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Hepatic Pathology in a Fresh-water Teleost *Channa punctatus* (Bloch) Exposed to Sub-lethal and Chronic Levels of Three Organophosphorus Insecticides

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Pathogenesis in fish tissues by organochlorine insecticides is well documented (Pimentel, 1971). However, only a few reports have appeared on histopathologic inductions in fish by organophosphorus insecticides and are restricted to studies made after pond applications or embryonic/fingerling/larval forms.
The present study presents the results of sub-lethal and chronic exposure of an adult fresh-water teleost to Diazinon, Methyl Parathion and Dimethoate. This is part of a program on the evaluation of histopathology as a possible detector of aquatic pollution by insecticides.

EXPERIMENTAL

Acquisition, care, maintenance, and insecticide treatment of the fish have been described (Anees, 1975). Sub-lethal and chronic concentrations of insecticides employed in the study are given (Table I).

TABLE I

Insecticides (ppm)	24h	96h	14 days
Diazinon	0.37	0.28	0.15
Methyl Parathion	1.15	1.05	0.90
Dimethoate	10.00	8.00	5.00

0007-4861/78/0019-0524 $1.00

Liver samples were fixed in Bouin's Fluid. After routine processing, 7-8 micra thick, serial, transverse, Paraffin-embedded sections were stained with Haematoxylin and Eosin.

RESULTS

Diazinon

Hepatocytes were considerably vacuolated and reduced in size after 24h exposure. 96h exposure produced lesser vacuolation but the liver gave a foamy appearance. Damage to the hepatic blood supply and the appearance of dark, granular cytoplasmic inclusions were characterized by 14 day exposure.

Methyl Parathion

24h and 96h exposures produced little vacuolation. However, damages to the blood supply and the appearance of dark, granular cytoplasmic inclusions were detectable as early as 24 hours which markedly increased after 96h exposure. Cytoplasmic vacuolation was highly increased and the dark granulation was decreased after 14 day exposure.

Dimethoate

Like 24h Methyl Parathion exposure, liver exhibited moderate vacuolation. However, cytoplasmic granulation did appear and was highly developed in case of 96h exposure, comparable to 14 day Methyl Parathion exposure. 14 day exposure had little effect by way of granulation or vacuolation. Some of the specimens showed evidence of parasitism.

DISCUSSION

The results have shown that the three test insecticides produced detectable liver injury in fish at both high and low concentrations. The same concentrations of these insecticides have already been observed to cause many tissue changes in the intestine of Channa punctatus (Anees, 1976) and disturbances in the distribution of serum proteins (Anees, 1974).

The onset and severity of liver lesions did not exhibit a definite pattern. In diazinon-treated fish, vacuolation appeared within 24 hours of exposure, whereas it was detectable in case of Dimethoate and Methyl Parathion after 96h and 14 day exposures, respectively. Dimethoate, known to be the least toxic of the organophosphates tested against C.punctatus (96h TLm 20.5 ppm - Anees, 1975) had little effect under prolonged exposure. However, 24h exposure did produce a high degree of cytoplasmic granulation.

The available evidence indicates that similar symptoms developed in fish liver after exposure to organophosphates. Kennedy and Eller (1969) reported that catfish liver was characterized by a marked vacuolation and that of goldfish by high cytoplasmic granulation after 200 ppb Methyl Parathion exposure. Granular dystrophy also developed in the liver of one-year and under-one-year carp exposed to Dimethoate for 25-30 days, but vacuolar degeneration was absent (Grishchenko, 1970). An increase in the SGOT and SGPT activity in fish liver after exposure to 2-10 ppm Malathion and other OP compounds was attributed to liver damage (Sakaguchi, 1972). Dylox has been reported to produce lipoid deposition in fish liver (Reichenbach-Klinke and Ollenschlage, 1972).

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