

## Toxicological Impact of BHC on the Ovary of the Air-Breathing Catfish *Heteropneustes fossilis* (Bloch)

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BHC, the organochlorine pesticide is used widely in the vast agricultural fields of Assam, India. During monsoon period, the pesticide reaches the neighbouring water bodies with runoff water and pollute the aquatic environment. (Kulshrestha et al. 1984). The dissolved pesticides in aquatic environment may induce effects on the reproductive potential of fish as revealed by some histopathological studies of the ovary of different fish exposed to pesticides. (Kapur et al. 1978, Kaur Kamaldeep et al. 1983, Kulshrestha et al. 1984, Mani et al. 1985, Sahai 1987, Modi et al. 1993).

In spite of the fact that the use of pesticide BHC is restricted on food plant, (Thakur et al. 1987). it is widely used in India (Kant 1987).

The present study is undertaken to investigate the detailed histopathological changes induced in ovary of *H. fossilis* exposed to sublethal dose concentration of organochlorine pesticide BHC (lindane) for a short term exposure of 72 hours.

### MATERIALS AND METHODS

Air-breathing fish *H. fossilis* (wet weight 20-25 gm, body length 8-10 cm) were collected from local pond and acclimatized to laboratory conditions in glass aquaria for two weeks. Fish were fed with commercial fish food, five days a week during acclimatization and toxicity test. Commercial grade hexachlorocyclohexane (Central Insecticides and Fertilizers, Indore, M.P. India, 50% wettable powder, 6.5%  $\gamma$ -HCH) was used in this study. Acetone: Ethanol (1:1, V/V) was used as a solvent for the preparation of stock solution. (Khargarot et al 1991)

The stock solution was diluted to 1 ppm, 5 ppm, 10 ppm concentration of BHC (which is less than Lc 50 value) and used as experimental test concentration. Control experiments with solvent were set side by side. The test water was renewed every 24 hours.

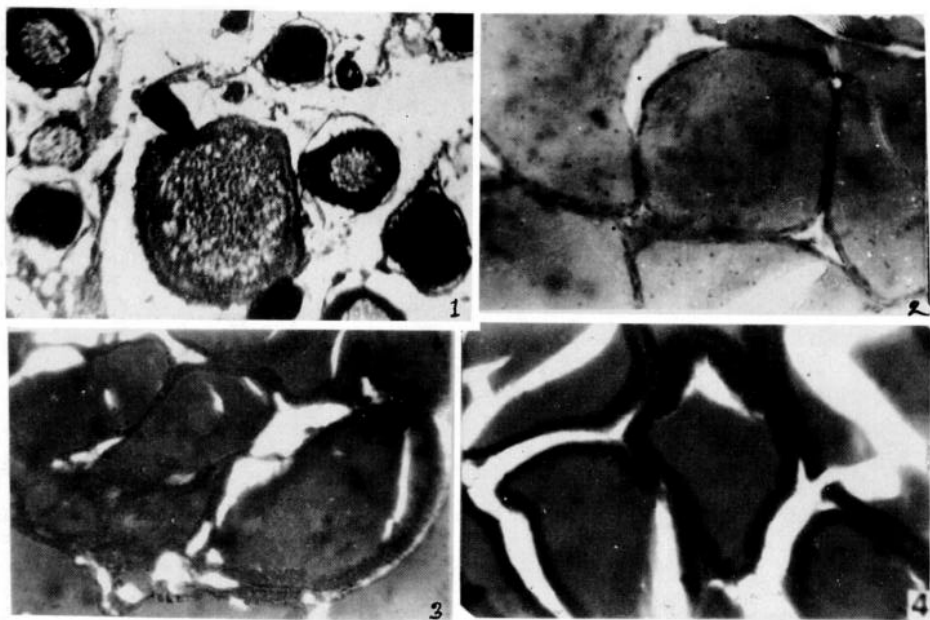


Figure 1. Histology of ovary of H. fossilis in control.  
[ X 400]

Figure 2. Ovarian histology of H. fossilis exposed to 1 ppm BHC concentration marked with dissolution of yolk granules, alteration in egg cell membrane and partial dissolution of ovarian follicles.  
[ X 400]

Figure 3. Ovarian histology of H. fossilis exposed to 5 ppm BHC, with marked dissolution of yolk granules, configurational changes in egg cells with thickening of germinal epithelium.  
[ X 400]

Figure 4. Ovarian histology of H. fossilis exposed to 10 ppm BHC, marked with benign cystic transformation of ovarian cells and conversion of germinal epithelium to tall columnar epithelium.  
[ X 400]

A group of ten fish with three replicates for each test concentration was tested in 60-L-glass aquaria. The room temperature was 25-30°C at the time of experiment. After 72 hours fish were taken out and sacrificed and immediately ovaries were fixed in carnoy's fixative. The paraffin sections were made and stained with hematoxylin and eosin for histopathological study.

## RESULTS AND DISCUSSION

The structural details of the ovary of control specimens are shown in Fig 1. The histopathological pictures of fish exposed to 1 ppm BHC indicated changes as compared to control. Significant changes were partial disruption of

Table 1. Summary of the histopathological lesions in the ovary of H. fossilis exposed to different dose concentrations of BHC for a period of 72 hours.

BHC dose concentration			
	1 ppm.	5 ppm.	10 ppm.
Histo- patholo- gical changes	(1) Reduction in size of mature oocytes.  (2) Disintegration in cortical alveoli and and yolk globules. (3) Severe damage of peritoneal lining. (4) Disruption of ovarian follicles.  (5) Vacuolation in cytoplasm of germinal cells.	(1) Ovarian follicles separated due to loss of interfollicular matrix. (2) Disruption of cortex.  (3) Madullary regions exhibited degenerative changes. (4) Elongation of effected ovarian follicle.	(1) Complete loss of normal configuration of ovary.  (2) Elongated ovarian follicles effected mainly. (3) Necrosis.  (4) Fibrosis. (5) Dilation of blood vessels. (6) Transformation of germinal epithelium to tall columnar epithelium resulting benign cystic transformation.

Note : In control section no damage to ovary tissue was observed.

ovarian follicles, vacuolation in cytoplasm of germinal cells and reduction in number of matured ovum and secondary oocytes. (Fig 2). A greater degree of histopathological changes were marked in the ovary exposed to 5 ppm BHC concentration. The cortical region of the ovary was grossly effected with the degree of changes.

The ovarian follicles were separated due to the loss of interfollicular connective tissue. The cytomorphological structure of ovarian follicles even in medullary region get deformed and elongated losing the typical round configuration. The medullary portion also exhibited degenerative changes (Fig 3). The 10 ppm BHC exposed ovary exhibited gross histopathological changes in structure as the normal configuration of ovary was completely lost. The important degenerative changes included total loss of connective tissues with dilation of blood vessels. The ovigerous lamellae were ruptured on pesticide exposure. The elongated ovarian follicles were effected showing the transformation of germinal epithelium in to tall columnar epithelium with the accumulation of mucopolysaccharide indicating a state of cystic transformation resulting complete inhibition of oogenesis. The total loss of germinal cells and ovarian follicles leading to benign cystic transformation (Fig 4) was due to impairment of steroid sex hormone secretion caused by pesticide toxicity, which represent the major change in high dose exposure (Sukla et al.1986).

The degree of histopathological lesions in three different dose concentrations of BHC are summarized in the table 1.

Ovarian pathology in the teleost Puntius conchoni (Hamilton) by some pesticides was reported by Kumar et al. 1988. Restogi and Kulshrestha (1990) reported that prolonged exposure to the pesticides endosulfan, carbofuran and methylparathion produced necrosis and fibrosis in connective tissue along with dilation of blood vessels and damage to yolk vesicle of maturing oocytes in carp minnow Rasbora daniconius.

Deleterious effects of pesticides have been reported in earlier studies such as increase of fibrous layer of tunica albuginea, dilation of blood vessels of ovary, decrease in percentage of different stages of oocytes (Kulshrestha and Arora 1984), reduction in reproductive efficiency (Burdick et al. 1972). Similar observations were reported by Pandey and Shukla (1985), Sing and Sahai (1985), Sahai (1987). The significant changes of the present study included severe damage to peritoneal linings, vacuolation to cytoplasm in the developing oocytes, loss of interfollicular matrix, damage to the yolk vesicles resulting follicular atresia and disinteg-

-ration of cortical alveoli and yolk globules in mature oocytes. Finally the transformation of germinal epithelium to tall columnar epithelium leading to benign cystic transformation was observed.

These results shows that the gonadotoxic impact of BHC induced deleterious changes on ovarian histology of the experimental fish H. fossilis, which distine to effect the fertility and productivity of fish population.

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