

## Egg characteristics of Leghorn and Tegel pullets in response to interaction between estrogen and calcium

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An increased  $\text{Ca}^{++}$  requirement for the laying hen is well established. During the onset of lay plasma estrogen ( $\text{E}_2$ ) rises. This impacts on shell characteristics since  $\text{E}_2$  is known to regulate the expression of protein essential for the absorption of  $\text{Ca}^{++}$  by hens (1). However, there is little information on the interaction between dietary  $\text{Ca}^{++}$  and estrogen on shell characteristics. The purpose of this study was to investigate this interaction and determine if it is strain-specific.

Sixty-four 18-week-old Leghorn and Tegel pullets were obtained from a commercial flock. Each strain was assigned to diets formulated from cereals with low phytoestrogen content differing in calcium (2% or 4%) and administered with four levels of estrogen (control, 10, 50 or 100  $\mu\text{g}/\text{kg}$  body weight/day) in a  $2 \times 2 \times 4 \times 4$  factorial design. Estrogen in peanut oil carrier was injected intramuscularly daily for 28 days. Eggs were collected for 20 successive days and weighed (EW). Egg shell weight (SW), shell surface area (SUR), shell weight as % of egg weight (SP) and specific gravity (SEG) were also assessed. Shell thickness (ST) at the equator was measured using a Mitutoyo Digimatic Outside micrometer.

No significant effect of interaction between calcium, estrogen or strain were observed on feed intake (DFI), final body weight (FBW) and feed conversion ratio (FCR). Egg productivity (EP) were similar between treatments. With EW, there was a significant interaction between  $\text{E}_2$  and high level of  $\text{Ca}^{++}$  ( $P < 0.001$ ) as well as between  $\text{E}_2$  and strain ( $P < 0.05$ ) compared with other treatment groups. SW ( $P < 0.05$ ) and ST ( $P < 0.01$ ) were increased by 0.28-0.82 grams and 9.8-66.3  $\mu\text{m}$  respectively when hens were injected with  $\text{E}_2$  and maintained on high dietary calcium in comparison with the other treatment groups. SUR, SEG and SP were identical between treatments moreover there was a increase interaction between  $\text{E}_2$  and high level of  $\text{Ca}^{++}$  ( $P < 0.001$ ) with regards to SUR. SP and SEG were significantly greater ( $P < 0.01$ ) in Leghorn ( $10.34 \pm 0.14$  and  $1.088 \pm 0.0006$  respectively) than in Tegel ( $9.76 \pm 0.098$  and  $1.085 \pm 0.0005$ ) pullets.

These results indicated that  $\text{E}_2$  can affect egg characteristics, however this is dependent on level of  $\text{Ca}^{++}$  in the diet and strain of birds. These results may reflect a complex interaction between exogenous  $\text{E}_2$  and endogenous regulation of  $\text{Ca}^{++}$  metabolism. These relationship, may induce calcium absorption and consequently could affect egg characteristics, particularly shell quality.

1. Nys Y, Baker K, Bouillon R, Baelen VH, Lawson, DEM. Regulation of calbindin  $\text{D}_{28k}$  and mRNA in the intestine of the domestic hen. *General and Comparative Endocrinology* (1992); 86: 460-468.