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ORIGINAL ARTICLE

Antidiabetic effect of Coenzyme Q 10 on testis tissue in Alloxan induced Rats

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ABSTRACT
Diabetes is a chronic disorder of the metabolism of carbohydrate, fat and protein, which is characterized by high blood sugar levels. Propose of the current study, was to evaluate the effect of supplementation of coenzymeQ10 on the structural changes in the tissue of testis in diabetic rats due to alloxan. Forty adult Wistar male rats were used. Adequate food and water was available for animals. The 1stgroup: control, the 2ndgroup: intervention with alloxan, the 3rd group: intervention with Q10, and4th group: intervention combination of alloxan with Q10.Diabetes has produced in rats by intraperitoneal injection of Alloxan monohydrate. In the control and Q10group structural tissue of testes and seminiferous ducts and germinal epithelium was quite orderly and normal. In the *2nd group structure of tissue had irregularities and wide spread degenerative changes.* I*nterstitial testicular connective tissue in alloxan treated group was almost same as others. Testicular tissue in tentative combined groups of alloxan and Q10werelargelysimilar to alloxan groups, with the difference that from the amount of extension of vessels in testicular capsule were decreased and from atrophy and disorganization the seminiferous ducts that had occurred in alloxan group was not observed. In histological examination of the testes of combined group's animals most of changes and structural disorders of the testicular tissue was modified with Q10 medicine. Our results indicated that the Q10supplements function effectively on decreasing the testes tissue damage caused by diabetes; therefore, we can consider this supplemental anti-diabetic medicine.*
Keywords: *Antidiabetic, coenzyme Q10, testis tissue, Alloxan, Rats*

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INTRODUCTION

Diabetes is a chronic disorder of the metabolism of carbohydrate, fat and protein, which is characterized by high blood sugar levels in patients. This disease is caused because of naught cellular suction of blood sugar due to decreased sprinkle of insulin or body cells resistance against insulin [8].
Although insulin and synthetic edible hypoglycemic agents medicines such as an Biguanide, sulfonylureas, the Thiazolidine Diones and inhibitors of alpha glucosidase form the basis of diabetic treatment but have important side effects and cannot make considerable changes in the way of side effects of diabetes [4].
Ubiquinone orcoenzyme CoQ10 was discovered by Fred Kerin in1957.Coenzyme Q10 is a vitamin or vitamin-like substance and like other vitamins found naturally in food sources but it is much lower in the food supply [5]. Scientific studies show that levels of coenzyme Q10 are reduced with passing of age and in cardiac patients, muscle dystrophy, Parkinson's disease, cancer, diabetes and AIDS. Also keep away ***THE*** membrane proteins from oxidative damage. In patients with diabetes, cancer, heart disease decrease of the coenzyme Q10 amounts have been observed [5]. In recent years, several drugs have been found useful for the treatment of diabetes, but protective or therapeutic effect of few of them have been studied with microscope. In the present study, the effect of supplementation of coenzymeQ10were studied on the structural changes in the tissue of testis in diabetic rats due to alloxan.

MATERIAL AND METHODS

40 adult male rats of Wistar strain weighing 200-300gwere bought. Animals in environment with temperature of 22± 2, environment humidity 38%, and light intensity 300Lux at the center of the room and aconsecutive12-hour periods of light and darkness were kept. Adequate food and water (concentrate) was enough available for animals. The first Group(control group), the second Group (intervention group with Alloxan), the third Group(intervention group with Q10), and fourth Group(intervention group combination of alloxan with Q10).

Diabetes induction: Tentative sample of sugary diabetes of type one insulin-dependent diabetes has produced in rats by intraperitoneal injection of Alloxan monohydrate at a rate of 120mg per kg body weight diabetes and physiology serum was used as a solvent of alloxan [1,14].72hours after Alloxan injection by measuring blood glucose of animal before breakfast by using glucometer system, being diabetic was identified [10]. Criteria for diabetes, elevated blood glucose level is above 130 mg per deciliter [12].

Rats in the control group, by citrate buffer M = 5% with ph =5.4 and were injected intraperitoneally. The mice intervention group with Q10, received Coenzyme Q10 with dose of 75 mg/kg for one month with edible type (gavage) [11].

Mice of intervention group with Alloxan have received Alloxan monohydrate medicine with a single dose of 120 mg/kg intraperitoneally.

Mice of Combined intervention group (Alloxan withQ10), first of all mice were made diabetic by Alloxan monohydrate with dose of 120 mg/kg then received Q10coenzymewith dose of 75 mg / kg with edible type (gavage) for one month. Finally, the testes were isolated and weight of them was measured by a digital scale with a precision 0.01g. In continue the testicles for studying were put under the optical microscope in formalin solution 10% and after passing Histo-technique stages were stained with Hematoxylin & Eosin method.

Statistical analysis: The mean and standard deviance of height and weight, testis weight, seminiferous tubular diameter and testicular capsule thickness and epithelium thickness of the seminiferous tubules in various groups with statistical methods of data were expressed as Mean ± SEM and to analyze the data, statistical analysis of one-way variance method ANOVA was used and following of it Duncan's multiple comparison test was done for comparing existence differences between groups by using SPSS 10statisticalsoftware.

RESULTS

In the control group and Q10 structural tissue of testes and seminiferous ducts and germinal epithelium of it was quite orderly and normal and there were not observed atrophy changes and degenerative changes.***IN THE*** intervention group of Alloxan structure of tissue and cellular of testicular had irregularities and wide spread degenerative changes and changes include: Disorganization and atrophy of the seminiferous ducts, duct irregularity of the basement membrane with a detachment of spermatogony cells from that were visible.Also in the seminiferous epithelium with compatible superficial, the cellular levels had irregular cosmetics. Sertoli cells in the germinal epithelium in less numbers and mostly with basal position near the basement membrane were detectable. Some times seminiferous ducts in animals treated with alloxan were without central lumen, which is probably due to deactivation of Sertoli cells. ***I***nterstitial connective tissue of testicular in group treated by alloxan was almost the same as other groups contain all the components and cells, but density and monotony of them was reduced and fibrosis and edema condition were observed.Testicular capsule or tunica albogina in this group has apparent conflict with thecontrolgroupandQ10that with the increase in density collagen fibers than cells and proliferation of capsule vascular in collagen fibers are observable. Testicular tissue in tentative combined groups of Alloxan and Q10from the aspect of the histological structure were largely similar to alloxan groups, with the difference that from the amount of extension of vessels in testicular capsule were decreased and from atrophy and disorganization of the seminiferous ducts that had occurred in alloxan group was not observed. Also ***T***he centers of seminiferous lumen were not free from cells. In Histological examination of the testes of animals of combined groups most of destruction changes and structural disorders of the testicular tissue was modified with Q10 medicine. ***AS IF*** seminiferous ducts are normal enough and zoogenic Epithelium is largely organized and found its complement and tumble decreased. Base Membrane was almost close to its natural state.

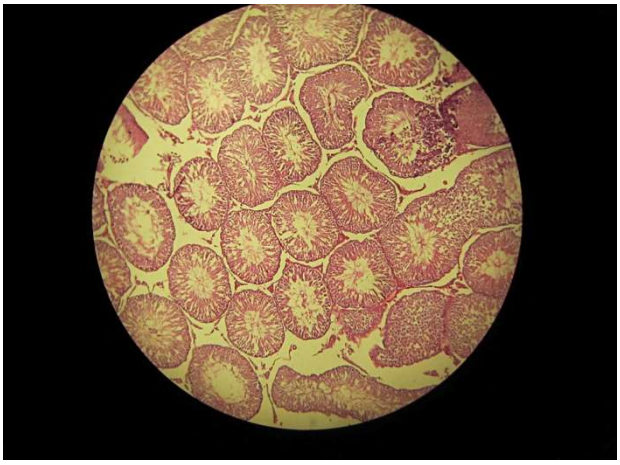

Figure1. Microscopic view of seminiferous tubules, Control Group-stained by Hematoxylin & Eosin (magnificationX10)

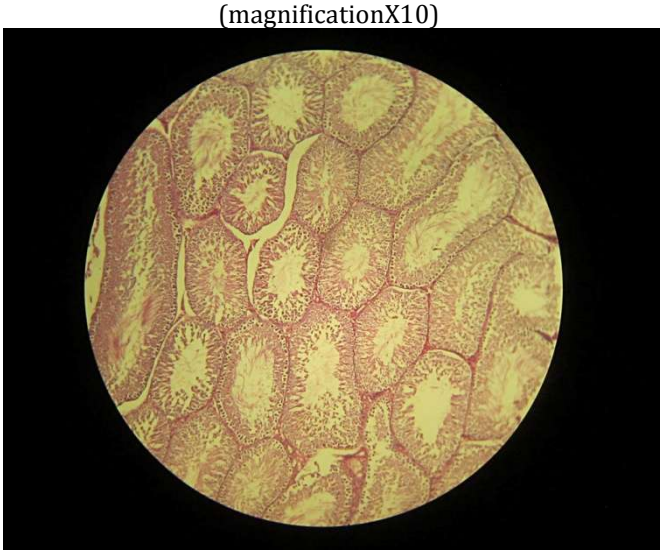

Figure2.Microscopic view of seminiferous tubules Q10 Group-stained by Hematoxylin & Eosin(magnificationX10)

Figure3.Microscopic view of seminiferous tubules, Alloxan Group-stained by Hematoxylin & Eosin (magnificationX10)

Figure 4.Microscopic view of seminiferous tubules, Combined Group -stained by Hematoxylin & Eosin (magnificationX10)

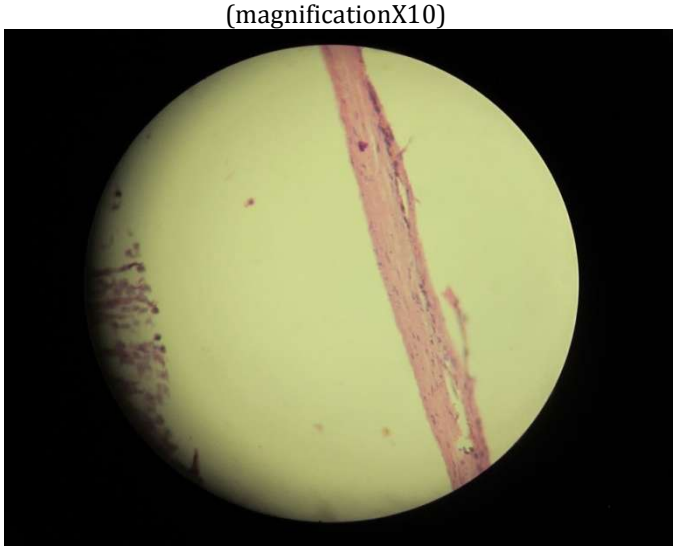

Figure5.Microscopic view of the capsule, Control Group-stained by Hematoxylin & Eosin(magnificationX40)

Figure6.Microscopic view of thecapsule, Alloxan Group-stained by Hematoxylin & Eosin (magnificationX40)

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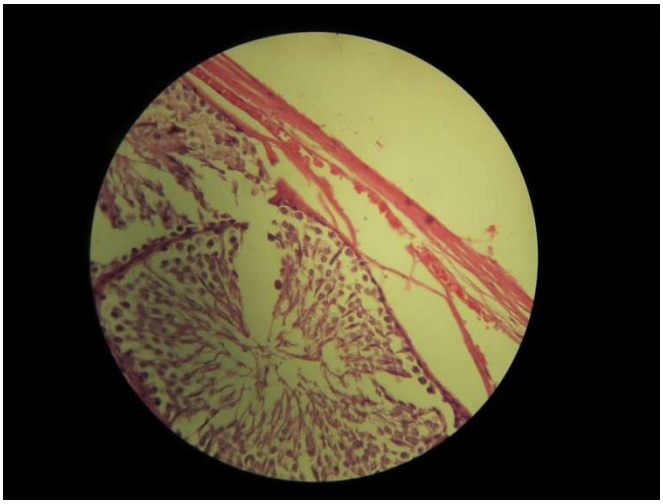

Figure7.Microscopic view of the capsule, Combined Group-stained by Hematoxylin & Eosin(magnificationX40)

Figure8. Microscopic view of a cross-sectional view of seminiferous tubular epithelium, Control Group-stained by Hematoxylin & Eosin(magnificationX40)

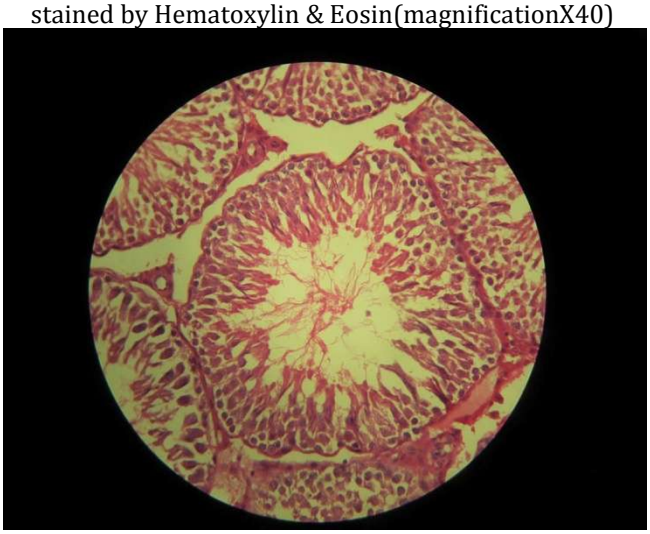

Figure9.Microscopic cross-sectional view of seminiferous tubular epithelium, Q10 Group-stained by Hematoxylin & Eosin (magnificationX40)

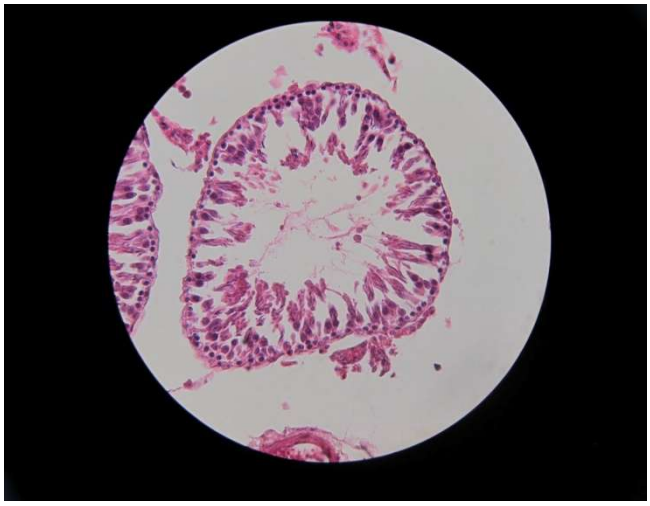

Figure10.Microscopic cross-sectional view of seminiferous tubular epithelium, Alloxan Group-stained by Hematoxylin & Eosin (magnificationX40)

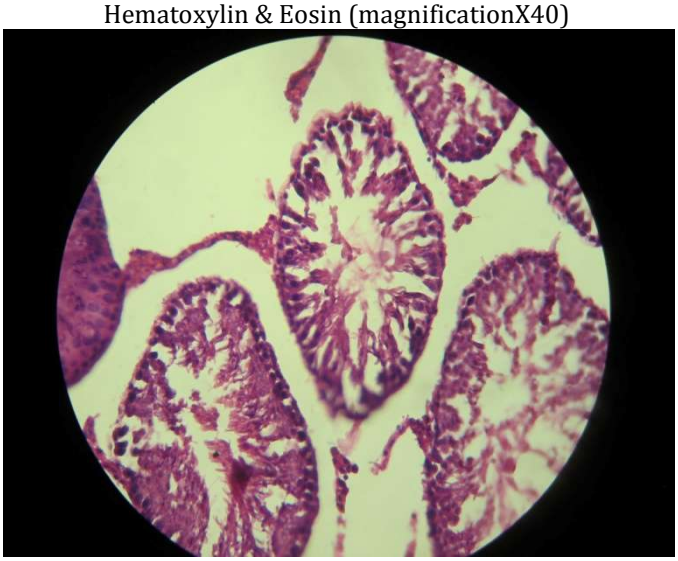

Figure11.Microscopic cross-sectional view of seminiferous tubular epithelium, Combined Group-stained by Hematoxylin & Eosin (magnificationX40)

DISCUSSION

From the results of the effect of medicines on the bodyweight of rats in this study it can be said that Q10 supplementation effect on gaining bodyweight in rats as seen in comparison with the control group. On the other hand alloxan medicine caused a salient weight loss in diabetic rat group. In every group that Q10 were used in diabetic rats, it was observed that weight gain was returned to near-normal condition. This indicates that the Q10 can compensate the weight loss caused by diabetes.

Diabetes is a chronic disorder of the metabolism of carbohydrate, fat and protein, which is characterized by high blood sugar levels in patients. This disease is due to naught of cellular uptake of blood glucose caused by decreasing of insulin secretion or resistance of body cells against insulin.

Although insulin and edible synthetic blood glucose lowering medicines such as Biguanide, Sulfonylureas, Thiazolidinediones and inhibitors of alpha glucosidase make the basis of diabetes treatment and also have important side effects and cannot change the way of side effects of diabetes significantly.

In recent years, various medicines have been found useful for the treatment of diabetes, but few of protective or therapeutic effect of them have been put under microscopic study. In the present study, the effect of supplementation of coenzyme Q10 have been studied the changes of the structural tissue of the testis in diabetic rats caused by Alloxan.

From the results that were obtained from the testes tissue of various groups in this study, it can be stated that alloxan cause chaos and disorganization in the structure of testes tissue as if these disorganization with increasing of testes tissue capsule diameter, shrinkage of seminiferous tubule basement membrane, disorganization of cells of spermatozoid category and are with the empty space inside the lumen cell.

Thickening of the capsule is a reaction that connective cells in capsule that one person shows against medicine damages with collagen secretion that such a situation was also seen in the diabetic group.
Q10 supplementation in groups that rats have been diabetic was able to show regulator effect as if we were not instance of chaos of tissue instruction and wrinkles of seminiferous ducts and disorganization of sexual cells category.Q10 could decrease the infiltration and developing of vessels in area of under capsule and in testes capsule that is salient in diabetic groups. In general it can be stated that Q10 antioxidant effects can prevent from damages caused by diabetic illness that caused by Alloxan in this study.
Ricci and colleagues [13] also examined the changes of testicular tissue and function of it in experimental diabetes in rats and observed that diabetes with in 50days caused considerable structural and functional changes in the testicular tissue.
In the study of Erfani *et. al.* [6] also have reported structural changes of testicular tissue such as reduced diameter of seminiferous tubules with damaged cellular epithelium in various stages of spermatogenesis, destruction and changes in the distribution and status of Sertoli cells in testicular tissue of diabetic rats.
In the study of Borland *et. al,* [2] and in the study of Foglia and colleagues [7]) have been stated that the lack of insulin function in diabetes illness have direct effects on Sertoli and leydig cells and cause disorder in testis's function.
In the study of Cameron *et. al* [3] have referred to changes in spermatogenesis process in diabetic rats. In research of Dhanasekaran has referred that Q10 coenzyme has important role in transferring of protons along lysosomic membrane to create anacidic pH (5).
In continuation of this study, revived Q10 coenzyme function as an antioxidant in mitochondria and lipid membranes and thus act sin removing free radicals, preventing from peroxidation of lipid in bio membranes and also in lipoprotein with low density (LDL).
Iwasaki and colleagues in their study stated that: Spermatogenesis process and sperm maturation is dependent on high levels of androgens in testicular and blood circulation thus the decrease in the concentration of androgens likely damages spermatogenesis and sperm maturation [9].

CONCLUSIONS

Based on the results of this study, the useofcoenzymeQ10asan antioxidant significantly protect spermatogenic cells, testicular capsule, weight of testes and the diameter of the seminiferous tubules of diabetic group receiving Q10 compared within treated diabetics and this index in diabetic rats that were treated and keep and prevent it in healthy control group stage its improvement in the control group maintained and protected.
So, Q10 supplements function effectively on decreasing the damage structure of testes tissue caused by diabetes, Therefore, we can consider this supplement as a anti-diabetic medicine. FURTHER biochemical and pharmacological researches should consider for using of it.

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