

## The Effect of Endrin on the Histopathological Changes in the Liver of *Channa punctatus*

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A number of workers have investigated the toxicity of organochlorine pesticides to fishes and of these endrin has received much attention. HOLMBERG *et al.* (1972) reported enlargement of liver associated with disturbed liver function in *Anguilla anguilla*. In *Labeo rohita*, KONAR (1970) observed pathological changes in liver and kidney with heptochlor poisoning. FERGUSON *et al.* (1955), SAANIN (1960) and TARZWELL (1965) have shown that endrin in water is highly toxic to fishes. ELLER (1971) reported hyperplasia of the islets of Langerhans when cutthroat trout (*Salmo clarki*) were chronically exposed to endrin by bath or in food. The carbohydrate metabolism was also altered by endrin. Under chronic conditions, endrin affects the central nervous system and reproductive system of *Poecilia reticulata* and *Pimephales notatus* (MOUNT, 1962). In Indian teleosts, very little work has been attempted on the effect of endrin in different tissues. The present study deals with the pathological changes in the liver of endrin intoxicated teleost fish, *Channa punctatus*.

### METHODS AND MATERIALS

Alive fishes were collected from local fresh water sources and were left in all glass laboratory aquaria with tap water. Prior to experimentation, the fishes were allowed to acclimatize for two days. Forty fishes weighing 50 to 60 gms. were selected and divided into two groups. The first group of twenty fishes were intraperitoneally injected with a sublethal dose of 2.5 mg. of endrin/Kg. body weight in distilled water. The second group injected with the same volume of distilled water alone served as controls. After 8, 12 and 24 hour intervals, fishes were dissected and livers were fixed in alcoholic Bouin's fluid and paraffin sections of 6-8  $\mu$ m were cut and stained with haematoxylin/eosin.

### RESULTS

Treatment with endrin produced acute pathological changes in the liver of *Channa punctatus*. 8 hours after injection, the liver was characterized by hypertrophy of hepatocytes. The toxic changes were more severe in the centrilobular area than in the perilobular area. The centrilobular portion was necrosed, the nucleus showed an increase in size and in some liver cells. The cell membranes were ruptured. The cytoplasm was highly granular. The connective tissue showed degenerative changes and mostly was

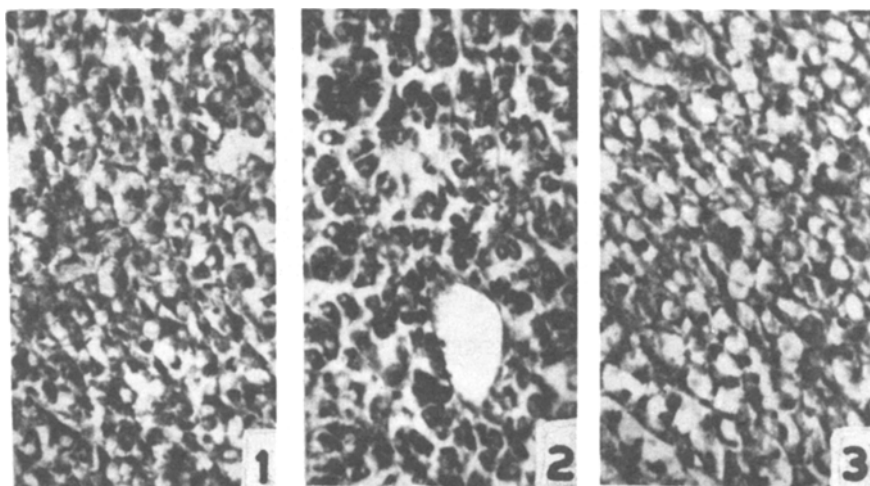
ruptured. In the perilobular zone, the only visible change was vacuolation of the cytoplasm. There was no change in blood vessels except for a slight shrinkage.

After 12 hours, the degenerative changes increased further. Hepatic cells were more swollen and the hypertrophy of nucleus was more pronounced than 8 hour stage. The liver on the whole showed necrosis and cirrhosis. Due to the connective tissue damage, intercellular spaces became widened. The cell membrane in majority of cells was ruptured. In contrast to the nuclear enlargement, the nucleolus showed disintegration and was almost dot-like in appearance. Connective tissue was thickened. Cytoplasm was granular. In the perilobular area, a few hepatic cells disappeared completely. No change was visible in the blood vessels.

At 24 hour stage, acute pathological conditions were produced in the liver. The whole structure of the liver was altered and it presented a torn up appearance. There was marked hypertrophy of hepatic cells. Necrosis was more severe. The cytoplasm of the cells disintegrated and due to its absence, the cells became empty and looked like vacuoles. The cell membranes in most of the cells were ruptured. The nucleus was slightly enlarged and nucleolus was degenerative. Shrinkage was more pronounced in blood vessels.

#### Explanation of Figures

- Fig. 1. Photomicrograph of T.S. Liver showing hypertrophy of hepatic cells after 8 hours X 400.
- Fig. 2. Photomicrograph of T.S. Liver showing connective tissue damage after 12 hours X 400.
- Fig. 3. Photomicrograph of T.S. Liver showing vacuolation in cytoplasm after 24 hours X 400.



## DISCUSSION

The histopathological changes produced in the liver of Channa punctatus by injecting 2.5 mg. of endrin/Kg. body weight have been studied at different intervals.

Some of the most conspicuous early changes were liver cord disarray, enlargement and pycnosis of nuclei, granulated cytoplasm and ruptures in cell membrane. The present observations point out that the effects produced by endrin are similar irrespective of the mode of administration. ELLER (1971) observed liver cord disarray, hepatic cells with mitotic figures, binucleated hepatic cells, swollen liver cells, atypical cells with enlarged nuclei, pleomorphic cells, acidophilic pigmented cells with eccentric nuclei and inflammatory foci in Salmo clarki exposed to endrin by bath for prolonged periods. Some of the observations being common, mitotic figures and binucleate cells were not observed in the present study. The changes mentioned above are not characteristic of prolonged periods alone but similar changes have been reported to occur in fishes exposed to short periods. BHATTACHARYA et al. (1975) have reported rupture and vacuolation of liver cells of Clarias batrachus exposed to 0.005 p.p.m. of endrin for 48 hours. According to them, the histopathological effects of endrin are proportionately greater in fishes exposed to higher concentrations. Thus it is evident from the present observations as well as from others that the overall changes produced by endrin are similar in nature. Variations in concentration and time period either increase or decrease the extent of damage but have no effect on the qualitative changes. Further it appears that the effects produced by endrin are not species specific, as similar changes are produced in different fishes.

The histopathological changes observed here are not characteristic of endrin alone but a number of organochlorine compounds are known to produce similar toxic effects. DDT and related compounds have been reported to produce identical histopathological changes (MATHUR, 1962a and b). SASTRY and AGRAWAL (1975) have shown that carbontetrachloride, also a chlorinated hydrocarbon, when administered intraperitoneally induced similar changes in the liver of Heteropneustes fossilis. It may be pointed out further that organochlorine compounds such as DDT act in a similar fashion in vertebrates other than fishes (FITZUGH and NELSON, 1947, 48; LITTLE et al., 1947; SARETT and JANDORF, 1947; KLATSKIN, 1956 and DURHAM et al., 1963). According to KENDALL (1974) and BAKER et al. (1972) mirex causes hepatocyte enlargement and bile stasis in rats.

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