

# OXIDATIVE STATUS OF DIETARY FAT INFLUENCES LIPID STABILITY OF ERYTHROCYTES IN CHICKENS

SCHIAVONE A.<sup>a</sup>, BARROETA A.C.<sup>b</sup>, BAUCCELLS M.D.<sup>b</sup>

<sup>a</sup>Dipartimento di Produzioni Animali, Epidemiologia ed Ecologia - Via Leonardo da Vinci n. 44 - Università di Torino - 10095 Grugliasco (TO) - ITALY. <sup>b</sup>Departament de Ciència Animal i dels Aliments - 08193 Bellaterra (Cerdanyola del Vallès) - Universitat Autònoma de Barcelona - SPAIN.

**INTRODUCTION:** Erythrocytes, the main components of blood, play a major role in the physiologic functions of the circulatory system such as oxygen transport and their integrity is associated to a good welfare conditions. It is well known that the quality of dietary lipid status and dietary supplementation with supranutritional amount of antioxidants leads to a significant improvement of the quality of the poultry products (meat and eggs), as the lipid stability during storage could be enhanced. Furthermore vitamin E ( $\alpha$ -tocopheryl acetate) acts by fortifying lipid stability of cellular membranes and in mammals its deficiency is associated to an higher incidence of the haemolysis rate. The present work aims to verify whether the oxidative status of dietary lipids or the vitamin E supplementation influences *in vivo* the stability of erythrocytes by measuring the haemolysis rate and susceptibility to lipid peroxidation.

**MATERIALS AND METHODS:** 48 female broilers (Ross 508) were randomly allocated in 4 experimental groups (6 replicates for each group, 2 animals/replicate). From 4 to 6 weeks of age animals received 4 dietary treatments. The same basal diet (BD) was supplemented by 6% animal fat (Control) or 6% sunflower oil (SO) or 6% sunflower oil + 200 ppm  $\alpha$ -tocopheryl acetate (SO+E) or 6% oxidised sunflower oil (SO-OX). Sunflower oil was oxidised in oven at 190°C for 22 hours. At the age of 6 weeks blood was collected in heparinized tubes from the brachial wing vein. Haemolysis rate and susceptibility to lipid peroxidation (TBARS) of erythrocytes were evaluated according to Moriguchi et al. (2001) and Soto-Salanova and Sell (1996) with slight modifications.

**RESULTS AND CONCLUSIONS:** Both the considered parameters have been influenced by the dietary treatment. Haemolysis rate was significantly higher in SO-OX group, suggesting that 2 weeks of dietary treatment are enough to induce a significant worsening of the erythrocyte membrane. The haemolysis rate of SO group is higher than Control and SO+E groups. This result could be associated to the richness of polyunsaturated fatty acids of the diet of SO group which are probably transferred in cellular membrane and are not protected by sufficient amounts of vitamin E.

	Control	SO	SO+E	SO-OX
Hemolysis rate (%)	1,89c	5,39b	1,92c	43,21a
TBARS (% of control)	100b	97b	73c	130a

a, b:  $p < 0.05$

A similar trend is observed for the susceptibility to lipid peroxidation of erythrocytes. Vitamin E act as a strong antioxidant and improve the lipid stability as shown by the data, which confirm this evidence. Animals belonging to the SO-OX group show the highest value of TBARS.

Results suggest that the erythrocyte characteristics are strongly influenced by dietary treatments. It is advisable that these parameters could be taken into account as predictors of the quality of poultry products. The negative effects on the structure of the erythrocytes induced by oxidised sunflower oil suggest as the quality of feed (in particular of lipids) are rapidly converted in negative effects in the organism. In this way chicken represents an interesting animal model to study the effects of the diet on the health status.

## REFERENCES

- Moriguchi T., Takasugi N., Itakura Y. (2001) The effects of aged garlic extract on lipid peroxidation and the deformability of erythrocytes. *J. Nutr.* 1016S-1019S.  
Soto-Salanova M.F. and Sell J.L. (1996) Efficacy of dietary injected vitamin E for poults. *Poultry Sci.* 75: 1393-1403.