HISTOPATHOLOGICAL ALTERATIONS IN TESTES ON CHRONIC DERMAL EXPOSURE OF CYPERMETHRIN IN WISTAR RATS

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ABSTRACT

The effect of chronic dermal exposure of cypermethrin on the testicular tissue in Wistar rats (n=18) was studied. Multiple small to large vacuolation and necrosis in the epithelial lining of seminiferous tubules, eosinophilic secretions in interstitium and presence of single or multiple giant cell in the lumen of tubules were seen. The changes were found to be exposure dependant. These observations suggest that chronic dermal exposure of cypermethrin cause degenerative changes in seminiferous tubules of rat testes.

Key worlds: Dermal exposure, Cypermethrin, Wistar rats, Testes

Cypermethrin, a synthetic pyrethroid, is extensively used for the management of pests in crops and as ecto-parasiticides in man and animals. Low biodegradability and indiscriminate use is responsible for its increased concentration in different food products and in environment (Taplin and Meinking, 1990). Experimental studies suggested that synthetic pyrethroids cause adverse effects on reproduction (Mukhopadhyay *et al.*, 2006; Ferah Sayým, 2007). Pyrethroids also have ability to induce structural chromosome aberrations in human lymphocyte cultures and Chinese hamster ovary cells (Chauhan *et al.*, 1997). Present study was designed to investigate the effect of chronic dermal exposure of cypermethrin on the testicular parenchyma in Wistar rats. Commercial grade Cypermethrin (10% solution w/v) was procured from Meghmani Organic Limited, Ahemdabad (India). The LD_{50} of cypermethrin when applied dermally to rats was reported to be 500 mg kg^{-1} b. wt (Luty *et al.*, 1998). The test dose of cypermethrin was 50 mg kg^{-1} b. wt (1/10 of LD_{50}). Eighteen male Wistar rats weighing 150 - 200 gm were procured from Indian Institute of Integrated Medicine (CSIR Lab) Jammu, India. In each polythene cage 4 rats were housed and provided commercial diet and tap water *ad libitum*. The animals were maintained strictly in accordance to the instructions of the Institutional Animal Ethics Committee. After two weeks of acclimatization to the local laboratory environment, the animals were divided randomly into three groups. Group 1 (n=6) served as control and received no treatment while animals of groups 2 and 3 (n=6 each) were applied 50 mg/kg cypermethrin (10% w/v) daily for 60 and 90 days, respectively on the inter-scapular area as described by Punareewattana *et al.* (2001). Body weight of the rats was recorded at weekly interval to adjust the dosage of application according to the body weight. The rats in the treatment groups were sacrificed after 60 and 90 days of dermal exposure respectively along with those of control group. The testes of the animals were collected in the Bouin's fluid. The tissues were processed and cut sections were stained with H & E staining technique for histopathological interpretations.

Dermal exposure of cypermethrin for 60 and 90 days in wistar rats produced significant microscopic changes in the testes. Multiple vacuolization of seminiferous tubules with eosinophilic secretions in the interstitial area were seen after 60 days of dermal exposure. Testes in the latter group (day 90) additionally

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exhibited severe degenerative changes with giant cells infiltration in the lumen along with the sloughing and shedding of epithelial cells of the seminiferous tubules. In contrast, no such degenerative changes have been observed in rats which were not exposed to cypermethrin (control group). Exposure of several chemical toxicants has been reported to produce sloughing of germ cells and increased apoptosis (Boekelheide, 1993). Vacuolization in the cytoplasm of the Sertoli cells has been reported to be the most common microscopic change after exposure with toxicants like diethyl hexyl phthalate (DEHP), nitrobenzene, dimethoate, deltamethrin, etc (Poon *et al.*, 1997; Shinoda *et al.*, 1998; Ferah Sayým 2007; El-Gohary *et al.*, 1999). The changes in the present study may be due to increased oxidative stress in animals. Various studies also suggested that the synthetic pyrethroids and other chemicals induce oxidative stress by excess formation of free radicals. These free radicals primarily target the cell membrane components leading to alteration in membrane permeability (Sen *et al.*, 2006). This may lead to disruption in the functioning of the testicular barrier resulting in increasing the intensity of testicular damage (Abou-Donia *et al.*, 2003). Observations from the present study suggest that chronic dermal exposure of cypermethrin causes exposure dependent degenerative necrosis and vacuolization in seminiferous tubules of rat testes.

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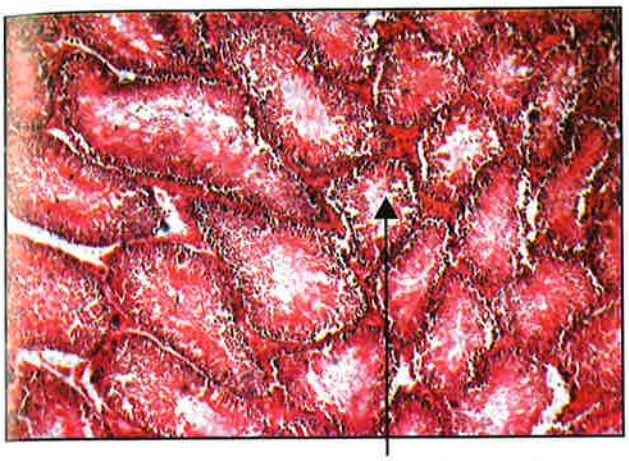
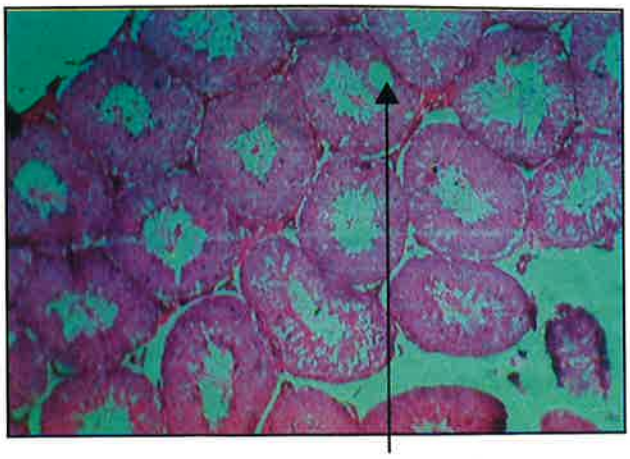


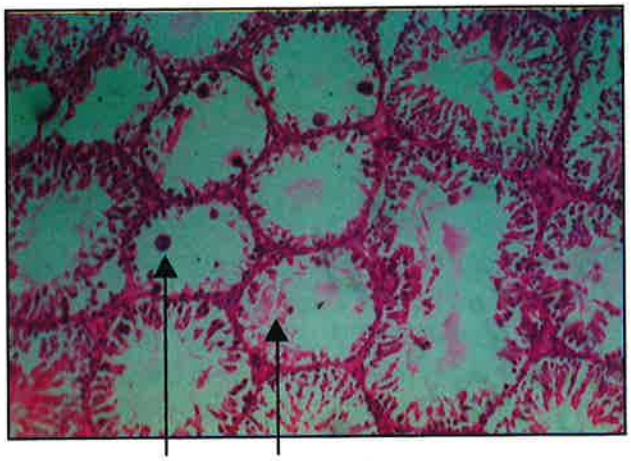
No degenerative changes in seminiferous epithelium

Fig. 1: Seminiferous tubules of rat testes - control (H&E X 70)



Vacuolization in seminiferous tubules

Fig. 2. Seminiferous tubules after dermal application of cypermethrin for 60 days (H&E X 70)



Giant cell Necrotic changes

Fig. 3. Seminiferous tubules after dermal application of cypermethrin for 90 days (H&E X 70)