EFFECTS OF A HIGH LEVEL OF VITAMIN E ON COMMERCIAL BROILER CHICKS

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Abstract
Graded doses of vit. E (30, 60, 100 ppm) were fed to one-week-old commercial balady native strains broiler chicks for one month. Results indicated improvement in blood profile. Biochemical analysis at mega dose revealed significant increase of serum cholesterol, aspartate amino-transferase (AST), alanine amino-transferase (ALT), urea and creatinine. Protein electrophoresis indicated hyperproteinaemia and hyper δ and γ globulinaemia at 60 ppm dose (immunostimulant), while, mega dose 100 ppm lead to hypoproteinaemia and hypo δ and γ globulinaemia.

It was concluded that mega dose of vit. E at 100 ppm was associated with biochemical hepato-nephrotoxic disorders in broiler chicks, while at suitable dose of vit. E revealed an immunostimulant effect and improved blood profile.

INTRODUCTION
The important role of vitamin E (lipophilic antioxidant vitamin) as an antioxidant and free radical scavenger is well established and it has the advantage of being nontoxic at required levels (McCay and King, 1980). Vit. E as an antioxidant nutrient can modify cell mediated immune responses in younger human individuals to middle-aged human subjects (Hughes, 1999). Its function as an antioxidant by stopping propagation of potent oxidants formed during cellular metabolism also protects the poly-unsaturated fatty acids from peroxidation.

It is required in the nutrition of poultry for normal protection, reproduction and effective antioxidant activity for the prevention of encephalomalacia and myopathies.

Vitamin E is generally considered to be of low toxicity to promote growth, hyper-vitaminoses E increase requirement for vit. D & K. Abdo et al. (1996) reported that ex-
cessive amount of vit. E (2000 mg/kg BW) in rats is potentially toxic. Moreover, Letimad et al. (1989) concluded that excess amount of vit. E to poultry induced hepatotoxicity, and severe haemorrhage.

The present work throws light on the adverse effect of mega doses of vit. E fed to broiler chicks on certain haematological and serum biochemical parameters.

MATERIALS AND METHODS

Vitamin E is L-α-tocopheryl acetate. It was obtained from Memphis Co. for Pharmaceutical Industries.

Experimental design

Sixty 1-day old balady (native) chicks of both sexes were obtained from the general poultry company and maintained in brooder batteries. Feed and water were provided ad libitum. At the age of 7 days the chicks were divided at random into 4 groups of 15 each.

Group I chicks was used as control and were fed the starter ration obtained from the General Poultry Company. Groups II, III and IV received vit. E added to the starter ration at 3 final dietary concentrations of 30 ppm, 60 ppm and 100 ppm, respectively, and were fed for 4 weeks. At the end of the experiment, birds were slaughtered and heparinized and non heparinized blood samples were collected for haematological and biochemical studies.

Haematological pattern

Erythrocytic count, hemoglobin, hematocrit, total leucocytic count and haemocytic indices were determined according to Natt and Herrik (1952) and Oser (1979).

Biochemical study

Non heparinized samples were left for coagulation and serum was separated by centrifugation at 3000 r.p.m. for 15 minutes and kept for biochemical examination of: (1) Alanine amino transferase (ALT) and aspartate amino transferase (AST) activities according to Reitman and Frankel (1957). (2) Alkaline phosphatase (ALP) activity
were determined (Kind and King, 1954); (3) Cholesterol (Lopes, et al., 1977). (4) Urea (Patton and Crouch, 1977); (5) Serum total proteins (Peters, 1968) and protein electrophoretic pattern (Henry et al., 1974).

Statistical analysis

The data were analyzed using student ANOVA test and comparison was done between means using LSD (Least Significant Difference) at P<0.05 as outlined by Patric and Watson (1999).

RESULTS & DISCUSSION

Results given in table 1, showed no significant differences in determined haematological parameters between control and G1, G2 and G3. Abdel Khalek et al. (1996) reported that also, rats treated with vit. E had no changes in the studied haematological parameters. Moreover, dietary tocopherols protect erythrocytes against lipid peroxidation by regulating the level of glutathion via an effect of the enzyme glutathion peroxidase. Abdo et al. (1986) and Khal and Kappus (1993) concluded that, to induce a marked haematological effect, tocopherols must be used in mega doses. They also reported that excess vit. E doses either retard blood cell maturation or shorten their life span.

Regarding serum enzyme activities (table 2) ALT showed increase in G1, G2 and G3 when compared with control (C), while, AST revealed a slight elevation in G1 when compared with control (C), but significant increase in G2 and G3. Moreover, alkaline phosphatase revealed a significant increase in G1, G2 and G3 when compared with control (C). This increase may be due to enzymatic activity as a result of effect of vit. E high dose on the activities of membrane bound enzyme (angiotensin) that could disrupt the endothelial barrier function. Letmad et al. (1989) concluded that excessive dietary vit. E was associated with hepato-nephrotoxicity and lead to significant increase in hepatic enzymes which are useful indicators of hepatic damage in chickens.

Urea and creatinine levels in chicken revealed a significant increase in all treated groups (G1, G2 and G3) when compared with control (C), which may occur due to renal impairment or reduction in glomerular filtration. These elevations reflect the nephrotox-
icity of chickens. Letimad et al. (1989) reported that vit. E treated broilers showed epithelial proliferation and necrosis of renal tubules, which consequently were unable of purifying blood from uric acid. Abdo et al. (1986) recorded haemorrhagic inflammation in kidneys of vit. E treated rats.

The mega dose of vit. E resulted in significant elevation of cholesterol level in the sera of G1, G2 and G3 when compared with control (C). In contrast, Letimad et al. (1989) noticed that serum cholesterol was reduced in the test groups with vit. E at graded doses, whereas Fukal et al. (1986) recorded a slight elevation of cholesterol level in one-day old chick sera.

Table 3 revealed that, there were positive correlations between vit. E supplementation in G2 and serum total proteins (Hyperproteinaemia), albumin (hyper albuminaemia) and β & γ globulin’s (hyper globulinaemia). These results agreed with McCay and King (1980). Also, our results suggest that vit. E at suitable doses leads to stimulation of B-lymphocyte proliferation and function which results in improved bio-synthesis of plasma globulins immune stimulant effect.

Mega dose of vit. E supplementation to broilers was associated with hypoproteinaemia, hypo-albuminaemia and hypoglobulinaemia. This could be accounted for stimulation of β-oxidation capacity which leads to hydrogen peroxidation production that becomes toxic to the cells and increase lipid peroxidation products resulting in oxidative damage and inhibit liver cell proliferation (Nanjir et al., 1995).

It was concluded that mega dose supplementation of vit E at 100 ppm lead to biochemical hepato-nephrotoxic disorders and immuno-deficiency effect on broiler chicks, while, suitable doses of 30 and 60 ppm vit. E induce immunostimulant effect and improve blood profile.
Table 1. Effect of supplementing diets with different doses of vit. E on certain haematological parameters in broiler chicks.

<table>
<thead>
<tr>
<th></th>
<th>R.B.Cs 10^6/mm³</th>
<th>Hb gm/dl</th>
<th>P.C.V %</th>
<th>M.C.V FI</th>
<th>M.C.H pg</th>
<th>MCHC g/dl</th>
<th>WBcs 10^9/mm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3.43 ±0.12</td>
<td>9.76 ±0.52</td>
<td>36.60 ±0.25</td>
<td>107.06 ±2.98</td>
<td>28.38 ±0.69</td>
<td>26.65 ±1.27</td>
<td>10.13 ±0.01</td>
</tr>
<tr>
<td>G₁</td>
<td>3.37 ±0.02</td>
<td>9.86 ±0.12</td>
<td>36.30 ±0.39</td>
<td>107.30 ±1.56</td>
<td>29.56 ±0.51</td>
<td>27.57 ±0.17</td>
<td>9.53 ±0.12</td>
</tr>
<tr>
<td>G₂</td>
<td>3.50 ±0.04</td>
<td>10.30 ±0.17</td>
<td>34.52 ±0.07</td>
<td>98.77 ±3.64</td>
<td>29.42 ±0.13</td>
<td>29.97 ±1.27</td>
<td>9.13 ±0.03</td>
</tr>
<tr>
<td>G₃</td>
<td>3.70 abc ±0.02</td>
<td>10.72 ±0.24</td>
<td>37.00 ±0.32</td>
<td>100.02 ±1.13</td>
<td>28.58 ±0.66</td>
<td>28.98 ±0.72</td>
<td>9.53 ±0.24</td>
</tr>
<tr>
<td>F. calculated</td>
<td>4.63</td>
<td>1.863</td>
<td>3.770</td>
<td>3.130</td>
<td>0.932</td>
<td>2.300</td>
<td>9.27</td>
</tr>
</tbody>
</table>

Mean values with different letters in the same row are significantly different (P<0.05).

R.B.Cs = red blood cells; Hb = haemoglobin; P.C.V = packed cell volume; M.C.V = mean corpuscular volume; M.C.H = mean corpuscular haemoglobin;
MCHC = mean corpuscular haemoglobin content (in g per 100 ml of cells); WBcs = white blood cells.
Table 2. Effect of supplementing diets with different doses of vit. E on certain serum biochemical parameters in broiler chicks.

<table>
<thead>
<tr>
<th>Dose</th>
<th>ALT U/I</th>
<th>AST U/I</th>
<th>A/P U/I</th>
<th>Urea mg/100 ml</th>
<th>Creatinine mg/100 ml</th>
<th>Cholesterol mg/100 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>19.4 ± 1.50</td>
<td>7.80 ± 0.663</td>
<td>5.26 ± 0.191</td>
<td>4.66 ± 1.35</td>
<td>0.32 ± 0.03</td>
<td>135.6 ± 1.5</td>
</tr>
<tr>
<td>G1</td>
<td>30.6 ± 0.509</td>
<td>10.00 ± 0.316</td>
<td>9.28 ± 0.435</td>
<td>6.92 ± 0.159</td>
<td>0.46 ± 0.03</td>
<td>147.6 ± 6.87</td>
</tr>
<tr>
<td>G2</td>
<td>25.2 ± 1.74</td>
<td>16.80 ± 0.663</td>
<td>6.86 ± 0.361</td>
<td>7.60 ± 0.122</td>
<td>0.76 ± 0.04</td>
<td>164.6 ± 1.74</td>
</tr>
<tr>
<td>G3</td>
<td>25.8 ± 0.58</td>
<td>16.80 ± 1.24</td>
<td>7.34 ± 0.32</td>
<td>7.98 ± 0.68</td>
<td>0.64 ± 0.04</td>
<td>150.8 ± 6.24</td>
</tr>
<tr>
<td>F. calculated</td>
<td>14.271</td>
<td>44.24</td>
<td>23.69</td>
<td>106.48</td>
<td>11.829</td>
<td>6.21</td>
</tr>
</tbody>
</table>

F. calculated significantly at P<0.05

Mean values with different letters in the same row are significantly different (P<0.05).

ALT= alanin amino-transferase; AST= aspartate amino-transferase; ALP= alkaline phosphatase;
Table 3. Effect of supplementing diet with different doses of Vit E on total protein and its fractions in sera of broiler chicks.

<table>
<thead>
<tr>
<th>T. Protein (g/100ml)</th>
<th>Albumin (g/dl)</th>
<th>α globulin (g/dl)</th>
<th>β globulin (g/dl)</th>
<th>γ globulin (g/dl)</th>
<th>Total globulin (g/dl)</th>
<th>A/G ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3.80±0.04</td>
<td>1.46±0.01</td>
<td>0.68±0.04</td>
<td>0.54±0.06</td>
<td>1.0±0.08</td>
<td>0.6±0.03</td>
</tr>
<tr>
<td>G1</td>
<td>4.13±0.06</td>
<td>1.62±0.01</td>
<td>0.70±0.04</td>
<td>0.56±0.03</td>
<td>1.09±0.04</td>
<td>0.6±0.05</td>
</tr>
<tr>
<td>G2</td>
<td>4.45±0.07</td>
<td>1.88±0.02</td>
<td>0.75±0.03</td>
<td>0.56±0.02</td>
<td>1.25±0.04</td>
<td>0.7±0.06</td>
</tr>
<tr>
<td>G3</td>
<td>2.86±0.021</td>
<td>1.38±0.03</td>
<td>0.40±0.01</td>
<td>0.38±0.02</td>
<td>0.7±0.06</td>
<td>0.9±0.04</td>
</tr>
</tbody>
</table>

Values are mean ± SD. *Significantly different from control (P < 0.05).

T. Protein = total protein; A/G = albumin/globulin.
REFERENCES


تأثير الجرعات العالية من فيتامين هـ في الدجاج

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يشمل هذا البحث إعداد بداري بديل للتصمن التجاري عمر أسبوع جرعات مختلفة من فيتامين هـ مخلوطة بالعالية بنسبة 0%–10% نوزع في المليون (مليجرام/كم علقت) وذلك لدورة شهر.

وقد أشارت نتائج فحص الدم إلى تغير غير معنوي في نسبة الهيموجلوبين وكرات الدم العمياء، كرات الدم البيض، والحجم الشمسي للكرات الدم العمياء. أما نتائج الفحص البيوكيميائي (ALT والأكسيرتنز، الكوليسترول، الالاتين) فللتصلب فقد أثبتت زيادة نسبة إنزيمات الأسيتامينوفين (AST) والكوليسترول والكوليسترول الهيدروكربوني في المجموعة المتعالة فيتامين هـ بجرعات عالية (0.1 مليجرام/كم علقت).

كما أثبت التحليل الكرومي للبروتينات في فحص زيادة في الجلوبولينات الكلية في حالة الجلور في المتعالة 0.1 مليجرام/كم علقت، بما أن نسبة البروتين الكلي والبروتين الجلوبولينات جلوبولين يبدأ معبرة عن نسبة البروتينات صغيرة في الجلوبولينات. أما الجرعة العالية 0.2 مليجرام/كم علقت أن الظلال الظلال في نسبة البروتين الكلية والبروتينات بجميع جلوبولينات.

وتتبين من النتائج السابقة أن إعطاء فيتامين هـ بنسبة 0.1 مليجرام/كم علقت أن الظلال، تأثير ضار في الصورة البيوكيميائية للمصل في بداري التسمين التجاري.