Bull. Environm. Contam. Toxicol. 22,017-020 (1979)

Alteration in Enzyme Activities in Liver and Kidney of *Channa punctatus* Exposed to Endrin

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ELLER (1971) studied the histopathological changes in the liver, gill, brain, pancreas and gonads of Salmo clarki. Hyperplasia of the islets of Langerhans was observed when chronically exposed to endrin by bath or in food. EISLER and EDMUNDS (1966) observed that northern puffers (Sphaeroides maculatus) exposed acutely to sublethal concentrations of endrin and impaired liver function as evidenced by the transfer of major cations from the hepatic tissue into the serum and by elevated serum cholesterol. FERGUSON et al. (1955) and SAANIN (1960) have reported that endrin in water is highly toxic to fishes. SASTRY and SHARMA (1977a) have reported that endrin interferes with the physiological functions of the liver and kidney of fishes. GRANT and MEHRLE (1970) investigated various physiological parameters of growth, reproduction, thyroid activity, intermediary metabolism and osmoregulation in Carassius auratus chronically exposed to endrin by bath.

The present communication deals with the alteration in the activities of few enzymes in the liver and kidney of Channa punctatus exposed to endrin in vivo.

MATERIALS AND METHODS

Treatment: Live fishes (varying from 10 to 15 cm in length and from 50 to 70 g in weight) were collected from local fresh water sources and were maintained in the laboratory aquaria. Before experimentation, fishes were allowed to acclimatize to the laboratory conditions for 2-3 days. The fishes were treated with a sublethal concentration (0.01 mg/L) of endrin for 30 days in tap water. Controls were maintained in endrin-free tap water. In each case, 20 fishes were examined.

Enzyme assay: After 30 days of treatment, both groups of control and experimental fishes were dissected and liver and kidney were collected. Ten percent (W/V) homogenates were prepared in 0.25M sucrose solution. The homogenates were centrifuged for 20 min at 1,000 g and the clear supernatant fluids were used as the source of enzymes. 0.016 M sodium-β-glycerophosphate was used as the substrate in pH medium of 9.3 and 5.0 for alkaline

0007-4861/79/0022-0017 $0.100

and acid phosphatase, respectively. The inclubation time was 1 h. The enzyme activity was estimated by the method of BODANSKY (1933). SWANSON (1965) method was followed for the estimation of glucose-6-phosphatase activity. 0.01 M glucose-6-phosphate solution was incubated for 15 min at a pH of 6.5. Amylase activity was estimated by BERNFELD method. The incubation period was 15 min. BIER (1955) method was followed for the estimation of lipase activity with Tween 20 as substrate. Enzyme protein was estimated by the method of LOWRY et al. (1951) using bovine serum albumin as standard. The t-test described by FISHER (1950) was employed to calculate the statistical significance between control and experimental values. All the incubations were conducted at 37°C.

RESULTS AND DISCUSSION

The results of the experiments are presented in Table 1. The activities of all three phosphatases and the lipase in the liver was inhibited by treatment of fishes by endrin. In contrast to liver, the three phosphatases showed a slight elevation in activity in the kidney. However, the stimulation of alkaline and acid phosphatases was statistically insignificant.

In our previous report (SASTRY and SHARMA 1977a) with the same concentration of endrin and treatment period for 20 days a slight elevation in acid phosphatase activity was observed in liver but this was statistically insignificant. In kidney, the activity showed a significant raise. Acid phosphatase is a lysosomal enzyme and, according to NOVIKOFF (1961) and DE DUVE (1968), the increased lysosomal activity occurs as a part of the prenecrotic changes. It is probable that after 20 days of treatment cellular damage is more severe and this is accompanied by an elevation in acid phosphatase activity. After the initial assault there may be regeneration and repair of damaged tissue and accordingly acid phosphatase shows a trend to return to the normal level. Alkaline phosphatase is a brush border enzyme involved in the transphosphorylation reactions. The inhibition of the activity of this enzyme in liver indicates that the transphosphorylation reactions are adversely affected in this organ. As the liver is the main detoxication organ in the body, maximum damage to the physiological functioning is caused by endrin as revealed by the inhibition in the activity of alkaline phosphatase and glucose-6-phosphatase. However, within the treatment period examined here, much damage is not produced by the sublethal concentration of endrin selected in the present experiment. With a slightly higher concentration (0.03 mg/L) of endrin also, similar results are obtained (SASTRY and SHARMA 1977b).

In conclusion, it may be pointed out that treatment of Channa punctatus with 0.01 mg/L of endrin for 20 days, results in the inhibition of some enzymes like alkaline phosphatase and glucose-6-phosphatase. However, the extent of the damage caused

TABLE 1

Enzyme Activities in Control and Experimental Fishes

Enzymes	Tissues			
	Liver		Kidney	
	Control	Experimental	Control	Experimental
Alkaline[c] phosphatase (3)	0.0571±0.025	0.0324±0.002(-)	0.0657±0.005	0.0750±0.005(-)
Acid[c] phosphatase (3)	0.567±0.004	0.0395±0.005(+)[b]	0.1115±0.006	0.1236±0.011(-)
Glucose-6-[c] phosphatase (3)	0.0418±0.025	0.0409±0.004(-)	0.0390±0.01	0.1231±0.033(+)
α-amylase[c] (3)	0.9326±0.132	2.2003±0.144(+)	-	-
Lipase[e] (2)	105±5	47.5±2.25(+)	72.5±1.25	60±5(+)

a.( ) represents the number of experiments conducted. Values are mean ± SE.
b. '+' indicates statistically significant difference from control values at 95% confidence interval.
c. Activity is expressed in mg. of inorganic phosphate liberated per mg. of tissue protein per hour at 37°C.
d. Activity is expressed in mg. of maltose liberated per mg. of tissue protein per hour at 37°C.
e. Activity expressed in lipase units per hour at 37°C.

is not so severe as to inhibit all enzymes; the activity of amylase increased. This may be due to the low concentration of endrin and the short term treatment.

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