Defensive Impact of Co Q10 in Japanese Quail Males Raised Under Oxidative Stress Conditions

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Abstract

This study was investigated the protective role of (CoQ10) on reproductive dysfunction of males quail induced by hydrogen peroxide (H2O2). Forty Japanese quail male 45 days old were randomly allotted into four groups with ten replicate one per each, and treated for 28 days as follows: (G1): the first control group (G2): reserved standard ratio and (1%) H2O2 in drinking water. (G3): reserved production ratio + (100 mg Co Q10/ kg diet) and (1%) H2O2 in drinking water. (G4): reserved production ratio + (100 mg Co Q10/ kg diet) and normal water. The results showed that exposure of birds to H2O2 caused decrease in serum glutathione level (GSH), testosterone, luteinizing hormones (LH) and follicle stimulating hormone (FSH ) hormones and this reflects on histology of testis by reducing seminiferous tubules diameter , area of germinal layer and germinal layer thickness. Whereas supplement of CoQ10 caused an increase the concentrations of these, hormones in group G4 as compared with group G2. It can noted that an addition was able to restore the oxidative stress birds (G3) to a state close to the natural state (G1). Though testicular histological modifications were made strides in grown-up Japanese quail male treated with CoQ10. In conclusion, the comes about of the display think about appeared that utilize of Co Q10 can easing the pernicious impacts on male regenerative work takingafter introduction toH2O2, maybe through enhancement the antioxidant parameters or testicular capacities or other related endocrine organs.

Keywords: Co Q10, Oxidative stress, Japanese quail males, Sex hormones.

1. Introduction

Free radicals are the items of typical cellular metabolism. Afree radical can be characterized as a molecule or atom containing one or more unpaired electrons in an external circle and is competent of free presence. The odd number of electron (s) of a free radical makes it unsteady, short-lived, and exceedingly responsive. Since of their tall reactivity, they can unique electrons from other compounds to achieve solidness. In this way the assaulted atom loses its electron and gets to be a free radical itself, starting a chain reaction cascade which at last harms the living cell [1,2]. The generation of free radical increment with natural movement [3]. The male regenerative framework is the most dynamic organ in fowls [4]. So it delivers ROS in bulk, and with the accessibility of a tall extent of unsaturated greasy acids. At that point, there's a chance of oxidative harm [5].

This leads to a decrease in antioxidants, which needs the arrangement of an outside source [6]. CoQ10 may be an omnipresent lipid-soluble biomolecule show within the mitochondria of nearly all creatures and microbes [7]. Coenzyme Q10 may be a component of the electron-transport chain, which is mindfull of the era of adenosine triphosphate (ATP) particles from the high-impact cellular breath [8]. Really, 95% of ATP within the human body is generated by high-impact breath [9]. In this manner, the concentration of coenzyme Q10 is exceptionally tall within the useful organs with tall ATP requests, such as the kidney, the heart, the liver [10] and the regenerative framework, in quail, testicles create 2.9*103 sperm/ moment .In common, oxidative stretch and lipid peroxidation were found to decrease the work of the cell [11]. In this manner, neutralizing this chemical oxidative mutilation ought to upgrade cell work and cell presentation [12]. Particularly, the collection of free radicals, and consequently the oxidative damage in Leydig cells within the testis by a given chemical oxidant, may break down their reaction and execution to synthesize testosterone.

Coenzyme Q10 is an intracellular antioxidant that secures layer phospholipids, mitochondrial layer protein, and LDL-C from free radical-induced xidative harm [13]. Furthermore, coenzyme Q10 is an antioxidant when including to maturing breeder male by diminishing MDA in blood and seminal plasma, expansion make strides sex hormone and testis histology settlements [14].
Subsequently, this ponder has explored the anti-oxidative and sexual parameters impacts of coenzyme Q10 supplementation in ordinary and unpleasant adult males of quail.

2. Materials and Methods

This thinks about was planned to decide the impact of Co Q10 dietary supplementation 100 mg/kg in grown-up Japanese quail male 45 days concomitantly uncovered to oxidative push initiated by hydrogen peroxide (1%) with drinking water for four weeks on a few physiological, histological settlements and antioxidant status. 40 grown-up Japanese quail males were arbitrarily isolated into four treatments group ten birds/group with ten imitate (one fowl per each) these fowls were kept in person cages. The guys were nourished with commercial diets counting 19.87 % unrefined protein and 2904 kcal ME / kg. The winged creatures uncovered to 16 h of light/day amid the exploratory period. The treatment bunch as stream (G1): saved standard eat less and ordinary water, (G2): saved standard count calories and (1%) hydrogen peroxide in drinking water, (G3): saved standard count calories + (100 mg Co Q10/ kg eat less) and (1%) H2O2 in drinking water. (G4): saved standard ratio + (100 mg Co Q10/ kg count calories) and ordinary water.

After four weeks of treatment beginning, blood tests were taken from three butchered feathered creatures from each bunch. Blood tests were collected into non-heparinized test tubes and serum was isolated by centrifugation at 3000 rpm for 15 min and kept at solidifying temperature (-20°C) until examinations. Glucose, Cholesterol, concentrations, AST and ALT movement, and FSH and LH concentrations in blood serum were decided. Spectrophotometer and commercial units (Bio-Merieux, Research facility Reagents, and Items, France) were utilized for assurance of a few biochemical in blood serum. Sex hormone (FSH and LH), were tested by coordinate radioimmunoassay procedure (RIA) utilizing prepared counteracting agent coated tubes units. Glutathione (GSH) was measured by a strategy of [14], malondialdehyde (MDA) was assessed as the strategy of [15].

2.1 Histology of the Testes

Little tests from the cleared out test tissues were taken and put in unbiased formalin (10% formalin arrangement, 38-40%) for 24-48 hours, at that point washed by ordinary water. in this way, tests were dried out (corrupted levels of ethyl liquor, 50,70,90, and 100%), cleared, segmented by microtone (5-7 μm in thickness), and recolored (hematoxylin and eosin). Light magnifying lens (x 100 and 400) was utilized for examination of the histological structure of the test. was conducted indiscriminately beneath the light magnifying lenses. With computerized AM-SCOP. Camera. [5].

2.2 Statistical Analysis

All information measurably analyzed totally randomized plan by investigation of fluctuation (ANOVA) utilizing Common straight Demonstrate Program. The critical contrasts among implies were built up atP≤0.05level utilizing Duncan’s Different Run Test strategy [16].

3. Result

Information in Table 1 uncovers a noteworthy diminish in glucose concentration in the G4 group compared with the second group. As well, the treatment by CoQ10 leads to drive to a critical diminish within the level of serum cholesterol, AST, ALT, and Frantic levels as compared with the G2 bunch (P≤0.05). Whereas that treatment did not record noteworthy contrasts compared with G1 in Add up to cholesterol, ALT, and GSH concentration, able to also take note from the same table that there are no critical contrasts between the third and to begin with treatment in all the considered characteristics but for GSH.

| Groups | Treats | G1 | G2 | G3 | G4 |
|--------|--------|----|----|----|----|
| Glucose (mg/dl) | 175.0±3.78ab | 184.3±3.48a | 173.3±2.02ab | 165.3±4.05b |
| Total cholesterol (mg/dl) | 242.3±5.23bc | 263.3±4.97a | 250.6±3.75ab | 234.0±3.78c |
| AST (U/l) | 145.3±3.75a | 158.3±3.17a | 152.0±5.29ab | 132.6±4.66b |
| ALT (U/l) | 45.0±3.72b | 60.3±1.76a | 44.0±4.04b | 38.0±2.88b |
| GSH µmole/mole | 4.8±0.19a | 3.5±0.17b | 3.7±0.22b | 5.3±0.22a |
| MDA µmole/mole | 3.7±0.16b | 4.2±0.05a | 3.9±0.13ab | 3.2±0.06c |

Different letters in each row mean significant differences at (P≤0.05). (G1): saved standard eat less and ordinary water.
We found dietary addition of CoQ10 reduced serum glucose, cholesterol, ALT and AST enzymes concentrations, which may be due to a CoQ10-induced decrease in the oxidative stress [17]. CoQ10 can also decrease serum levels of glucose and lipids in broiler birds [18]. Honda et al [19] proposed that dietary CoQ10 stifles hepatic cholesterogenesis by the hindrance of HMGR action at the posttranscriptional level in chickens, which in turn diminishes plasma VLDL cholesterol concentration.

4. Discussion

We found dietary addition of CoQ10 reduced serum glucose, cholesterol, ALT and AST enzymes concentrations, which may be due to a CoQ10-induced decrease in the oxidative stress [17]. CoQ10 can also decrease serum levels of glucose and lipids in broiler birds [18]. Honda et al [19] proposed that dietary CoQ10 stifles hepatic cholesterogenesis by the hindrance of HMGR action at the posttranscriptional level in chickens, which in turn diminishes plasma VLDL cholesterol concentration.

Different letters in columns mean significant differences at (P≤0.05).

(G1): saved standard count less and ordinary water.
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(G3): saved standard count calories + (100 mg Co Q10/ kg eat less) and (1%) H2O2 in drinking water.
(G4): saved standard ratio + (100 mg Co Q10/ kg count calories) and ordinary water.

From the comes about of table 2, noted significant diminish in S.D. for birds treated with H2O2 (T2) compared with others, T4 recorded altogether prevalence in S.D compared comparison with control bunch and stressful groups, indeed so no critical contrasts found in L.D and L.A among all treatments. Approximately the seminiferous tubule relative thickness (S.R.D %) we discover qualification T4 versus T2. As well as that notes from the table itself noteworthy increment in G.A and G.L.T for 4th gather by comparison with others, including CoQ10 to the diet of stressful birds (T3) enhancement all histological structure of the gonad to a circumstance drawing nearer the treatment of control.

Table 2. Impact of Co Q10 in quail males stressful by H2O2 in the histological structure of the testicle.

| Groups | G1        | G2        | G3        | G4        |
|--------|-----------|-----------|-----------|-----------|
| Treats | S.D 308.3 ± 4.6 b | 275.76 ± 3.4 c | 304.73 ± 5.2 b | 322.13 ± 1.4 a |
|        | L.D 164.78 ± 3.2 a | 172.80 ± 2.6 a | 167.0 ± 4.2 a | 161.46 ± 4.1 a |
|        | S.R.D% 73.74 ± 1.9ab | 68.30 ± 3.0 b | 75.23 ± 2.4 ab | 80.96 ± 1.3 a |
|        | G.A 53315.1± 1384.0b | 36264.3± 761.0 c | 51018.7± 1387.9b | 60970.1± 1645.1 a |
|        | L.A 21331.5 ± 848.0a | 23451.1± 723.8a | 21921.2± 1112.1a | 20492.6± 1049.6a |
|        | G.L.T 143.52 ± 1.3 b | 102.9 ± 0.7 c | 137.7± 0.9 b | 160.6±5.2 a |

Different letters in each row mean significant differences at (P≤0.05).

(G1): saved standard eat less and ordinary water.
(G2): saved standard count calories and (1%) hydrogen peroxide in drinking water.
(G3): saved standard count calories + (100 mg Co Q10/ kg eat less) and (1%) H2O2 in drinking water.
(G4): saved standard ratio + (100 mg Co Q10/ kg count calories) and ordinary water.
S.D: seminiferous tubules diameter, L.D: seminiferous tubules lumen diameter, S. R. D % (seminiferous tubule relative density) G.A (area of germinal layer), LA (area of seminiferous tubules lumen), GLT: (germinal layer thickness).

Figure 1. Impact of Co Q10 in quail males stressful by H2O2 in sex hormone concentration.
We also observed that CoQ10 reduced serum MDA concentration (as an important biomarker for polyunsaturated fatty acids peroxidation), which correspond previous findings [14]. The oxidative stress induced by hydrogen peroxide in poultry are primarily induced by the increasing of the ROS [5, 20], this lead to loss cells membranes selective permeability. Where we notice that the levels of MDA in G2 increased with an increase in the levels of enzymes ALT and AST, this may give an indication of these enzymes leaching out of cells [20, 21].

Banihani, [3] noted and the presence of several studies linking assistant enzyme Q10 with the testosterone level as the main sex hormone in males, The administration of coenzyme Q10 raised the low testosterone levels due to many factors that lead to malfunction of the male reproductive system. These include injury to the testicle with sodium arsenic [22], advanced age and increased body weight, reduced antioxidants [23] and chemicals that cause reproductive system disorders such as sodium fluoride [24]. The increase in testosterone concentration may be due to the coenzyme Q10 role in inhibiting oxidative stress in the tests, preventing fat oxidation and restoring the antioxidant defense mechanisms [22] that in turn keep up the work of Leydig cells to deliver testosterone and increment sperm generation [25]. This is in agreement with what Thakur et al. [23] found that testosterone level is associated with antioxidant activity that protects testosterone-producing glands from free radical damage, leading to an increase in sperm count. This increasing in testosterone level it may be the reason for the improvement in the testicle tissue structure by increasing area of germinal layer and germinal layer thickness (table 2). This result agreement with Taha [5] found positive correlation between germinal layer area and hormone testosterone levels. Moreover, the reason for this improvement may be due to an increase in hormonal concentration LH and FSH.

FSH is important for Sertoli cells, which are necessary for the testis formation and sperms, to facilitate the development spermatogenesis by providing support, support and control of the internal environment of the seminiferous tubules. Sperms production regulated by the hormones FSH and testosterone, as testosterone is considered necessary for the formation of sperm, while FSH works to enhance sperm production by increasing the number of Sertoli cells [27].

The reason for the significant increase in the thickness and area of the germinal layer can be due to an increase in FSH and LH hormones levels, these hormones enhance spermatogenesis in the seminiferous tubule. FSH hormone works directly on Sertoli cells, leading to an increase in sperm production by providing the appropriate environment for division and differentiation, and it can work to increase the androgen-binding protein, that provide the androgen necessary for sperm development, the production of testosterone depends mainly on the presence of the hormone LH. It stimulates the Leydig cells to produce this hormone.

The significant reduction in area and thickness of the germ layer in birds used with hydrogen peroxide, correlated with high MDA levels and low GSH, indicate the phenomenon oxidative damage [20].

Increased re active oxygen species (ROS) are toxic to the cells of the seminiferous tubules, which leads to degenerative lesions, with the occurrence of necrosis in the seminiferous tubules cells and atrophy of testicular tissue [28].

Taha [5] observed a negative correlation between germ layer thickness and MDA levels, and this may reflect the negative impact of oxidative stress on the spermatogenesis process through its effect on both stem cells and Sertoli cells. Oxidative stress may achieve on the production of the androgen-binding protein thus provides adequate quantities of this hormone near the sperm cells to control the division and maturation by a negative effect on Sertoli cells [29].

Conclusions

Concluded from this think about that treated stressfully Japanese quail males Coenzyme Q10 appeared that the utilize of Co Q10 can be easing the pernicious impacts on male regenerative work taking after presentation to HO2, perhaps by means of advancement of the antioxidant parameters of testicular capacities or other related endocrine organs.

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