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Cypermethrin Induced Biochemical Alterations in the Blood of Albino Rats

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Abstract

This study was carried out to investigate blood biochemical alteration in albino rats after cypermethrin treatment. Nitrogen contents of blood in the albino rats have been influenced by the amount of cypermethrin used for toxicity in the acute (1d) and sub chronic (7,14and21days) treatment in the present investigation. The free amino acid, total protein, urea, urea nitrogen, uric acid and creatinine of blood were increased while blood albumin was decreased after both the treatments.

Keywords: Nitrogen contents, blood, cypermethrin.

1. Introduction

Pesticides are widely used throughout the world in agriculture to protect crops and their residues have affected the environment adversely. Their poisoning is an important cause of morbidity and mortality in developing countries. The uses of such biologically active compounds possess potential problems of toxicity among those who manufacture, formulate or use these compounds. The pyrethroid represents a relatively new group of synthetic insecticides, although members of the group have been commercialized since mid 1950s. Their popularity has been increasing substantially in recent years, and new members are constantly being developed and commercialized. The pyrethroid has been proved as effective insecticides, and thus was applied at low doses.

The toxicity of pyrethroid insecticides to mammalian animals has received much attention in resent years because animals exposed to these insecticides exhibited changes in their physiological activities beside other pathological features (Sakr 2002). Although extensive research work is under way in different laboratories on various aspect of synthetic pyrethroid, including metabolism, pharmacological characteristics, ecotoxicity and detection of residues (Cremer &Seville1982, Ray 1982,Casida *et al.*1983), little attention has been paid to their biochemical effects in non target species. Cypermethrin is a synthetic pyrethroid. It is widely used as insecticide in developing countries controlling pests (Jayakumar *et al*. 2008). The present report aims at studying the effects of sub lethal doses of cypermethrin on some blood biochemical changes in albino rats after 1day and 21 days continuous feedings.

2. Materials and methods

Adult albino rats (*Rattus norvegicus)* weighing 125-135gm from an inbred colony representing both the sexes were selected for the experimentation. Rats were housed in polypropylene cage and were allowed standard pellet diet and water *ad libitum*. Cypermethrin 25%EC was procured from Syngenta group company, India .Cypermethrin suspended in coconut oil was administered orally by gavage. The acute oral LD_{50} value was calculated as 620 mg/kg body weights .The doses for acute (1 day) and sub chronic (7, 14, and 21 days) studies were 310mg/kg.bwt. and 15mg/ kg.b.wt., respectively. Doses were selected on the basis of LD50. The control animals received the same volume of coconut oil alone. Rats used for experimentation were selected randomly either of sex and anaesthetized with chloroform. The blood samples, collected from the rats with the help of sterilized disposable syringe, fitted with a hypodermic needle and stored in plain vials. Serum was assayed for free amino acid, total proteins and albumin, urea, urea nitrogen, uric acid, and creatinine.

The free amino acid contents obtained from serum were analyzed according to the Ninhydrin method of Moore and Stein (1957). Total serum proteins and albumin were estimated by Biuret method of Gornall *et al.* (1949) modified by Dumas *et al.* (1971). The estimation was done by using diagnostic reagent kit for *in vitro* determination of total proteins in serum, manufactured by Span diagnostics Ltd. India. The estimation of urea was performed according to the DAM method (Evans, 1968) using the diagnostic reagent kit for *in vitro* determination of urea in serum, manufactured by Span diagnostics Ltd. India. Urea nitrogen was estimated by mathematical

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calculation taking the serum urea value in consideration. The uric acid was determined by uricase/PAP method (Fossati&Prencipe, 1980) using the diagnostic reagent kit manufactured by Crest bio systems, a division of coral clinical systems Goa, India. Concentration of serum creatinine was determined by alkaline picrate method (Henry *et al.* 1974) using the diagnostic reagent kit same above. Statistical significance difference between experimental and controls values were calculated according to Fisher's student't' test (Fisher and Yates, 1963).

3. Results

Results (Table-1) indicate that treatment with cypermethrin caused a significant increase in serum, free amino acid, total proteins, urea, urea nitrogen, and uric acid, while serum albumin decreased significantly after all the treatments. Serum creatinine declined after acute treatment but increased after 14 & 21days treatment.

Table-1 Effect of Cypermethrin on Serum Biochemical Parameters in Albino Rats

Serum Biochemical Parameters	Control[o]	Post Treatments Days			
		1st Day(acute)	7th Day (sub chronic)	14th Day (sub chronic)	21stDay (sub chronic)
Free amino acid (mg/dl)	11.13±.46	15.27±.65**	11.47±.26	13.67±.33*	16.00±.52**
Total Protein (gm/dl)	6.06±.21	6.83±.12*	6.71±.06*	6.69±.06*	6.94±.05*
Albumin (gm/dl)	4.14±.14	3.48±.05*	3.78±.09	3.62±.14	3.94±.02
Urea (mg/dl)	23.40±.79	32.21±.32***	28.02±.23**	29.41±.21**	32.82±.08***
Urea Nitrogen (mg/dl)	10.93±.37	15.04±.15***	13.09±.11**	13.73±.10**	15.33±.40**
Uric Acid (mg/dl)	4.20±.44	6.70±.01***	4.41±.25	5.84±.21***	6.56±.14***
Creatinine (mg/dl)	0.64±.41	0.13±.08*	0.82±.08	1.41±.01***	2.85±.01***

O=controls were given the same quantity of diluent (coconut oil), *=Significant p<0.05, **=Highly Significant <0.01,

***=Very Highly Significant<0.001

4. Discussion

Table 1 shows the overall means of serum free amino acid, protein, albumin, urea, urea nitrogen, and creatinin. Present observation suggests that the level of free amino acid, protein, and urea content in treated animals were influenced by the amount of cypermethrin used for poisoning, i.e., it shows dose dependent toxicity and duration of toxic effects.

Alteration in serum free amino acid (FAA) content reflects either an increase or a decrease in protein break down or synthesis. Alteration in deamination and transamination of amino acid are associated with changes in nitrogen metabolism, which can be observed in terms of serum urea level. FAA is also involved in the formation of excretory product by the process of conjugation. Increase in FAA content associated with increase in urea level probably reflects an increase in transamination and production of biogenic nitrogenous compound in the form of urea. This is well supported by the increase in urea level in present investigation after cypermethrin toxicity. Lower doses for long period may exert hypertrophy of hepatocytes and thus increase the total protein and FAA in serum of rats (Shakoori *et al.*1988). The increased level of protein in human blood is due to flumethrin (Box and Lee 1996) and in albino rat after cybil, a synthetic pyrethroid (Saxena and Saxena 1997). This once again supports the finding in the present study. The changing levels of serum albumin, thus, provide valuable indices of severity, progress, and prognosis in hepatic disease. Decreased albumin in serum indicates hepatocellular origin of liver disease (Sood 2006).

The increased blood urea concentration in rats treated with cypermethrin are in agreement with the results obtained by AI-Qarawi *et al.*, (1999) and Yousef *et al.*, (2003). Elevated serum urea is also correlated with an increased protein catabolism in mammalian body or from more efficient conversion of ammonia to urea because of increased synthesis of enzyme involved in urea production (Murray *et al.*, 1990). Pesticides induced increase in urea level observed in the present study may be due to the effect of pesticides on liver function, as urea is the end product of protein catabolism (Coles 1986). An increase in serum creatinine was recorded in cypermethrin-treated rats. Abu-El-Zahab *et al.*, (1993) and Sakr *et al.*, (2001) obtained the same results in rats treated with pyrethroid. In the light of these observations, it is recommended that cypermethrin should be used with caution, at it could be hazardous to domestic animals and human beings as well.

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