

The effect of omega-3 in reducing the toxicity of lambda cyhalothrin on hepatorenal parameters of male rats

تأثير الحامض الدهني الاوميغا-3 في تقليل سمية المبيد الحشري Lambda cyhalothrin على فعالية الكبد والكلية في ذكور الجرذان المختبرية

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Abstract:

this research was aimed to asses the effect of omega-3 against lambda cyhalothrin (LCT) on some biochemical parameters of rats. The experiment was done on 18 male albino rats in Kerbala University /animal house of Pharmacy College for two months ,and the research was done with the agreement of the animal ethical committe in the college. The rats were divided into three groups, control group represented healthy animals, Lambda cyhalothrin group was drenched orally with 10mg/kg/day of this pesticide and the last one was drenched orally with 20mg/kg/ day of omega-3+ 10 mg/Kg/day of LCT. The samples of blood were collected for laboratory analysis and the liver and kidney tissues were excised for histopathological examination. The results showed a significant elevation in (AST , ALT ,Bilirubin and ALP)levels ,as well as parameters such as (urea, and creatinen) in both second and third group in comparing with healthy group. histopathological examination of liver and kidney in animals drenched with LCT showed significant hepatocyte necrosis while in rats intoxicated with(LCT+omega-3) showed significant healing. so this research showed the protective effect of omega-3 in reducing the toxic effects of cyhalothrin pesticide.

الخلاصة:

تهدف الدراسة الحالية لاثبات التأثير الدفاعي للاوميغا-3 ضد سمية المبيد الحشري Lambda cyhalothrin ، حيث تم استخدام 18 ذكرا من الجرذان المختبرية التابعة للبيت الحيواني لكلية الصيدلة / جامعة كربلاء وتم الحصول على موافقة لجنة حقوق الحيوان في الكلية قبل البدء بالتجربة وقسمت الحيوانات لثلاثة مجاميع بواقع ستة حيوانات لكل مجموعة مجموعة السيطرة و مجموعة المبيد الحشري جرعت (10 ملغم/كغم/يوم) واخيرا مجموعة المبيد 10 ملغم/كغم/يوم والاوميغا-3 جرعت (20 ملغم/كغم/يوم) واستمرت التجربة لمدة شهرين وعند انتهاء التجربة جمعت عينات الدم واجريت فحوصات كفاءة الكبد والكلية واجريت الفحوصات النسيجية لمقاطع الكبد والكلية . وأظهرت النتائج تأثير الاوميغا-3 في تقليل سمية هذا المبيد على المعايير الحيوية وتقليل حدة الضرر الحاصل بالمقاطع النسيجية جراء التسمم بالمبيد .

Introduction:

Lambda cyhalothrin (LCT) is a very effective pyrethriod pesticides as its highly toxic effect on insects [1]. this insecticide considered as potent synthetic type2 which has systemic toxic effects against many animals [2] . lambda cyhalothrin has low toxicity on non target organisms ,particularly, vertebrates especially mammals [3]. Exposure to this pesticide lead both sever and moderate risks. Acute effects include skin and eye irritation, non-cardiogenic pulmonary edema, cardiovascular toxicity, coma, convulsions and severe muscle fasciculation [4]. moderate effects in rats include decreased body weights, organ weight changes (liver, kidney, brain, heart and lung), reduced brain size [5], cell damage (neoplastic and histopathological lesions), tumors [6] and endocrine toxicity[7] ,also LCT acts by Disable functionality the nervous system in the living body [8] The researches on LCT showed its biochemical and genetics toxicity [9,10]which induced alternation of histopathological in mice[11].

On the other hand there is one of the important antioxidants used in the world, omega-3 has considered the essential fatty acids which has a protective effects against the toxicity of pesticides [12]. Dietary fish oil is the certain source of omega-3 fatty acids, which show to have beneficial

effects on some chronic degenerative diseases such as cardiovascular disease [13,14]. The beneficial effects of fish oil ,because it rich in omega-3 polyunsaturated fatty acids(PUFAs) such as docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA)(12).Many articles provide that this fatty acid has significant effect in reducing inflammations [15]. Many evidence revealed that if our food content a lot of long chain omega-3 fatty acids this will help in the development of healthy nervous, immunity and cardiovascular systems. It has a role in Ease of movement of ligaments, Psychic comfort, a sense of well being, strength, stamina and maintaining cholesterol levels within the normal range[16]. The most widely available source of EPA and DHA is cold water oily fish such as salmon, herring, mackerel, anchovies and sardines [17].

The aim of study : is to evaluate the effect of omega-3 fatty acid against Lambda cyhalothrin toxicity.

Materials and methods:

modals and chemicals:

Eighteen male rats ,weighting (250-300) g were used in this research .housed in animal house of university of Karbala/ college of pharmacy with ,which given free access to food and water ad libitum. These animals divided into three groups.

1- **Control group** :drenched normal saline for two months.

2- **Lambda cyhalothrin group**: drenched 10 mg/kg/day, which equivalent to5% of LD₅₀ of LCT for two months. [18]

3- **Omega-3 +LCT groups**: drenched 10 mg/kg/day of LCT +20 mg/kg/day of omega-3 [19] for two months.

-Biochemical measurements: the most important biochemical parameters for hepatorenal is:

Serum alanine amino transferase ALT , aspartate amino transferase (AST), Serum alkaline phosphates AIP , creatinen , urea and bilirubin

- Histopathological preparations:

histological sections were prepared according to the procedure of [20].

-Statistical Analysis:

The result were represented as mean \pm SE. Differences between control and other experimental groups were tested for statistical significance using SPSS version (20) one-way analysis of variances (ANOVA). $P \leq 0.05$.

Results:

1-Biochemical results:

Table(1) Show the effect of Omega-3 against Lambda cyhalothrin (LCT)

On ALT ,AST and ALP levels so there is significant increase in theses parameters levels in LCT group (92.50 ,79.52 ,139.83) compared to control group(46.56 ,33.32 ,100.08)and returned to normal by the effect of omega -3 fatty acid in third group (55.12 ,53.32 ,111.16). besides, Creatinine ,Urea and Bilirubin levels. there is significant increase in theses parameters levels in LCT group (0.32 ,54.21 ,0.54)compared to control group(0.22 ,36.15 ,0.30) and returned to normal by the effect of omega -3 fatty acid in third group (0.26 , 46.28 , 0.41) this results are significant at level $p \geq 0.05$.

2-Histological results:

First control liver: normal looking hepatocytes arranged in regular plates around central venue .also in control kidney :showed normal histological structure in the glomeruli (g) and tubules (t) at the cortex, while in Lambda (L) (liver):diffuse significant feathery degeneration, single cell necrosis and irregular plates with lost intervening spaces.No significant inflammation or congestion seen. And in (kidney):showed congested peritubular blood vessels (bv) and interstitial hemorrhage. while in group (L+O) the liver showed significant changes ,reducing in necrosis and degeneration seen with irregular plates. As well as in (kidney):there was protective effect against Lambda-induced damage and show normal kidney

Table(1) Show the effect of Omega-3 against Lambda cyhalothrin (LCT)
On ALT ,AST , ALP, Creatinine ,Urea and Bilirubin levels.

Parameters groups	ALT U/L	AST U/L	ALP U/L	Creatinin e Mg/dl	Urea Mg/dl	Bilirubi n Mg/dl
Control	46.56±0.33 ^a	33.32±0.83 ^a	100.08±0.34 ^a	0.22±0.004 ^a	36.15±0.25 ^a	0.30±0.004 ^a
Lambda cyhalothrin	92.50±1.86 ^b	79.52±0.46 ^b	139.83±0.68 ^b	0.32±0.009 ^b	54.21±1.134 ^b	0.56±0.022 ^b
Lambda cyhalothrin+o mega-3	55.12±1.35 ^c	53.32±1.22 ^c	111.16±1.75 ^c	0.26±0.006 ^c	46.28±0.80 ^c	0.41±0.012 ^c

-Different small letter means significant changing.-a, b, c means significant difference between control, LCT and LCT+Omega-3 groups .

– $P \leq 0.05$.

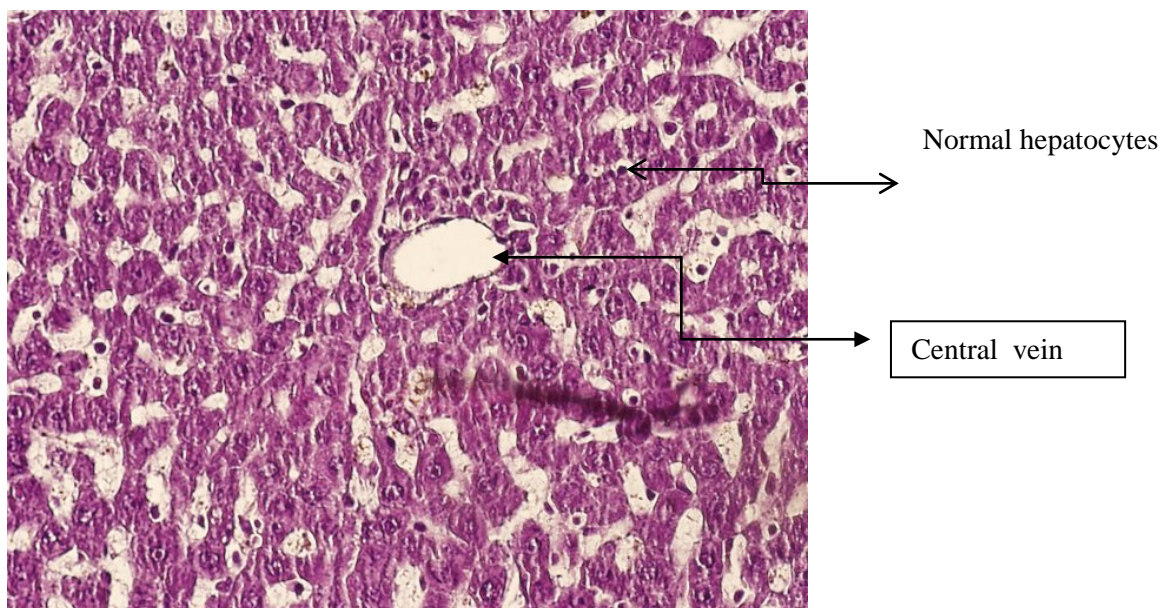


Image (1) transverse section of liver in control group (400X, H&E stain)

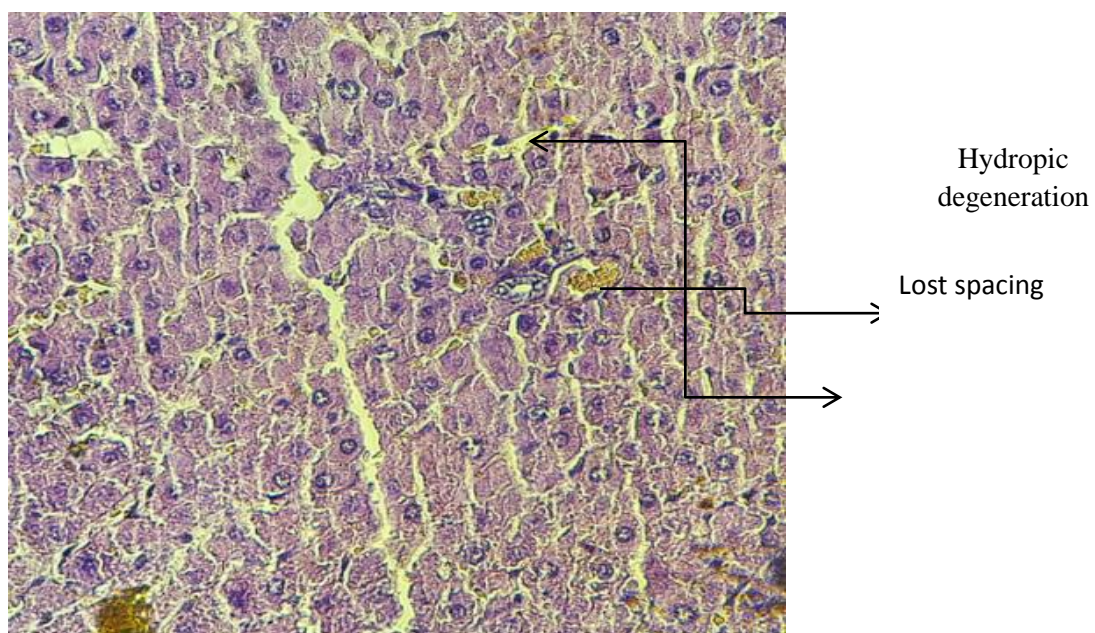


Image (2) transverse section of liver of (LCT) group (400X, H&E stain)

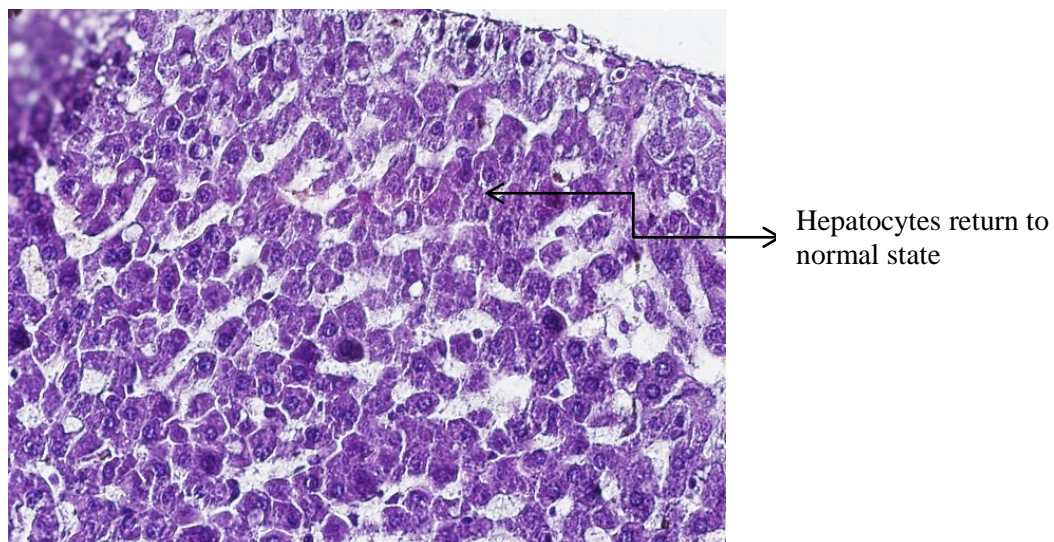


Image (3) transverse section of liver of (LCT+omega3) group (400X, H&E stain)

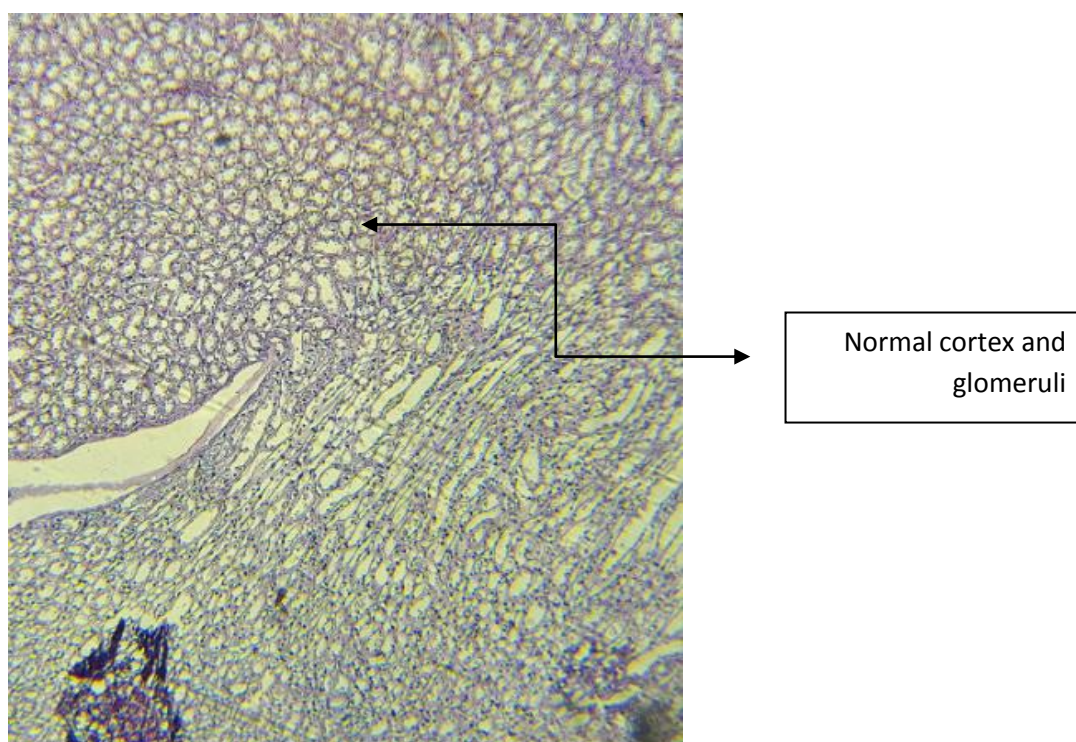


Image (4) transverse section of kidney in control group (400X, H&E stain)

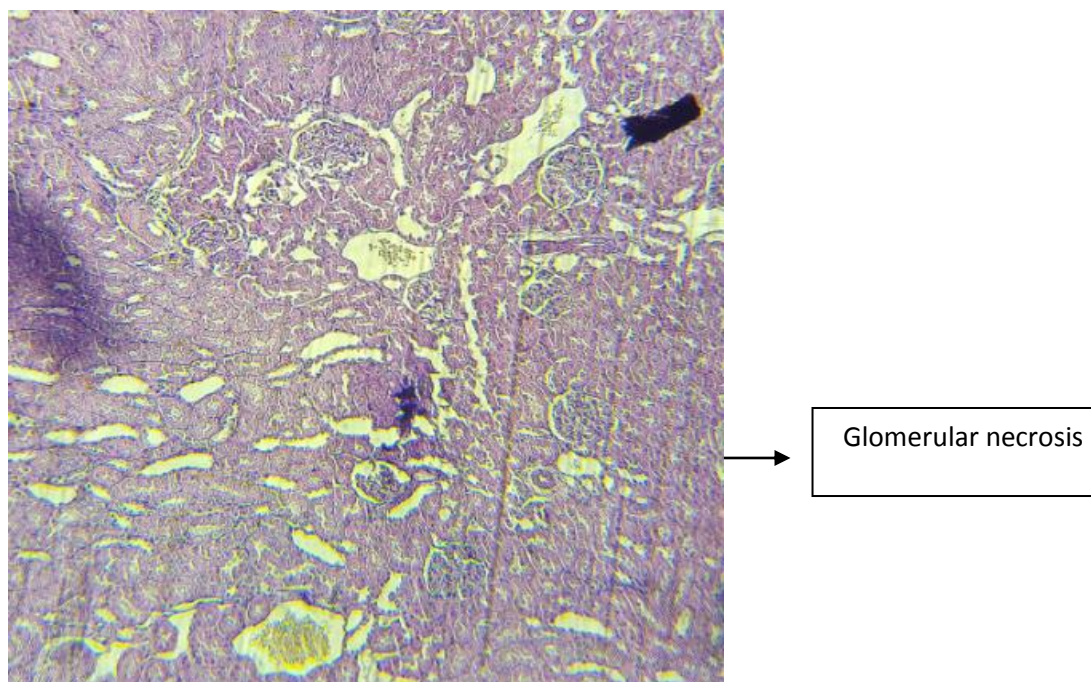


Image (5) transverse section of kidney in LCT group (400X, H&E stain)

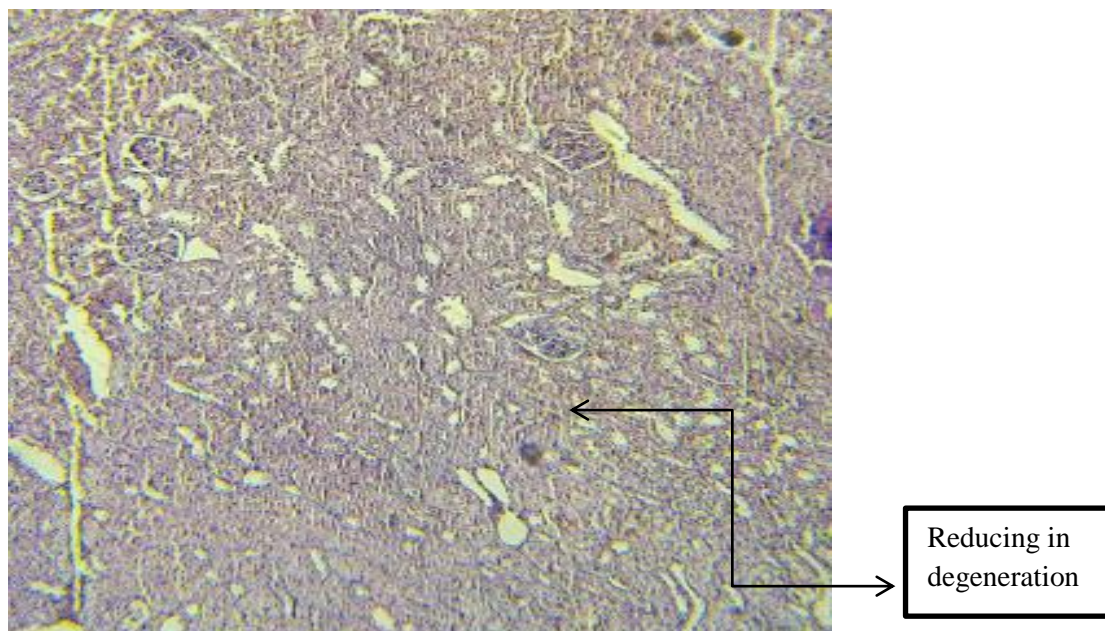


Image (6) transverse section of kidney in (LCT+omega-3) group (400X, H&E stain)

Discussion:

This research shows the effect of omega-3 in reducing the toxicity of Lambda cyhalothrin on male albino rats . regarding liver function ,this fatty acid reduced significantly the high levels of (AST,ALT, ALP)which refers to the hepatic cellular injury ,because damaged liver cells develop leaky membranes, allowing for escape of intracellular enzymes (including GOT, GPT and other enzymes) into the blood stream ,so, this results agreed with[21] which found that , there is asignificant damage in hepatorenal system which represented as elevation in serum ALT ,AST ,ALP and bilirubin ,so these parameters as good evidence for liver disorder in function and structure [22]. In this research we found asignificant elevation in these parameters as a result on the toxicity of lambda cyhalothrin which indicates increased permeability, damage or necrosis of hepatocytes [23].on the opposite side the antioxidant effect of omega3 fatty acid by reducing the toxic effect of lambda . This oxidant/antioxidant theory may explain the protection role of Omega-3 FAs against the hepatotoxicity and nephrotoxicity . Also, This suggests the repairing of injured liver cells by this fatty acid ,this can be proposed that fish oil can serve as apotent hepatoprotective agent [24]. Concerning to the effect of lambda cyhalothrin the levels of serum urea and creatinine of rats group which recived lambda cyhalothrine , there were significant increase in levels of serum Urea, Uric acid and creatinine as compared to other groups. These results are full agreement with [25 ,26,27]. The elevation in creatinine level might be retaren to the disorder of kidney function and considered as good indicator of renaltoxicity of lambda cyhalothrin [28]. The histopathological changes revealed less damage in the omega-3+LCT if compare with LCT group. So this refers to the protective effect of the omega-3 fatty acids also, The present research showed that the treatment with omega-3 fatty acids attenuated the physiological and histopathological alterations induced by LCT in rats. This indicated the effectiveness of omega-3 fatty acids in prevention of toxicity. The possible mechanism of the studied omega-3 fatty acids as hepatoprotective factor may be due to its antioxidant effect which impairs the activation of LCT into the reactive form [16,29] which ,They suggested that omega-3 fatty acids could ameliorate the toxic effects of toxin in part by means of its free radical scavenging activity and may be of therapeutic value in the protection of liver against any toxin.

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