



Pathological and biological effects of treatments with lambda-cyhalothrin in rabbits

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Abstract

Lambda-cyhalothrin (LCT) is a type II pyrethroid insecticide, which is widely used to control a large variety of agricultural pests throughout the world as well as in Algeria. The aim of this study was to investigate the effects of LCT exposure on body weight, hematological and blood biochemical parameters and to evaluate histopathological changes in some organs. Twelve (12) healthy local rabbits with a mean body weight of 1.8 kg were divided into three groups of four each: First group was kept as control (CTRL), second group (LCT 10) and third group (LCT 20) were given oral LCT at 10 and 20 mg/kg b.w, respectively three times a week for 25 days. The results showed no significant difference in mean body weight between groups. Blood analysis revealed no significant variation in hemogram between LCT-treated groups and control group. Serum biochemical analysis revealed a significant increase ($P < 0.05$) in total cholesterol content and glucose in LCT10 and LCT20, respectively. Total protein increased significantly ($P < 0.0001$) in LCT 20 group. While a very high increase ($P < 0.0001$) in the activity of aspartate aminotransferase (AST) was recorded in both treated groups, no change was observed in the activity of alanine aminotransferase (ALT). LCT treatment exhibited severe histopathological changes in liver, kidney, lung and brain. It is concluded from the study that LCT produced serious toxic pathological alterations and metabolic dysfunctions in rabbits.

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Introduction

Pyrethroid insecticides have been used for more than four decades to control a wide range of agricultural, animal and human pests throughout the world (1). They are used as alternatives to other insecticides, particularly organophosphates, organochlorines and carbamates because of their high efficiency, low toxicity and rapid biodegradability (2,3). The large-scale application of pesticides to crops has played a crucial role in the improvement of agricultural yields, the increase in agricultural productivity and decrease of vector-borne diseases (4-6). However, the over and non-rational use of these chemical compounds have unfortunately led to the

accumulation of toxic substances in the environment and constitute potential health hazards to animals and people handling them or living in the vicinity of plantations (7,8). Algeria is a high consumer of pesticides with about 400 homologated products and more than 30000 tons of active ingredients used annually (9). Lambda-cyhalothrin (α -cyano-3-phenoxybenzyl-3-2(chloro-3,3,3-trifluoro-1-propenyl)2,2-dimethylcyclopropane carboxylate) is one of the newer synthetic type II pyrethroid insecticides most extensively used in agriculture and home pest management as well as in veterinary formulations against a large variety of arthropods (2,10). Like other pyrethroids, LCT inhibits the closing of voltage-sensitive neuronal sodium ion channels and disrupts normal nerve function in insects and mammals resulting in

paralysis or death (11,12). In spite of its effectiveness against target organisms, LCT has been found to exhibit toxic effects against non-target organisms particularly mammals (12). Many reports have shown that LCT induces hepatotoxicity and nephrotoxicity in rats and mice (2,7,13). Furthermore, several reports have exposed the biochemical and histopathological alterations induced by LCT in rats and mice (2,12). However, to our knowledge few reports have shown the effects of LCT on hemato-biochemical parameters and histopathological alterations in rabbits. It is well known that in toxicological studies, a variety of biomarkers are measured to assess a wide range of physiological and metabolic functions that influence the identification of target organs and the evaluation of tissue lesions (12). Further, histopathology is considered a fast and sensitive method usually used to detect the effects of pesticide in various animal tissues and organs (14). Therefore, the present study was performed to evaluate the potential risks of subacute toxicity induced by LCT on hematological parameters and some biochemical parameters and aimed to assess histopathological changes in liver, kidney, lung and brain in orally LCT-treated rabbits.

Materials and methods

Chemicals

A commercial formulation of Lambda-cyhalothrin (Emulsifiable concentrate) named "KARATEKA® 5EC" (Nanjing Zonechem Co., Ltd, China) was used in this experiment. The test solutions were freshly prepared in distilled water before each use. All other reagents used were purchased from Sigma Chemical Co. (St. Louis. France).

Animals and diet

The present study was carried out at the animal house of institute of veterinary sciences, University of Tiaret, Algeria. Twelve healthy local rabbits 3 to 3.5 months of age with an initial mean body weight of 1.8 kg were obtained from the experimental farm of veterinary institute of Tiaret University. The animals were housed in metal cages (20cmx 30cmx 40 cm) and kept in controlled environment with 25±2°C temperature and 12h light/dark cycle. They were fed on commercial standard pellets and given tap water *ad libidum*. The experimental protocol was carried out in accordance with National committee of Health Guidelines for Care and use of laboratory animals.

Experimental design

After 15 days acclimatization, animals were divided into three groups of four animals each (two males and two females) with similar body weights on the day of dosing. Animals in the first group served as control (CTRL) and received distilled water (1 ml/kg b.w/48h) orally by gavage using stomach tube. Group 2 (LCT 10) and group 3 (LCT 20) were orally given Karateka® at 10 mg/kg b.w and 20

mg/kg b.w; respectively three times a week for 25 days. Animals in each group were monitored for clinical signs and behavioral alteration twice daily over the total period of experiment. Individual body weights were recorded three times a week (i.e. prior to each dose administration) and also prior to terminal euthanasia.

Blood sampling and analysis

Two Blood samples from all rabbits were collected from the jugular vein prior to first treatment (day 0) and at the end of the experiment (day 25). Blood samples collected in EDTA tubes were used for hematological analysis and samples collected into heparin tubes were used for biochemical parameters. Hematological parameters were measured using a coulter hematology analyzer (MYTHIC 18) equipped with veterinary software (15). They include red blood cells (RBCs) counts, white blood cells (WBCs) counts, hemoglobin (Hb), hematocrit (HF) and erythrocyte indices including mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC). Blood samples into heparin tubes were centrifuged at 3000 rpm for 10 minutes. Plasma was then collected and stored in eppendorf tubes at -20°C until biochemical analyses performed. Biochemical parameters were determined by enzymatic colorimetric method using commercial kits (SPINREACT, S.A/ S.A.U, SPAIN) according to the manufacturer's directions. They include total cholesterol (CHO), glucose (GLU), total protein (TP), total bilirubin (TB), urea, creatinine, serum alanine aminotransferase (ALT) and asparatate aminotransferase (AST) enzyme activities.

Relative organ weight

At the end of experiment (day 25), all animals were slaughtered and dissected, then the brain, liver, heart, kidney, lung and spleen were removed, rinsed in normal saline solution (0,9% NaCl), dried on filter paper and weighted individually. The relative organ weight was calculated using the following formula: $Rw = (\text{organ weight} / \text{animal weight}) \times 100$ (16).

Histopathological examination

Small pieces (10-15mm) from liver, kidney, brain and lung were immediately fixed in formalin solution (10%). Tissue samples were then routinely processed through an automatic tissue processor (Leica TP1020). After that, the tissues were embedded in paraffin, sectioned and stained with hematoxylin and eosin (H&E) according to the technique described by (A). Photomicrographs of selected lesions were taken using light microscope (17) equipped with a camera (AwioCam EPc 5s).

Statistical analysis

Data collected were subjected to the one-way analysis of variance (ANOVA) with Tukey's post hoc test for multiple

comparisons using Prism Graph PAD 6 (GraphPad software, Inc, USA). All statements of significance were based on probability of less than 0.05 (P<0.05).

Results

Clinical signs

Ten to fifteen minutes after the administration of lambda-cyhalothrin dose, animals in both treated groups started showing clinical signs characterized mainly by dyspnea, strong nervous symptoms expressed by restlessness, convulsion, grinding of teeth, head shaking, muscular tremors, jerky movements of the forelegs and intense licking of the limbs and other body parts. Feces of two animals in group 2 were semi-solid. In addition, hair losses with severe neck skin irritation were observed in all treated rabbits.

Effects of LTC on body weight

Results related to the effect of lambda-cyhalothrin treatment on mean body weight of rabbits are illustrated in Figure 1.

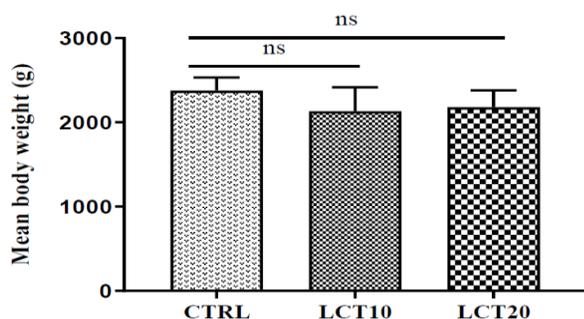


Figure1: Mean body weight of rabbits orally administrated with 10 and 20 mg/kg b.w/48h of Lambda-cyhalothrin for 25 days. No significant difference of mean body weight was observed in both LCT- treated groups compared to the control group.

Effects of LTC on Relative organ weight

Table 1 summarizes the results related to the effects of oral administration of lambda-cyhalothrin on relative organ weights. No significant difference was observed among control rabbits and LCT treated rabbits for liver, lung and spleen mean relative weights. However, the mean brain weight was significantly increased (P<0.05) in the group received LCT at 20 mg/kg b.w compared to the control group. Likewise, the kidney relative weight was highly increased (P<0.01) in LCT 10 group compared with the control group.

Effects of LTC on hematological parameters

Table 2 shows the effect of Lambda-cyhalothrin on RBC's and WBC's counts, Hb, Hct and erythrocyte indices (MCV, MCH and MCHC). No significant difference was

observed in RBC's and WBC's counts between the non-treated and treated groups. Similarly, hemoglobin concentration, hematocrit, MCV, MCHC and MCH were not significantly affected.

Table 1: Relative organ weights of rabbits after treatment with lambda-cyhalothrin three times a week for 25 days

Organ	Relative organ weight (%)		
	Control	LCT 10	LCT 20
Brain	0.2±0.04	0.25± 0.12	0.28± 0.05*
Heart	0.2± 0.02	0.27± 0.02	0.23± 0.02
Liver	3.1±0.50	2.98± 0.35	3.11± 0.63
Lung	0.6±0.05	1.22± 1.16	0.6± 0.08
Kidney	0.6±0.05	0.77± 0.07**	0.61± 0.07
Spleen	0.1±0.02	0.08± 0.04	0.07± 0.01

Values are expressed in means ± SE, n=4 rabbits for each treatment group. LTC-treated groups vs. control group: *P<0.05; **P<0.01; ***P<0.001; ****P<0.0001.

Table 2: Effect of lambda-cyhalothrin treatment for 25 days on hematological parameters of rabbits

Parameter	Control	LCT 10	LCT 20
RBC (10 ⁶ /μl)	4.72 ± 0.22	4.07 ± 2.02	4.3 ± 0.62
WBC (10 ³ /μl)	7.8 ± 1.98	7.05 ± 2.5	6.12 ± 2.7
Hb (g/dl)	9.55 ± 0.07	8.02 ± 4.01	8.6± 2.46
Hct (%)	30.4 ± 0.28	25.47±11.44	28.32±6.8
MCV (μm ³)	64.55 ± 3.61	65.45±9.03	60.25±7.13
MCHC (g/dl)	31.4 ± 0.57	30.55±2.91	30.15±1.76
MCH (pg)	20.25 ± 0.78	19.82±1.35	18.2±2.87

Values are expressed in means ± SE, n=4 rabbits for each treatment group. LTC- treated groups vs. control group: *P< 0.05; **P< 0.01; ***P< 0.001; ****P< 0.0001.

Effects of LTC on biochemical parameters

Results related to the effects of lambda-cyhalothrin treatment at 10 and 20 mg/kg b.w/48h for 25 days on biochemical parameters and serum enzymes activity of rabbits are summarized in table 3.

Data in table 3 showed that oral administration of LCT at 10 mg/kg.bw induced a significant increase (P<0.05) of mean plasma cholesterol compared to control group. The mean concentration of plasma glucose was also significantly increased in the group treated with high dose of LCT (LCT20) in comparison with the control group. Moreover, a highly significant increase (P<0.0001) of total protein was observed in LCT 20 group compared to the control. In contrast, urea, creatinine and total bilirubin did not show any significant change. While a very high increase (P<0.0001) in the activity of asparatate aminotranferase (AST) was recorded in both LCT treated groups, no significant variation was observed in the activity of alanine aminotransferase (ALT) in comparison with non-treated animals.

Table 3. Effect of lambda-cyhalothrin treatment for 25 days on metabolites and enzymes activity of rabbits blood sera

Parameter	Control	LCT 10	LCT 20
Cholesterol (g/L)	0.94 ±0.08	1.99 ± 0.86*	0.95±0.08
Glucose (g/L)	1.81 ± 0.01	2.25 ± 0.52	2.57± 0.19*
TP (g/dl)	6.12±0.34	6.38±0.58	8.70±0.42****
TB (mg/dl)	0.09±0.03	0.06±0.02	0.09±0.04
Urea (g/L)	0.38±0.04	0.50± 0.08	0.47±0.15
Creatinine (mg/dl)	1.16± 0.30	1.25±0.48	0.92±0.30
ALT (U/L)	50.92±7.49	53.54±19.2	47.72±19.63
AST (U/L)	19.57±1.72	5.61±9.64****	76.51± 10.31****

Values are expressed in means ± SE, n=4 rabbits for each treatment group. LTC- treated groups vs. control group: *P< 0.05; **P< 0.01; ***P< 0.001; ****P< 0.0001.

Effects of LTC on organ and tissues

No histopathological changes were observed in liver, kidney, lung and brain of untreated control animals. Histological study of the liver showed a normal hepatic architecture with normal hepatocytes, sinusoids, portal area and centrilobular veins in control group. Liver alterations induced by Lambda-cyhalothrin including cloudy swelling, cytoplasmic vacuolization and hypertrophy of hepatocytes, congestion and enlargement of central veins, narrowing of sinusoids and mild mononuclear infiltrate in portal area (Figure 2). Animals treated with Lambda-cyhalothrin showed severe tubular lesions in the kidney. The renal cortex showed a severe dilation of renal tubes associated with flattened epithelial cells and cast deposits. Some tubules showed cell degeneration with edema and peritubular inflammatory infiltrates (Figure 3).

The histological study of lung tissue sections of treated rabbits revealed a severe mononuclear cell infiltration of the pulmonary parenchyma (interstitial pneumonia), mild congestion and bronchial associated lymphoid tissue (BALT) hyperplasia (Figure 4). Mild to moderate degenerative alterations were observed in peripheral cerebral cells with vacuolization and perinuclear hallow. Mononuclear cell infiltrates were observed in cerebral cortex and meninges of rabbit treated with LCT (Figure 5).

Discussion

Lambda-cyhalothrin is a non-systemic broad spectrum pyrethroid insecticide which has adverse effects on the nervous tissue and exhibits toxic effects on other organs leading to neurotoxicity, behavioral and biochemical dysfunctions (18-20). In the present study, 10 to 15 minutes after oral administration of lambda-cyhalothrin, all treated animals started showing neurotoxicity clinical signs such as restlessness, convulsion, grinding of teeth, head shaking, muscular tremors, jerky movements of the forelegs, intense licking of the limbs and other body parts. Similarly, nervous signs including licking of the legs and other body parts, muscular tremors and hyperexcitability were observed by

Basir *et al.* (21) after intraperitoneal injection of lambda-cyhalothrin to rabbits.

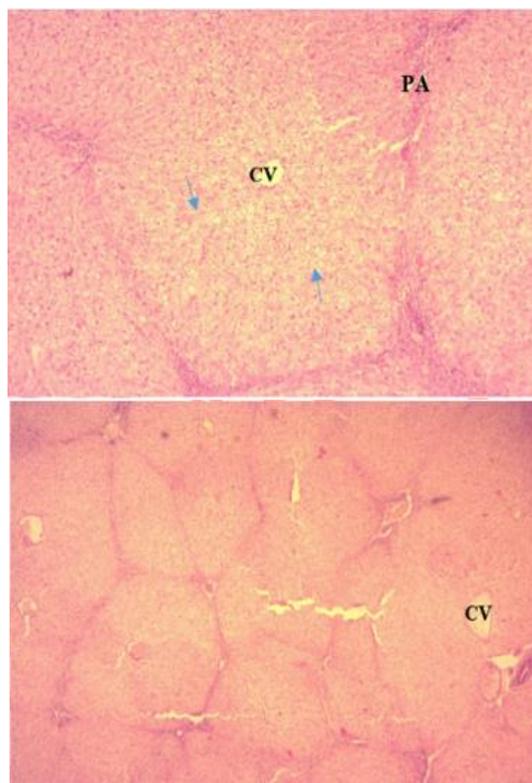


Figure 2: Photomicrograph of liver of rabbit treated with LCT for 25 days (H&E): (a) Section of liver reveals cloudy swelling, cytoplasmic vacuolization and hypertrophy of hepatocytes (arrow), narrowing of sinusoids and mild mononuclear infiltrate in portal area (pa) (400 x), (b) congestion and enlargement of central veins (cv) (400 x).

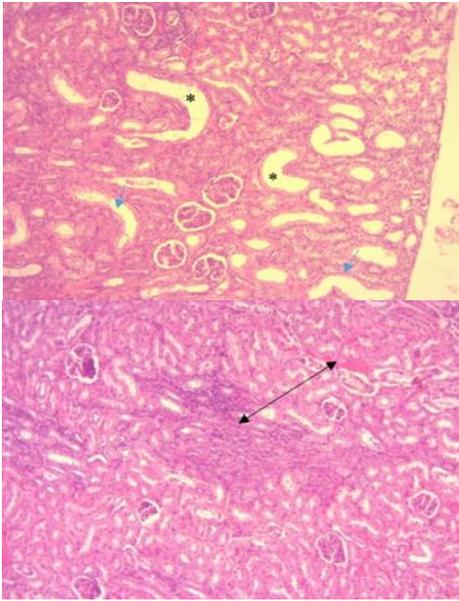


Figure 3: Photomicrograph of Kidney of rabbit treated with LCT for 25 days (H&E): (a) dilation of renal tubules (asterisk) associated with flattened epithelial cells and cast deposits (arrow), (b) tubules showing cell degeneration with edema and peritubular inflammatory infiltrates (double head arrow) (400 x).

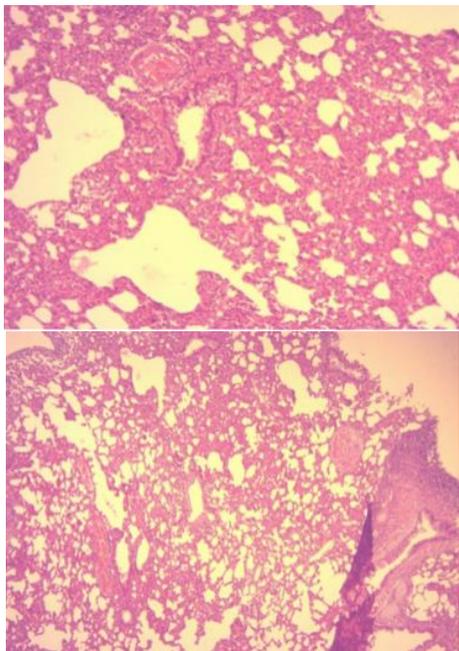


Figure 4: Photomicrograph of Lung of rabbit treated with LCT for 25 days (H&E): (a) interstitial pneumonia with severe mononuclear cell infiltration (b) congestion and bronchial associated lymphoid tissue (BALT) hyperplasia (100 x).

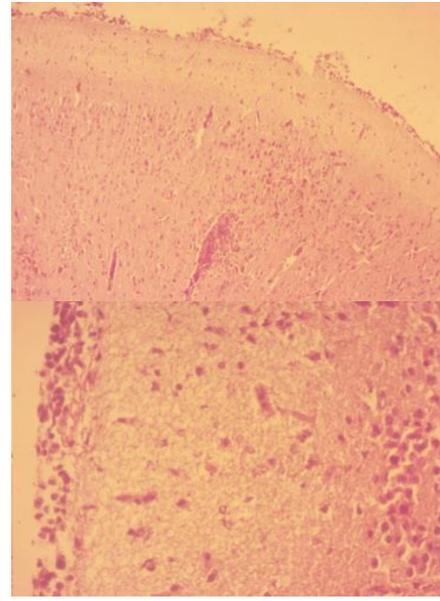


Figure 5: Photomicrograph of Cerebellum of rabbit treated with LCT for 25 days (H&E), (a) infiltration of cerebral cortex and meninges with mononuclear inflammatory cells (100x), with (b) peripheral cell degeneration, cell vacuolization and perinuclear hallow formation (400x).

The nervous signs observed in our study are mainly attributed to blockage of sodium channels which cause membrane depolarization and lead consequently to discharges from sensory neurons (1,22). In addition, other clinical signs of lambda-cyhalothrin toxicity including skin irritation of the neck and skin scratching were observed in both treated groups in the current study. Likewise, skin irritation has been reported with other pyrethroid insecticides in rabbits (1,23). Moreover, other authors have reported salivation in lambda-cyhalothrin treated rats and rabbits (11,19). Body and organs weights are very important criteria for the evaluation of toxicity in toxicological studies (24). In our study, mean body weights of LCT- treated rabbits were not affected compared to the control group. This result disagrees with previous studies where LCT administration caused weight loss in rats and rabbits (2,13,19). The effects of insecticide exposure on body weight are contradictory, probably depending on various factors, such as dose and route of administration, species, sex, and treatment duration (25).

No significant changes were observed in mean relative organ weights of liver, spleen and lung in both LCT-treated groups in comparison with non-treated rabbits. However, kidney and heart mean relative weights were significantly increased in rabbits of LCT 10 group. Furthermore, a significant increase in mean brain relative weight was recorded in LCT 20 group. Most previous studies have focused on the effect of lambda-cyhalothrin on the mean

absolute or relative liver weight and there is no data available on its effects on other organs weight and this makes the discussion of the results observed in the current study more difficult. Regarding the liver mean relative weight, our result is in agreement with that of Shakoori *et al.* (19) who reported no significant variation in the mean relative liver weight of rabbits after oral administration of cyhalothrin at 10 mg/kg b.w. In contrast, a significant decrease in relative liver weight of rats given LCT through drinking water was noticed by Fetoui *et al.* (2). Concerning the effects of lambda-cyhalothrin on erythrogram, no significant changes in total red blood cell and total white blood cell counts were observed in the treated groups when compared with control rabbits. This result partly agrees with the findings of Shakoori *et al.* (19) who reported that oral administration of LCT to rabbits did not affect the total leukocyte count but induced an increase of total erythrocyte count.

Contrarily, a cytotoxic effect characterized by total white blood cell decrease was reported by Basir *et al.* (21) in rabbits following intraperitoneal injections of lambda-cyhalothrin. Moreover, the administration of a mixture of alpha-cypermethrin, deltamethrin and fenvalerate induced an increase of total number of white blood cells in Swiss mice (26). In addition, no significant variations were observed in hemoglobin concentration and hematocrit in both LCT-treated groups compared to the control group. These results are not consistent with those obtained by Basir *et al.* (21) who reported that hemoglobin concentration and hematocrit were significantly reduced after IP injection of LCT in rabbits. Moreover, oral administration of 10 mg/kg b.w of LCT in rabbits induced a significant increase in hematocrit (19). Furthermore, erythrocyte indices (MCV, MCHC and MCH) of LCT-treated groups were unaffected. These results are in agreement with the findings of Shakoori *et al.* (19) who did not notice any change in MCV, MCHC and MCH in orally LCT-treated rabbits.

Our results and previous toxicological studies revealed that the effects of lambda-cyhalothrin and other pyrethroid insecticides on hemogram of either rabbits or other animal species are inconsistent and the observed differences could be attributed to various factors influencing hematological parameters such as feeding pattern, food utilization, fluids and salts balance, blood sampling and experimental variables (3). We think also that experimental duration and route of insecticide administration might affect blood parameters. According to Khan *et al.* (3), significant blood findings in pyrethroid orally fed animals could be attributed to adaptive reactions rather than hematotoxicity.

A significant increase in total plasma cholesterol levels was observed in LCT 10 group over control group while a significant elevation in plasma glucose concentration was recorded in LCT 20 group. These findings are partly in agreement with those obtained by Shakoori *et al.* (19) who reported hyperglycemic and hypocholesterolemic effects of cyalothrin in rabbits. In addition, pyrethroid insecticides

such as cypermethrin and deltamethrin, were reported to increase blood cholesterol level in rabbits (27). The hyperglycemia observed in the current study may be attributed to the formation of glucose from non-carbohydrate source by enhancing the activities of the enzymes involved in gluconeogenesis (27). Also, some insecticides increase glucose release from liver into blood through activation of glycogenolysis and gluconeogenesis as a detoxication mechanism to overwhelm the induced toxic stress (28). Further, the hypercholesterolemia observed in the present work might be due to the inhibitory effect of pesticide on hepatic CP450 enzymes (28). Furthermore, the hypercholesterolemia observed in the present work might be due to the inhibitory effect of pesticide on hepatic cyto-p-450 enzymes (28). It has been also reported that pesticides induce changes in the permeability of hepatic cell membrane and their accumulation in the liver disrupt lipid metabolism increasing therefore plasma cholesterol levels (29).

Serum total protein in this study exhibited a very significant increase in LCT 20 group. This result is in agreement with the findings of Shakoori *et al.* (30) who have reported a very high increase in protein content in rabbits orally administrated 15 mg/kg b.w of cyhalothrin. In contrast to our result, plasma total protein levels were not affected in LCT-treated rabbits (19,21) whereas it decreased significantly in rats orally treated with LCT for two months (20). Results reported by several authors on the effects of some insecticide on total protein are contradictory and this contradiction could be attributed to several factors such as the type and used dose, sex of the experimental animals and period of treatment (27).

Also, no significant change was observed in urea, creatinin and total bilirubin concentrations between LCT treated groups and control. These results concur with those obtained by Waheed *et al.* (18) who did not find any significant variations of urea and creatinine in rats orally administrated LCT. In contrast, a highly significant decrease in bilirubin was observed in orally LCT treated rabbits (19).

Our results also showed a very high increase in the activity of aspartate aminotranferase (AST) in both treated groups which might be due to the increase of cell membrane permeability as confirmed by histopathological findings. On the other hand, no change was recorded in the activity of alanine aminotransferase (ALT) and this might be due to the duration of the experiment. In fact, Shakoori *et al.* (19) have reported an increase in the activity of ALT in orally LCT treated rabbits after 15 days but the activity of the same enzyme was in the standards after 25 days of treatment. In contrast, many studies (2,21,31) have reported increased serum activities of alanine aminotransaminase (ALT) and aspartate aminotransaminase (AST) in pyrethroids treated animals.

The degenerative changes of hepatocytes observed in the current investigation are in agreement with those obtained by Basir *et al.* (20), Morgan and Osman (32), who observed

vacuolization of hepatocytes with condensation of nuclei in rabbits treated with 10 mg / kg b.w of LCT for 30 days and fibrous connective tissue proliferation of portal triads with leukocytic infiltration in rabbits treated with 1400 ppm LCT for 08 weeks, respectively. Previous studies have reported similar results showing marked changes in hepatic parenchyma of rabbit (32,33) and rats (2). In addition, similar liver lesions were observed in rabbits exposed to pyrethroid insecticides (34,35).

Our results revealed severe tubular lesions in the kidney corroborating those of (14) who have reported that lambda-cyhalothrin induced multiple foci of hemorrhage, tubular dilation at the level of the proximal tubule, desquamation of tubular cells, infiltration of inflammatory cells and enlargement of tubules. Similarly, Fetoui *et al.* (7) showed that LCT induced histopathological changes of rat kidney with tubular necrosis and enlargement, inflammatory cell infiltration, and hemorrhage which could be attributed to the accumulation of free radicals as the consequence of increased lipid peroxidation by cyanides and aldehydes in the renal tissues of LTC-treated rats. Likewise, Cypermethrin, a pyrethroid insecticide, induced similar kidney histopathological changes in treated rabbits as reported in two recent studies by Ahmad *et al.* (34) and Vardavas *et al.* (35).

Severe mononuclear cell infiltration of the pulmonary parenchyma was observed in the present study. A similar result was obtained by Basir *et al.* (21) who reported an accumulation of inflammatory cells around the bronchial structures after oral administration of 10 mg / kg of LCT in adult rabbits. The cerebral cortex sections illustrated cellular degeneration with mononuclear cell infiltrates in cerebellum and meninges in LCT treated rabbits and this finding is strongly correlated with brain pathological findings reported by Morgan *et al.* (32) in rabbits exposed to LCT via food. Although, there is a little available data about pathological effects of LCT on brain tissue; many studies have been conducted to investigate oxidative stress induced by LTC in the brain (33). In fact, the imbalance between the production of reactive oxygen species ROS and the capability of antioxidant mechanisms to deactivate them could lead to histopathological alteration of brain tissues as reported by Al-kahfah *et al.* (35) Pathological findings of this study are correlated with hepatic, renal, pulmonary and nervous disorders reported clinically and prove the multi organ toxicity of LCT in rabbit.

Conclusion

The present study demonstrated that exposure to lambda-cyhalothrin induced cytotoxic changes mainly in the hepatic biochemical markers reflecting a metabolic disorder. Lambda-cyhalothrin is a potent toxic chemical that alters the histological architecture of many organs such as liver, kidney, lung and brain. In the light of these observations, it

is recommended that lambda-cyhalothrin should be used with caution since it could be hazardous to many non-target organisms and more investigations need to be performed to study the mechanisms of biochemical alterations and tissue damage.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

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التأثيرات المرضية والبيولوجية والعلاج بلامداسيهالوثرين عند الأرانب

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الخلاصة

لامدا سيهالوثرين هو مبيد حشري من النوع الثاني من البيروثرويد يستخدم على نطاق واسع لمكافحة مجموعة كبيرة ومتنوعة من الآفات الزراعية في جميع أنحاء العالم وفي الجزائر. كان الهدف من هذه الدراسة هو تقييم آثار التعرض للمداسيهالوثرين على وزن الجسم ومعايير الدم الحيوية والكيمياء حيائية بالإضافة إلى تقييم التغيرات النسيجية في بعض الأعضاء عند الأرانب. أجري البحث على اثني عشر أرنباً من السلالة المحلية من الجنسين والبالغ معدل وزنها ١,٨ كغ تم تقسيمها إلى ثلاث مجموعات من أربعة أرانب: تم الاحتفاظ بالمجموعة الأولى كمجموعة سيطرة، المجموعة الثانية والمجموعة الثالثة تم إعطاؤها لامداسيهالوثرين عن طريق الفم بتركيز ١٠ و ٢٠ ملغم / كغم من وزن الجسم على التوالي بالتجريب ثلاث مرات في الأسبوع لمدة ٢٥ يوماً. أظهرت النتائج التي تم الحصول عليها عدم وجود فرق كبير في متوسط وزن الجسم بين المجموعات. كشف تحليل الدم عن عدم وجود فروق نوعية في الدم بين المجموعات المعالجة بلامداسيهالوثرين والمجموعة الشاهدة. أظهر التحليل الكيميائي الحيوي للمصل ارتفاعاً معنوياً في تراكيز كل من الكوليسترول والغلوكوز لدى المجموعة الثانية والمجموعة الثالثة على التوالي. ارتفع تركيز البروتين الكلي بنسبة عالية لدى المجموعة الثالثة. في حين تم تسجيل ارتفاع جد معنوي في نشاط إنزيم أسبرتات ناقلة الأمين في كلتا المجموعتين المعالجات، لم يطرأ أي تغير معنوي في نشاط إنزيم الأنين ناقلة الأمين. أظهر العلاج بلامداسيهالوثرين تغيرات نسيجية مرضية حادة في الكبد والكلى والرئة والدماغ. نستنتج من خلال هذه الدراسة أن لامداسيهالوثرين تحدث تغيرات سمية مرضية خطيرة واختلالات أفضية ووظيفية عند الأرانب.