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Effect of Co-Q10 with Peanut on Immune Support for Albino Rats Inflicted With Diabetic Diseases

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Abstract

CoQ10 administration effectively increases the highest antioxidant power of the liver by protecting endogenous CoQ9, mitochondrial function and particularly succinate oxidase activity and by limiting lipid peroxidation. This work aims to the investigation of the hypoglycemic influence of peanut, investigate the possible immunity support of some diseases such as diabetic feeding of control (+) rats on diets containing Co-Q10 or Co-Q10 plus any botanical additives, known to support the immune system. In this experiment, 16 rats were split into 4 groups (4 rats per one), all groups were fed for 28 days on experimental diet as follows:

Group (1): This group fed on standard diet only as a control negative (healthy rats).

Group (2): This group fed on standard diet only as a control positive (rats with diabetes).

Group (3): This group fed on standard containing 10% peanut+10mg CoQ10 (formula **A**).

Group (4): This group fed on standard containing 10% CoQ10 (formula **B**).

In all experimental groups, blood samples were collected for estimating BMG %, FER, CHOL. T.G, HDL, LDL and VLDL, ALP, CREAT and URIC. And the end analytical methods and Statistical analysis. The results are summarized as CoQ10 produced a significant decrease in elevated levels of glucose, cholesterol, triglycerides, very-low- density lipoprotein, and increased high- density lipoprotein cholesterol levels and reduce high pressure blood.

Keywords: peanut, CO-Q10, immune support, diabetic.

1. Introduction

The immune system is a compound functional system consisting of diverse organs, tissues and cells, distributed throughout most of the body. The successful immunity depends on the successful collaboration of these cells, which leads to many new cells and molecules that match up with and counteract each challenger this activity constitutes the immune response. **(Elgert, 1996).**

The immune system includes rapidly multiplying cells whose functions are dramatically affected by an individual's micronutrient status. **(Bendich, 2001).**

Calder and Kew (2002) observed that Nutrient status is an important factor contributing to immune competence, under nutrition impairs the immune system, suppressing immune functions that are fundamental to host protection against pathogenic organism. **Ibrahim *et al*., (1999)** found that vitamin E (VE) and coenzyme Q (CQ) are essential for maintaining function and integrity of mitochondria, and high concentrations of these compounds are found in their inner membranes. There is a complex interaction and reciprocal control among the immune system, the endocrine system and the central nervous system **(Marcos, 2000)**. Malnutrition may have an impact on these interactions and may impair the communication between these systems. **(Brambilla, 2001).**

Emekli *et al*., (2008). This study shows that consuming peanut may enhance the oxidant – antioxidant status in diabetic and healthy status without rising blood lipids. Further, increased HDL-C levels and decreased AI levels in diabetic rats indicate that, consuming peanut may have protective effects against cardiovascular complications of diabetes. This work aims to the investigation of the hypoglycemic influence of peanut.

2. Materials and methods

2.1. Source of materials

Plants (peanut) were purchased from local markets at Cairo, Egypt, Alloxan, were obtained from Memphis Company for pharmacy Chemical Industry, Cairo, Egypt Casein as main source of protein was obtained from Morgan Company, Cairo, Egypt. Co-enzyme (CoQ10), Vitamin mixture and salt mixture were purchased from El-Gomheriya Company, Cairo, Egypt. Male, white albino rats, Sprague Dawely strain, weighting (220-250g) were obtained from the National Research Center, El- Duke, Giza, Egypt.

2.2. *Preparation of peanut*

Peanut seeds were peeled to separate peels from seeds. The obtained seeds were dried by solar energy, milled and finally sieved by 60 mesh screens.

2.3. *Biological experimental*

Sixteen white male albino rats, Sprague Dawley strain, week age, weighting (220-250g) were used. Rats were kept in cylindrical wire cages with wire bottoms. The diet was introduced in special food cups to avoid scattering of food. Also, water was provided to the rats by glass tube, projection through the wire cage. Food and water provided ad- labium and checked daily.

2.4. *Preparation of diabetic rats*

Diabetes was induced in normal rats by subcutaneous injection of alloxan (150mg/kg body weight) according to the method described by **(Desai and Bhide, 1985).** One week later, fasting blood samples was obtained by a retro orbital method for estimating fasted serum glucose. Rats having fasting serum glucose more than 200mg/dl were considered diabetics **(NDDG, 1994).**

2.5. *Experimental design*

All biological experiments were done at the Faculty of Home Economics Minufiya University. Rats (n =16 rats) were housed individually in wire cages in a room maintained at 25±2°C and kept under normal healthy conditions. All rats (16 rats) were fed on standard diet for one week before starting the experiment for acclimatization. After one-week period, the rats were divided into 4 groups (4 rats each), all groups were fed for 28 days on the experimental diet as follows:

Group (1): This group fed on standard diet only as a control negative (healthy rats).

Group (2): This group fed on standard diet only as a control positive (rats with diabetes).

Group (3): This group fed on standard containing 10% peanut+10mg CoQ10 /100gm diet (formula **A**).

Group (4): This group fed on standard containing 10% CoQ10/100gm diet (formula **B**).

2.6. *Blood sampling*

In all experimental groups, blood samples were collected after 12 hours fasting at the end of each experiment, using the orbital method by means of micro capacity glass heparinized tubes. Blood samples were collected into dry clean centrifuge tubes and left to clot in water both (37°C.) for half an hour. The blood was centrifuged for 10 minutes at 3000 rpm to separate the serum; serum was carefully aspirated into clean curved tube and stored frozen at -20° C for analysis as described by **(Schermer, 1967).**

2.7. *Biological evaluation*

Biological evaluations of the various diets were executed by definition of body weight gain % (BMG %), food efficiency ratio (FER) according to **Chapman *et al.*, (1959)** using the following formulas:

BWG % = Final weight- Initial weight

———————————— X100

Initial weight

FER= Gain in body weight (g)

Food intake (g)

And relative organ weight calculated by the following formula:

Relative organ weight (ROW) = Organ weight

———————————— X100

Animal body weight

2.8. *Determination of blood glucose*

Enzymatic determination of plasma glucose was executed calorimetrically according to the method of **Yound (1975) and Tietz (1976).**

2.9. *Statistical analysis*

Statistical analyses were performed by using the computer program statistical package for social science (SPSS), and computer with each other using the suitable tests. All obtained results were tabulated. Statistical analysis has been achieved using IBM-P-C computer by SPSS, program **(SPSS, 2008).**

1. Results and Discussions

Table (1) shows the effect of some foods with Co-Q10 on BWG, FI and FER of diabetic diseases in rats. It could be observed that the mean value of BWG of control positive was lower than control negative, which were 51.6±4.14 and 64.0±2.31% respectively. As for FI the results showed that the mean value of control positive was lower than control negative, which were 19.1±2.51 and 25.5±1.61 respectively,

as well as the values of testing formulas **A** and **B**

In the same table the mean value of FER of control positive was higher than control negative, which were 0.096±0.009 and 0.089±0.003 respectively. but formula **A** and **B** were higher than control positive, by means 0.11± 0.081 and 0.12± 0.041. However, the paired sample T.test did not show any significant differences.

Table (1): Effect of Peanut with CoQ10 on BWG, FI and FER of diabetic disease in rat.

Treatment				
Parameter	**Control (-) Mean ±SD**	**Control (+) Mean ±SD**	**Formula A Mean ±SD**	**Formula B Mean ±SD**
BWG	64.0±2.31	51.6±4.14	66.0±4.4	80.51±3.3**
T. test		.302	.781	.584
FI	25.5±1.31	19.1±2.51	20.99±2.3	23.61±1.77
T. test		.096	1.000	.171
FER	0.089±0.003	0.096±0.009	0.11±0.081	0.12±0.041
T. test		.424	.711	.441

**Differences are high significant at 1% ($p<0.01$).

Data given in table (2) illustrates the effect peanut with Co-Q10 on serum CHOL. T.G, HDL, LDL and VLDL of diabetic diseases in rats. From the same table show the level of serum lipid fraction (TC, TG, HDL, LDL, VLDL), it could be noticed from (Table 2) that fasting serum TC, TG, LDL, VLDL was increased, while the level of HDL decreased.

The best of TC, TG, HDL, LDL and VLDL levels were recorded for formula **B** which showed more than ($p<0.01$) by mean 116.50±5.31, 88.6±4.00, 52.0±2.1, 46.78±2.0 and 17.72±1.11 respectively, when compared to control positive which were 167.2±12.41, 125.09±11.61, 40.0±6.40, 102.18±8.12 and 25.01±3.2 respectively, In the same table the TC, TG, HDL, LDL and VLDL levels in formula **A** showed more than ($p<0.05$) by mean 122.3±6.71, 100.0±6.31, 50.10±3.4, 52.2±2.71 and 20.0±1.31 respectively, when compared to control positive which were 167.2±12.41, 125.0911.61, 40.0±6.40, 102.18±8.12 and 25.01±3.2 respectively. According to **Emekli *et al*., (2008)** reported that peanut consumption may improve the oxidant-antioxidant status in healthy and diabetic status without increasing blood lipids.

Table (2): Effect of Peanut with CoQ10 on CHOL, T.G, HDL, LDL and VLDL of diabetic disease in rat.

Treatment				
Function of heart	**Control (-) Mean ±SD**	**Control (+) Mean ±SD**	**Formula A Mean ±SD**	**Formula B Mean ±SD**
CHOL (Mg %)	105.93±5.93	167.2±12.41	122.3±6.71*	116.50±5.31**
T. test		.001	.171	.220
T.G (mg/dl)	71.59±4.53	125.09±11.61	100.0±6.31*	88.6±4.00**
T. test		.854	.169	.267
HDL (mg/dl)	53.58±2.56	40.0±6.40	50.10±3.4	52.0±2.1**
T. test		.696	.905	.052
LDL	38.04±1.02	102.19±8.12	52.2±2.71*	46.78±2.0**

Treatment				
Function of heart	**Control (-) Mean ±SD**	**Control (+) Mean ±SD**	**Formula A Mean ±SD**	**Formula B Mean ±SD**
(Mg/dI)				
T. test		.634	.110	.464
VLDL (mg/dI)	14.31±.99	25.01±3.2	20.0±1.31	17.72±1.11
T. test		.854	.169	.267

*Differences are significant at 5% ($p<0.05$).
**Differences are high significant at 1% ($p<0.01$).

Table (3) illustrates the effect of peanut with Co-Q10 on serum ALP, CREAT and URIC of diabetic diseases in rat. As shown the mean value of ALP of control positive was higher than control negative, which were.111.31±10.71 and 92.7±4.53 mg/dI respectively, Moreover, increased HDL-C levels and decreased AI levels in diabetic rats indicate that, peanut consumption may have protective effects against cardiovascular complication of diabetes.

The best of ALP level was recorded for formula **B**. Which showed more than ($p<0.01$) by mean 93.6±6.0 mg/dI, when compared to control positive which were 111.31±10.71 mg/dI. As for CREAT level showed that mean - value of control positive was higher than control negative, which were,1.19±0.11 and 0.82±0.03 mg/dl, respectively as well as the values of formula **B**, **A** were high significantly more ($p<0.01$) and more ($p<0.05$) which were 0.86±0.04, 0.89±0.05 when compared to control positive which were 1.19±0.11 mg /dl respectively,

In the same table URIC level showed that mean - value of control positive was higher than control negative, which were, 3.56±0.46 and 2.79±0.17 mg/dl,

respectively as well as the values of formula **B**, **A**, that best treatment, were high significantly more ($p<0.01$) and more ($p<0.05$) which were 2.80±0.21, 2.88±0.28 when compared to control positive which were 3.56±0.46 mg /dl respectively. **Yanardag *et al.*, (2002)** concluded that the extract of this plant may reduce serum urea and creatinine levels and confer a protective effect on the kidney of diabetic rats.

Table (3): Effect of Peanut with CoQ10 on ALP, CREAT and URIC of diabetic disease in rat.

Treatment				
Function of kidney	**Control (-) Mean ±SD**	**Control (+) Mean ±SD**	**Formula A Mean ±SD**	**Formula B Mean ±SD**
ALP Mg/dI	92.7±4.53	111.31±10.71	94.0±5.17*	93.6±6.0**
T. test		.048	.245	.881
CREAT Mg/dI	0.82±0.03	1.19±0.11	0.89±0.05*	0.86±0.04**
T. test		.530	.374	.374
URIC Mg/dI	2.79±0.17	3.56±0.46	2.88±0.28*	2.80±0.21**
T. test		.023	.074	.146

*Differences are significant at 5% ($p<0.05$).

**Differences are high significant at 1% ($p<0.01$).

Data presented in table (4) illustrate the effect peanut with Co-Q10 on serum ALT, AST and RBC of diabetic diseases in rat. It could be noticed that the mean value of S.ALT and S.AST of control positive was higher than control negative by means, 60.9±5.44, 160.33±13.22 and 42.94±2.76 and 131.43±6.03 u/ I respectively, **Al-Thakafy *et al.*, (2004)** indicated that CoQ10 supplementation helps to prevent clinical complications during the course of the disease in diabetic rats.

Results form same table show the activities of GPT and GOT enzymes as influenced by feeding on peanut and coQ10.

It is evident (Table 4) that the activities of GPT and GOT could be almost arranged ascending as follows: CoQ10 and peanut. Arrangement of food groups was different, being also nearly the same for GPT and GOT. peanut decreased the GPT and GOT activity. Formula B which were 45.33±3.621and 139.0±7.81 u/I that best treatment, was high significantly more ($p<0.01$) when compared to control positive which were 60.9±5.44 and 160.33±13.22 u/I respectively.

The value of the formula **A** was 56.41±4.61, 157.12±12.13 were nearly to control positive which were 60.9±5.44 and 160.33±13.22 u/I respectively.

As for RBC, the results showed that mean - value of control positive more than control negative, which were 195.43±16.11 and 114.3±5.33 respectively, whereas value of formula **B** was lower than control positive, which were 115.66±6.71, **Modi *et al*., (2006)** reported that CoQ10 treatment significantly improved deranged carbohydrate and lipid metabolism of experimental chemically induced diabetes in rats. The mechanism of its beneficial effect appears to be its antioxidant property.

Table (4): Effect of Peanut with CoQ10 on ALP(Got), S.AST(Gpt) and RBC of diabetic disease in rat.

Treatment				
Function of liver	**Control (-) Mean ±SD**	**Control (+) Mean ±SD**	**Formula A Mean ±SD**	**Formula B Mean ±SD**
S.ALT(Got) (u/ I)	42.94±2.76	60.9±5.44	56.41±4.61	45.33±3.621**
T. test		.721	.793	.176
S.AST(Gpt) (u/ I)	131.43±6.03	160.33±13.22	157.12±12.13	139.0±7.81**
T. test		.388	.400	.872
RBC	114.3±5.33	195.43±16.11	173.0±11.31	115.66±6.71**
T. test		.053	.079	.144

2. Conclusion

CoQ10 produced a significant decrease in elevated levels of glucose, cholesterol, triglycerides, very-low- density lipoprotein, and increased high- density lipoprotein cholesterol levels and reduce high pressure blood. This study shows that peanut consumption may improve the oxidant –antioxidant status in healthy and diabetic status without increasing blood lipids. Moreover, increased HDL-C levels and decreased AI levels in diabetic rats indicate that, peanut consumption may have protective effects against cardiovascular complications of diabetes.

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