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Mineral nutrition – growers

Feeding over winter can be a tricky task as it will often be dependent on what has been set aside from spring/summer in the form of conserved forages, how the harvest has done and current cereal prices etc. Ensuring basic nutrition requirements are met is the first stage of any winter feed planning in terms of energy, protein and water supply.

Mineral nutrition is then a follow on from this once the base ration has been accounted for. You will need to know what you are going to feed and what it contains in order for you to accurately and efficiently add additional minerals as required. Over supplementation is an expensive option so when margins are low it is important to ensure that any and all cost savings are employed.

The main minerals that are often talked about within the industry and press are:

- Sodium (salt)
- Calcium
- Magnesium
- Potassium
- Phosphorus
- Selenium
- Copper
- Iodine
- Vitamin E

Tables 1 and 2 show inclusion rates as recommended by the National Research Council and would be considered the baseline when looking at ruminant requirements.

Table 1: Macromineral requirement in growing/finishing beef cattle

Mineral	Percentage diet DM requirement
Sodium	0.08 (0.2% in Salt form)
Calcium	0.31
Magnesium	0.10
Potassium	0.60
Phosphorus	0.21

Table 2: Micromineral requirement in growing/finishing beef cattle

Mineral	PPM (mg/kg) diet DM requirement
Selenium	0.10
Copper	10.00
Iodine	0.50
Vitamin E*	75 IU/kgDM

Above information adapted from NRC 2000 Nutrient Requirements of Beef Cattle

*Vit E inclusion dependent on Selenium status and type of feed therefore above value is an estimate

Macrominerals

Sodium (Na)

- As a component in salt and often low in forage diets, Na works in conjunction with potassium (K) for nutrient transport into and out of cells. Inclusion can drive water intake and thus DM intakes. It can be provided as a free choice mineral or as a lick (inclusion in concentrate can also be used to limit feed intake).

Calcium (Ca)

- Most abundant mineral in the body, good levels in forage but can be reduced in mature or weathered forage. Legumes contain more than grasses. Grains have lower Ca levels. When dietary phosphorus (P) exceeds Ca then uptake is reduced. Ideally maintain Ca:P ratio in excess of 1.5:1. P levels exceeding Ca levels increase the risk in growing male cattle of urinary calculi.

Magnesium (Mg)

- Important for enzyme activation, glucose breakdown and other functions. Deficiency can present as excitability, anorexia, convulsions and salivation. Young cattle can mobilise large amounts unlike older cattle, but clinical disease can be seen at any age. Forage Mg concentrations will vary with plant species, soil levels, plant stage, season and environment. Legumes contain higher levels than grasses but forage contains roughly twice as much as grains. Supplementation at 2-10% of the ration depending on confounding factors (i.e. 10% on lush spring grass).

Potassium (K)

- Third most abundant mineral in the body, involved in acid-base balance, osmotic pressure/water balance, muscle contraction and nerve impulse transmission + more. Deficiency can present as decreased feed intake and weight gains, depraved appetite, and rough hair coat. Forages are usually good source (1-4% K) very high in lush pasture decreasing with age. Cereals typically low with high concentrate diets often requiring supplementation.

Phosphorus (P)

- In growing cattle P is required for skeletal development and maintenance, muscle tissue building, cell growth and differentiation, energy use and transfer and much more. Deficiency can have large implications: decreased growth, DM intakes and feed conversion efficiency. Forages are generally low in P compared with concentrates (opposite to Ca). Drought and increased forage maturity also decreases P content of forages. Recommended levels of P supplementation is generally 4-8% depending on forage conditions and concentrate inputs. Consider again the Ca:P ratio of the final ration.

Microminerals

Selenium (Se)

- Important part of selenoproteins including glutathione peroxidase – an antioxidant. Functions related to Vit E. Deficiency can lead to white muscle disease, reduced immune function, unthriftiness/weight loss and diarrhoea. In excess can cause lameness, anorexia, sore feet, cracked and deformed hooves. Inclusion in ration should not exceed 0.3ppm.

Copper (Cu)

- Essential component of many enzymes. Accumulates in the liver. Young growing animals more susceptible to toxicity. Molybdenum (Mo), Sulphur (S) and Iron (Fe) all interact, significantly reducing bioavailability. Deficiency signs include, decreased growth, loss of pigmentation in hair, brittle bones and diarrhoea. Breed differences in requirements. Copper is more available in concentrate diets than in forage diets.

Iodine (I)

- Often noted in growing animals as young stock seen with goitre, or calves being born weak, hairless or dead. Deficiencies more usually associated with breeding herds rather than in growing animals. Iodine is an essential component of thyroid hormones, acting to regulate energy metabolism in the body.

Vitamin E

- Vitamin E serves as an antioxidant in the body, similar to Se. It is important in membrane and muscle structure and function. Elevated polyunsaturated fats in the diet (oils) will increase the demand for Vitamin E and high moisture feeds will lose Vitamin E faster than dried feeds. Signs of deficiency are linked with those of Se deficiency.

There are of course other minerals and vitamins that we need to be aware of and consider:

- Sulphur
- Chlorine
- Chromium
- Cobalt
- Iron
- Manganese
- Molybdenum
- Zinc

Nutrient requirement for all of the above minerals will vary depending on the age, weight, stage of production, breed, stress and mineral bioavailability. Mineral bioavailability is particularly important due to the levels of interactions that occur between different minerals that can impact significantly on availability to the animal.

A sound understanding of what the base levels are in the feeds being made available to the animals is also important, this includes the levels found within the water sources (often can contain high levels of iron for example in bore hole water). Without this background information it can be very difficult to determine what form additional supplementation needs to take or what type ie organic versus inorganic mineral compounds.

Animal status is also important when looking at minerals to help us to recognise where the potential pitfalls may be in what we are doing with regards to supplementation. Copper would be a good example as it is relatively expensive but often used in excess of requirements. Blood testing will not show this excess, only liver biopsies will give you the information you require to determine the animal's status.

It is also worth remembering that mineral supplementation is not a case of more equals better in all situations. All of the minerals mentioned above can be toxic to a greater or lesser degree when provided in excess so be cautious of the sales pitch and ask yourself the question, "do my animals really need this?" It is also worth making sure that the base inputs are adequately met, ie energy, protein and water allowances as minerals are only then next on this list; make sure these are adequate before chasing minerals as the cause of the problem. Over feeding of minerals (especially salt and magnesium) at finishing can also result in loose faeces and carcass spoiling, therefore potentially incurring costs.

Good discussions with your vet and nutritional advisor are key parts to determining what is needed with regards to mineral supplementation for your animals. A close eye on the animals will also tell you a lot, what does their hair coat look like, are they growing adequately, what is their behaviour like? All are elements that can be influenced by mineral imbalances.