

# L-selenomethionine and sustainable meat production

The world population continues to grow and this increases the global demand for food. Besides the increasing human population, rising incomes also contribute to the increasing demand for meat, especially in developed countries.

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The rise in the world population and meat consumption highlights the need for finding more sustainable solutions to produce these large volumes of meat.

Meat sustainability can be improved by increasing productivity, but also by reducing waste and spoilage. Increasing meat quality can contribute to a longer shelf-life, which reduces early withdrawal or rejection of the meat for human consumption. Did you know that a source of selenium in the diet of the animal influences the quality of final meat products?

## Field trial in bull calves

Recently, Orffa performed a field trial to evaluate the effects of sodium selenite and L-selenomethionine (Excential Selenium 4000, Orffa Additives, BV) on meat quality of Bonsmara bull calves. The trial included



24 calves of seven months of age that were transported to the experimental trial facility Rumen-8 in Bethlehem, South Africa, after finishing a grower period of 60 days at a commercial feedlot.

The animals completed a 10 day adaptation period after arrival at the research station.

After those 10 days, the animals were divided over two treatments.

Both groups were fed Total Mixed Ration (TMR) supplemented with 5.25mg selenium/cow per day.

The diets only differed in the source of selenium which was either sodium selenite or L-selenomethionine, for control and treatment groups respectively.

In order to ensure similar selenium intake between animals, feed intake was limited to 10kg DM per day. The trial lasted for 47 days, after which the animals were slaughtered and meat quality was measured.

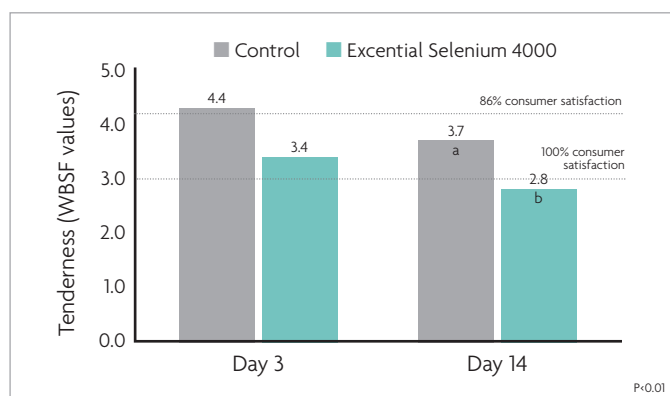
Tenderness was determined using Warner Bratzler Shear Force (WBSF); a mechanical method.

Low WBSF values indicate higher tenderness of the meat. In the field trial, meat was shown to be more tender when animals received L-selenomethionine, compared to sodium selenite.

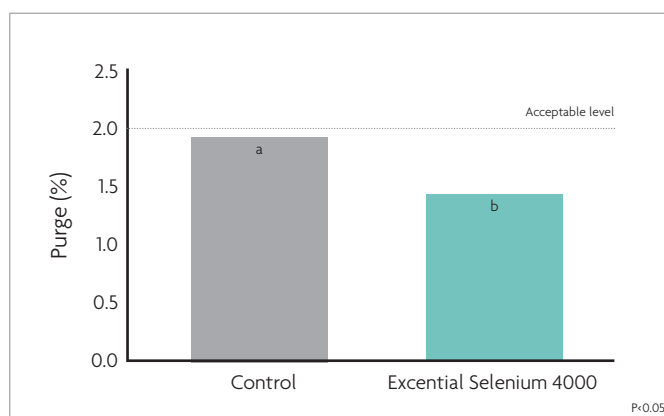
At day three after slaughter, WBSF values were 4.4 and 3.4 for the sodium selenite and Excential Selenium 4000 supplemented

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**Fig. 1. Variation in Warner Bratzler Shear Force (WBSF) measured in Orffa field trial.**



**Fig. 2. Levels of purge measured in Orffa field trial.**



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groups respectively and at day 14, the WBSF values were further reduced to 3.7 and 2.8 respectively (Fig. 1).

The group receiving Excellent Selenium 4000 shows WBSF values that allows for complete consumer satisfaction.

Another interesting finding in the field trial was a reduction in final pH of the group receiving L-selenomethionine. Lower final pH possibly indicates higher glycogen reserves in the muscles which reduces the risk of dark firm dry carcasses (DFD).

DFD carcasses are undesirable since they have a shorter shelf life and are rejected by consumers.

DFD carcasses show a high final pH and have a dark colour and a spongy texture. However, in order to confirm the hypothesis that L-selenomethionine might reduce the risk of DFD meat, glycogen levels would have to be measured at slaughter.

Purge is a liquid that is drained from meat and contains water and proteins. Low levels of purge are desirable since meat with low levels of purge is more juicy and besides, consumers are put off by high levels of purge.

In general, levels of purge under 2.0% are considered acceptable by consumers. It was shown that the animals that received L-selenomethionine had lower levels of purge than animals that received sodium selenite (Fig. 2).

The difference was 0.5%.

Besides the increase in consumer satisfaction, lower levels of purge also allow for more sellable meat, which is economically interesting.

In total, the supplementation of Excellent Selenium 4000 increased the profit with 83.13 RAND (€4.67 or \$US5.33) per animal.

The return on investment (ROI) of L-selenomethionine for this trial is 1:3.84.

## Selenium and meat quality

Oxidation is a major cause of declining meat quality. During oxidation, free radicals can cause damage to proteins, lipids, and DNA. In order to improve meat quality, oxidation reactions should be reduced, both pre- and post-slaughter.

Since selenium functions as an antioxidant, supplementing the diet of animals with selenium could reduce oxidation reactions and therefore improve meat quality.

Over the past years, multiple research groups focused on the effects of different selenium sources on improving beef quality.

Grossi et al. (2021) investigated the effect of different selenium sources on the quality of beef.

Results have shown that the organic selenium sources allowed for a decrease in shear force, which allows for an increase in beef tenderness.

Besides, drip loss and lipid oxidation were also shown to be reduced. During eight days

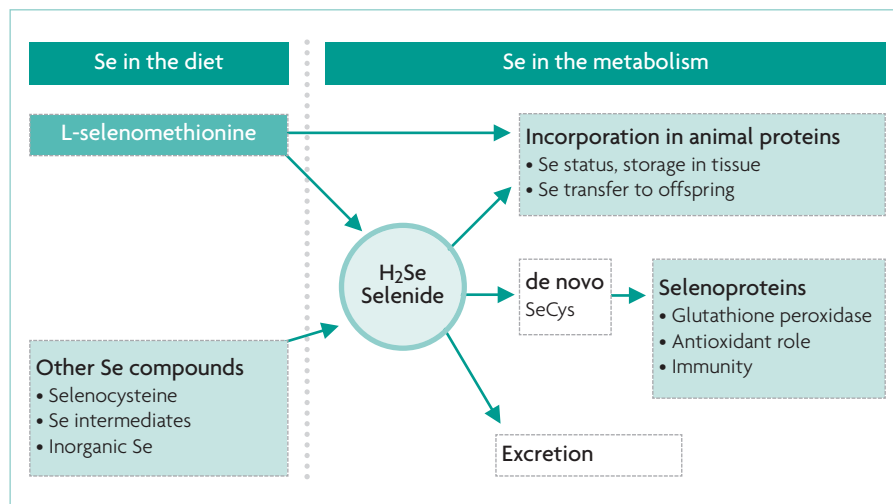


Fig. 3. Different sources of Selenium in the metabolism of the animal.

of storage, the colour of the meat slightly changed as the lightness and yellowness were reduced.

However, reduction in lightness was smaller in the groups of animals that received organic selenium sources in their diet, compared to the group receiving the inorganic source sodium selenite.

Overall, the best results were found for organic selenium.

In another study, measuring the effects of inorganic and organic dietary selenium on meat quality of Charolaise beef cattle during the finisher phase, the results on improved meat quality were confirmed.

Besides the significant improvement in selenium deposition caused by organic selenium compared to sodium selenite, shear force tended to reduce as well.

Lightness and yellowness both significantly decreased upon storage with better results found in the organic selenium group.

Colour was also scored visually, and this score was more optimal for the organic selenium group.

Odour, overall appearance and surface wetness were also determined and were shown to be better for the group that received organic selenium.

Overall, it can be concluded from this trial that tenderness, shelf life, colour and selenium deposition improved upon supplementation with organic selenium.

## Difference in dietary sources of selenium

Selenium is an essential trace element with functions in animal health, reproduction and performance.

During life, the trace element is involved in several processes. Selenium is incorporated in multiple selenoproteins such as glutathione peroxidase (GPx), thioredoxin reductase and iodothyronine deiodinases.

GPx and thioredoxin reductase function as

antioxidants and protect the cellular metabolism from free radicals.

Adding selenium to animal feed is an efficient way to enhance the selenium status of animals, allowing for improved animal health and production, but also to improve meat quality.

In animal nutrition, both inorganic and organic sources of selenium can be used. However, the metabolic pathway in the animal is different between selenium sources (Fig. 3).

Inorganic selenium is often used in the form of sodium selenite.

Organic selenium, in the form of L-selenomethionine, will also be used for selenoproteins synthesis, but also allows for selenium storage in general body protein and animal products (e.g. meat, milk).

Organic selenium, in the form of L-selenomethionine, ensures a safe deposit of selenium inside the animal, which could be used during times of stress or low selenium intake. L-selenomethionine is therefore considered as the most effective form of selenium.

Orffa provides a 100% pure, dust free form of L-selenomethionine (Excellent Selenium 4000).

## L-selenomethionine improves meat quality

An extensive array of positive effects of dietary selenium supplementation on meat quality has been described in various literature. Although this applies for both inorganic and organic sources, most beneficial effects are measured by the use of organic L-selenomethionine in the diet of the animal.

Orffa's latest field trial shows how L-selenomethionine improves beef quality, consumer satisfaction and contributes to a more economical production. L-selenomethionine contributes to a lower spoilage of meat products and a more sustainable meat production. ■