*By Izak Hofmeyr*

# Mineral and vitamin supplementation in the dry season

Although vitamins and minerals play a critical role in maintaining the health of production animals through their diet, this role encompasses much more. There are other processes in the animal's body that are dependent on the correct balance of minerals and vitamins, which can either promote or adversely affect health and efficiency.

According to Alheit du Toit, professional livestock expert at Feedtek Animal Feed Solutions in Cradock in the Eastern Cape, a properly functioning rumen remains a key facet to bear in mind when formulating winter licks for livestock; however, this is only one part of the process. Most of the body's functions and processes cannot proceed if the minerals and vitamins ingested are insufficient.

"In terms of minerals and vitamins in winter licks, it is more appropriate to refer to licks for the dry season than winter licks, as the Western Cape's dry season does not signify winter. The primary focus during the dry season is the efficient utilisation of dry roughage. Strategic supplementation of minerals and vitamins is essential for optimal rumen functioning, and should put the animal in the best possible position to produce and reproduce."

*Minerals and vitamins are critical for optimal rumen function, as well as production and reproduction.*

## Efficient rumen function

When discussing licks for the dry season, he says, there is a misconception that protein, especially non-protein nitrogen, and to a lesser extent energy, are the only critical elements to consider. "Yet the truth is that minerals that are not balanced properly, will hamper the rumen microbes' ability to best utilise other nutrients such as protein and energy.

"The rumen microbes utilise nitrogen to produce microbial proteins, which then become available to the animal. However, to optimise the process, sulphur, in relation to nitrogen, is needed. Sulphur-containing amino acids such as methionine and cysteine can now be manufactured."

Nevertheless, the processes of microbial protein synthesis and fibre fermentation require energy. Phosphorus and magnesium are the most important minerals when it comes to energy metabolism. Phosphorus is a component of adenosine triphosphate (ATP), the energy-carrying molecule, and magnesium together with phosphorus are needed for optimal energy utilisation.

"In addition, the pH in the rumen needs to be optimal and minerals must function as electrolytes in order to maintain osmotic balance. When the correct pH and osmotic balance is maintained, it promotes rumen health and the transfer of nutrients through cell walls. Sodium, potassium and chlorine, as well as phosphorus, magnesium and sulphur play a role in this process. These are the most important macro-minerals where the rumen is concerned, but a balanced spectrum must be present."

In the context of the rumen, says Alheit, vitamin supplementation is less important since some vitamins can be synthesised by the rumen microbes.

Where trace minerals are concerned, he asserts that rumen microbes require a balanced spectrum. For example, rumen microbes utilise cobalt, a particularly important element, to produce vitamin B12. As the metabolism of every cell in the body is dependent on vitamin B12, cobalt is indispensable for production and reproduction.

## Other processes

Once the macro- and trace mineral balance in the rumen becomes optimal, the other processes in the animal's body that are dependent on balanced macro-mineral, trace mineral and vitamin levels, can receive attention.

"Virtually all processes in the body require a combination of minerals and vitamins to function optimally. For example, calcium, magnesium and potassium are necessary for muscles

*In high-producing animals, such as ewes with multiplets, it is necessary to supplement B vitamins at times.*

to function. Calcium, phosphorus and magnesium are important components of the skeleton, but calcium, sodium and potassium are also needed for healthy nerves.

"The body therefore requires more minerals than those utilised by rumen microbes alone. To have enough of these minerals and vitamins available for important functions in the body," he adds, "the ration needs to contain more than the level needed for rumen function. The supplement given and the animal's production phase must also correspond.

"For example, there is a perception that phosphorus only has to be supplemented in summer. But it is important to understand that reproducing female animals, in particular, require a basic amount of phosphorus when entering the dry season. This applies to both pregnant cows and ewes that must calve or lamb in late winter or early spring.

"The phosphorus levels must be adjusted according to the production stage, either through low intake of concentrated maintenance licks, or production licks with lower concentrations but higher daily intakes."

## Trace minerals and vitamins

In addition to cobalt, ruminants require essential trace minerals such as copper, manganese, zinc, selenium, iodine and iron. Each of these trace minerals function in an extremely complex manner; however, they form an integral part of specific tissues and play a role as activators in enzyme and hormone systems.

Vitamins also play a critical role in enzyme activation, with the B vitamins playing a central role. "Although trace minerals and vitamins are essential, they are not needed in large quantities. Yet the relationship between these vitamins and other nutrients is important. Selenium and vitamin A, for example, work together to maintain mucosal health, which is necessary for fertility and disease resistance."

While regional differences do exist with regard to trace minerals found naturally in plants, Alheit is comfortable with a blanket approach to dry-season licks containing the main trace minerals, making it acceptable for countrywide use.

A good starting point, he says, is having a basic level of all the important trace elements in balanced amounts. Macro- and trace mineral supplementation, in a bid to achieve the correct levels in the body, is a medium- to long-term approach. It definitely does not happen overnight.

## Vitamin deficiencies

As for vitamins in dry-season licks, he says, vitamin A and E supplements are vital, as they cannot be produced by rumen microbes or the animal.

"It is believed that ruminants on green grazing ingest sufficient beta-carotene, which is the precursor of vitamin A, and that they therefore do not require supplements. This is not necessarily the case, as the available vitamin A often cannot meet the animal's requirements."

A good example of this deficiency, says Alheit, was observed in the Karoo last year. In the past, the winter shrubs had apparently always provided sufficient levels of vitamin A. However, in 2019 a significant increase was observed in eye problems, a clear indication of vitamin A deficiency, due to the drought of the last few years.

"While it certainly has a cost implication, supplementing high levels of vitamins A and E through a dry-season lick definitely has a positive long-term effect on herd fertility."

Alheit goes on to say that it is often assumed that water-soluble B vitamins, as well as vitamins C and K, are synthesised in the rumen, therefore making supplementation unnecessary. "However, in high-producing animals it is sometimes necessary to supplement B vitamins as the rumen microbes do not produce enough to meet the high demand."

In this context, high-producing animals refer to ewes with multiplets, for example.

## Mineral and vitamin bioavailability

Supplementation of minerals is a complicated process and the availability of minerals for the animal must also be considered. In this instance, the source of the mineral plays an essential role, as does the pH of the digestive tract, the relationship with other minerals and vitamins, and the animal's current mineral status. Using organically bound trace minerals is one way of increasing availability.

Although the activity of minerals and vitamins in the body is very complex, he concludes, the effect is evident in growth, wool production, reproduction and health – the elements that determine profitability. Livestock farmers must therefore make a concerted effort to guard against mineral and vitamin deficiencies in their herds. SF

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