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Branchial, renal and hepatic lesions in an estuarine mullet, *Liza parsia* Hamilton - Buchanan, induced by sublethal exposure to BHC

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ABSTRACT

Gill of *Liza parsia* exposed to sublethal concentration (0.5 ppm) of BHC responded initially with the copious secretion of mucus followed by oedematous separation of epithelial lining cells from the basement membrane. Fusion of secondary gill lamellae, tissue hyperplasia and multiple telangiectases (aneurysms) were noticed on day 10 of the exposure. By day 15, the entire interlamellar spaces became filled with the hyperplastic epithelium. Kidney revealed an initial hypertrophy of the cells lining proximal convoluted tubules followed by shrinkage in the glomerular tufts resulting in the increase of Bowman's space and oedema. Tubulonecrosis, hyperemia and fibrosis were noticed in the reneal tissue after day 19 of BHC intoxication. Exposure to BHC elicited an initial dilation of bile canaliculi, enhanced secretion of bile and cellular hypertophy on day 4. Necrotic changes like excessive vacuolation, and karyorrhexis and karyolysis were seen on day 8. By day 10 and 15, complete vacuolation of hepatocytes, pycnosis of nuclei and focal necrosis were noticed.

Introduction

Organochlorine (OC) pesticides have become very popular because of their broad spectrum insecticidal efficiency and relatively low operational cost (Ruvio, 1972). Benzene hexachloride (BHC) or hexachlorocyclohexane (HCH) is used extensively in India for pest management in agriculture and forestry (Basak and Konar, 1977). The pesticide gets accumulated in fish and thus finds its way to food chan (Ruvio, 1972; Dikshith *et al.,* 1990; *Bakre etal.,* 1990). Mathur (1964) has recorded the pathological symptoms in the liver of freshwater teleosts exposed to acute doses of BHC. However, nothing is known about the toxic effects of this pesticide on the fishes inhabiting coastal or marine environments (Sen Gupta and Qasim, 1985). Therefore, an attempt has been made to record the branchial, renal and hepatic lesions caused by sublethal exposure of BHC to the estuarine mullet, *Liza parsia,* a commercially important species inhabiting both the coasts of India.

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Materials and methods

Live specimens of *Liza parsia* (average length 10.5+0.8 cm, average weight 8.6±0.4 g) were collected by operating cast net from Vypeen Island (09°57.8', N, 76° 14.4' E') near Cochin and transported to the laboratory. Fish were acclimatised in the aquaria of 120 litres capacity containing well-aerated sea water (salinity 22 ppt, pH 7.69, oxygen content 4.32 ml/litre, water temperature 29.2°C) for a period of one week prior to use. Thereafter, they were divided into two equal groups of 40 specimens each at radom and were subjected to the following treatments.

Group A : Fishes were maintained in sea water and served as controls.

Group B : Experimental fishes were exposed to the sublethal (chronic-one-half of LC_{60} value for 96 hrs) concentration (0.5 ppm) of BHC (Hindustan Insecticides Limited, Delhi). Since the pesticide is insoluble in water, it was initially dissolved in acetone and the required concentration was achieved by adding sea water.

The media were renewed every alternate day. Since fish did not accept the formulated feed under the experimental conditions, they were not fed during the entire course of investigation. About 30 % mortality was observed among the Group B fishes after day 10 of the exposure. Dead fishes were removed immediately from the aquarium to avoid oxygen depletion and discarded from the study.

Five specimens from both the groups were killed on day 1, 2, 4, 8, 10 and 15 of the treatment. Tissues (gill, kidney and liver) were surgically removed and fixed immediately in freshly prepared aqueous Bouin's solution and Zenker's fluid. After 24 hrs, the tissues were washed thoroughly in running tap water, dehydrated in ascending series of alcohol, cleared in xylene and embedded in paraffin wax at 60°C. Serial sections were cut at 6-8 (i and stained in hematoxylin-eosin (H&E) and periodic Acid-Schiffs reagent (PAS).

Results

BHC exposure elicited excessive secretion of mucus in the interlamellar spaces of the gill by 24 hr. Dilation of blood vessels, swelling of the tips of secondary gill lamellae and partial separation of epithelial lining cells from the basement membrane were observed on day 2. By day 4, the experimental group mullets revealed lamellar oedema and complete separation of epithelial cells from the basement membrane of secondary gill lamellae. Furthermore, the epithelial cells of secondary lamellae depicted necrotic changes too (Fig.l). The first telangiectatic secondary lamellae was observed on day 8 (Fig. 2).

Fig. 1. Gill of *Liza parsia* on day 4 of BHC exposure. Mark the oedematous separation of epithelium from the basement membrane of pillar cells (arrow). H&E x 600.

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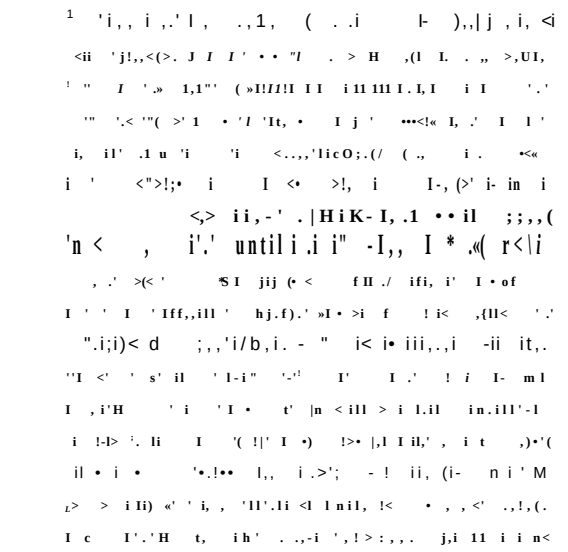

BHC treatment **for.** 2 clays elicited dilation of **bile canaliculi,** increased secretion **of bile** and cellular **hypertrophy.** Most of **the hepatocytes depicted cytoplasmic** vacuolation resulting in **the displacement of** nuclei **towards** the

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Fig. 9. Kidney of *Liza parsia* on day 12 of BBC exposure? exhibiting degenerative **changes** like **hyperemia, pycnosis** (arrow) **and** fibrosis (broken arrow), H&E x 800,

Liver is an important target organ affected by pollutants in fishes (Roberts, 1989). Several workers have reported degenerative changes in hepatic tissue subjected to pollution by various pesticides and insecticides (Kumar and Pant 1984; Gill *et al.,* 1990; Pandey *et al.,* 1993). The present observation in *Liza parsia* clearly demonstrates liver to be the organ affected most severely in response to BHC expsoure.

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