

5.Zinc: Zinc has been found in all animal tissues, it is found in higher concentration in skin, hair and wool than other tissue of the body. Zinc is a constituent of several enzyme systems in the body like carbonic dehydrogenase, pancreatic carboxypeptidase, glutamic dehydrogenase and a number of pyridine nucleotide dehydrogenases, In addition zinc act as a co-factors for many other enzymes.

Functions of Zinc:

1. Zinc is an important trace element for the proper growth of body and development of hairs and keratinization of epithelial tissues,
2. Zinc is an essential part of insulin hormone it plays important role in the metabolism of carbohydrates. It is involved in nucleic acid and vitamin A metabolism and protein synthesis.
3. Zinc play a key role in both cell and antibody mediated immune responses for resistant against infection and also provide protection against liver damage caused by fungi toxins .

Absorption of zinc: Zinc absorption takes place in small intestine by special protein called Zinc binding proteins . The rate of zinc absorption varies significantly between organic and inorganic sources so, inorganic sources have low solubility and poor absorption. Zinc is mainly excreted through faeces and a small proportion through urine.

Deficiency symptoms:

1. Zinc deficiency in cattle: milk production reduced, poor fertility, loss of hair, lower feed efficiency, loss of appetite .
2. Zinc deficiency in calves: include inflammation of the nose and mouth, stiffness of the joints, swollen feet and parakeratosis.
3. Zinc deficiency in chicks: Retarded growth, 'Frizzled' feather, parakeratosis and bone abnormality referred to as the 'Swollen hock syndrome'.

Sources of Zinc :Brans are rich source of zinc. Feed and fodders contain adequate amount of zinc.

6. Manganese: it present in the animal body is very small, the highest concentrations occurring in the bones, liver, kidney, pancreas and pituitary gland

Functions of manganese:

1. Manganese plays an important role in bone development by building of organic matrix of the bone .

2. Manganese is important for normal growth, reproduction, egg production and for the prevention of perosis among poultry.
3. Act as enzyme activators such as phosphate transferases and decarboxylases associated with the Krebs's cycle.
4. this trace mineral has an active role in immune functions where it helps in detoxifying free oxygen radicals which can cause tissue damage .

Absorption of manganese: Manganese is one of the poorly absorbed . High dietary intake of calcium, phosphorous and iron reduces manganese absorption from the small intestine. The mineral is excreted out from the body along with bile in faeces and urine.

Deficiency symptoms:

1. Cattle: Deficiency of manganese show poor growth, leg disorders, skeletal abnormalities, ataxia of the new born and reproductive failures.
2. Poultry: In young chicks a deficiency leading to perosis in young birds may be worse by high dietary intakes of calcium and phosphorus. Manganese deficiency in breeding birds reduces hatchability and causes retraction in chicks.

Sources of manganese: Forages are rich in manganese as compared to cereals. In feed it is available in maize, oat, wheat. green fodder and brans.

7. Fluorine: The amount of fluorine in common feed stuffs is 1 to 2 ppm and above 3 ppm in drinking water is toxic to animals.

Functions of Fluorine: In very small amount the mineral is essential for the growth and proper development of the bones and teeth. It reduces the incidence of dental caries.

8-Selenium: Selenium is present in all cells of the body but concentration is normally less than 1 ppm. Toxic concentration in liver and kidney are normally between 5 and 10 ppm. Most important role of selenium in livestock is prevention of liver necrosis and exudative diathesis in chicks.

Functions of Selenium:

1. Selenium is essential for growth, reproduction, prevention of various diseases .
2. It act with vitamin E as an antioxidant and required for adequate immune response and protection of the integrity of the tissues.
3. It is essential for prostaglandin synthesis , essential fatty acid metabolism and sulphur amino acid synthesis.
4. It has a strong tendency to contact with heavy metals and exerts a protective effect against these heavy metals.

4. Selenium is important part of an enzyme glutathione peroxidase which destroys peroxides before they can damage body tissues.

Deficiency symptoms:

1. In sheep and cattle: Deficiency of selenium in the diet causes myopathies .
2. In hens: reduced hatchability and egg production. Exudative diathesis, a haemorrhagic disease of chick are prevented by either selenium or Vitamin E

Toxic effect: Selenium toxicity is known .is 'alkali disease' and 'blind staggers'. Which is characterized by stiffness of joints, lameness. loss of hair from mane and tail and skin lesions on the legs.

9. Molybdenum: This mineral is available in pasture grasses, liver, intestinal tissues and milk of the animals.

Deficiency symptoms under natural condition have not been reported.

Functions of Molybdenum:

1. As component of the enzyme such as xanthineoxidase and nitrate reductase, that important for uric acid and nitrate Utilization in poultry.
2. It participate in purine metabolism and stimulates action of rumen microorganism.
3. Molybdenum facilitates the reduction of cytochrome C by aldehydeoxidase enzyme .

Absorption of molybdenum: Molybdenum is absorbed from the intestine. It is excreted through urine with a small amount in bile and milk.

Synergistic interaction:

1. Calcium is synergism with phosphorous.
2. Phosphorous with calcium, sulphur, iodine, copper and cobalt.
3. Sodium, chlorine and potassium with each other.
4. Sulphur with cobalt, magnesium and phosphorous.
5. Zinc with molybdenum.
6. Manganese with copper, molybdenum, cobalt and iron.
7. Copper with manganese, iodine, cobalt, iron and phosphorous.
8. Iron with copper and manganese.
9. Molybdenum with manganese and zinc.
10. Magnesium with sulphur.

11. Iodine with copper, cobalt and phosphorous.
12. Cobalt with iodine, copper, manganese, sulphur and phosphorous.