

## **Effect of Se (Sel-Plex®) in combination with $\alpha$ -tocopherol on GSH-Px activity and TBARS in plasma of broilers**

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### **Abstract**

The objective of the present research was to determine the antioxidative effect of Se dosed as Sel-Plex in combination with Vit. E ( $\alpha$ -tocopherol; 100 IU/kg feed) on blood TBARS and glutathion peroxidase activity. Birds were supplemented with 0, 0.05, 0.10 and 0.30 ppm Se from Sel-Plex with or without 100 IU Vit E per kg feed. At days 14 and 28 blood samples (n=6 per treatment) were analysed for the activity of plasma GSH-Px and TBARS. TBARS results indicated that at 14 days of age, levels of 0.05 ppm Se without added Vit E gave a similar levels as the Vit E treatment without added Se. At 28 days of age a dose of 0.1 ppm Se without added Vit E was required to equal the effect of merely added Vit E. GSH-Px levels in plasma at 14 and 28 days showed no significant differences between all treatments except towards the control.

### **Introduction**

Se is incorporated into proteins to make selenoproteins, which are important antioxidant enzymes. Some of these enzymes as glutathione peroxidase (GSH-Px) are involved in membrane integrity and play a major role in the antioxidant defence in the cell to prevent cellular damage from free radicals. These free radicals can contribute to the development of chronic diseases as cancer in humans. Other selenoproteins help to regulate thyroid function and play a role in the immune system (McKenzie et al, 1998). As also Vit E in form of  $\alpha$ -tocopherol exert antioxidative effects, it was necessary to investigate if the augmentation of Se in the feed (as Sel-Plex) could replace high Vit E addition with respect to broiler meat stability.

### **Material and Methods**

The experiment was carried out with 56 broilers (Arbor Acers) randomly divided in 8 groups. Birds were supplemented with 0, 0.05, 0.10 and 0.30 ppm Se from Sel-Plex® (Alltech Inc., USA) with or without 100 IU Vit E per kg of feed for 42 days. Feed composition is given in Table 1.

At days 14 and 28 blood samples (n=6 per treatment) were taken and plasma was separated. The activity of plasma GSH-Px (measured as  $\mu$ kat/l) was measured by the coupled test (Günzler et al., 1974) using a Guilford spectrophotometer set at 366 nm with a stable temperature at 38°C. Plasma TBAR (expressed as  $\mu$ mol malonaldehyde (MDA)/l) was determined spectrophotometrically according to Uchiyama and Mihara (1978). In brief: to 0.30 ml plasma 3.0 ml 1% orthophosphoric acid and 1.0 ml 0.6% 2- thiobarbituric acid are added. After this, 0.10 ml 1  $\mu$ mol FeSO<sub>4</sub> is added, mixed on a vortex and kept for 60 minutes in a boiling water bath. After cooling, 4.0 ml n-butanol is added, well mixed and centrifuged at 1500xg for 10 minutes. The n-butanol layer is withdrawn with a Pasteur pipette and transferred to the spectrophotometer for reading absorbance values (E). The TBAR values are calculated according to the following formula: TBARS ( $\mu$ molMDA/l)= E x 85.47

Results were analysed using ANOVA followed by a Student t test.

**Table 1: Feed composition**

| <b>Ingredient</b>     | <b>Content (g/kg)</b> |
|-----------------------|-----------------------|
| Corn                  | 540                   |
| Full fat soya         | 130                   |
| Soybean meal          | 220                   |
| Sunflower meal        | 72                    |
| DcaP                  | 10                    |
| Limestone             | 15                    |
| Salt                  | 3                     |
| Premix                | 10                    |
| Moisture              | 111                   |
| Ash                   | 61                    |
| Protein               | 214                   |
| Fat                   | 49                    |
| Fibre                 | 45                    |
| Calcium               | 10                    |
| Phosphor              | 7                     |
| Lysine + Methionine   | 11                    |
| Cysteine              | 6                     |
| Tryptofan             | 3                     |
| Metabolic energy (ME) | 12,33 (MJ/kg)         |

### *Results and Discussion*

Results indicated that all additions of Se from Sel-Plex or Vit E significantly reduced the TBARS in blood at 14 and 28 weeks of age, except for treatments containing 0.1 ppm Se with or without added Vit E at 14 days. At 14 days of age, levels of 0.05 ppm Se without added Vit E gave a similar level as the Vit E treatment without added Se (2.02 versus 2.09  $\mu\text{mol MDA/l}$  respectively). Higher levels of Se did not reduce TBARS further. At 28 days of age, TBARS levels were 2-3 times higher compared to day 14, while a dose of 0.1 ppm Se without added Vit E was required to equal the effect of merely added Vit E (5.34 versus 5.58 respectively). At this date, supplemental addition of Vit E on top of Se reduced TBARS further with 0.65, 1.34 and 1.71  $\mu\text{mol MDA/l}$  at 0.5, 0.1 and 0.3 ppm Se respectively ( $P < 0.05$  at 0.1 and 0.3 ppm Se).

GSH-Px levels in plasma were increased by all treatments at 28 days, except for the treatment where only Vit E was added; at 14 days only treatments with 0.1 or 0.3 ppm added Se + added Vit E increased GSH-Px levels significantly (31.6 and 31.5 versus 21.5  $\mu\text{kat/l}$  for the control respectively). No significant differences between Se and Vit E treatments were observed for GSH-Px at 14 or 28 days of age.

Table 2: Effect of Se (Sel-Plex) and Vit E on TBARS and GSH-Px activity in plasma

| Se (ppm) | Vit E (IU/kg) | TBARS ( $\mu\text{mol MDA/l}$ ) |         | GSH-Px ( $\mu\text{kat/l}$ ) |         |
|----------|---------------|---------------------------------|---------|------------------------------|---------|
|          |               | 14 days                         | 28 days | 14 days                      | 28 days |
| 0        | 0             | 2,94a*                          | 7,13a*  | 21,5a                        | 27,9a   |
| 0        | 100           | 2,09bc*                         | 5,58b   | 26,3ab                       | 38,5ab  |
| 0,05     | 0             | 2,02b*                          | 6,10b*  | 27,1ab                       | 41,6b   |
| 0,05     | 100           | 2,29bc                          | 5,45b   | 29,0ab                       | 44,4b   |
| 0,1      | 0             | 2,65ab                          | 5,34b   | 29,0ab                       | 41,7b   |
| 0,1      | 100           | 2,58abc                         | 4,00c*  | 31,6b                        | 41,1b   |
| 0,3      | 0             | 2,23bc                          | 5,47b   | 26,1ab                       | 41,4b   |
| 0,3      | 100           | 1,86c*                          | 3,76c*  | 31,5b                        | 39,1b   |

Values in a column followed by a different letter are significantly different ( $P < 0.05$ )

Values in a column followed by a different letter and asteric \* are significantly different ( $P < 0.01$ )

### Conclusions

It could be concluded from this trial that Se from Sel-Plex exerted a similar effect as Vit E on plasma GSH-Px and TBARS, but that a combination of both can have a supplemental effect. Levels of 0.05 ppm Se as Sel-Plex is sufficient for maintaining the blood GSH-Px activity at 14 and 28 days. Vit E can have an additional effect on blood TBARS at 28 days of age and on GSH-Px at 14 days of age.

### References

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