Effect of Feeding by *Spirulina platensis* and Kareish Cheese on Liver and Kidney Damage Induced by Lead Toxicity in Rats

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Abstract: Lead is considered a potential hazard for human and animal health. The present study was performed to evaluate chemical composition and mineral content of *Spirulina platensis* and Kareish cheese replace on hepatic and renal damage induced by chronic lead toxicity in Rats. Thirty adult female rats were randomly divided into five main groups (6 per each group). The G1 was kept as control (untreated group), G2 is lead intoxicated rats (2 g/L lead acetate in drinking water), G3 rats fed on *Spirulina* (0.3%) of diet plus lead acetate (2 g/L water), G4 rats fed on Kareish cheese plus 2 g/L lead acetate in drinking water and G5 rats fed on both Kareish cheese with *Spirulina* (0.3%) plus 2 g/L water lead acetate. Kareish cheese has high nutritive value due to its high content of protein, ash, minerals (calcium, phosphorous) and vitamins. Also *Spirulina platensis* have nutrition value of protein, fiber, fat and minerals. Results showed that lead acetate increased the activities of AST, ALT, urea and creatinine, and decreased the contents of glutathione in liver compared to control. Also, revealed marked elevation in liver function markers and toxic renal metabolites in lead intoxicated rats as well as severe hepatic and renal alterations with increased lead tissue content in these organs. The sole replace of *Spirulina* and kareish or their combination were markedly improved both hepatic and renal functions, reduced their lead content and markedly ameliorated the hepatic and renal pathology induced by lead intoxication.

Keywords: Lead, *Spirulina platensis*, kareish cheese, liver, kidney, rats

INTRODUCTION

Lead (Pb) toxicity is the most common form of heavy metal intoxication. It is well documented as one of the most dangerous and insidious poisons (El-Neweshy and El-Sayed, 2011). Lead toxicity has been recognized as a major environmental health hazard worldwide affecting both humans and animal all ages especially young children in humans for a long time (Lalith Kumar and Muralidhara, 2014). There are evidences, which show that lead is a toxic agent with multiple target organs such as hematopoietic system, immune system, kidneys, liver and nervous system. Lead does not have any beneficial effects to human, and its presence by high concentrations produce very undesirable toxic consequences to humans affecting all the body organs (Ibrahim *et al.,* 2012). Lead is absorbed through digestive and respiratory tracts, and skin. After absorption into the blood, 99% of lead is bound to erythrocytes and the remaining of 1% stay in plasma to be carried to other tissues. Serum lead half-life is around 25 days (Kadhim *et al*., 2016). Liver and kidney are the major target organs of Pb, this element is highly dangerous to hepatic and renal function (Yuan *et al*., 2014). Lead may be rapidly absorbed and reached considerable amount in the blood (Sharma *et al.,* 2010) suggested that this element is strongly bound to macromolecules in the intracellular compartment because Pb binding proteins have been isolated from the kidney, liver, blood and brain explained the high concentration of Pb in tissue of kidney. The toxicity of many heavy metals is due to their ability to cause tissues oxidative damage. Damage includes enhanced lipid peroxidation, DNA damage and the oxidation of protein sulfhydral groups (El-Sokkary *et al*., 2005). *Spirulina platensis* or blue green algae are popularly used as a nutritional supplement as well as in therapeutic applications. *Spirulina* contains proteins, lipids, carbohydrate some vital minerals, essential fatty acids vitamins and a pigmented protein C-phycocyanin (Hemalatha *et al*., 2012). *Spirulina* contains antioxidants such as β-carotene and zeaxanthin. *Spirulina* may increase the production of immuno-stimulatory and immuno-modulator chemicals known as interferon and interleukins. Simultaneous administration of *Spirulina* and reduces levels of lipid peroxidation products. *Spirulina* has a significant effect on scavenging free radicals, thereby protecting the organs from damage caused by the exposure to lead (Rahman *et al*., 2012). Kareish cheese is one of the most popular cheese varieties consumed in Egypt especially in countryside owing to its high protein, low fat and reasonable price. It is an acid cheese made from skimmed cow's and buffalo's milk. Increased demand has led to the commercial production of Kareish cheese which, under such conditions, is frequently made from pasteurized and/or homogenized milk or reconstituted milk using *Lactobacillus delbrueckii* ssp. *bulgaricus* as starter and usually with rennet rather than acid as coagulant (Todaro *et al*., 2013). Lactic acid bacteria (LAB) are the basic in dairy fermented products such as yoghurt and Kareish cheese. In recent, LAB has drawn attention for their efficiency to secrete extracellular-polysaccharides (EPS). Worth mentioning, EPS include produced by LAB have various functional roles in human or animal health including immunomodulatory properties, antiviral activity, antioxidant activity and antihypertensive activity cholesterol-lowering activity. In addition, its properties of anti-tumor, anti-ulcer interests, at the same time, it has benefits as prebiotics (Abou Ayana and Ibrahim, 2015). This investigation

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aimed to study the effect of feeding female rats on kariesh cheese and *Spirulina platensis* to protect liver and kidney function from toxicity of lead acetate.

MATERIALS AND METHODS

Kareish cheese was obtained from Faculty of Agriculture, Cairo University. *Spirulina platensis* blue alga was obtained from Algal Biotechnology Unit National Research Centre, Giza, Egypt.

Sugar, corn oil from local market, salt mixture, vitamins mixture and Casein (protein ≥ 85%) cellules and choline chloride were purchased from El-Gomhoria Company, Lead acetate was obtained from Sigma Chemical Company, Kits were used for determination of ALT, AST, ALP, creatinine, urea, MDA, SOD, Catalase, GSPx and GSH were purchased from Biodiagnostic Company, Cairo-Egypt.

Animals: Thirty adult Sprague–Dawley females (about 145 g) in the animal house of the Ophthalmology Research Institute, Giza, Egypt, were used in the present study. The rats were kept under normal healthy laboratory condition; temperature was adjusted at 25±2°C and 12 hour light–dark. Animals were adapted on free access of water, and fed for one week on basal diet before the initiation standard of the experimental according to Reeves *et al.* (1993) and modification the protein ratio Barltrop and Khoo (1975) to 20% in diet.

Experimental design

Five groups each of six female rats were housed in wire cages in a room temperature maintained at 25 ± 2C° and kept under normal healthy conditions for 60 days. All rats and food consumption weight every week for determination the body weight gain. Rats of first group (G1) kept as negative control (normal control) fed on basal diet and drink tap water. Rats of group (G2) were used as positive control, fed on basal diet and drink water containing 2 g/L lead acetate. Rats of (G3) fed on *Spirulina* 0.3% of diet plus lead acetate (2 g/L water). Rates of (G4) fed on Kareish cheese as protein 20% of diet and drink water which containing 2 g/L lead acetate. Rats of the (G5) fed on mixture of (31.1%) Kareish cheese (20% protein of diet) with *Spirulina* (0.3% of diet) and drink water containing 2 g/L lead acetate.

Table (1): Composition of the experimental diets (%)

Ingredients	G1	G2*	G3*	G4*	G5*
Casein (Protein)	23.53	23.53	23.53	--	--
Sugar	10	10	10	10	10
Corn oil	10	10	10	10	10
Salt Mix	4	4	4	4	4
Vitamin mix	1	1	1	1	1
Choline chloride	0.2	0.2	0.2	0.2	0.2
Cellules	5	5	5	5	5
Spirulina	--	--	0.3	--	0.3
Kareish cheese	--	--	--	31.1	31.1
Corn starch	46.27	46.27	45.97	38.7	38.4

***** Drinking water containing lead acetate (2 g/L)

G1 (normal control), (G2) positive + drink water containing 2 g/L lead acetate. Rats of (G3) fed on *Spirulina* 0.3% of diet + lead acetate 2 g/L water, (G4) rats fed on Kareish cheese + 2 g/L lead acetate. Rats of the (G5) fed on Kareish cheese and *Spirulina* + 2 g/L lead acetate

Methods:

Chemical analysis: Protein, fat, carbohydrates, moisture and ash content were determined according to AOAC (2000). Minerals were measured in the ash using atomic absorption, Unicam 929 (AOAC, 1981).

Growth of rats%: The gain in the body weights was calculated by the following equation= final weight-initial weight/initial weight.

Biochemical assay: At the end of the experimental period, blood samples were collected from the animals from the eye plexuses on ice. Each sample was collected into both heparinized tubes to obtain the plasma and put in a dry clean centrifuge glass tube to prepare serum. Blood was left for15 min at room temperature, then the tubes were centrifuged for 15 min at 3000 rpm and the clear supernatant serum was kept frozen at -20°C until the analysis. Liver function: Alanine amino transferase (ALT) and Aspartate amino transferase (AST) activities were assayed by the method of Bergmeyer and Harder (1986). Alkaline phosphatase (ALP) activity was measured at 405 nm by the formation of paranitrophenol from para-nitrophenyl phosphate as a substrate using the method of Varley *et al*. (1980). Kidney function: (Creatinine) was measured using the method of Henry (1974). Urea was measured using the method of Fawcett and Scott (1960). The activity of lipid peroxidation level (Malondialdehyde, MDA) was determined in serum by the colorimetric method described by Meltzer *et al*. (1997). Superoxide dismutase (SOD), catalase (CAT), glutathione peroxides (GSPx) and glutathione reduced (GSH) were measured calorimetrically in erythrocyte according to the methods of Nishikimi *et al.* (1972), Aebi (1984), Rotruck *et al.* (1973) and Ellman (1959), respectively.

Statistical analysis: All data were expresses as mean± stander error. The obtained results were subjected to statistical analysis using the standard analysis of variance as outlined by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Chemical composition of Kareich cheese and *Spurilina plantesis:*

Table (2) showed the chemical composition of kareich cheese and *Spirulina plantesis*. The results showed the protein, lipid, carbohydrate, fiber, moisture and ash contents were 16.5, 1.2, 5.0, 0, 74.3 and 3.0%, respectively of Kareish cheese while it amounted in 50.6, 6.5, 20, 5.4, 7.1 and 10.4 of *Spirulina platensis*, respectively. The data (Table 2) revealed that the Kareish cheese rich in P (450 mg/100g), Ca (565 mg/100g) and Mg (8 mg/100g) while was about 5.11, 2.93 and 7.7 fold as that of *Spirulina.* Meanwhile, *Spirulina* characterized with high amounts of Fe (16.2 mg/100g), K (125 mg/100g) and Se (2.5 g/100g) which was about 231.4, 1.2 and 3.6 fold as that of Karish cheese. The presence of Zn decrease of toxic effect of pb as mentioned by (Hassan *et al.,* 2015). Calcium (Ca) plays a central role in nerve transmission and Pb has been postulated to act at synaptic sites by increasing the Ca flux (Silbergeld and Adler, 1978), the availability of Ca with changes in the Pb-Ca interaction must influence this effect.

Table (2): Chemical composition (g/100g) and Minerals of kareich cheese and *Spirulina plantesis*

Chemical composition	Kareish cheese	*Spirulina platensis*
Protein	$16.5^{b} \pm 0.93$	$50.6^{a} \pm 1.06$
Lipid	$1.2^{b} \pm 0.16$	$6.5^{a} \pm 0.21$
carbohydrate	$5.0^{b} \pm 0.19$	$20^{a} \pm 0.35$
Fiber	0.0 ± 0.0	$5.4^{a} \pm 0.24$
Moisture	$74.3^{a} \pm 1.45$	$7.1^{b} \pm 0.13$
Ash	$3.0^{b} \pm 0.13$	$10.4^{a} \pm 0.15$
P (mg/100g)	450	88
Ca (mg/100g)	565	193
Zn (mg/100g)	3.4	2.2
Mg (mg/100g)	8	1.1
Fe (mg/100g)	0.07	16.2
K (mg/100g)	104	125
Se (mg/100g)	0.7	2.5

Means, within the same row, followed by the same letter are not significantly different at $P<0.05$.

These effects were attributed to increase formation of insoluble Pb phosphate in renal cells following mitochondrial breakdown although it might have been attributed to changes in tubular reabsorption in the kidney. These effects on the kidney are analogous to those found by Kostial *et al.* (1974). Selenium content of *Spirulina* induced elevation of selenium containing enzymes as GSH peroxidase proteins thus modulating the toxic effects of heavy metals .On the other hand, Kareish contained various nutritive minerals including iron, calcium, zinc, selenium (Todaro *et al*., 2013).

Effect of kareish cheese, *Spirulina plantesis* and their mixtures on the body weight gain and relative weights of organs in experimental female rats induced with lead acetate

The effect of inducing lead acetate for 60 successive days period with kareich cheese, *Spurilina plantesis* and their mixtures on body weight gain of rats and relative weight of organs, had been summarized in Table (3). Data showed the initial body weights (143.3 - 144 g) which did not significantly differ among the groups. At the end of experiment, (G2) the positive control resulted in lowest significant increase (14.49%) in body weight gain comparing negative control group (37.96%). Meanwhile, the groups the body weights that gain of fed kareish cheese, *Spirulina plantesis* and their mixtures with lead acetate increased by 29.26, 31.80 and 33.12%, respectively. On contrary, there were non significant differences found in liver and kidney relative weight of rats except in group G2 (Table 3). Djebli *et al.* (2004) suggested that the reduced growth was due to reduced food consumption via lead effects on the satiety set-up. *Spirulina* group (G3) succeeded to induce an improvement in body weight compared to positive control group (G2). El-Tantawy (2016) mentioned that improvement of body weight could be attributed to *Spirulina* higher content of some macro and micronutrients including high quality protein, iron, gamma-linolenic fatty acid, carotenoids, vitamins B1 and B2, β-carotene, α-tocopherol and phycocyanin. The phycocyanin has been considered the predominant compound in the antioxidant activity of the *Spirulina* (Wang *et al.,* 2007). The beneficial effect of antioxidant administration against lead acetate poisoning with respect to body weight observed in the present study confirms previous results obtained by El-Tantawy (2016) who concluded that feeding rats with antioxidants could play an important role as a prophylactic against the toxic effects of lead acetate. Lactic Acid Bacteria (LAB) are the basic in dairy fermented products such as yoghurt and kareish cheese. In recent, LAB has drawn attention for their efficiency to secrete extra cellular-polysaccharides (EPS) (Abou Ayana and Ibrahim, 2015).

Wang *et al.* (2007) reported that the relative organs weight were significantly increased after induced with lead acetate compared to negative control Meanwhile, treatment with karish, *Spirulina* on their mixture resulted in significant in control then negative control and decrease than positive control increasing liver and kidney. The increase in organ weight could be attributed to the relationship between organ weight increase and various toxicological effects or to the reduction in body weight gain of experimental animals.

Table (3): Effect of kareish cheese and *Spirilina plantesis* on the body weight gain and organs in experimental female rats induced with lead acetate

Treatments	Initial (g)	Final (g)	Weight gain (%)	Liver (%)	Kidney (%)
G1	$143.3^{a} \pm 1.73$	$197.7^{a} \pm 1.54$	$37.96^{a} \pm 0.19$	$3.23^{c} \pm 0.13$	$0.54^{c} \pm 0.02$
G2	$143.5^{a} \pm 2.88$	$164.3^{e} \pm 2.45$	$14.49^{e} \pm 0.30$	$4.68^{a} \pm 0.01$	$0.94^{a} \pm 0.01$
G3	$143.5^{a} \pm 1.15$	$185.5^{d} \pm 1.44$	$29.26^{d} \pm 0.28$	$3.58^{b} \pm 0.21$	$0.61^{b} \pm 0.04$
G4	$143.7^{a} \pm 3.46$	$189.4^{c} \pm 2.54$	$31.80^{c} \pm 0.92$	$3.53^{b} \pm 0.24$	$0.60^{b} \pm 0.04$
G5	$144.0^{a} \pm 2.30$	$191.7^{b} \pm 0.95$	$33.12^{b} \pm 1.35$	$3.47^{b} \pm 0.27$	$0.59^{b} \pm 0.02$

- Means, within the same column, followed by the same letter are not significantly different at $P< 0.05$.
- Means are followed by the corresponding standard errors.

Effect of kareish cheese, *Spirluina plantesis* and their mixtures on liver and kidney functions in experimental female rats induced with lead acetate

Administration of lead acetate resulted in significant adverse effects on the liver functions of the rats, which is evidenced by a significant increase elevation (194.71, 211.35 and 339.79%, respectively) in the actions of ALT, AST and ALP enzymes in G2 compared to (G1) treatment of lead acetate rats with kareish cheese, *Spirulina plantesis* and their mixtures exhibited improvement in the actions of ALT, AST and ALP enzymes compared to positive control rats of G2. On the other hand, there were non-significant differences in the actions of ALT, AST and ALP enzymes among rats feed on kareish cheese, *Spurilina plantesis* and their mixtures groups throughout the feeding periods (60 days). It was clear from Table (4) that lead acetate treatment resulted significant adverse effects on the kidney functions of the rats, which is evidenced by a significant increase elevation (221.15 and 244.12%, respectively) in creatinine and urea in G2 compared to G1. Treatment of lead acetate rats with kareish cheese, *Spurilina plantesis* and their mixtures exhibited improvement in kidney functions compared to rats of (G2). Meanwhile, there were non-significant differences in creatinine and urea among rats fed kareich cheese, *Spirulina plantesis* and their mixtures throughout the feeding periods (60 days). The liver is considered one of the target organs affected by lead toxicity owing to its storage in the liver after lead exposure. Also, the liver being one of the major organs involved in the storage, biotransformation and detoxification of toxic substances, is of interest in heavy metal poisoning (El-Tantawy, 2016).

In the present study, there was a significant increase of ALT, AST and ALP activities in lead treated group as compared to the control group. These results showed that the exposure of lead affects hepatic tissue. It is believed that the most accepted hypothesis of hepatotoxicity for Pb is the bioactivation of Pb molecules to the toxic free radical by coenzymes of cytochrome P 450 (Singh *et al.,* 2011). When Pb is formed, it leads to lipid peroxidation of the polyunsaturated fatty acid in cell membranes, break down of membrane – structure and leading to the release of microsomal corboxyal esterase and other enzymes, such as amino transferases into the extra cellular compartments including serum (Bhattacharjee, 2014). The mechanism of elevated serum levels of creatinine and urea were explained by Ghorbe *et al.* (2001) who reported that the elevation in serum creatinine caused by lead and suggest that renal function impairment which might result from intrinsic renal lesions, decreased perfusion of the kidney obstruction of lower urinary tract or due to metabolic process caused by this metal. Rats treated with lead had significantly increase in serum urea, which has been reported to increase in acute and chronic intrinsic renal disease and also when there is decreased effective circulating blood volume with decreased renal perfusion. Treatment of kareish cheese, *Spirulina plantesis* and their mixture exhibited improvement in liver and kidney functions compared to G2. These results may attribute to the presence of antioxidants of *Spirulina plantesis* which had important beneficial effects on the liver regeneration. In this respect, it could be suggested prolonged time for more important it liver and kidney functions.

Table (4): Effect of kareish cheese and *Spirulina plantesis* on the liver and kidney functions in experimental female rats induced with lead acetate

Treatments	Liver functions			Kidney functions	
	ALT (U/L)	AST (U/L)	ALP (U/L)	Creatinine (mg/dL)	Urea (mg/dL)
G1	$24.19^{c} \pm 1.26$	$28.80^{c} \pm 2.19$	$67.35^{c} \pm 1.35$	$0.52^{c} \pm 0.02$	$21.60^{c} \pm 0.92$
G2	$71.29^{a} \pm 0.74$	$89.67^{a} \pm 2.69$	$296.2^{a} \pm 3.58$	$1.67^{a} \pm 0.04$	$74.33^{a} \pm 2.20$
G3	$37.20^{b} \pm 1.10$	$58.16^{b} \pm 1.82$	$152.5^{b} \pm 1.42$	$0.95^{b} \pm 0.02$	$44.55^{b} \pm 2.05$
G4	$37.75^{b} \pm 1.58$	$57.81^{b} \pm 2.20$	$151.5^{b} \pm 0.86$	$0.93^{b} \pm 0.04$	$43.89^{b} \pm 2.24$
G5	$36.82^{b} \pm 1.05$	$57.56^{b} \pm 1.47$	$150.2^{b} \pm 3.02$	$0.90^{b} \pm 0.02$	$43.18^{b} \pm 1.25$

- Means, within the same column, followed by the same letter are not significantly different at $P<0.05$.
- Means are followed by the corresponding standard errors

Effect of kareish cheese and *Spurilina plantesis* on serum MDA and erythrocyte (SOD, Catalase, GSPx and GSH) levels in experimental female rats induced with lead acetate

Table (5) showed the activity levels of serum, enzymatic antioxidants %, SOD, Catalase, GSH-Px and non-enzymatic antioxidant, GSH in erythrocyte, and malonaldehyde content respectively, in normal and experimental rat groups. The amount of serum maloaldehyde (MDA) was significantly increased by about 145.36% in G2 compared to (G1). While the activities of enzymatic antioxidants (SOD, Catalase, GSH-Px) and non-enzymatic antioxidant (GSH reduced) were significantly decreased (38.50, and 31.78, 53.04 and 44.96%, respectively) in rats induced with lead acetate (G2), when compared with the normal group G1. Treatment the experimental lead acetate rat groups with kareish cheese, *Spirulina plantesis* and their mixtures decreased the levels of malonaldehyde (MDA) and increased the activities of enzymatic antioxidant, (SOD, Catalase, GSH-Px) and non-enzymatic antioxidant, GSH reduced level. Hepatic induced by lead acetate was associated with oxidative stress due to lead acetate induced free radical production and toxic (Atef *et al.,* 2013). Oxidative stress plays an important role in chronic complications of lead acetate and is postulated to be associated with increasing lipid peroxidation. The cytotoxic action of lead acetate is associated with the generation of reactive oxygen species causing oxidative damage. The increased free radicals produced may react with polyunsaturated fatty acids in cell membranes leading to lipid peroxidation. Lipid peroxide-mediated damage has been observed in the development of lead acetate. The increased lipid peroxidation in the serum with lead acetate may be due to the observed remarkable increase in the concentration of free radical in the serum induced with lead acetate G2.

Table (5): Effect of kareich cheese and *Spirulina plantesis* on serum MDA and Erythrocyte SOD, Catalase, GSPx and GSH) levels in experimental rats female induced with lead acetate

Treatments	SOD (U/ml)	Catalase (U/ml)	GSPx (U/ml)	GSH (mg/dl)	MDA (nmol/ml)
G1	$306.2^{a} \pm 3.562$	$140.23^{a} \pm 1.287$	$171.30^{a} \pm 0.751$	$40.28^{a} \pm 0.739$	$11.64^{c} \pm 0.370$
G2	$188.3^{c} \pm 1.299$	$95.66^{c} \pm 3.268$	$80.45^{c} \pm 3.724$	$22.17^{c} \pm 1.253$	$28.56^{a} \pm 2.055$
G3	$276.1^{b} \pm 2.973$	$131.6^{b} \pm 2.023$	$146.90^{b} \pm 1.097$	$32.86^{b} \pm 3.961$	$19.44^{b} \pm 1.986$
G4	$276.4^{b} \pm 4.272$	$132.19^{b} \pm 1.264$	$147.36^{b} \pm 0.785$	$32.78^{b} \pm 2.182$	$20.17^{b} \pm 0.675$
G5	$278.4^{b} \pm 1.940$	$133.57^{b} \pm 2.061$	$148.15^{b} \pm 1.241$	$35.60^{b} \pm 2.656$	$18.48^{b} \pm 1.432$

- Means, within the same column, followed by the same letter are not significantly different at $P<0.05$.
- Means are followed by the corresponding standard errors.

In the current study, level of serum MDA in groups treated with kareish cheese and *Spirulina plantesis* showed a significant reduction which indicates a decrease rate of lipid peroxidation (Supratim *et al.,* 2007). In general, superoxide dismutase (SOD) is an important antioxidant enzyme which catalyzes the conversion of toxic superoxide radical to less reactive hydrogen peroxide (Taro and Hirotaka, 2017). The SOD is known to be reduced markedly in lead acetate induced hepatic. While oxidative stress could be ameliorated via the elevation of hepatic SOD level (Ismail *et al.,* 2012). In addition, glutathione peroxidase (GPx) is another antioxidant enzyme commonly used to investigate the oxidative stress. It has been indicated that antioxidant-like compounds produce hepatic protection through an increase in GPx to scavenge the free radicals (Zuhal *et al.,* 2011).

Effect of kareich cheese and *Spirulina plantesis* on lead level in liver and kidney of experimental female rats induced with lead acetate

Administration of lead acetate produced significant adverse effects on the lead level in liver and kidney of the rats, which is evidenced by a significant increase elevation (444 and 105.13%, respectively) in liver and kidney of G2 compared to G1. Treatment of lead acetate rats with kareich cheese; *Spirulina plantesis* and their mixtures exhibited improvement lead level in liver and kidney compared to G2. On the other hand, there were non-significant variances in the lead level in liver and kidney among rats feed on kareich cheese, *Spurilina plantesis* and their mixtures groups throughout the feeding periods (Table 6). These results proved that lead induced hepatic toxicity via increased oxidative stress on hepatocytes with subsequent development of degenerative hepatocellular changes and activation of pro apoptotic genes with subsequent induction of apoptosis, and these results was confirmed by the increased lead content in liver tissue of lead treated groups (Jarrar and Taib, 2012).

Table (6): Effect of fed on Kareich cheese and *Spirulina platensis* on Lead level in liver and kidney of experimental female rats induced with lead acetate

Treatments	Liver (mg/100g	Kidneys (mg/100g
G1	$2.50^{a} \pm 0.08$	$1.56^{b} \pm 0.32$
G2	$13.60^{a} \pm 2.07$	$3.20^{b} \pm 0.28$
G3	$7.54^{a} \pm 0.31$	$2.93^{b} \pm 0.07$
G4	$6.35^{a} \pm 0.77$	$2.88^{b} \pm 0.04$
G5	$5.55^{a} \pm 0.89$	$2.60^{b} \pm 0.34$

- Means, within the same column, followed by the same letter are not significantly different at P<0.05.
- Means are followed by the corresponding standard errors

CONCLUSION

From the present study, it can be concluded that the feed with Kareish cheese and *Spirulina platensis* protect liver and Kidney tissues from damage with lead acetate by decrease the level of lipid peroxidation and increase antioxidant activities, which need a long period of treatments.

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تأثير التغذية بطحلب *Spurlina platensis* والجبنة القريش على أضرار الكبد والكلى الناجمة عن سمية الرصاص في الفئران

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يمثل عنصر الرصاص خطراً شديداً على صحة الإنسان والحيوان. أجريت الدراسة الحالية لتقييم التركيب الكيميائي والمحتوى المعدني لطحلب *Spurlina platensis* والجبنة القريش. وكذا تأثير التغذية عليهما لتقليل الضرر الكبدي والكلوي الناجم عن سمية الرصاص في فئران التجارب. تم تقسيم ثلاثين فأر إناث بالغين عشوائياً إلى خمس مجموعات رئيسية (٦ لكل مجموعة). المجموعة الأولى G1 كنترول (المجموعة غير المعالجة). المجموعة الثانية (G2) من الفئران المصابة (٢جم/لتر خلات الرصاص في مياه الشرب)، والمجموعة الثالثة G3 الفئران تم تغذيتها على سبيرولينا (٣٠٪) من النظام الغذائي بالإضافة إلى خلات الرصاص (٢جم/لتر ماء)، والمجموعة الرابعة G4 تغذية على الجبنة القريش بالإضافة إلى خلات الرصاص ٢جم/لتر في مياه الشرب والمجموعة الخامسة G5 التي تغذت على الجبن القريش مع سبيرولينا (٣٠٪) بالإضافة إلى خلات الرصاص ٢جم/لتر ماء. الجبنة القريش لها قيمة غذائية عالية بسبب محتواها العالي من البروتين والرماد والمعادن (الكالسيوم والفوسفور) والفيتامينات. أيضا طحلب *Spurlina platensis* له قيمة غذائية عالية من البروتين والألياف والدهون والمعادن. وأظهرت النتائج أن خلات الرصاص أدت إلى زيادة لكل من ألانين أمينو ترانزو وأسبارتاتي أمينو ترانزو اليوريا والكرياتينين، وإنخفضت محتويات الجلوتاثيون في الكبد مقارنة بالكنترول. وأيضا إرتفاع ملحوظ في وظائف الكبد والكلية في الفئران المصابة بالرصاص وكذلك التغيرات الكبدية والكلى. وأوضحت النتائج أن إضافة طحلب سبيرولينا والجبنه القريش أو (خليط) منهم أدي إلى تحسن بشكل معنوي في كل من وظائف الكبد والكلى، وخفض محتوى الرصاص فيهما وحدث تحسن ملحوظ في الكبد والكلى وتقليل الآثار الناتجة عن تسمم الرصاص.