

	Function	Deficiency Symptoms/ Signs	Toxicity Symptoms
Macro Minerals			
Nitrogen			
Phosphorus	Skeletal Structure, fertility, growth, milk yield, energy metabolism (Makes up 29% of total minerals in body)	Poor appetite, Reduced growth and milk yield. Dull, Dry hair coats Silent heats, low conception rates, low P has been linked to eating/licking stones	-Prolonged high intakes required - Downer Cow
Potassium	Osmotic pressure, pH Balance,	Deficiency is unlikely on grass based diet. Poor appetite, reduced growth, loss of hair glossiness	Increased thirst and urination Reduced rumen efficiency
Calcium	Bone & Teeth formation, blood clotting, smooth muscle contraction	Milk fever, lazy calving, slow growth, bone fractures, lower milk yield, rickets	Toxicity is rare with normal diets
Magnesium	Enzyme activator, bone and muscle	Grass Tetany Mature Lactating cows most susceptible Lazy calving, retained afterbirth	-Toxicity rare with normal diets -Excess Mg causes diarrhoea and loss of condition
Sodium	Nutrient transfer, waste removal, electrolyte, appetite & palatability	Poor appetite, urine licking, lower milk production, reduced male fertility	Toxicity is rare with normal diets- can be associated with water availability.
Micro Minerals			
Copper	Enzyme activation, blood synthesis, nervous system, hormonal system	Poor appetite, poor growth, bone abnormalities Hair discolouration	Toxicity is rare with normal diets Poor appetite, reduced growth and milk yield Excess Copper fed in supplement could result in vomiting, salivation, abdominal pain.
Zinc	Enzyme activation, repair of damaged tissue. Very important role in immune system	Poor appetite, poor growth, reduced male fertility. Elevated SCC, mastitis and slow healing of wound. Hoof dysfunction	Toxicity is rare with normal diets Excess Zinc could result in feed refusal
Selenium	Anti-oxidant, enzyme formation, protects cell membranes	Retained placenta, reproductive disorders, loss of pregnancy, mastitis, reduced disease resistance, white muscle disease	Toxicity is rare with normal diets Excess can result in alkali disease Hair Loss, lameness, teeth grinding

Cobalt	Synthesis of Vitamin B12	Poor appetite, anaemia rough hair coat. Associated with low pH and high metal availability. Can be induced due to high Mo or Mn in soil. Poor appetite, reduced growth & ilk yield. Reduced conception rates, abortion	Toxicity is rare with normal diets Excessive urination, defaecation and salivation Shortness of breath
Iodine	Synthesis of thyroxine (Hormone)	Enlarged thyroid gland, weak dead or hairless new-born calves. Reduced growth rate and milk yield. Abortion, still births	Toxicity is rare with normal diets Poor appetite, reduced growth and milk yield Decreased fertility Dull, dry coats and skin
Manganese	Growth, bone formation, brain & nervous system function. Enzyme activation and insulin activity	Impaired growth, poor reproduction Poor milk production Poor Fertility	Toxicity is rare with normal diets
Antagonists			
Iron	Part of blood haemoglobin oxygen and electron transporter, enzyme systems, immune system function	Rarely seen in animals on grassland as Iron is usually adequate. Most likely in young animals when milk is low in Iron. Reduced growth, diarrhoea and fatigue	High levels of iron can be found on low pH and compacted soils. with normal diets Poor appetite, reduced growth and milk yield Acute toxicity causes anorexia, diarrhoea, hypothermia, metabolic acidosis
Aluminium			Excess will interfere with the uptake of copper, manganese and zinc
Molybdenum		Direct deficiency unlikely but may occur due to excess copper or Sulphur. Reduced conception, increased abortion, increased incidence of copper toxicity	Copper deficiency Symptoms mainly due to a copper deficiency
Sulphur	Acid-Base balance, cellulose digestion,	Reduced microbial growth, poor appetite loss of appetite. Weepy cloudy eyes, weakness, hair loss	Production of Hydrogen sulphide in the rumen – toxic to rumen microbes Reduced feed intake Margin between requirement and toxicity is very small Sulphur also interferes with the availability of copper and selenium.
Lead			

Summary of the main Mineral Deficiency and Toxicity symptoms.

This table is by no means exhausted and is only recommended as an indication.

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