

Why Feed Minerals?

With increasing production levels and a higher requirement for a quality end product the proper supplementation of minerals, vitamins and trace elements is more important than ever. In animal production it is well established that a good supply of mineral vitamins and trace elements is critical to normal rumen function, immune system, metabolism, production and reproduction.

Essential Vitamins

Essential vitamins are vitamins that cannot be synthesised by the ruminant animal and must be supplied by the diet. Vitamin A, Vitamin D3 and Vitamin E are normally classified as being essential vitamins for the ruminant. Their normal sources are fresh forage so animals grazing grass will normally get enough from this grazed grass to meet their requirements. In the case of preserved forages the essential vitamin content will vary greatly. For instance vitamin content will fall over time. Forages preserved in poor conditions or where preservation is poor may have no vitamin content at all. Secondary fermentation will often destroy the essential vitamin content of forage. Secondary fermentation is often a problem where silage pits are open and fed in warm conditions.

For different classes of animals a deficiency of these essential vitamins will have different consequences. Vitamins A and E are associated with the immune system and as such are associated with increased incidence of disease.

Table 1 Vitamin function and deficiency symptoms

Dry cows	Important for normal foetal development and calf vitality. Vitamin E deficiency often associated with increased incidence of metritis in fresh cows. Level in diet will effect levels in colostrum which is important for calf health.
Milking cows	Increased incidence of mastitis
Growing cattle	Immune problems and poor growth rates. Ring worm (<i>Trichophyton verrucosum</i>) is often a sign of poor anti-oxidative status i.e. low levels of vitamin A and E in the diet.
Calves	Research indicates that deficiency of vitamin A and E are associated with incidence of diarrhoea and respiratory infections. Weaning is a stressful period and vitamin A and E status can be reduced resulting in immune problems particularly respiratory infections.

Vitamin D supplementation is important in that it is required for normal absorption of calcium and phosphorus. Functional parathyroid hormone is required for conversion to an active form. It plays an important role in calcium metabolism around parturition where deficiency can result in milk fever (hypocalcaemia). However it is equally important in the milking cow where large amounts of calcium and phosphorus are absorbed daily to meet the requirements for milk production. For growing animal's poor levels in the diet lead to poor appetite and growth rates.

Macro elements

Macro elements are minerals required in large amounts and there requirement is usually expressed as a percentage of dry matter intake. Trace elements are required in small amounts and their requirements are usually expressed in ppm or mg/kg or dry matter

intake. Normally it is important to look at calcium, phosphorus, sodium and magnesium. Other macro elements such as potassium, sulphur and chloride are normally found in sufficient levels in a typical diet.

Table 3 Function of macro elements

Mineral	Deficiency
Calcium	Important for bone immune system and normal metabolic function. Large volume excreted in milk
Phosphorus	Large volume excreted in milk. Plays an important role in metabolic function and energy metabolism. Deficiency often effects appetite, reproduction and production.
Sodium	Electrolyte balance –milk contains a high level. Significant sodium recycling into the rumen via saliva in the form of bicarbonate which is an important buffer in the rumen
Magnesium	Involved in over 300 biochemical reactions in a ruminant. Plays a critical role in calcium and phosphorus in both dry and lactating cow

Fresh grazed high quality herbage usually contains adequate levels of macro elements. Preserved grass silage is more mature than what is typically grazed and some supplemented macro elements will be required. Alternative forages such as straw, maize silage and whole crop have low levels of macro elements and significant supplementation will be required. Diets containing alternative forages are often not properly balanced. Advice. A nutritionist should always check diets containing alternative forages to ensure they are properly balanced. Magnesium supplementation will be required in all cases to lactating animals and dry cows as levels in all herbages will not meet requirements.

Trace elements

While many trace elements are required for normal metabolic function in the ruminant only six (copper, zinc, manganese, cobalt, selenium and iodine) are usually considered for supplementation as others are normally found in adequate quantity's in a normal ruminant diet. Some trace elements can be found in excess and cause mineral antagonism (example iron and molybdenum, sulphur). Mineral antagonism is where a mineral or trace element interferes with the absorption and metabolism of another mineral or trace element. For example molybdenum iron and sulphur will interfere with copper absorption and metabolism.

Whereas grass silage will provide a significant portion of a cows macro mineral requirement it will only provide a small percentage of its essential trace element requirements (see graph 1). All sources of alternative forages (example maize or whole crop silage) will have lower levels than grass silage.

Graph 1 – grass silage as a source of minerals and trace elements for dry cows.

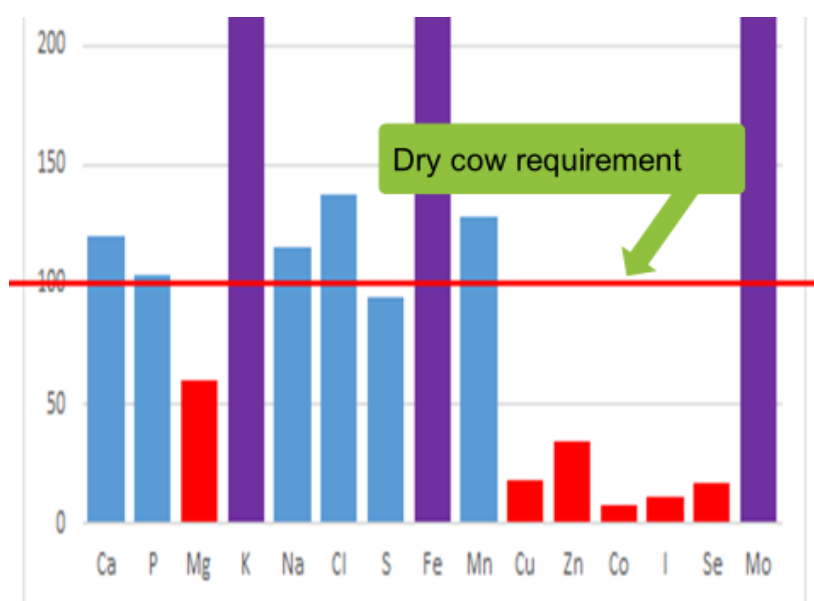


Table 4 Function of trace elements

Copper	Co factor in metabolic reactions, plays an important role in oestrus and reproduction.
Zinc	Co factor in metabolic reactions. Important role in immune system and formation of keratin which is important for feet and udder.
Cobalt	Used by microbes to synthesise vitamin b12 which plays an important role in rumen function and metabolism. Not stored so daily supplementation needed.
Iodine	Important part of thyroxine which controls metabolism and many metabolic functions. Not stored so daily supplementation needed.
Manganese	Co factor in metabolic reactions.
Selenium	Plays an important role in immune system

Supplementing minerals, vitamins, trace elements

In Ireland the supplementation of minerals vitamins and trace elements is haphazard on many farms. If we look at other species of intensively farmed animals (pigs& poultry) minerals and vitamins are supplemented on a continuous basis. The same would be true for dairy cows and to a certain extent beef cattle and sheep in intensive livestock systems abroad.

Table 5 Dairy cow supplementation program

Pre-dairy cows	In most cases preserved forages are fed – vitamins minerals, macro elements especially magnesium need to be fed
Post calving	Concentrate fed at 6-8 kg will provide most of what the cow requires. Risk when concentrate feeding is below this level additional sources of trace elements should be provided example fertility booster feed, through water or bolus

In general beef cows receive very little supplementation the table below outlines a suggested supplementation program for spring calving cows.

Table 6 Beef Cows supplementation program

Pre-calving	Good quality powder mineral for at least 8-10 weeks. Longer period if there are problems or the cow has not received trace elements in late lactation.
Post calving indoors	Post calving powder minerals best indoors.
Post calving at grass	Good quality high Mag bucket-containing magnesium and a high levels of trace elements. Supplementation of magnesium is important to breeding animals regardless of tetany risk.
Post breeding	Good quality trace element bolus – this should supply trace elements right up to the pre-calver period.