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Effects of Chlorpyrifos on the Kidney of Freshwater Catfish, *Heteropneustes fossilis*

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The toxicity of pesticides to non-target organisms has been reported to be of great concern, but their use can not be denied for economic reasons. In many countries, restrictions have been imposed on the use of organochlorine pesticides. This has shifted the use patterns away from the organochlorine toward organophosphate pesticides. Though several studies have reported the effects of organophosphorus pesticides on aquatic organisms but they are mostly restricted to mortality studies. Kumar and Pant (1984) have stated that histopathological studies are useful to evaluate the pollution potential of pesticides since trace levels of pesticides, which do not cause animal mortality over a given period, are capable of producing considerable organal damage.

Chlorpyrifos (O, O - diethyl O - (3, 5, 6 - trichloro -2-pyridinyl) phosphorothioate) is a widely used multipurpose organophosphate insecticide. In the present study we investigated the effect of chlorpyrifos on the kidney of a freshwater catfish, Heteropneustes fossilis.

MATERIALS AND METHODS

Live specimens of H. fossilis (50 - 70 gm) were collected locally and acclimatized to the laboratory conditions for a fortnight. Eighty healthy fish were finally selected and divided into two numerically equal groups - A and B. Group A served as controls and were kept in tap water containing acetone (0.5 ml/litre). Group B were employed as experimental and exposed to chlorpyrifos at a concentration of 2 mg/litre (acetone was used as carrier for the pesticide). Fish (10 from each group) from both the groups (A and B) were sacrificed at 24, 48, 72 and 96 hr after initiation of the experiment. Their kidneys were extirpated and

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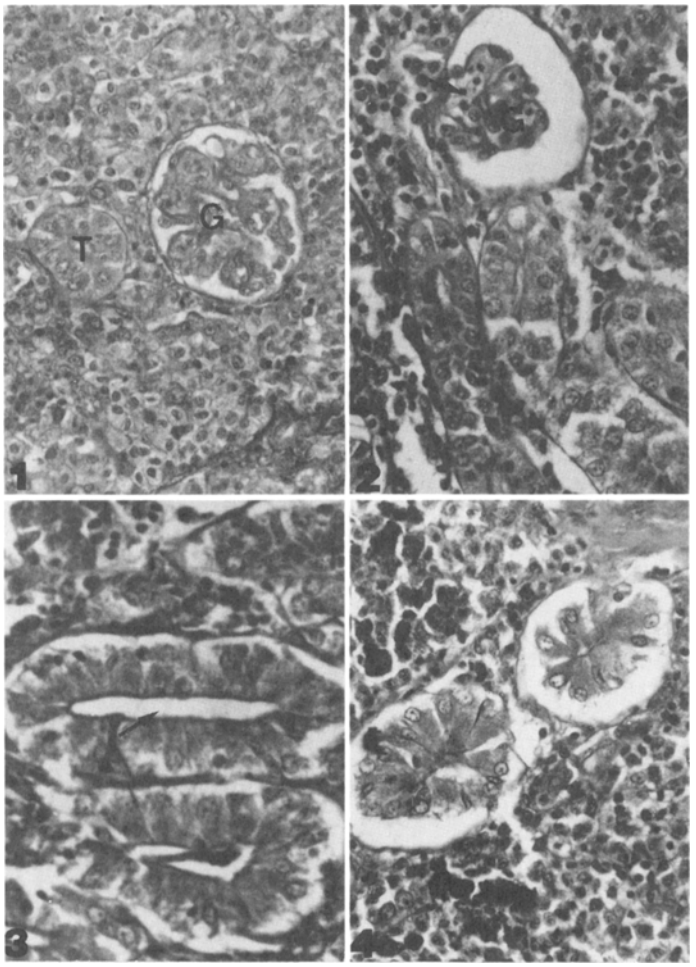

Figure 1. Photomicrograph of kidney of control fish. Mark the glomerulus (G) and tubule (T). Hematoxylin/eosin x 400.

Figure 2. Photomicrograph of kidney of 72hr chlorpyrifos treated fish. Note shrunken glomerulus (G) and vacuolated blood cells in the glomerular tuft (arrow). Hematoxylin/eosin x 400.

Figure 3. Dilation of the lumina of renal tubules (arrow) in the kidney of 72 hr chlorpyrifos treated fish. Hematoxylin/eosin x 400.

Figure 4. Fragmentation and necrosis in the renal tubule of 96 hr treated fish. Hematoxylin/ eosin x 400.

fixed in aqueous Bouin's fluid. Sections were cut at 4-6 μm after routine paraffin method and stained with hematoxylin/eosin.

Fish were not fed 24 hr before and also during the experiment.

RESULTS AND DISCUSSION

The structural details of the kidney of control H. fossilis are shown in Fig. 1.

No marked histological changes have been noticed in the kidney of chlorpyrifos - treated specimens up to 48 hr. After 72 hr following the chlorpyrifos treatment, the glomeruli are shrunken (Fig. 2) and the blood cells in the glomerular tuft become vacuolated (Fig. 2). The lumina of the renal tubules get dilated (Fig. 3) After 96 hr treatment, these changes are exaggerated. Moreover, the renal tubules are seen to be fragmented out and suffer necrosis at this stage (Fig. 4).

In the present study, chlorpyrifos treatment caused histopathological changes in the kidney of H. fossilis. Shrinkage of glomerular tuft noticed in the present study has also been reported in the past after exposure of pollutants - lindane (Colisa fasciatus - Verma et al. 1975), DDT (coho salmon-Buchlar et al. 1969), 3,3,4 triaminoazobenzene (Channa punctatus -Goel and Gard 1977), hydrothol - 191 (sunfish - Eller 1969) and carbofuran (Colisa lalia-Sukumar and Karpagaganapathy 1986).

The dilation of the lumina of the kidney tubules and necrosis of tubules as observed in the present investigation after chlorpyrifos treatment have been reported from various fish exposed to pollutants (Kumar and Pant 1981, 1984; Srivastava and Srivastava 1981; Casillas et al. 1983; Sukumar and Karpagaganapathy 1986; Gill et al. 1988).

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