



Strategic trace element and vitamin supplementation in the ruminant:

Focus on selenium

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Trace elements are minerals that are needed by the body in small amounts. Typical examples of trace elements that are important in ruminants include copper, zinc, manganese and selenium. Vitamins that are important in ruminants include vitamins A, B, D and E. Trace elements and vitamins play a major role in the antioxidant systems of the body where they are built into certain enzymes. These enzymes then function in the body where they act against free radicals that cause damage in the body. Trace elements and vitamins therefore play a major role in the overall health and immunity of the animal by increasing the function of these enzymes as well as improving the immunity of the animals. ^{1, 2, 3}

Trace element and vitamin deficiencies:

Most trace element and vitamin deficiencies are subclinical, which means that the farmer does not necessarily "see" a deficiency. Subclinical selenium deficiencies in ruminants can lead to irregular heat cycles, increased number of retained placenta's, mastitis cases and high somatic cell counts, decreased milk and wool production, decreased fertility and decreased weight gain.^{2,4} Severe selenium deficiencies can be "seen" as clinical cases in the form of white muscle disease. With white muscle disease, the muscle tissue and heart muscle tissue are severely damaged because of the protective antioxidant systems that are being overwhelmed. Typical symptoms of white muscle disease are weak lambs or calves that have difficulty moving. Muscle and heart muscle tissue have characteristic white stripes when cut through on post mortem examination. The severely affected heart muscle tissue leads to heart failure and deaths.

Source and availability of trace elements and vitamins:

Trace elements are usually obtained by ruminants through plant, feed and water intake. Trace elements are taken up by plants from the soil and water. The availability of trace elements to the ruminant is therefore determined

by what is available in the plant material. Certain plant species are known to contain low levels of a trace elements. An example of this is lucerne. A diet consisting mainly of lucerne can lead to selenium deficiencies.⁵ Certain factors including antagonistic interactions between elements as well as the pH of the soil can impede the uptake and availability of certain elements by plants and animals. An example of this is a high sulfur concentration which impedes the uptake of copper and selenium. A low (acidic) soil pH can impede the uptake of selenium.⁵

Supplementation:

The administration of trace elements and vitamins should be seen as a supplement and the greatest benefit that animals get from any supplement is usually when there are deficiencies.

Various methods can be used to supplement trace elements and vitamins. Trace minerals and vitamins can be supplemented orally by means of feed (as a "premix"), water, oral dosing or by administering injectable formulations subcutaneously. Injectable formulations are a direct route of administration that bypasses the interactions in the rumen and intestinal tract.

Strategic supplementation:

During certain times of the production cycle, namely the breeding season, lambing or calving season and during weaning, animals are under tremendous stress and the antioxidant and immune systems are usually overwhelmed during these times. Deficiencies in trace elements and vitamins are experienced during these times and sufficient trace elements and vitamins are therefore needed. Therefore we recommend strategic application during these critical times.

Before breeding:

Overall health and immunity are important during this time since animals must be in optimal condition. Vaccinations are usually given before this time and a functional immune system is important to stimulate optimal immunity after vaccination. Trace elements play a role in the fertility of animals.

Selenium can be used as an example because it occurs in high concentrations in the testes and spermatozoa of male animals. A deficiency of selenium can therefore result in low sperm counts and poor fertility.^{2, 4}

Before lambing / calving:

The ewes and cows are under tremendous physiological stress, they have to produce good quality colostrum and milk, the growing fetus "drains" reserves from the cow / ewe and trace elements are channeled from the cow / ewe to the fetus. Trace elements, especially selenium, are also found in colostrum and milk, which are then a great source for the young lambs and calves.^{2,4} After lambing and calving, optimal udder health is required. Adequate selenium and selenium supplementation before lambing / calving play a major role in udder health.^{2, 4, 6}

During weaning:

Animals are under tremendous stress during weaning. Weaner lambs and weaner calves are in a rising growth phase. Sufficient trace elements are needed to ensure a strong immune system, optimal health and growth.

Recommendation:

Consult with your local veterinarian about trace element and vitamin deficiencies in your area. Excessive trace elements can be toxic and expert advice must be obtained when there is any uncertainty about trace element levels.

References:

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