

Vitamins

Vitamins	Vitamin A (Retinol)	Vitamin D3 (cholecalciferol)
Function	Vital for vision, disease resistance, growth and development	Roles in storage, transport and absorption of calcium and phosphorus in the skeleton. Linked to immune function
Source	Plants do not directly produce vitamin A. They produce beta-carotene which is converted to vitamin A in the rumen. Grazing, herbal leys, grass, carrots and other yellow, orange, or red pigmented fruits and vegetables are all good sources of beta-carotene	Plants do not contain Vitamin D. It is produced by the skin with exposure to sunlight. Housed stock are at risk of deficiency
Storage	Highest concentrations is in the liver	Stored in the liver and subcutaneous fatty tissues
Requirement	It is fat soluble so is not required in daily feeding	Fat soluble vitamin which can be mobilised when required
Chemical sources	It is usually included in bought-in concentrates and some mineral supplements. Vitamins can be broken down by extreme temperatures or sunlight so storage is important	It can be included in bought-in concentrates and mineral supplements. Injectable vitamin D ₃ products are often found in combination with vitamin A and E
Relationships	None known	<ul style="list-style-type: none"> • Vitamin D₃ is required for calcium and phosphorus absorption Lead disrupts vitamin D metabolism
Clinical signs (deficiency)	Disorders of vision, skin and bone problems, depressed immune function and reduced growth rates	Impaired immune function, rickets, slow growth, stiffness, or osteoporosis in mature animals
Clinical signs (toxicity)	Can accumulate in the liver leading to jaundice, enlargement of the liver and spleen and liver damage	It is linked to its role in calcium metabolism inducing hypercalcaemia. Other clinical signs include increased urination, loss of appetite, dehydration, weakness and constipation

Vitamins	Vitamin E (Tocopherol)	Vitamin B1 (Thiamine)
Function	Major roles in disease resistance, muscle growth, immune function and it acts as an antioxidant. Protects cells from damage in combination with selenium	Nervous system functions and a role in energy production from food
Source	It is synthesised by plants but not animals. Grass, rape, kale and silage contain good sources of vitamin E. Root crops and hay maybe low. Cereals contain moderate levels but preservatives destroy vitamins	Readily synthesised by the rumen microbes. Care should be taken when grazing poor quality forages, bracken, low fibre or high sulphur feedstuffs. Deficiency can occur in youngstock where the rumen is not functioning well yet
Storage	Stored in the liver and fatty tissues	Water-soluble, only tiny amounts are stored in the liver
Requirement	Not required daily	Daily supply is required
Chemical sources	Included in bought-in concentrates and supplements. Also in injectable blends with vitamin A and D	Not normally included in bought-in feeds and supplements. More likely to be in drenches or an injectable from veterinary prescription
Relationships	<ul style="list-style-type: none"> • Vitamin E is required for selenium absorption 	<ul style="list-style-type: none"> • High sulphur has been implicated in some B₁ deficiency cases
Clinical signs (deficiency)	Poor immune status, white muscle disease in combination with selenium and decreased performance	Poor coordination, a rigid stance or arched back, apparent blindness, coma and death
Clinical signs (toxicity)	This is rare but signs include diarrhoea, easy bruising and bleeding	Not a concern as it isn't stored

Vitamins	Vitamin B12 (Cyanocobalamin)
Function	Energy utilisation, protein metabolism, normal functions of the brain and nervous system and formation of red blood cells
Source	It not found in plants. Produced by rumen microbes breaking down cobalt. Cobalt is essential for production of B ₁₂
Storage	Water-soluble vitamin but a sufficient supply can be stored in the liver to last for a few months
Requirement	
Chemical sources	Found in a lot of supplements, drenches, licks and injectables. Correct storage of vitamin products is essential
Relationships	<ul style="list-style-type: none"> • Cobalt is required for vitamin B₁₂ conversion by the rumen microbes
Clinical signs (deficiency)	Anaemia, reduced appetite and weight loss, depressed growth, muscle wasting, rough coat and thickening of the skin, reproductive disorders, decreased milk yield and pine; otherwise known as wasting disease
Clinical signs (toxicity)	Not an issue