several studies have reported that the blood glucose, tissue glycogen level of fishes act as good parameter to assess the health of fish (Naidu *et al.,* 1984, Rajalekshmi *et al.,* 1993; Javed *et al.,* 2014). Metal present in any aquatic ecosystem enter the cell of fishes and effect the metabolism (Javed *et al.,* 2015).Heavy metals as lead and zeolite effect biochemical parameters (Cogun *et al.,* 2013)and also accumulate in muscle (Yacoub et al;2012). It was therefore thought worthwhile to investigate the effect of methylmercury pollution on several aspects which have not received the attention they deserve. In this study effect on general, feeding behaviour, growth, mortality, blood glucose level, liver and muscle glycogen were investigated.

MATERIALS AND METHODS

Four hundred fishes *Channa punctatus* 0.008 mg/l mmc
Belonging to 1+ age group (av. weight 21.0gm, av. length 130 mm) were selected for experiment and were acclimatized for fifteen days in plastic pools on pelleted diet.
Fishes were divided into five groups at sublethal concentration of 1.12%,2.9%4.6% and 6.2% of 48 hours LC 50 value{(=0.268 mg/l for methylmercury (mmc)}
G1 = Control (water free from mmc)
G2 = 0.004 mg/l mmc
G3 =0.008 mg/l mmc
G4 =0.013 mg/l mmc
G5 = 0.017 mg/l mmc.

Fishes were exposed to pollutant water for 45 days and then transferred to normal water free from mercury for 15 days Weight of fishes was taken every week during experiment.
Biochemical studies (a) Blood Glucose (BG) level was estimated following using Nelson Somogyi method.(b) Liver glycogen (LG) and muscle glycogen (MG) estimations were done using Rex-montogery method.

RESULTS

a) General Behaviour-

Fishes belonging to group G3, G4 and G5 fishes showed disturbed swimming as they were transferred to mmc concentrations. The opercular movement increased at initial stage and after 48 hrs it was normalized. In G4 & G5 later

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on fishes were seen lethargic and motionless, but as they were transferred to control water (free from mmc water) all showed varying degree of recovery. The feeding behaviour was subnormal in G5 group after 15 days and poor from 30 to 45 days and showed normal feeding when restored to mercury free water.

b) Survival and Growth-

It was observed that there was retardation of growth in G2 to G5 as compared to control. Similarly the mortality was higher in G4 and G5 exposed to higher concentration (0.013 and 0.017).

Biochemical changes-

Blood glucose level-

Results are graphically presented in Fig 1.1. A close examination of the data reveals that there was an initial increase for a week in all experimental groups followed by a rapid decline in blood glucose level. Rate of decline depended on exposure level being greater with each higher level. Restoration of mercury free water after 45 days exposure for 15 days resulted in rapid restoration of blood glucose level in the effected fishes so much that at the end of 15 days the value were higher than the control.

An abbreviated table giving data of key significance in given below:

Table 1. Changes in blood glucose due to methylmercury

Exposure Levels (ppm)	Blood glucose% Days			
	7	30	45	60(R)*
0.004	+8.69	+1.1	-2.2	+2.18
0.008	+18.47	+3.3	-13.04	+4.92
0.013	+25.00	+10.0	-15.21	+9.29
0.017	+30.43	-2.22	-18.82	+11.47

(R)*=Recovery

(ii) Liver and Muscle glycogen-

Changes in glycogen level, both in liver and muscles are presented in Fig 1.2 and key data of significance is given in Table (2).

It is evident from the data that there is continuous and consistent depletion in both liver and muscle glycogen. The depletion being concentration and time dependent, increasing with time and concentration .Restoration to normal water conditions brought reversal of depletion trend but the level remained below the control glycogen values even after 15 days.

Table 2. Changes in glycogen level, both in liver and muscles.

Group	Tissues	Days			
		7	30	45	60(R)*
0.004	Liver	8.6	13.04	13.33	5.49
	Muscle	7.3	20.5	22.25	10.14
0.008	Liver	13.51	17.77	21.66	10.04
	Muscle	8.03	22.94	25.81	13.04
0.013	Liver	14.59	23.33	26.66	14.83
	Muscle	14.92	28.82	31.75	24.64
0.017	Liver	20.00	27.77	30.66	18.23
	Muscle	23.88	35.29	40.65	30.43

*=Recovery

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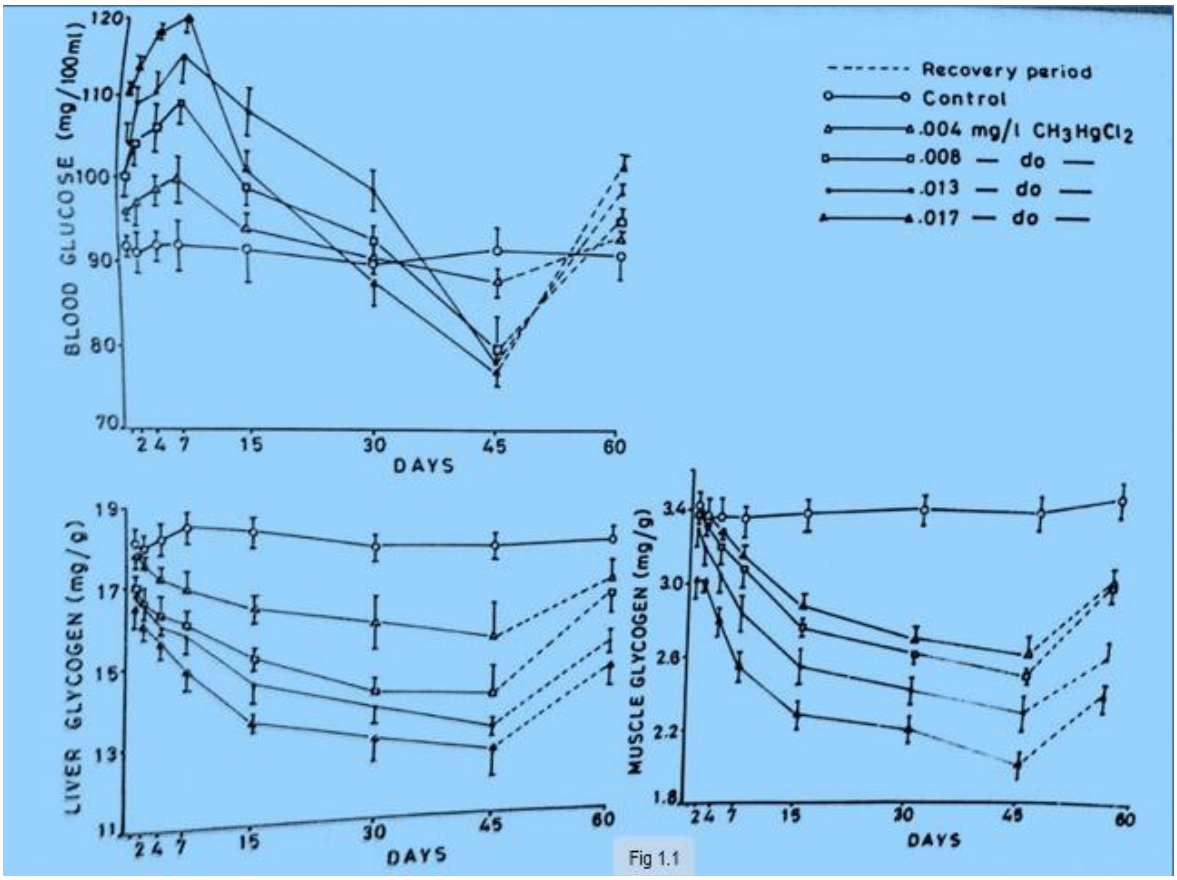

Figure 1.1 Showing changes in blood glucose level, liver and muscle glycogen in Channa punctatus under different exposure levels of methylmercury chloride, Bars indicate standard error and broken lines recovery period.

DISCUSSION

The biochemical and physiological parameters have great important role when fishes were exposed to polluted water. The present investigation showed that mercury effect the glucose and glycogen level .Carbohydrate metabolism is also disturbed due to mercury stress in water. Industrial effluents effect changes in carbohydrate metabolism (Palanisamy *et al.*, 2011; Yousaf zaj *et al.*, 2011). The slowdown of feeding affects the liver and muscle glycogen. Prolonged mercury stress in fishes created weakness in fishes which reduces the glycogen level.(Mesmar *et al.*, 1987). Blood glucose and glycogen levels indicate direct stress (David *et al.*, 2005) in *Labeo rohita* due to intoxication. The glucose level is affected due to glyconeogenesis and glycolysis. Due to heavy metal pollution the liver enzyme activity is effected (Bedi *et al.*, 2005). Thus blood glucose, liver and muscle glycogen are sensitive indicators of environment stress caused in fishes by particular pollutant.

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