Effect of dietary supplementation of vitamin e on the antioxidant status of broilers and the oxidative stability of its cooled meat.

M.A. FELLENBERG1*, PEÑA1 AND H. SPEISKY2,3.

1Facultad de Agronomía e Ingeniería Forestal/Animal Science Department/Pontificia Universidad Católica de Chile/Av. Vicuña Mackenna 4860, Macul, Santiago, Chile. 2 Facultad de Ciencias Químicas y Farmaceúticas, Universidad de Chile. 3 Instituto de Nutrición y Tecnología de los Alimentos, Universidad de Chile. * Corresponding autor: mafellen@uc.cl

Is well known meat is a kind of food susceptible to suffer deterioration. In this case poultry meat is more susceptible because it has poly unsaturate fatty acid (PUFA), which one suffers lipoperoxidation. The other hand the live chick need to maintain the oxidative equilibrium and if these equilibrium is broken the meat of those will be more susceptible to suffer lipoperoxidation. A way to avoid this process is protect the meat with dietary antioxidants in live poultry. Vitamin E is a nutrient that must be in the poultry diet, but in higher doses than the usual it is a natural antioxidant that protects the poultry meat and helps the chicks to raise the antioxidant equilibrium. We wanted to know how a high dose of vitamin E (200 mg/kg) affects some parameters of the poultry antioxidant status like as antioxidant capacity of plasma (CAOXpl), tiols contents and basal and induced lipoperoxidation of liver tissue, leg and breast by the thiobarbituric acid reactive substances. The other hand we wanted to corroborate that the dietary vitamin E can protects cooled meat. In order to the antioxidants status parameters, these were not affected by the high dose of vitamin E, nevertheless this antioxidant vitamin was able to protect the cooled meat.

Keywords: Poultry, vitamin E, antioxidant status

Introduction

In oxidative stress (OS) which affects live animals and in oxidative rancidity (OR), which affects meat quality, oxidation products are produced and accumulated. In OS, it is well known that dietary vitamin E (Vit E) supplementation confers antioxidant protection to body tissues of broilers (Bartov and Bornstein, 1977; Woodall et al., 1996). However, until now the effect Vit E supplementation on other parameters of antioxidant status has not been evaluated.

With respect to OR, lipoperoxidation is the main cause of deterioration of broiler meat and Vit E supplementation increases its oxidative stability in: fresh (Bartov and Bornstein, 1977; Woodall et al., 1996), refrigerated (Ruiz et al., 1999) and frozen (Grau et al., 2001) conditions. This study evaluated the effect of dietary Vit E supplementation on antioxidant status of broiler chicks and on the oxidative stability of cooled meat.

Materials and methods

This work was made during 2003 in the Chilean Central Area. Ninety 1-day-old-male chicks (ROSS 208) were raised until 42 days of age. A commercial food was offered *ad libitum*, which was modified according to treatments. Forty-five chicks were assigned randomly to the control diet (commercial diet) and the rest to the supplemented diet with Vit E (commercial diet + 200 mg/kg of α-tocopheryl acetate). Food intake and weight gain of the birds was measured periodically. Antioxidant
capacity of plasma (CAOXpl) was determined by the FRAP method, thiols (GSH) content by the Ellman’s method, and basal and induced lipoperoxidation of liver tissue, leg and breast by the thiobarbituric acid reactive substances (TBARS) method. Breast and leg samples were taken and cooled for 0, 2, 4 and 6 days at 6°C to six weeks old chicks at samples of each time of refrigeration, the extent of the lipoperoxidation by TBARS method (basal and induced lipoperoxidation) was determined. The statistical analysis was performed using the Statistical Analysis System (SAS Inc. Institute., 1999) software. Differences between averages were determined using DUNCAN analysis with p<0.05.

Results and discussion

No significant differences were found for both weight increase and food intake compared to the control, which agrees with Woodall et al. (1996).

With respect to the CAOXpl and GSH content, neither of them was increased significantly with vitamin E supplementation, indicating that this vitamin would not affect these parameters of the antioxidant status of the live organisms.

On the other hand, dietary Vit E supplementation diminished significantly basal and induced lipoperoxidation, in liver, breast and leg tissue of all ages analyzed (Figure 1) and for all refrigeration times (Figure 2). This could be due to the fact that the greater Vit E concentration in the food increases in all the tissues, protecting them against lipoperoxidation (Applegate and Sell, 1996).

Figure 1 Liver (A), breast and leg (B) of 2, 4 and 6 age old broiler (Fe 50 µM and 20 min in a 37°C shaking bath

Figure 2 Breast and leg TBARS of cooled meat (Fe 50 µM and 20 min in a 37°C shaking bath
Conclusions

It is important to emphasize that in the case of cooled meat (leg and breast), TBARS content diminished significantly after 6 days of refrigeration. This could be due to the fact that with that period of refrigeration, there is no longer any lipoperoxidable substrate left in the chicken meat. On the other hand, it was confirmed that vitamin E is an antioxidant that protects lipids of broiler meat against the oxidative rancidity, even after 6 days of refrigeration.

References


