The Effects of Antioxidant Vitamins Supplementation on Serum Lipid Parameters in Chicken

DİYETE ANTİOKSİDAN VİTAMİN EKLENMESİNİN TAVUĞUN SERUM LİPİD PARAMETRELERİ ÜZERİNE ETKİSİ

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Summary

Purpose: To elucidate possible effects of antioxidant vitamin supplementation on serum lipid parameters taking chicken as a model.

Materials and Methods: Serum lipid parameters were studied in chicken of 45 days old fed on diets with and without antioxidant vitamin supplementation. The animals were fed on a standardized diet with Vitamin E (100 mg/kg/day) and vitamin C (200 mg/kg/day) supplementation in the study group and without supplementation in the control group for 45 days.

Results: Serum triglyceride and LDL-cholesterol levels were found decreased ($p<0.005$ and $p<0.05$, respectively), total cholesterol unchanged and HDL-cholesterol increased ($p<0.005$) in the study group compared with control group. Vitamin supplementation caused significant elevation in serum HDL/LDL cholesterol ratio ($p<0.01$).

Conclusion: Results suggest that antioxidant vitamin supplementation results in drastic changes in serum lipid parameters of chicken. These results may be of importance in relation to the amelioration of blood lipid profile since changes in blood lipid parameters are accepted to be primary factor in the occurrence of some diseases like atherosclerosis.

Key Words: Serum lipid parameters, Vitamins C and E, Chicken

T Klin J Med Res 2000, 18:95-97

Özet

Amaç: Diyete antioksidan vitaminlerin ilave edilmesinin kan lipid parametreleri üzerindeki muhtemel etkilerinin araştırılması.

Materyel ve Metod: Yumurtadan çıktıktan sonra diyetlerine antioksidan vitamin ilave edilerek ve edilmeden beslenen piliçlerde serum lipid parametreleri ölçülmüştür. Deney grubundaki hayvanlara 45 gün süreyle E vitamini (100 mg/kg/gün) ve C vitamini (200 mg/kg/gün) eklenmiş standart diyet verilirken, kontrol grubundakilere sadece standart diyet verilmiştir.

Bulgular: Deney grubunda kontrollerle kıyaslandığında, serum trigliserid ve LDL-kolesterol değerleri azalmış (sırasıyla; $p<0.005$ ve $p<0.05$), total kolesterol değişmemiş ve HDL-kolesterol artmış ($p<0.005$) olarak bulunmuştur. Vitamin takviyesi, serum HDL/LDL kolesterol oranında anlamlı bir yükselmeye ($p<0.01$) neden olmuştur.

Sonuç: Bulgular, diyete antioksidan vitamin eklenmesinin tavukların serum lipid parametrelerinde belirgin değişikliklere yol açtığını göstermektedir. Kan lipid parametrelerindeki değişikliklerin ateroskleroz gibi bazı hastalık durumlarının gelişiminde başlıca faktör olarak kabul edilmesi nedeniyle, bu sonuçlar kan lipid profilinin iyileştirilmesi açısından önemli olabilir.

Anahtar Kelimeler: Serum lipid parametreleri, C ve E vitamini, Tavuk

T Klin Araştırma 2000, 18:95-97

Received: June 15, 1999

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Cardiovascular disease is the leading cause of morbidity and mortality in the world and certain dietary factors have been implicated in the incidence of coronary heart disease (1,2). High levels of blood cholesterol, especially low density lipopro-

Table 1. Values of serum lipid parameters of control (n=12) and study (n=12) groups

Groups	TG (mg/dl)	TCOL (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	HDL/LDL
Control	34.7±3.5	128.0±5.5	74.0±4.5	44.5±7.3	1.60±0.40
Study	28.2±5.3***	130.3±15.2	84.5±6.5***	39.6±7.2*	2.06±0.42**

**p<0.05, **p<0.01, ***p<0.005. All values are expressed as mean±SD.*

TG:Triglyceride, TCOL.Total cholesterol, HDL:HDL cholesterol, LDL:LDL cholesterol.

tein (LDL) has been associated with increased risk of atherosclerosis (3,4). Recent studies suggest that decreased antioxidant protection may increase the risk of atherosclerosis and that increased intake of some antioxidants may have a role in prevention of coronary heart disease (2,5). There is accumulating evidence indicating that initiation of atherosclerosis is associated with free radical reactions, lipid peroxidation and oxidative modification of LDL (6,7). It has been reported that oxidative modification of LDL increases their incorporation into arterial intima, which is an essential step in the development of atherosclerosis. Antioxidants are hypothesized to prevent atherosclerosis by inhibiting LDL oxidation (8).

In some retrospective studies, a lower risk of coronary disease was observed for people with higher intakes of some antioxidant vitamins including vitamins E and C (8-10). Although major concern is focused on preventive effects of antioxidants on oxidised LDL formation, it is still unknown whether this is the only mechanism involved in the process. Some researchers have reported that antioxidant vitamin supplementation causes significant improvement in blood lipid parameters of humans and exerts protective functions on traditional cardiovascular risk factors other than prevention of LDL oxidation (11-13). In another study, however, no changes were reported in plasma lipoprotein concentrations after antioxidant supplementation (14).

Present study was performed to elucidate possible effects of antioxidant vitamin supplementation on serum lipid parameters taking chicken as a model.

Materials and Methods

Thirty broiler kind chickens were used in the study. After hatching, the animals were fed on standardized diet with (study group, n=12) and without (control group, n=12) vitamin supplementation (Vitamin C: 200 mg/kg/day, Vitamin E: 100 mg/kg/day). At 45th day, they were killed and blood samples were obtained. After serum was removed by centrifugation at 2500 rpm for 10 min. (three samples from each group were hemolysed), levels of triglyceride, total cholesterol and cholesterol fractions in serum samples were measured in routine biochemistry laboratory. Total cholesterol and triglyceride measurements were performed by auto-analyzer. HDL values were determined by a manual method with heparin-Mn^{+2} precipitation and LDL values by calculation.

Statistical analyses were made by Mann Whitney U-test.

Results

Results are given in Table 1. As seen from the results, serum triglyceride and LDL-cholesterol levels are lower ($p<0.005$ and $p<0.05$, respectively), total cholesterol unchanged and HDL-cholesterol higher ($p<0.005$) in the vitamin-supplemented group as compared with control group. Serum HDL/LDL ratio is also significantly higher ($p<0.01$) in the study group.

Discussion

In recent years, dietary antioxidant supplementation to prevent atherosclerotic diseases draws much attention. It has been argued that decreased antioxidant protection may increase the risk of ath-

erosclerosis and that balanced intake of antioxidant vitamins may play important part in the prevention of coronary heart diseases (2,5). Protective effects of antioxidant vitamins are believed to result from their capacities to prevent LDL oxidation (8). However, there might be some other unknown factors, which were previously suggested by some researchers (14) in this event. In some previous studies for example, it has been reported that antioxidant vitamin supplementation causes reduction in serum LDL-cholesterol levels but elevation in serum HDL-cholesterol levels in humans (11,12). In these studies, serum HDL/LDL ratio was also found significantly higher in vitamin-supplemented group. In another study however, no meaningful changes were established in plasma lipoprotein concentrations after antioxidant vitamin supplementation (13,14).

We think that although chicken metabolism exhibits some important differences from that of human being as do some other animals used in experimental studies like this, the results may be of importance for humans as well.

Under the light of these explanations, how can our results be evaluated? As seen from Table 1, antioxidant vitamin supplementation reduces serum triglyceride and LDL-cholesterol levels but increases HDL-cholesterol levels. Serum HDL/LDL cholesterol ratio, an important risk criteria, is significantly higher in the vitamin group compared with control group. Although there is no difference between total cholesterol levels of both chicken groups, increased HDL/LDL cholesterol ratio as well as reduced triglyceride level in vitamin supplemented group suggest that antioxidant vitamin supplementation into diet may make beneficial effects on blood lipid profile.

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