

## **HEMATOLOGICAL AND BIOCHEMICAL CHANGES IN MALE ALBINO RATS INDUCED BY INHALATION OF CYPERMETHRIN SPRAY**

**ZUHAIR Y.A1-SAHHAF**

Department of Biology , Faculty of Applied Sciences, Umm Al Qura University,  
Saudi Arabia

### **ABSTRACT**

The present investigation deals with the effect of inhalation of the pyrethroid insecticide, cypermethrin on hematological and biochemical parameters in male albino rats. Exposure of animals to cypermethrin for 3 weeks induced insignificant changes in RBCs count, and hemoglobin content. On the other hand, the WBCs count showed significant increase whereas the hematocrit percentage and the blood platelets decreased significantly in the treated rats. Serum triglycerides were insignificantly changed while cholesterol values showed significant increase after 3 weeks. Serum total proteins and albumin revealed significant decrease in the treated animals during the experimental period. Transaminases , ALT and AST were gradually increased in the sera of treated rats and this increase became significant ( $P<0.05$ ) at the end of the third week.

### **INTRODUCTION**

Much of the pollution problems of the environment have occurred as a consequence of industrial pollution and high residual insecticides, Pyrethroids have been known as insecticides for many years and are belong to highly active insecticides. The studies conducted on animals indicate that the toxicity of pyrethroids depends on many factors, such as body construction, route of administration and period of administration The source of pyrethroids is the flowers of the pyretherum plant *Chrysanthemum cinerariaefolium* (Casida, 1973). Due to the persistence of these insecticides in the environment, structures similar to pyrethroids have been synthesized and proved to be effective against different insects (McEween and Stephenson,1979). On the other hand, pyrethroids were found to produce serious side effects of different types. Animals exposed to these insecticides exhibited disturbance in their physiological activities beside other pathological features (Kulkarni and Hodgson, 1980, Abu-El Zahab *et al.*, 1993, Sakr, 1999, Alsahhaf, 2006). The wide spread utilization of insecticides in insect

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control has performed the need for evaluation of the hazards caused by such substances. Therefore, the present work was aimed to study the effect of inhalation of the pyrethroid, cypermethrin in albino rat.

### MATERIALS AND METHODS

Sexually mature male albino rats (*Rattus norvigicus*) with initial body weight  $140 \pm 5$ g. were used. Animals were kept in the laboratory under constant conditions of temperature ( $24 \pm 2^{\circ}\text{C}$ ) for at least one week before and throughout the experimental work, being maintained on a standard diet and water were available *ad libitum*.

Animals were divided into two groups. Rats in the first group (25 animals) each inhaled one ml of the pyrethroid, cypermethrin, once every two days for 3 weeks. Animals were kept individually in a closed cage and 1 ml of the pyrethroid was sprayed in each cage for 5 minutes (Sakr, 1999). This pyrethroid is obtained from local markets and is used as an insecticide for cockroaches and ants. It contains 0.025% cypermethrin and 99.8% solvents and propellants. Animals in the second group (15 animals) were used as controls.

For hematological study, blood was collected from control and treated animals after 1,2 and 3 weeks of treatment. The hematological parameters: red blood cells count

(RBCS), hemoglobin value (Hb), hematocrit value (HCT %), white blood cells count (WBCS) and blood platelets number were measured by a fully automated Coulter counter (Coulter Electronics Limited, England). For biochemical study sera were obtained by centrifugation of the blood Samples and stored at  $20^{\circ}\text{C}$  until assayed for the biochemical parameters. Total proteins, albumin, cholesterol, triglycerides, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were measured using a fully automated Hitachi 911 analyzer (Tokyo, Japan). A commercial randox kits (Randox Laboratories, LTD, Ardomre, Crumlin, United Kingdom) were used in these analysis.

#### Statistical analysis:

The results are given as mean  $\pm$  standard deviation ( $X \pm \text{S.D.}$ ). Significance of the differences was tested by the Student "t" test. The levels of significance were taken at  $p < 0.05$ .

### RESULTS AND DISCUSSION

Table (1) showed that treatment of animals with cypermethrin reduced the body weight of the rats and this reduction became significant ( $P < 0.05$ ) after three weeks as compared to the control.

Data in table (2) showed that the number of erythrocytes and haemoglobin content were insignificantly changed during the period of treatment, while the haematocrit percentage and the number of blood platelets were significantly decreased after 3 weeks of treatment with the insecticide. On the other hand, the leucocyte counts were found to increase and this increase became significant after 3 weeks. Results in table (3) showed that total proteins was decreased in sera of cypermethrin -treated rats and this decrease was significant ( $P < 0.05$ ) after 2 and 3 weeks. Albumin was significantly decreased after 3 weeks. Triglycerids showed insignificant increase during the period of treatment while a significant increase in cholesterol was recorded in animals treated with the insecticide for 3 weeks (table 3).

Concerning the effect of insecticide on transaminases, data in table (4) revealed that ALT and AST were gradually increased in the sera of treated rats and this increase became significant ( $P < 0.05$ ) after 3 weeks.

The present results showed that body weight decreased significantly in rats that had inhaled the insecticide. The loss of body weight may be attributed to the decrease in food consumption of the treated animals. This result is in agreement with that of Sakr (1999) who found that inhalation of tetramethrin caused reduction in body weight of rats. Many other investigations have recorded depression in body weights of different experimental animals under the effect of various insecticides (Breckenridge et al.1982, Imamura et al.1983, Lakkawar et al.2004).

The heamatological results indicated that the number of leucocytes was significantly increased in the treated rats. This means that the defense mechanism represented in the leucocytes could compensate the toxic effect of the used insecticide. This finding is similar to that obtained by some investigators who observed hematological changes in mammalian animals treated with organophosphate, organochlorine and carbamate insecticides (Reena et al., 1989; Meerdink, 1989; Tasheva and Hristeva, 1993, Alsahhaf, 2006). Yousef et al. (2003) reported that cypermethrin significantly ( $P < 0.05$ ) decreased hemoglobin, total erythrocytic count and packed cell volume, while total leukocyte count increased in rabbits. The number of circulating blood platelets was significantly

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reduced in the treated animals. This result is in agreement with that of Saleh et al. (1998) under the effect of the pyrethroid, tetramethrin.

The biochemical results , indicated that serum total proteins and albumin was decreased in insecticide-treated rats. Similarly, Parker et al. (1983); Saleh et al. (1986) and Abu El- Zahab et al. (1993) stated that the total serum proteins and albumin were decreased in animals treated with various pyrethroids. On the other hand, Seki et al. (1987) reported that paralethrin induced an increase in serum total proteins and albumin of rats.

Insignificant increase in triglycerids and significant increase in cholesterol were recorded in sera of treated animals. Seki et al . (1987) and Saleh et al (1998) reported that pyrethroid insecticides affected triglycerides and cholestrol in different experimental mammals. It is speculated that treating rats with pyrethroids increased tissue lipogenesis and probably this has been achieved through acceleration of acetyl -Co A to be the precursor of cholesterol biosynthesis (Ray and Cremer,1978).

In this study , the data obtained revealed a significant increase in transaminases in sera of rats that inhaled the insecticide. Similarly , Abu-El-Zahab et al.(1993) reported that serum, GOT, GPT and alkaline phosphatase showed a significant increase in rats that had inhaled mixed pyrethroids ( tetramethrin and sumithrin) and that the increase was proportional to the duration time of inhalation. These enzymes also elevated in rats treated with the pyrethroid, fenvalerate (Foldstorm et al.1988) and after dermal application of baythroid(El-Elimay,1986).Transaminases were considered to be a more sensitive measure in evaluating liver function and damage(Sherlock,1981). Hatoff and Hardison mentioned (1980) reported that elevations in serum levels of these enzymes were mostly attributed to acute hepatocellular damage or extrahepatic obstruction, or both. Thus , the increase in serum ALT and AST suggest that cypermethrin inhalation causes hepatic damage in albino rats.

**Table (1).Effect of different treatments on body weight of rats**

| Period of treatments (weeks) | Control     | TREATED    |
|------------------------------|-------------|------------|
| 1                            | 136.5 ± 4.2 | 137 ± 5.1  |
| 2                            | 143 ± 2.2   | 126 ± 1.2  |
| 3                            | 146 ± 1.3   | 121 ± 2.4* |

-Values are expressed as mean ± SD g.

-(\*) Significant at p<0.05

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Table (2) : Effect of pyrethroid inhalation on blood parameters of male rats.

| Treatment \ Parameters    | Control  | One week | 2 weeks   | 3 weeks   |
|---------------------------|----------|----------|-----------|-----------|
| RBCs $10^6/\text{mm}^3$   | 5.8±0.2  | 5.2±0.4  | 5.8±1.2   | 6±0.6     |
| Hb gm/dl                  | 11.3±1.6 | 11.1±0.6 | 11.2±0.5  | 10.8±1.7  |
| HCT %                     | 21.4±1.1 | 33.7±1.5 | 34.28±1.2 | 42.2±2.3* |
| Platelets $10^3/\text{L}$ | 613±5.2  | 627±6.4  | 544±4.3   | 312±5.7*  |
| WBCs $10^6/\text{mm}^3$   | 6.6±0.7  | 6.8±1.6  | 8.1±0.4   | 11.3±1.1* |

-Values are expressed as mean ± SD

-(\*) Significant at  $p < 0.05$

Table (3): Effect of pyrethroid inhalation on biochemical parameters of male rats.

| Treatment \ Parameters | Control | One week | 2 weeks  | 3 weeks   |
|------------------------|---------|----------|----------|-----------|
| Total proteins(g/dl)   | 5.6±1.1 | 4.7±1.1  | 3.2±0.8* | 2.1±0.7*  |
| Albumin (mg/dl)        | 2.8±0.2 | 1.53±0.1 | 1.6±0.3  | 0.9±0.01* |
| Triglycerides(mg/dl)   | 77±2.3  | 72±1.4   | 72±2.3   | 74±3.7    |
| Cholesterol (mg/dl)    | 38±3.1  | 43±2.0   | 55±2.1   | 68±3.3*   |

-Values are expressed as mean ± SD

-(\*) Significant at  $p < 0.05$

Table (4): Effect of pyrethroid inhalation on AST and ALT of male rats..

| Treatment \ Parameters | Control | One week | 2 weeks | 3 weeks |
|------------------------|---------|----------|---------|---------|
| AST (u/l)              | 43±2.1  | 45±2.0   | 51±3.1  | 65±2.3* |
| ALT (u/l)              | 72±4.1  | 64±4.2   | 79±2.1  | 87±3.4* |

-Values are expressed as mean ± SD

-(\*) Significant at  $p < 0.05$

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