Trace minerals as a solution in poultry nutrition

Optimising poultry health and performance starts with the right trace minerals. Highly bioavailable sources such as L-selenomethionine and hydroxy trace minerals can enhance fertility, growth and sustainability in modern poultry production.

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Modern-day poultry production is focused on optimising production and reproductive performance, such as egg production, growth or fertility. Optimal nutrition, management, and genetics are the fundamentals for achieving best production results. For nutrition, trace minerals play an important role in sustaining various biological functions that support high performance.

For example, selenium, via its incorporation into selenoenzymes, has the ability to reduce oxidative stress and improve fertility, immune functioning and growth. Other trace minerals such as copper, zinc, and manganese play an important role in different enzyme activities. Copper functions in red blood cell maturation and neutralising free radicals. Both copper and zinc are essential for skin (footpad) health and cartilage metabolism, while manganese is involved in skeletal development and fertility.

Trace elements are naturally present in feed ingredients, however these levels are generally too low to meet the requirements of intensively reared animals. Furthermore, their levels in raw materials can be variable. Therefore, it is common practice to supplement trace minerals. The key to good mineral nutrition is to supplement highly bioavailable trace minerals in the feed, which is largely determined by their source.

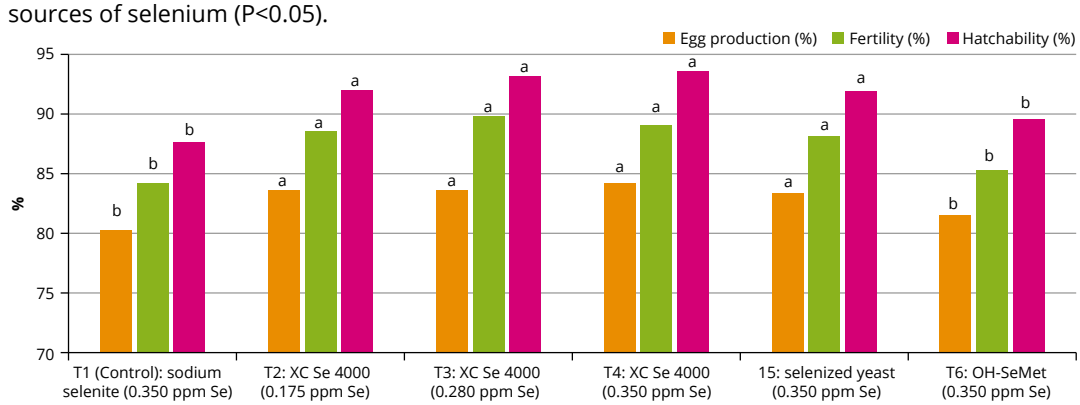
L-selenomethionine - the most effective form of selenium

The different selenium sources available can be categorised in two groups: organic and inorganic forms. Within the organic group, L-selenomethionine is the only form of selenium that, apart from being incorporated into selenoenzymes, can be stored in animal protein in the same way as methionine. During the process of natural protein turnover, this stored selenium can be made available again and used for the synthesis of selenoenzymes. This 'safe deposit' allows for a continuous selenium supply to the animal, even during times of (heat) stress when feed intake is reduced. The use of L-selenomethionine has been shown to have a variety of positive effects in poultry due to its optimal bioavailability.

In broilers, use of L-selenomethionine has improved growth performance (with or without the presence of stressors) and meat quality parameters (colour, drip loss, tenderness) compared to the use of inorganic selenium. For laying hens, the supplementation of L-selenomethionine can improve selenium deposition in eggs and prolong the shelf life of eggs.

Recently, a study at the University of Lavras (Brazil) compared the effects of different sources of organic selenium in broiler breeders. Cobb-500 breeders, 360 females and 36 males, at 24 weeks of age were divided over six treatments, each with 10 replicates. The treatments consisted of different selenium

Figure 1 – Egg production (%), fertility (%) and hatchability (%) of female breeders fed different sources of selenium (P<0.05).



sources (sodium selenite (control), L-selenomethionine, selenized yeast, OH-selenomethionine) or levels of supplied selenium (0.175 ppm, 0.280 ppm, 0.350 ppm). The L-selenomethionine in this trial was Excential Selenium 4000 supplied by Orffa Additives B.V.

The results showed improved reproductive performance (egg production, fertility and hatchability) in female breeders supplemented with organic selenium. Female breeders supplemented with L-selenomethionine at all selenium levels had better egg production than birds supplemented with selenised yeast, and significantly outperformed OH-selenomethionine for laying percentage and fertility (*Figure 1*). For male breeders, it was shown that sperm motility was significantly higher in the L-selenomethionine supplemented groups compared to sodium selenite with no significant effects for selenised yeast and OH-selenomethionine. For sperm viability, organic selenium sources, except for OH-selenomethionine, led to a significant improvement compared to sodium selenite.

This trial highlights the importance of supplemental selenium and how different selenium sources can affect animal performance. L-selenomethionine, compared to other (organic) selenium sources, has been shown to lead to optimal results.

Hydroxy trace minerals for optimal bioavailability and stability

As previously mentioned, bioavailability in trace mineral nutrition is a very important parameter. In a broiler trial at a research facility in Belgium (KU Leuven), the effects of hydroxy trace minerals and inorganic sulphates on broiler performance were studied. A total of 870 broilers (Ross 308) were divided over two treatments (each with 14-15 pens/treatment and 30 birds/pen) for 42 days. The control feed contained 15 ppm Cu from Cu-sulphate and 120 ppm Zn from Zn-sulphate, while the hydroxy mineral group was supplemented with 10 ppm Cu and 80 ppm Zn in hydroxy forms (Excential SMART C and Excential SMART Z, Orffa Additives B.V.). Overall, with a lower inclusion of Cu and Zn from the hydroxy trace minerals, broilers from this group achieved a similar performance (ADG, FCR) to the birds in the control group. During the grower period (0-28 days), the hydroxy minerals group even had a significantly better FCR than the control group (P=0.026). This indicates that, thanks to the better bioavailability of hydroxy trace minerals compared to sulphates, lower inclusion levels of Cu and Zn can be supplemented to achieve similar performance.

When considering feed additives for poultry, phytase will be on the top of the list. However, phytate can form complexes with elements such as copper, zinc and manganese. As phytase is less able to degrade these phytate-mineral complexes, phytase efficacy is reduced and the bioavailability of trace elements in diets will be lower. To optimally utilise the exogenous phytase, the formation of phytate-mineral complexes should be reduced, which can be achieved when replacing highly soluble inorganic trace mineral sources with hydroxy trace minerals.

Photo: **Orffa**

Several trials have shown that phytase efficacy was improved by replacing copper sulphate with hydroxy copper. It is not only the effect on phytase efficacy that is important to consider; minerals can also degrade the activity of vitamins. When studying vitamin A degradation in a premix, it was shown (*Figure 2*) that a premix containing inorganic minerals (copper sulphate, zinc sulphate and manganese sulphate) had a 10% lower vitamin A concentration than a premix containing hydroxy copper, zinc and manganese (Excential SMART C, Excential SMART Z, Excential SMART M, Orffa Additives B.V.) after three months. This highlights the importance of selecting a stable trace mineral source, when combined with other feed ingredients and additives.

Mineral nutrition - there is more to it

With essential nutrients such as trace minerals, it is important to not only consider the level of inclusion, but also the source. L-selenomethionine has been shown to be the most efficient form of selenium while for copper, zinc and manganese the hydroxy chloride form has been proven to be an excellent source. Choosing these premium sources of trace minerals will allow your animals to be healthy and capable of dealing with (health) challenges in their environment. This is very important, especially with the current focus on improving sustainability, which increases the need to have healthier and more robust animals. Optimal trace mineral nutrition can therefore be the answer that the poultry industry is looking

Figure 2 – Vitamin A stability in premix containing sulphates or hydroxy trace minerals.