

## TOXICOPATHOLOGICAL EFFECTS OF DELTAMETHRIN ON MALE REPRODUCTIVE SYSTEM OF ALBINO RATS (EPIDIDYMUS)

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**ABSTRACT :** This experiment aimed to investigate Toxicopathological effect of deltamethrin on the adult male rats reproductive system(epididymus). Twenty four adult male rats were used in this experiment. After acclimatization for three weeks they were divided equally into three groups as follows three; Group-A normal diet and water for 30 days (n=8 rats), Group-B Deltamethrin 0.1 ml/100 gmB.w (1/10 LD<sub>50</sub> for 30 days (n=8 rats) and Group-C Deltamethrin 0.1 ml/100 gmB.w (1/20 LD<sub>50</sub>) for 30 days (n=8 rats). The experiment was lasted for 4 weeks. Body weight was measured at 0, 2, and 4<sup>th</sup> weeks of the experiment. At the end of experiment all animals were sacrificed. The epididymis was kept in 10% formaline used for histological examinations. Results revealed thinking of the capsule of the epididymus absent of sperm from the lumen with mild infiltration of inflammatory cells, other sections showed decreased in the high of the epithelia covered the epididymus tubules with absent of microvillus with stasis of abnormal shaped sperm inside the lumen. In conclusion: there were histopathological effects of Deltamethrin on male reproductive system of rats (epididymus) with different LD<sub>50</sub> doses (1\10 LD50, and 1\20LD50).

**Key words :** Deltamethrin, histopathology, epididymus, rat.

### INTRODUCTION

Deltamethrin [(1R,3S) [ $\alpha$ -cyano(3-phenoxyphenyl) methyl]-3-(2,2 - dibromo-ethenyl)- 2,2-dimethyl-cyclopropanecarboxylate] is a synthetic pyrethroid used universal in agriculture, home pest control, protection of foodstuff, and disease vector control. It is likewise used in the public and animal health programs. It is quickly absorbed and excreted in urine (19 - 47%) and feces (32 - 55%) in 24 hours of oral administration in rats. The key routes of metabolism contain cleavage of the ester bond and oxidation on position 4 of the phenoxy ring of the alcohol moiety. The acid and alcohol moieties are more transformed to conjugated metabolites. Unchanged deltamethrin is the main compound in faces. During its metabolism, reactive oxygen species (ROS) are produced and result in oxidative stress in intoxicated animals (Kale *et al*, 1999)

The most main sources of the animal and human exposure to deltamethrin are contaminated food and water, and it is readily absorbed by the oral route.(Barlow *et al*, 2001).The production of ROS is a normal physiological happening in numerous organs.However, overproduction of ROS can be dangerous to reproductive (Oda and El-Maddawy, 2012) hepatic (Manna *et al*, 2005) and nephritic system (Sakr and Al-Amoudi, 2012).

Deltamethrin owing to its rapid metabolism and little toxicity to humans and other non-target animals in addition to its high influence on a large number of pests, it has become an insecticide of special in most countries (Sharma *et al*, 2013). This material is a associate of one of the pesticides called synthetic pyrethroids.This pesticide is a highly toxic to aquatic life, mainly fish, and therefore must be used with risky caution around water.

Ketaki *et al*, (2016) reported that Deltamethrin is a toxic pyrethroid pesticide that formed significant reproductive toxicity in treated male mice which presented a significant reduction in body and organ weights, sperm count, sperm motility percentage, sperm viability, serum testosterone level, sialic acid content of caudal epididymis and fructose level of seminal vesicle.. Histological examinations exposed significant changes in the testes of dosed groups

Deltamethrin affects reproduction and fertility in rats at dose 0.6 mg/kg, injected subcutaneously twice a week for 60 days.In rats fed with deltamethrin, a decrease in the weight of reproductive organs, sperm count, percentage of sperm motility, and the amount of sperm and testosterone levels were noticed. The study group presented a significant increase in spermatozoa malformations. In histopathological studies, disorders of

the testicles and epididymis were noted (Oda and El-Maddawy, 2012).

## MATERIALS AND METHODS

Deltamethrin will be administration to three groups of rats daily /oral in dose of 1/10 LD<sub>50</sub> (G1), and 1/20 LD<sub>50</sub> (G2) individually and D.W. for control group (C) of deltamethrin for 30 days. The animals were sacrificed after 4 weeks. LD<sub>50</sub> was calculated to be 150 mg/kg (Manna S *et al*, 2005).

This experiment aimed to examine Toxicopathology effect of Deltamethrin administration on the adult male rats reproductive system (epididymus).

### Experimental animals

This study included (19) male albino rats with ages about three months and body weight ranged between (150-200g) were used to perform this experiments. The animals were raised and bred in the animal house of College of veterinary Medicine/ University of Baghdad where the research was done. The animals were kept in cages of (20\*30\*50) cm<sup>3</sup> dimensions in average of three rats in each cage one month before study for acclimatization in optimum conditions of breeding at (22±3) °C with a (14/10) Hours (Light/Dark) cycle. Commercial feed pellets and drinking water were given all the time of experiment (Hafes, 1970).

**After acclimatization they were divided equally into three groups as follows**

- 1-Group-C (Normal diet and water *ad libitum* for 30 days (5 rats)
- 2-Group- G1 (Deltamethrin 1/10 of LD<sub>50</sub> (0.1 mg/kg bw) for 30 days (7 rats)
- 3- Group- G2 (Deltamethrin 1/20 of LD<sub>50</sub> (0.1 mg/kgbw) for 30 days (7 rats)

\*All of the group animals sacrificed after 4 weeks.

\*All animals were subjected for histopathological examination of selected organ (epididymus) at the end of the experiment 31 days.

### Histological study of Epididymis

At the end of the experiment, rats were scarified and withdrawal of blood from the heart. Immediately after death, a piece of, epididymis was dissected free of connective tissues. Then submitted to preservation in formalin 10%. Histopathological preparation and staining with hematoxyline&Eosine stain were performed according to (Luna, 1968).

## RESULTS AND DISCUSSION

### The epididymus from the (1/10LD<sub>50</sub>) group

Treated rats at this group show thinking of the capsule

of the epididymus, the tubules revealed absent of sperm from the lumen of it, with mild infiltration of inflammatory cells. (Fig-1) while other section showed also show thinking of the capsule of the epididymus, the tubules revealed stasis of the sperm in the lumen of it, the microvillus moderated absent with hyperplasia of the epithelia (Fig-2). Microvillus of the epithelia covered the epididymus tubules showed absent with abnormal sperm inside the lumen with rounded cells (Fig-3). This section showed microvaculation of the epithelial cells and absent of sperm from the lumen of the epididymus. Fig-4.

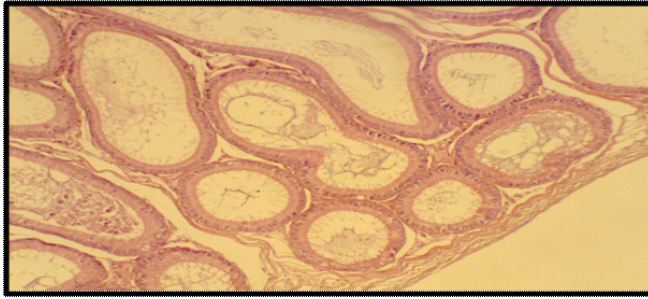
### The epididymus from the (1/20LD<sub>50</sub>) group

The epididymus histopathological sections showed decreased in the high of the epithelia covered the epididymus tubules with absent of microvillus and stasis of abnormal shaped sperm inside the lumen fig-5,6. other section revealed thinking of the tubules with disarrangement of it some time edema between them (Fig. 7).

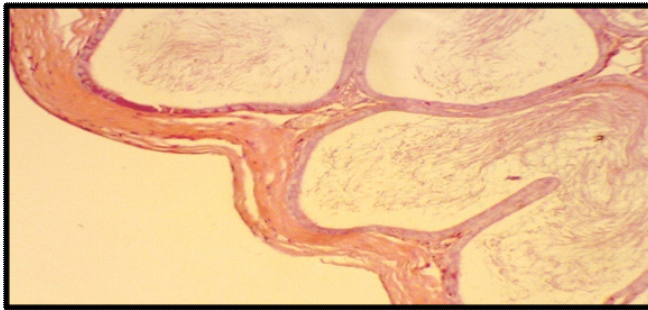
Usages of synthetic pyrethroids have increased in previous few years owing its rapid biodegradability and target leaning insecticidal action. Extensive use deltamethrin have increased the risk of toxicity in humans. A number of studies on the side effects of deltamethrin have been reported, counting neurotoxicity, (Husain *et al*, 1994) immunosuppression, (Lukowicz and Krechniak, 1992) and reproductive side effects. (Sakr, Al-Amoudi, 2012) Decreased in weight of testis and epididymis have been reported in this study. The relation between ROS and reduced motility may be due to a cascade of events that results in a decrease in axonemal protein phosphorylation and sperm immobilization, both of which are related with a reduction in membrane variability that is necessary for sperm oocyte union. (de Lamirande and Gagnon, 1995) The reduction in sperm count may be due to the adverse effect of different doses of deltamethrin on spermatogenesis. Increase in LPO level may be due to oxidation of molecular oxygen to produce superoxide radicals. This reaction is also the source of H<sub>2</sub>O<sub>2</sub>, which causes the production of Malondialdehyde (MDA) by originating the peroxidation of unsaturated fatty acids in the membrane. The hydroxyl radical can initiate lipid peroxidation which is a free radical chain primary to loss of membrane structure and function. (Ray, 1991 and Kale, *et al*, 1999) The increase in LPO and generation of ROS may reduce cell possibility. Thus the oxidative stress produced by deltamethrin resulted in increased LPO level in liver, kidney, and testis.

## CONCLUSION

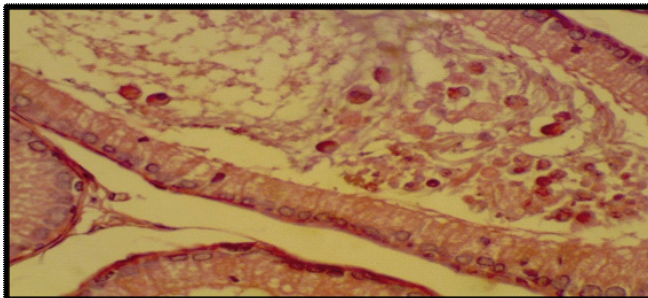
Deltamethrin different LD<sub>50</sub> doses (1/10, 1/20 LD<sub>50</sub>) revealed histopathological changes effect on male



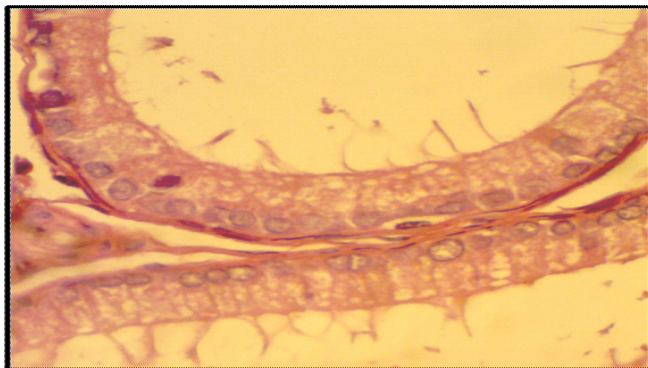
**Figure 1 :** Histopathological section of epididymus (1\10Ld50) showed epididymus tubules revealed absent of sperm from the lumen , with mild infiltration of inflammatory cells and thickened capsule.



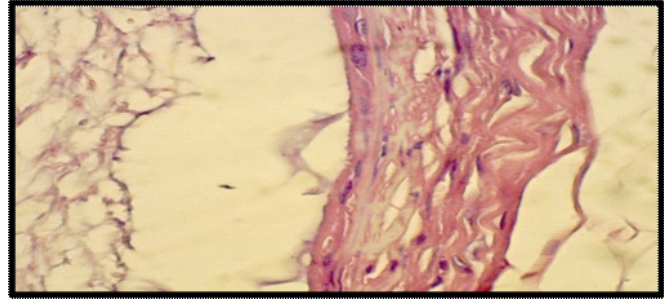
**Figure 2 :** Histopathological section of epididymus (1\10Ld50) showed epididymus thickening of the capsule of the epididymus ,the tubules revealed stasis of the sperm in the lumen of it ,the microvillus moderated absent with hyperplasia of the epithelia.



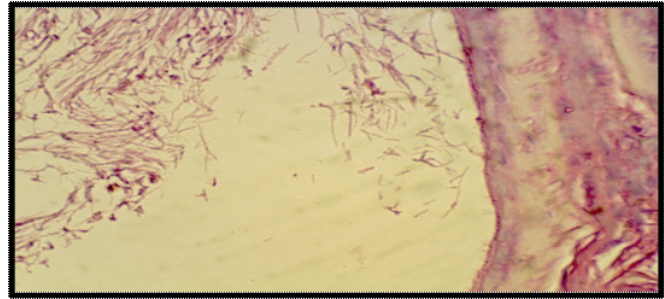
**Figure 3 :** Histopathological section of epididymus (1\10Ld50) showed epididymus microvillus of the epithelia covered the epididymus tubules were absent with abnormal sperm inside the lumen with rounded cells.



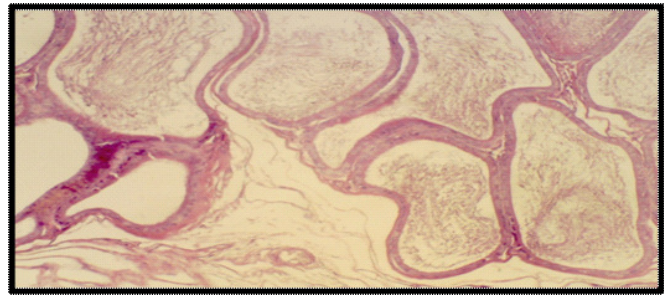
**Figure 4 :** Histopathological section of epididymus (1\10Ld50) showed epididymus with microvaculation of the epithelial cells and absent of sperm from the lumen of the epididymus.



**Figure 5 :** Histopathological section of epididymus( 1\20LD50 ) showed decreased in the high of the epithelia covered the epididymus tubules with absent of microvillus.



**Figure 6 :** Histopathological section of epididymus( 1\20LD50 ) showed decreased in the high of the epithelia covered the epididymus tubules with absent of microvillus and stasis of abnormal shaped sperm inside it.



**Figure 7 :** Histopathological section of epididymus( 1\20LD50 ) showed thickening of the tubules with disarrangement of its time edema between them.

reproductive system significant lesions of albino rat epididymis.

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