Supporting pig performance with L-selenomethionine

Selenium has various functions with regard to pig health. The effects of selenium can be long lasting and depend on the source of selenium supplied to the animals. That applies to finisher pigs as well as sows and piglets.

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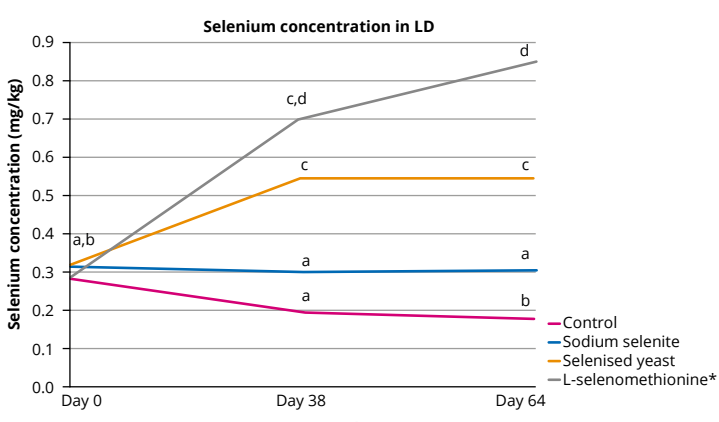
Selenium, an essential trace element, has functions in reducing oxidative stress and improving reproduction and immune status. A factor that contributes to oxidative stress in pigs is the high growth rate in modern pig production. In addition, during gestation and lactation, sows are confronted with increased levels of oxidative stress, which can harm the development and health of the embryos.

Therefore, high-performing sows require good antioxidant levels. An optimal level of selenium in the diet of pigs is known to protect against the harmful effects of oxidative stress in finishing pigs, sows and their offspring.

Different sources of selenium are available that can be used to enrich the diet, including inorganic forms such as sodium selenite, but also organic forms such as selenised yeasts or L-selenomethionine. Organic selenium (in the form of L-selenomethionine) is preferred as it can be stored in animal proteins – like muscles, colostrum and milk – and can be efficiently transferred to the offspring.

It is therefore hypothesised that organic selenium will have better and long-lasting effects in supporting finishing pigs, sows and their offspring during times of oxidative stress. The effects of different selenium sources – including L-selenomethionine in finishing pigs, sows and piglets – were studied in several trials by the Norwegian University of Life Sciences (NMBU) in 2018, 2019 and 2020.

Figure 1 – Selenium concentration in *Musculus longissimus dorsi* (LD) for different selenium sources; control (0.05 mg Se/kg diet), sodium selenite (0.33 mg Se/kg diet), selenised yeast (0.32 mg Se/kg diet) and L-selenomethionine* (0.32 mg Se/kg diet).



** Excential Selenium 4000, Orffa.*
Source: Adapted from Falk et al. (2018).

Selenium deposition in finishing pigs

A study with 24 finishing pigs investigated the effects of three selenium-supplemented diets and a non-supplemented control diet on selenium deposition and immune responses. The selenium-supplemented diets differed in the selenium source: sodium selenite, selenised yeast or L-selenomethionine (Excential Selenium 4000, Orffa). L-selenomethionine allowed for the highest increase in selenium deposition in muscle tissue (see *Figure 1*). Other tissue samples also showed higher selenium levels for the group receiving L-selenomethionine in their diet than receiving the other selenium sources. That indicates that L-selenomethionine allows for higher selenium storage in body tissue, which animals can use under stress when selenium uptake is limited.

Pigs that were supplemented with selenium under normal conditions without a disease challenge showed a better immune status and lower levels of inflammatory markers. This is shown by the fact that selenoprotein W (SelenoW) and selenoprotein H (SelenoH), both selenogenes, were higher expressed in pigs that received additional selenium. Interferon gamma (IFN-γ) and cyclo-oxygenase 2 (cox2) expression, both inflammatory markers, were lower in selenium-supplemented pigs. Organic selenium also allows for a better balanced immune system, which is shown by the reduction in caspase 3 (casp3) expression, involved in apoptosis. When the pigs were challenged with the endotoxin LPS, the important anti-inflammatory cytokine IL-10 was upregulated in the pigs that received L-selenomethionine.

Effects of two selenium sources in sows

A subsequent trial investigated the effects of two selenium sources on feed intake, blood parameters and selenium deposition in plasma, colostrum and milk in high-yielding sows. A total of 32 sows were included in this study, receiving either

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High-performing sows require good antioxidant levels.

sodium selenite or the same source of L-selenomethionine as in the previous trial, at two concentrations.

Results showed that the average daily feed intake (ADFI) was higher in diets enriched with L-selenomethionine. Selenium levels in colostrum and milk were higher for sows supplemented with L-selenomethionine and increased with higher dosages (see *Figure 2*). Levels of selenoproteins, such as selenoprotein (SelP), selenomethionine (SeMet) and selenoalbumin (SeAlb), increased in the colostrum of sows that received L-selenomethionine, and levels increased with higher dosages.

Blood parameters, such as glutamate dehydrogenase (GLDH) and gamma-glutamyl transferase (GGT), which are markers for oxidative stress, showed that sows supplemented with L-selenomethionine had better antioxidant status than sows supplemented with sodium selenite. Just changing the selenium source from inorganic sodium selenite to L-selenomethionine can improve a sow's performance and antioxidant status.

Selenium in maternal diets and piglets

After the study in sows, the team of researchers randomly selected piglets of these sows to examine whether the two selenium sources fed to sows can affect weight gain, blood parameters and total selenium levels in their offspring.

Sows and piglets were divided over four treatment groups, supplemented with sodium selenite and again the same source of L-selenomethionine as in the previous trials, at two concentrations.

From birth onwards, piglets from sows that received L-selenomethionine showed higher selenium concentrations in plasma than piglets from sows that received sodium selenite. Selenium concentrations in plasma were dose-dependent.

Blood parameters, such as aspartate transaminase (AST) and lactate dehydrogenase (LDH), that indicate oxidative stress, showed lower oxidative stress in piglets from sows supplemented with higher levels of L-selenomethionine. That shows that L-selenomethionine is more efficient than sodium selenite in transferring selenium to the piglets via the colostrum and milk. Higher maternal selenium transfer by dietary L-selenomethionine provides the piglets with better antioxidant status.

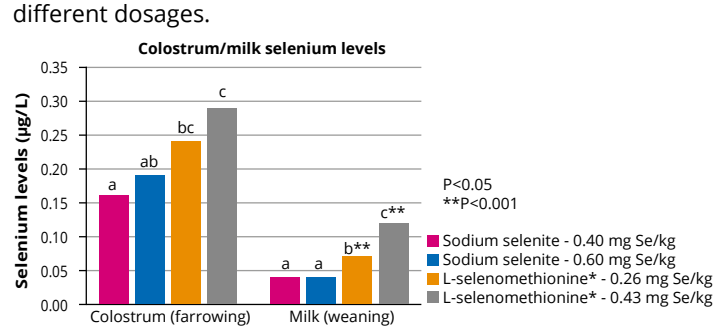
It was also shown that L-selenomethionine increases body weight of piglets. At birth, body weight for piglets in all groups is similar. After several days, body weight of piglets from sows that received low levels of sodium selenite in their diet was lower than for piglets from other groups.

Conclusions

Overall, these three studies have shown that L-selenomethionine (Excential Selenium 4000) supplementation to the diet of finishing pigs and sows reduces oxidative stress and increases levels of selenium in plasma, muscle, colostrum and milk compared to supplementation with sodium selenite. Maternal supplementation with L-selenomethionine has been shown to improve the selenium and antioxidant status of their offspring and supports growth of piglets. That allows for more robust piglets with a higher body weight at weaning.

References available on request. The author can be reached at soest@orffa.com.

Figure 2 – Selenium levels (µg/L) in colostrum (farrowing) and milk (weaning) for sodium selenite and L-selenomethionine* at different dosages.



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