



L-SELENOMETHIONINE FOR DAIRY CATTLE:

A major driver of immune and antioxidant defence

Mineral supplementation is a hot topic in dairy rations. Critical phases require special attention, also regarding macro- and micronutrients. Stressful periods, such as calving and early lactation, require mineral supplementation. The trace mineral selenium is involved in both antioxidant activity and the immune system. Selenium-deficient animals have been shown to have lowered immunity and resistance to disease. Selenium deficiency is prevalent in animals around South Africa, and this presents a challenging issue for every farm manager.

WHY IS SELENIUM IMPORTANT?

Selenium is the best-studied mineral in terms of (subclinical) mastitis. Energy demanding cells, such as mammary gland cells, need protection against oxide radicals, which are by-products of cellular energy production. Specific enzymes (selenoproteins, e.g. glutathione peroxidase), requiring the incorporation of selenium, reduce the presence of these oxide radicals. The activity of these selenoproteins results in reduced cell damage and the subsequent malfunction of tissues. Studies confirm the potential of selenium to enhance the

humoral immune defence in the bovine mammary gland. This combination of enhanced antioxidant activity and immune system functioning results in recording fewer new and total cases of (subclinical) mastitis.

There is a negative relationship between bulk tank somatic cell count (SCC) and herd plasma selenium status, meaning that higher selenium levels equal lower SCC. It is also reported that selenium supplementation lowers mean SCC after intramammary challenge with *Staphylococcus aureus*. It is, therefore, important to provide additional dietary selenium and regularly assess the herd's selenium status by analysing blood and milk.

HAS EVERY SELENIUM ADDITIVE THE SAME VALUE?

Since the early 1970s, diets have been supplemented with inorganic selenium (e.g. sodium selenite or sodium selenate). Unfortunately, the absorption is low in all animals, including ruminants ($\pm 10\%$). Microorganisms in the rumen also transform this form of selenium partly into non-absorbable elemental selenium, which is then excreted in the faeces. Recent reviews in ruminants concluded that inorganic selenium sources were not effective to fulfil their nutritional requirements. Based on these shortcomings, organic selenium has been introduced in animal feed since the early 2000s.

First-generation organic selenium sources comprise selenised yeasts. Yeasts are able to incorporate inorganic selenium as organic selenium in their protein fraction. Unfortunately, due to biological limitations, these organisms are not able to accumulate all inorganic selenium in the form of l-selenomethionine, and huge variability is seen in the quality of these products. l-selenomethionine is the desired selenium molecule since, as a methionine source, it can be incorporated in animal proteins and accumulate in the body, to a great extent. This way, it provides a safe deposit of selenium for future usage.

The quality of selenised yeast is expressed by consequence in the percentage of selenium in the form of l-selenomethionine. Recently, a new-generation organic selenium source has entered the South-African market. This source contains pure, synthetically made l-selenomethionine, present as a single amino acid. l-selenomethionine is the desired molecule for ruminants. Free l-selenomethionine and l-selenomethionine incorporated in the rumen microorganisms is readily available for absorption in the small intestine. The absorbed l-selenomethionine is then deposited as a

methionine source in animal protein, and acts as a safe storage. In times of stress, l-selenomethionine is released from the proteins into the amino acid pool due to protein turnover, and selenium can be utilised for selenoprotein production and immune stimulation, thus enabling consistent selenium supply tailored to the animals' specific needs.

Various trials with l-selenomethionine have resulted in the highest bioavailability, compared to any other selenium source, when it comes to deposition in meat, eggs, or milk. Where biofortification of milk is considered, l-selenomethionine is the best option. For cheese makers specifically, the additional value of increased l-selenomethionine levels in milk are shown to relate to lower oxidation of the cheese.

LIFTED TO MAXIMUM POTENTIAL

Thanks to state-of-the-art engineering and innovation, organic selenium has been lifted to its maximum potential. Excential Selenium 4000 (Orffa Additives B.V., The Netherlands) is the only organic product in the market providing all selenium in the most effective, bioavailable form – l-selenomethionine. There is no variation in concentration in comparison with other organic selenium sources (for example, selenised yeasts) and, from a health and safety perspective, it is supplied as a dust-free preparation. Excential Selenium 4000 is now available for inclusion in feed premixes in South Africa. For more information contact one of our specialists.

