مجلة المثنى للعلوم الصرفة
AL-Muthanna Journal of Pure Sciences (MJPS)
VOL.(3)...NO.(1) ….2016

# Effect of co-administration of Honey and L-carnitine on biochemical parameters of blood of rabbits in response to gentamicin induced nephrotoxicity

**Noor Thamer Al-saadi**
**Safa.A.Razaq Al Khalidy** **Aiad. G. Arean Al Khzaay**
**Al Muthanna University- College of Medicine**

## Abstract

Drug induced nephrotoxicity is an important cause of renal failure. Ototoxicity and nephrotoxicity are the main side effects of aminoglycoside antibiotics, such as gentamicin (GS). This is focused on the use of material as antioxidants against the toxic oxidative action that exert a cell damaging effect. The aim of this study is to evaluate the antioxidant effect of L-carnitaine and honey combaination against gentamicin induced nephrotoxicity biochemical analysis were done for all groups. Nephrotoxicity was confirmed by comparing the serum levels of urea, Creatinine (Cr), Glutathione (GSH) and Malonaldehyde (MDA) in gentamicin -treated group with that of normal saline treated groups. L-carnitine and honey alone and in combined form showed the ability to decrease the serum creatinine, urea and MDA levels, and increase serum GSH levels. By comparing L-carnitine in combination with honey with L-carnitine and/or honey, combined form of L-carnitine and honey showed a significant ($P<0.05$) improvement in biochemical parameters of kidneys in gentamicin induced nephrotoxicity. Better than L-carnitine and honey alone this study concluded that, administration of L-carnitine and honey alone and in combination form decrease nephrotoxicity induced by gentamicin through interference with the oxidative stress process, i.e. L-carnitine and honey act as free radical scavenger.

***Keywords: gentamicin, L-carnitine, honey, oxidative stress, nephrotoxicity.***

## Introduction

The kidney is an essential excretory organ of our body, plays a dominant role in homeostasis by excreting the metabolic waste products and excess necessary substances. It conserves necessary products depending on the needs of the body[1]. It is prime target of several drugs, toxic xenobiotics or chemicals due to high rate of blood flow (20%-25% of cardiac output) and presence of cellular transport systems that causes accumulation of these compounds within the nephron epithelial cells[2]. Metabolites of the drugs that are excreted from kidney may also cause cellular damage leading to kidney dysfunction. several xenobiotic substances like aminoglycosides, cephalosporin, anticancer drugs (cisplatin), amphotericin B, analgesics etc. exert their toxic effects by one or more common pathogenic mechanism that can produce nephrotoxicity[3]. Aminoglycosides induced nephro and oto-toxicity, which are the limiting factors for their clinical use, in which the oxygen free radicals have been involved[4]. Aminoglycosides exert their renal adverse effect by generation of reactive oxygen species. Additionally it has been demonstrated that aminoglycoside form a complex with mitochondrial $Fe^{2+}$ to catalyze the formation of free radicals[5]. Gentamicin belongs to a class of aminoglycoside antibiotics, is very effective antibiotic well suited to the treatment of severe infections and widely used in the treatment and prevention of gram negative bacterial infections[6]. Usually gentamicin-induced nephrotoxicity arise when gentamicin accumulates in the proximal convoluted tubules[7].This accumulation of gentamicin involve the production of free radicals in these tubules and diminishes the antioxidant defense mechanism of the body which may cause the acute tubular necrosis and glomerular congestion[8,9].Indeed, gentamicin was reported to induce oxidative stress in kidneys, by producing hydrogen peroxide in a dose dependent manner throughout renal cortical mitochonderia[10,11]. Several studies reported that the nephrotoxic effects of gentamicin can be reduced or ameliorated by administration of agents with antioxidant properties [12,13]. The antioxidants play major protective roles against the deleterious effects of oxidant agents produced in human body. They include both enzymatic (such as catalase, glutathione peroxidase and superoxide dismutase) and non-enzymatic substances (such as tocopherols, phenolic compounds, flavonoids, catechins, ascorbic acid and carotenoids) [14]. Honey is a natural popular sweetener and being used to treat a variety of illness due to its pleiotropic medicinal properties such as antibacterial, hepatoprotective, hypoglycemic, reproductive, antihypertensive and antioxidant effects[15].It is basically a saturated water solution of sugar, which also includes a highly complex mixture of carbohydrates, enzymes, amino acids, organic acids, minerals, aromatic substances, pigments, wax, pollen.

Studies reported that honey also possesses natural antioxidants through many compounds like vitamin C and polyphenols like chrysin, pinobanksin, luteolin and pinocembrin that can decrease oxidative stress in humans[16]. The antioxidant properties of honey due to it contains both aqueous and lipophilic antioxidants. These properties enable honey to act at different cellular levels as an ideal natural antioxidant [17]. Honey with higher water content and with darker color proved to have a higher antioxidant activity[15]. In this study we use honey in combination with another antioxidant which is L-carnitine, L-Carnitine plays an important role in long chain fatty acid transfer from cytosol to mitochondria for achieving β-oxidation[18- 21]. L-Carnitine is a naturally occurring amino acid-like compound located at the outer surface of the inner membrane. By combination with carnitine to form O Acylcarnitine, acyl groups could be transferred from cytosolic coenzyme A on the outer surface of mitochondrion membrane, then to the inner surface by exchange with free carnitine using an antiport mechanism. The acyl groups are then transferred from carnitine to coenzyme A within the mitochondrion [22]. Carnitine is also associated with buffering of excess acyl-Co A which is potentially toxic to the cells [7], and it was reported that L-Carnitine had protective effect on lipid peroxidation by reducing formation of hydrogen peroxides and malondialdehyde, and it improved antioxidant status in rats. Moreover, it increased free radical scavenging from the cellular sites [23- 25]. Although, various studies have been conducted to investigate the nephroprotective effects of L-carnitine and honey separately, but there is no online data available in which L-carnitine and honey have been studied to investigate the nephroprotective effects in drug-induced nephrotoxicity. In our present study, we have determined the combined nephroprotective effects of L-carnitine and honey in gentamicin induced nephrotoxicity.

## Materials and method

Our study was conducted on 30 male albino rabbits with body weight range from 1.8 Kg which were purchased from local market. These rabbits were placed in the animal house of the college of medicine/university of Al-Muthanna in temperature controlled room with 12 hrs. Light/ dark cycle. The commercial food was given to them with tap water. The rabbits were familiarized by placing them in stainless steel cages one week before the start of treatment. The approval for animal experiments was obtained from institutional ethic committee.

The honey used in this study was eucalyptus honey, brought from the local market. Carnitine (Carnitine ,Sigma-Tan Industrie Farmaceu tiche pomezia-Italya). Creatinine Kit (spinreact,.a.u.), Urea, MDA, GSH,(bio Meriex®sa,France). Spectrophotometer, U.K.



## Experimental protocol

Group 1: six rabbits were treated with intraperitoneal (IP) injection of normal

saline for 15 days, this group served as control.

Group 2: six rabbits were treated with intraperitoneal (IP) injection of 80 mg/Kg/day of gentamicin for 15 days, this group served as positive control for nephrotoxicity induced by gentamicin.

Group 3: six rabbits were treated with intraperitoneal (IP) injection of 50mg/ Kg/ day of L-carnitine concomitantly with I.P. dose of gentamicin 80 mg/Kg/day for 15 days, this group utilized to investigate the possible protective effect of L-carnitine against nephrotoxicity induced by gentamicin.

Group 4: six rabbits were treated with oral dose 1000mg/Kg/day of honey concomitantly with I. P. dose of gentamicin 80 mg/Kg/day for 15 days, this group utilized to investigate the possible protective effect of honey against nephrotoxicity induced by gentamicin.

Group 5: six rabbits were treated with intraperitoneal (IP) injection of 50mg/ Kg/ day of L-carnitine and orally with 1000 mg/ Kg/ day of honey concomitantly with I.P. dose of gentamicin 80 mg/Kg/day for 15 days, this group utilized to investigate the possible protective effect of L-carnitine and honey combination against nephrotoxicity induced by gentamicin.

**Preparation of blood samples:**

After 15 days of treatment, the blood samples (5ml) were collected from the marginal vein of rabbits with sterilized disposable needles. After coagulation, the blood samples were centrifuged at 4000 round per minute for 15 min to obtain serum for further biochemical analysis which was stored at -20 $^{0}$C until used for determination of urea [26], creatinine [27], glutathione[28], and MDA[29].

**Statistical analysis**

Data presented are means ±SD the differences between the experimental groups were computed using SPSS version 20. Comparison between the means was carried out by unpaired student's t-test. P-values <0.05 were considered significant.

**Results**

To investigate the nephroprotective effects of L-carnitine, honey, and combination of L-carnitine and honey we measured various biochemical parameters. The results of this study showed significant increase ($p<0.05$)in the serum level of both urea and creatinine of rabbits treated with 80mg/Kg/day of gentamicin (group 2) as compared to the corresponding levels in the control animals (group 1), these values significantly ($p<0.05$) decreased in L-carnitine (group3),honey (group4) and/or combination of L-carnitine and honey (group5) treated groups when compared with the values of these parameters in gentamicin treated control group (group 2), we also compared the nephroprotective effects of L-carnitine in combination with honey with either L-carnitine and/or honey alone.

From the results (table 1), it was observed that L-carnitine in combination with honey had the ability to decrease serum levels of creatinine and urea induced by gentamicin sulphate as compared to the L-carnitine or honey alone. In this study we also measured the serum levels of MDA and GSH of rabbits, the serum levels of GSH in GS treated control group (group2) were significantly ($p<0.05$) much lower than that of control group (group1), while the serum levels of GSH in L-carnitine (group3), honey (group4) and/or combination of L-carnitine and honey (group5) treated groups were significantly ($p<0.05$) higher than that of GS-treated group (group2).

While the serum levels of MDA in GS treated control group(group2) were significantly ($p<0.05$) much higher than that of control group (group1), while the serum levels of MDA in L-carnitine (group3), honey (group4) and/or combination of L-carnitine and honey (group5) treated groups were significantly ($p<0.05$) lower than that of GS-treated group (group2). We also compared the nephroprotective effects of L-carnitine in combination with honey with either L-carnitine and/or honey alone, from the results (table2), it was observed that L-carnitine in combination with honey had the ability to increase serum levels of GSH and decrease serum level of MDA induced by gentamicin sulphate as compared to the L-carnitine or honey alone.

**Table 1: effect of gentamicin, L-carnitine, honey and combination of L-carnitine and honey on serum urea and creatinine (n=6)**

| Parameter | Group 1 X±SD | Group 2 X±SD | Group 3 X±SD | Group 4 X±SD | Group 5 X±SD |
|---|---|---|---|---|---|
| Ureammol/L | 6.95 ± 0.16 | 17.17 ± 0.47 ∞ | 9.79 ± 0.209 * | 10.99 ± 0.186 * | 7.78 ± 0.62 * |
| Creatinine mmol/L | 38.66 ± 1.19 | 61.22 ± 2.23 ∞ | 52.32 ± 0.2 * | 54.18 ± 1.71 * | 41.31±2.29 * |

X=mean, SD=standard deviation, n=number of animals, ∞=significant ($p<0.05$) when compared group 2 with group 1, * significant ($p<0.05$) when compared group 3, 4 & 5 with group 2.

**Table 2: effect of gentamicin, L-carnitine, honey and combination of L-carnitine and honey on serum GSH and MDA (n=6)**

| Parameter | Group 1 X±SD | Group 2 X±SD | Group 3 X±SD | Group 4 X±SD | Group 5 X±SD |
|---|---|---|---|---|---|
| GSH uμmol/L | 2.94±0.18 | 1.038±0.11 ∞ | 2.26±0.19 * | 2.05 ±0.15 * | 2.73±0.115 * |
| MDA uμmol/L | 3.97±0.208 | 7.1±0.24 ∞ | 4.765±0.179 * | 5.34±0.24 * | 4.2±0.19* |

X=mean, SD=standard deviation, n=number of animals, ∞=significant ($p<0.05$) when compared group 2 with group 1, * significant ($p<0.05$) when compared group 3, 4 &5 with group 2.

## Discussion

Biochemical results show a considerably significant ($p<0.05$) nephroprotection effect of these two antioxidants either alone or in combination form on gentamicin-induced nephrotoxicity. Aminoglycoside antibiotics have long been used as antibacterial therapy. Despite their beneficial effects, aminoglycosides have considerable oto- and nephro- toxic side effects[30]. The nephrotoxicity of aminoglycoside (represented by acute tubular necrosis) usually appeared 5 to 10 days after a toxic insult and may be seen even after discontinuation of aminoglycosides therapy [16]. In general, aminoglycosides induced acute kidney injury results in non oliguric renal failure [16, 31]. Gentamicin induced nephrotoxicity is considered to be conditioned by increased production of free radicals and ROS along with initiation of necrosis and apoptosis in tubular parts of kidneys due to the accumulation of gentamicin in these parts[8,9]. In this study the serum levels of Cr and urea in GS-treated group (Group 2) was significantly high ($p<0.05$) as compared to control (group 1), while the serum levels of Cr and urea in group 3, 4 and 5 were significantly decreased ($p<0.05$) as compared to their levels in GS-treated group (Group 2).The marked elevation of serum Cr and urea in group 2 as compared with group 1 give an indication to the reduction in the glomerular filtration rate. Since serum Cr and urea are waste products of protein metabolism that needed to be excreted by the kidney, therefore such increase of serum Cr and urea as reported in our study confirm an indication of functional damage of the kidney and these results were in agreement with other studies [30,32]. In this study we also found that the combined effects of L-carnitine and honey were significantly high for nephro protection ($p<0.05$) as compared to the individual effects of L-carnitine and/or honey alone. The reason of the effects of L-carnitine in combination with honey may be due to the synergistic effects that resulted in the decreased levels of serum Creatinie and urea due to the cytoprotective effects of the combination by inhibition of ROS. Moreever, the results of this study showed a significant decrease in the serum levels of GSH with a significant increase in the contents of the end product of lipid peroxidation (MDA) of group 2 as compared with group 1. Previous studies showed that GS treatment in rats increase lipid peroxidation and resulted in decreasing of GSH concentration as well as tissue hypoxia in kidneys. Furthermore another studies showed that GS has induced an oxidative stress in kidney, evident by increase of plasma and kidney MDA concentrations[33]. MDA is one of the well-known secondary products generated after exposure to reactive oxygen species and free radicals, and may be used to evaluate oxidative damage by measuring serum levels of thiobarbituric acid reactive substance[16].This results were in agreement with other studies[39].

GSH belongs to antioxidant defense systems and prevents harmful effects of free radicals by scavenging hydroxyl radicals and singlet oxygen[34,35]. It is found exclusively in its reduced form, since the enzyme that reveres it from its oxidized (GSSG) to reduced form is constitutively active and inducible upon oxidative stress and its level in the tissue is considered a critical determinant of the threshold for tissue injury, therefore decreased GSH after gentamicin treatment due to increased consumption of GSH in non-enzymatic and enzymatic removal of oxygen radicals with efflux of GSSG being the major factor responsible for maintenance of redox ratio[16]. Concerning the results of this study which showed gentamicin nephrotoxic effects is in agreement with similar other studies in which a significant depletion of GSH in kidney cells resulting in their damage due to enhancement of lipid peroxidation[36]. The elevation of GSH levels in the serum of group 3, 4 and 5, and decrease of MDA levels in comparison with group 2, was attributed to the free-radical scavenging properties of L-carnitine and honey. The anti-oxidant activity of honey was attributed to its constituents like anti-oxidant trace elements and flavonoids compounds; therefore honey has been suggested to be able to decrease lipid peroxidation[16]. Also the anti-oxidant activity of honey is due to phenolic compounds and enzymes (glucose oxidase, catalase and peroxidase)[37, 38]. And it was reported that L-Carnitine had protective effect on lipid peroxidation by reducing formation of hydrogen peroxides and malondialdehyde, and it improved antioxidant status in rats, moreover, it increased free radical scavenging from the cellular sites [23, 24, and 25]. Result of this study are in agreement with result of Heba M Halawa, et al (2009), which found that natural honey has protective effect against the damage in liver and kidney cells from oxidative stress induced by toxic level of lead in rats[40], and other study which found that co-administration of vitamin C and E significantly prevented the aminoglycosides induced nephrotoxicity demonstrated by preservation of GFR and GSH level and prevention of elevation of urinary enzyme activities [29,41, 42].

## Conclusion

In this study we found that the combination of L-carnitine and honey provides more encouraging results by lowering serum creatinine, urea and MDA levels, and augmenting serum GSH levels more as compared to L-carnitine and honey alone.

## References

1-Sadia C. S.(2011).Effect Of Ashwagandha (Withania Somnifera)Root Extract Against Gentamicin Induced Changes Of Serum Urea And Creatinine Levels In Rats.J Bangladesh Soc Physiol. 6(2):84-89.

2-Pfaller W. and Gstraunthaler G. (1998). Nephrotoxicity Testing In Vitro- What We Know And What We Need To Know. Environ Health Perspect.;106(2):559-569.

Naughton C.A.(2008). Drug Induced Nephrotoxicity.Am Fam Physician; 78 (6):743-750.

3-Pedraza-Chaveri J.;Meladona P and Medina-Campos O..(2000).Garlic Ameliorates Gentamicin Nephrotoxicity: Relation Antioxidant Enzymes. Exp Physiology; 29:602-611.

4-Wojciech L.;Vincent L.;Pecoraro, And Jochen,S.(2005). Ternary Complexes Of Gentamicin With Iron And Lipid Catalyzeformation Of Reactive Oxygen Species,Chem.Res.Toxicol.;18(2),Pp 357.

5-Kaloyanides G.(2005). Aminoglycoside Induced Fuctional and Biochemical Defects in the Renal Cortex, Fundam. Appl, Toxicol.; 4; 930-943.

6-Whiting P. and Brown P.(1996).The Relationship between Enzymuria and Kidney Enzyme Activities in Experimental Gentamicin Nephrotoxicity. Ren Fail.;18: 899-909.

7-Geleilete T.; Melo G.; Costa R.; Volpini R.; Soares T.and Coimbra T.(2002).Role Of Myofibroblasts, Macrophages,Transforming Growth Factor-Beta Endothelin, Angiotensin-II, And Fibronectinin The Progression Of Tubulointerstisial Nephritis Induced By Gentamicin.J Nephrol.; 15: 633-642.

8-Abdel-Raheem I.; Abdel-Ghany A. and Mohamed G.(2009). Protective Effect of Guercetin against Gentamicin Induced Nephrotoxicity in Rats. Biol Pharm Bull.;32: 61-67.

9-Walker P. and Shah S. (1987). Gentamicin Enhanced Production Of Hydrogen Peroxide By Renal Cortical Mitochondria. AM. J. Physiol.; 253:495-499.

10-Walker P. and Shah S.( 1988). Evidence Suggesting A Role For Hydroxyl Radical In Gentamicin-Induced Acute Renal Failure In Rats. J,Clin. Invest.; 81: 334-341.

11-Maldanado P.;Barrera D.;Rivero I.; Mata R.;Medina-Campos O.;Hernandez-Pando 12-R. and Pedra-Za-Chaverro J. (2003).:Antioxidant S-Allylcysteine Prevents Gentamicin Induced Oxidative Stress and Renal Damage. Free Radic. Boil.Med.; 35: 317-324.

13-Pedra-Za-Chaverro J.;Maldanado P.; Barrera D.;Medina-Campos O. and Hernandez-Pando R. (2003). Protective Effect of Diallyl Sulfide on Oxidative Stress and Nephrotoxicity Induced by Gentamicin in Rats .Mol. Cell. Biochem.;254: 125-130.

14-Martin, Cathi J.;Goeddeke-Merickel and Catherine M.(2005).Oxidative Stress in Chronic Kidney Disease, Nephrology Nursing J.;7:1-9.

15-Basma K.;Ramadan and Mona F.(2011). The Renoprotective Effect Of Honey On Paracetamol-Induced Nephrotoxicity In Adult Male Albino Rats. Life Science J.; 8:3.

16-Abeer R. and Sajida H.(2012). The Protective Effect Of Honey Against Amikacin- Induced Nephrotoxicity In Rats. Iragi J Pharm Sci. Vol.21 :2.

17-Aljadi A.And Kamaruddin,M.(2004) Evaluation of the Phenolic Contents and Antioxidant Capacities of Two Malaysian Floral Honeys.Food Chemistry,85:513-518.

18-ARDUINI A.(1992): Carnitine and Its Acyl Esters as Secondary Antioxidants?
19-BRASS E. (2000). Supplemental Carnitine and Exercise. Am. J. Clin. Nutr. ;72 :618-23.
20-RANI P.J. and PANNEERSELVAM C. (2001).Carnitine as a Free Radical Scavenger in Aging. Exp. Gerontol.; 36: 1713-26.
21-SZILAGYI M.(1998). L-Carnitine as Essential Methylated Compound in Animal Metabolism. An Overview. Acta Biol. Hung.;49:209-218.
22-Kelly G. (1998). L-Carnitine: Therapeutic Applications Of A Conditionally-Essential Amino Acid. Altern. Med. Rev.; 3: 345-360.
23- KALAISELVI T. and PANNEERSELVAM C. (1998). Effect of L-Carnitine on the Status of Lipid Peroxidation and Antioxidants in Aging Rats. J. Nutr. Biochem; 9:575-581.
24- RANI P.J. and PANNEERSELVAM C.(2002). Effect Of L-Carnitine On Brain Lipid Peroxidation And Antioxidant Enzymes In Old Rats. J. Gerontol. A. Biol. Sci. Med. Sci.; 57:134-137.
25- SENER G., PASKALOGLU K., SATIROGLU H., ALICAN I.,KACMAZ A. and SAKARCAN A.(2004).L-Carnitine Ameliorates OxidativeDamage Due To Chronic Renal Failure In Rats. J. Cardiovasc.Pharmacol.; 43: 698-705.
26- Fawcett J. and scott, J.(1960).determination of urea in blood or serum. J Clin. Path.; 13: 156-159.
27- heinegard D. and tederstrom G. (1973). determination of serum creatinine by irect colorimetric. method. Clin. Chem. Acta.; 43:305 -309.
28-walf G.(2002).free radical in the physiological control of cell function. Physiological review J.; 82: 47-95.
29-wade C.; jacksonn P.; highton J. and van RIJ A.(1987).clinical laboratory tests. clin. chem. Acta.; vol.5,1649:245.
30-Enver,Y.;Muammer E. and Vahdettin .(2003).Effects Of Aminoglycoside Antibiotics On Renal Antioxidants, Malondialdehyde Levels, And Some Serum Biochemical Parameters. Candian Journal Of Veterinary; 67:239-240.
31. Michael L.; Howard L. Corwin and Joseph D.(2010).Drug Induced Acute Kidney Injury In The Critically Ill Adult: Recognition And Prevention Strategies. Crit Care Med.; 38: 169-173.
32-Atef M. and wafaa A.(2010). preventive effects of black seed (nigella sativa) extract on Sprague dawley rats exposed to diazinon.Austeralian journal of basic and applied sciences,; 4(5):957-968.
33-KART A.; YAPAR K.; KARAPEHLIVAN M.; TUNCA R.; OGUN M. and CITIL M.(2006).Effects of L-carnitine on kidney histopathology, plasma and tissue total sialic acid, malondialdehyde and glutathione concentrations in response to gentamicin administration in Balb/C mice. Revue Med.Vet.; 157 , 4: 179-184.

34- DIPLOCK A.: Antioxidants and free radical scavengers; in Rice-Evans C. and Burdon R.(1994). Free radical damage and its Control. Amsterdam, Elsevier,;113-130.

36- Ihab T. (2010). gamal a el-sherbiny and ashraf taye: green tea ameliorates renal oxidative damage induced by gentamicin in rats. Pak. J. pharm.; 23:21-28.

37- Vilma B.; petras V. and violeta C.(2007). radical scavenging activity of different floral origin honey and bee bread phenolic extracts. Elsevier; 30:1-6.

38. Cristine F. and Grael E. (2010).in vitro study of antioxidant and scavenging properties of phenolic compounds from lychnophora species. Maced J Med Sci.; 33:867-870.

39- Derakhshanfa A. ; Bidadkosh A. And Kazeminia S.(2007). Vitamin E protection against Gentamycin- induced nephrotoxicity in rats : a biochemical and

35-WU G.;FANG Y.;YANG S.; LUPTON J. and TURNER N.(2004).Glutathione metabolism and its implications for health. J. Nutr.; ;134:489-492.

histopathologic study. Iranian Journal of veterinary research, university of Shiraz, ; Vol. 8:3- 20.

40-Heba M.; Halawa, ; Nagwa E.; Noha A. and Awatef A.(2009). Evalution of honey protective effect on lead induced oxidative stress in rats. JASMR,; 2:197-209.

41-Merh k.(2005). effect of co-supplementation of vitamin E and C on gentamicin-induced nephrotoxicity in rats. Exp physiol; 90:571-576.

42- EL-Sayed M EL-Sayed. Mohamed F Abd-Ellah and Sabry M.(2008). protective effect of captopril against cisplatin-induced nephrotoxicity in rats Pak. J. Pharm. Sci.;21:255-261.

## التأثير المشترك للعسل و الكارنتين على المعايير الكيموحيوية للتسمم الكلوي المستحث بالجنتاميسين في الأرانب

**الخلاصة**

التسمم الكلوي الناشئ بسبب الأدوية هو أحد أهم أسباب الفشل الكلوي. التسمم الأذني والسمية الكلوية هي احد الآثار الجانبية الرئيسية للمضادات الحيوية الأمينوغليكوسيد، مثل الجنتاميسين. وتركز هذه الدراسة على استخدام المواد المضادة للاكسدة للعمل ضد الأكسدة السامة التي تمارس تأثيرا مدمرا للخلية. أن الهدف من هذه الدراسة هو تقييم التأثير المشترك للكارنتين والعسل كمضادات الأكسدة ضد التسمم الكلوي الناتج عن الجنتاميسين بأجراء تحليل الكيمياء الحيوية لجميع الفئات. وأكد وجود التسمم الكلوي من خلال مقارنة مستويات كل من اليوريا، الكرياتينين، الكلوتاثيون والمالوندايد الديهايد في المجموعة المعالجة بالجنتاميسين مع تلك المجموعة المعالجة بالمحلول المالح (نورمل سلاين).

وأظهرت نتائج الكارنيتين والعسل كلا على حدة، ومعا القدرة على خفض مستويات اليوريا،الكرياتينين ،MDA و زيادة مستوى الجلوتاثيون في الدم.أظهرت نتائج الكارنيتين والعسل معا تحسنا كبيرا ($p<0.05$) في القياسات البيوكيميائية للتسمم الكلوي الناتج عن الجنتاميسين أفضل من الكارنيتين والعسل كلا على حده وخلصت هذه الدراسة إلى أن انخفاض التسمم الكلوي الناجم عن الجنتاميسين من خلال التدخل في عملية الاكسدة، أي أن عمل الكارنيتين والعسل هو بازالة الجذور الحرة.

**كلمات المفتاحية: الجنتاميسين، الكارنيتين ، العسل، مضادات الاكسدة، التسمم الكلوي.**