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Clinical Study of Acute Cypermethrin Poisoning in Sheep

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Summary

This study was done to determine the effects of Cypermethrin (CYP) on clinical , some haematological and biochemical parameters in sheep .

High single dose of CYP of 70 mg/kg b.w. given to 4 animals, the clinical signs were observed daily, while blood samples were collected at zero time ,6 ,12 and 24 hours of experiment. The result revealed that: there was no significant difference in the mean of temperatures, RBCs count, Hb%, PCV, MCV and MCHC between the zero and treating times in all animals until the end of the experiment. While there was a significant increase in the pulse and respiratory rates, liver enzymes which include: AST,ALT,ALP and LDH between the zero and treating times in all animals until the end of experiment, but there was significant decrease in TP .

INTRODUCTION

Cypermethrin (CYP) is a synthetic pyrethroid insecticide found in the flower heads of *Chrysanthemum* species (WHO,1989;Cox,1996). It is use for more than 40 years and accounts for 25% of the worldwide insecticide market . (Cox,1996; Khan *et al*.,2009).

Cypermethrin is used for the control of ectoparasites . It consists of a mixture of four cis- and four trans-isomers. The cis-isomers are considered to be more acutely toxic than the trans-isomers. It is used to

treat the infested cattle, sheep, poultry and some companion animals (Cox,1996; EMEA,1998,2003,2004).

The main target organ of CYP is the nervous system . It acts on the sodium channel in the nerve membrane by delaying the closing for several seconds (Seth *et al.* ,2000 ; Brown,2005 ; Valez *et al.*2008) .

Because of its rapid absorption , metabolism , wide distribution and slow elimination (Beasley,1999; Beyrbach,2000) , so it is classified as class II in toxicity (WHO,1997; Reigart,1999) . It induce many effects on hematological and biochemical features of the immunological , reproductive , respiratory ,dermatological , muscular, urinary, central and peripheral nervous and digestive systems (Temple and Smith.,1996).

Cypermethrin residues are found mainly in the fat, but also in the liver , kidney , muscles and milk where presents in various concentrations in the ruminants (sheep ,goats, cattle) (Beyrbach,2000 ; EMEA ,1998 ,2003 ,2004)

Materials And Method

Four local sheep of both sexes , age range between eight to fourteen months and body weight about 29 to 35 k g .All sheep taken from the animals field of veterinary college in Basrah university . It were conducted according to the local breeding conditions .The animals were treated with Albendazole and Oxytetracycline then acclimatized for 15 days before starting the experiment .

In this experiments the sheep were treated orally with CYP at a dose of 70 mg / kg b.w as a single dose .

Clinical signs were observed at zero time, 6, 12 ,24 hours of the dosing . Blood samples were drawn at the periods above ; the hematological (RBCs count, Hb%,PCV, MCV and MCHC) and

biochemical studies(AST,ALT,ALP,LDH,BUN,TP and Creatinine) has been made immediately at zero time, 6, 12, 24 hours of dosing according to (Coles ; 1986) and the commercial kits respectively.

Statistical Analysis

The results underwent statistical analysis using (One Way Anova, SPSS) Least significant difference (SAS,2001) .

Results

Clinical Signs

After the oral administration of CYP. with a dose of 70 mg / kg b.w. ,the clinical signs which reported involve the following : Head shaking ; this symptom persist for 15 mints after the administration .Lip liking appear immediately and persisting for 20-30 mints .Restlessness continues for about 30 minutes after the oral administration .Diarrhea was reported after 10-12 hours of dosing with a greenish color and normal odor ,the diarrhea persisted until the end of the experiment .

Temperatures , Pulse and Respiratory Rates

There is no significant difference in the means of temperatures between the pre exposure and treating times in all animals .

While, there is a significant increase in the pulse and respiratory rates after the 6 hours of the dosing and the increase persisting until the end of experiment .These results were illustrated in table (1) .

Table (1) : Means of Temperatures , Pulse and Respiratory Rates . of Sheep Treated with High Dose of CYP.

parameter / Time	Temperatures / Minute Mean ± Standard error	Pulse rate / minute Mean ± Standard error	Respiratory rate/ Minute Mean ± Standard error
Zero Time	a 39.3 ± 0.5	a 85.5 ± 5.2	a 28 ± 1.2
6 hours	a 39.2 ± 0.75	b 100 ± 4.5	b 44 ± 2.3
12 hours	a 39.5 ± 0.25	b 98 ± 4.2	b 45 ± 3.5
24 hours	a 39.0 ± 0.5	b 101.5 ± 5.5	b 47 ± 2.5

* Different small letters mean significant differences among different periods .

Haematological Parameters

There is no significant differences in the haematological parameters which include RBCs count, Hb%, PCV, MCV and MCHC between the pre exposure time and treating times in all animals until the end of the experiment . these values were illustrated in table (2) .

Table (2) : Haematological Parameters of Sheep Treated with High Dose of CYP.

parameter / Time	Hb g/dl Mean ± Standard error	PCV% Mean ± Standard error	RBCs X 10^{12} cell / L Mean ± Standard error	MCV Mm^3 Mean ± Standard error	MCHC g/dl Mean ± Standard error
Zero Time	a 12.2 ± 0.82	a 35 ± 2.5	a 6.40 ± 0.55	a 54.68 ± 3.51	a 34.85 ± 2.1
6 hours	a 12.5 ± 0.95	a 36 ± 2.8	a 6.35 ± 0.65	a 56.69 ± 3.65	a 34.72 ± 2.3
12 hours	a 12.3 ± 0.75	a 36 ± 2.6	a 6.5 ± 0.75	a 54.72 ± 2.65	a 34.16 ± 2.7
24 hours	a 12.5 ± 0.8	a 38 ± 2.8	a 6.28 ± 0.5	a 55.22 ± 3.8	a 32.89 ± 2.4

*Similar small letters mean no significant differences among different periods .

Biochemical Results

Liver Enzymes

There were a significant increase in the liver enzymes which include AST ,ALT ,ALP and LDH at the 6^{th} hours after the inoculation of the animal dosing and this increase continues until the end of the experiment .these values were illustrated in table (3) .

Table(3):Liver Enzymes of Sheep Treated with High Dose of CYP.

parameters / Time	AST IU / L Mean ± Standard error	ALT IU / L Mean ± Standard error	ALP IU / L Mean ± Standard error	LDH IU / L Mean ± Standard error
Zero Time	a 36.3 ± 3.2	a 28.25 ± 1.5	a 135.68 ± 1.5	a 152.0 ± 4.45
6 hours	b 59.6 ± 2.5	b 42.5 ± 2.3	b 139.7 ± 1.8	b 160 ± 4.3
12 hours	c 92.5 ± 3.5	c 50 ± 2.5	c 165.8 ± 2.3	c 188.5 ± 3.9
24 hours	d 155.5 ± 4.8	d 47.75 ± 2.6	d 168.34 ± 2.5	d 231.75 ± 5.4

* different small letters mean significant differences among different periods .

Kidney Functions and Total Protein

There was significant increase in the blood urea nitrogen (BUN) and Creatinine at the 6^{th} hours of the experiment and the increase continues until the end of the experiment .

The T.P. show a significant decrease , these results were illustrated in table (4) .

Table (4) : Kidney function and T.P. of Sheep Treated with High Dose of CYP. .

parameters / Time	TP g /L Mean ± Standard error	Urea mmol / L Mean ± Standard error	Creatinine µmol / L Mean ± Standard error
Zero Time	a 68.1 ± 1.5	a 2.5 ± 0.15	a 85.2 ± 1.2
6 hours	b 52.2 ± 2.2	b 2.9 ± 0.145	b 91.4 ± 2.5
12 hours	c 42.7 ± 1.2	c 3.45 ± 0.135	c 111.5 ± 3.7
24 hours	d 30.6 ± 1.2	d 5.22 ± 0.140	d 120.4 ± 5.2

* different small letters mean significant differences among different periods

Discussion

Head shaking and restlessness observed ,this signs are due to the toxicity of CYP which delays the closing of sodium channel ; thus increase neuronal plasma membrane excitability by membrane depolarization . there were similar nervous manifestations reported by Tamang *et al*. (1991) and Khan *et al*. (2009) in goats which treated by CYP dipping , as well as Shah *et al*. (2007) showed similar results in rabbits .

However, these results disagree with Flaskos *et al*.(2006) . Flaskos *et al*.(2006) observed no effects of CYP on neuronal cells . The duration of nervous signs corresponding with Kol *et al*. (2007) and Shah *et al*. (2007) , who reported that the nerve stimulation is started after 5-10 minutes and persisting for 30 – 90 minutes .

Lip licking which occurred is due to the CYP physical properties (burning) , and that because of irritation of CYP which causes papules in the skin and congestion or edema which reported by Smith *et al*. (1996) and Tample and Smith. (1996) . Also Krastev *et al*. (2000) mentioned that it occurred due to stomotitis caused by CYP .

Diarrhea in the experiments probably occurs due to the intestinal mucosal epithelium degeneration and the desquamation of the intestine was reported by Khan *et al*. (2009) . Diarrhea may be due to the degeneration and vacuolation of the nerves which stimulate to cause diarrhea .

There was no significant differences in the body temperatures of the treated animals and there were increases in respiratory and pulse rates ,these results were in agreement with Yousef *et al*. (1998) , the increase in respiratory and pulse rates are due to the histopathological changes of the lungs (emphysema) can be explain these results.

there is no significant differences in the treated group in blood parameters (RBCs count , Hb% , PCV , MCV and MCHC). These results are disagreed with Yousef *et al*. (1998) in sheep and Khan *et al*. (2009) in goats ;they reported differences in these parameters. Also Yousef *et al*. (2003) Shah *et al*. (2007) and Ahmad *et al*. (2009) reported similar results in rabbits ,this difference in the results may be due to the short time of the experiment .

The study shows that there is a significant increase in alanine aminotransferase (ALT), aspartate aminotransferase (AST) , alkaline phosphatase (ALP) and lactate dehydrogenase (LDH) this result which agreement with Yousef *et al*. (1999) in sheep, Khan *et al*. (2009) in goats, Seth *et al*. (2000) in rabbits , Jagvinder *et al*. (2001) in buffalo calves , they explain that elevation of these enzymes occurs due to the

hepatocytes injury ,but the activities of these enzymes in blood plasma can be used as relevant stress indicators .while these results are disagreement with Yousef *et al*. (1998) and Krastev *et al*. (2000) in sheep and Kol *et al*. (2007) in women .

Also Khan *et al*. (2009) explain that the increase of both transaminases by indicated amplified transamination process ,this is due to amino acid that undergoes biodegradation in order to cope with the energy .

ALP and LDH in the present study show significant increase due to the liver damage or the impaired liver function as well as oxidative tissue damage Krastev *et al*.(2000) and Khan *et al*. (2009) .

Blood urea nitrogen and creatinine were show significant increase in the experiments that indicating kidney function is abnormally distress . This is explained by the histopathological changes (dilatation of cortical tubules) . These results did not correspond with Krastev *et al*. (2000) who report that is a decrease in the creatinine in similar studies in sheep .Whereas Yousef *et al*.(2003) reported results occur in sheep kidney similar to those in rabbits .

The total protein (T.P) show a significant decrease . This results is agreement with Yousef *et al*.(1998) in sheep and Khan *et al*. (2009) in goats .The decrease in T.P due to the defect in the protein metabolism or due to histopathological changes of the liver , kidney and intestine .

The defect in the metabolism of the protein and free amino acids and their synthesis in the liver may be one of the causes of these decreasing .this result is disagreed with Krastev *et al*. (2000) .

In general this decrease may be due to the loss of the protein either because of reduced protein synthesis or by increased protolytic activity or the degradation of the protein .(Yousef *et al*.,1998 ; Khan *et al*.,2009). But Yousef *et al*. (1998) and Ahmad *et al*. (2009) added the excessive

losses of protein through the nephrosis as one of the causes ; but Ahmad *et al*. (2009) explain that it occurs due to the pesticide which is disturbs the protein synthesis .

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دراسة سريريه للتسمم الحاد بالسايبرمثرين في الأغنام

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الخلاصة

أجريت هذه الدراسة لغرض تحديد تأثيرات السيبرمثرين على العلامات السريرية وبعض المعايير الدمية والكيموحيوية والتغيرات النسجية المرضية في الأغنام.

تم إعطاء جرعة منفردة عالية من السيبرمثرين بمقدار ٧٠ ملغم / كغم وزن الحيوان لـ ٤ حيوانات ، العلامات السريرية تم ملاحظتها أمانماذج الدم تم جمعها في الأوقات قبل التعرض و٦ و١٢و٢٤ ساعة ، تمت مقارنة الفترات ما بعد المعالجة مع تلك قبل المعالجة في الدراسات الدمية والكيموحيوية حيث أشارت النتائج إلى ما يلي :لم يوجد اختلاف واضح في معدل درجات الحرارة وحساب كريات الدم الحمر وتركيز خضاب الدم وحجم الدم المضغوط ومعدل الحجم ألكريي ومعدل تركيز خضاب الدم ألكريي ما بين زمن قبل التعرض وزمن المعالجة في جميع الحيوانات حتى نهاية التجربة .بينما لوحظت زيادة واضحة في معدلات النبض والتنفس وإنزيمات الكبد التي تشمل : الاسبارتيت امينوترانسفيريز والالنين امينوترانسفيريز والالكلاين فوسفاتيز اللاكتيت ديهايدروجينيز بين زمن قبل المعالجة وزمن المعالجة في جميع الحيوانات حتى نهاية التجربة. ولكن كان هناك تناقص واضح في البروتين الكلي .