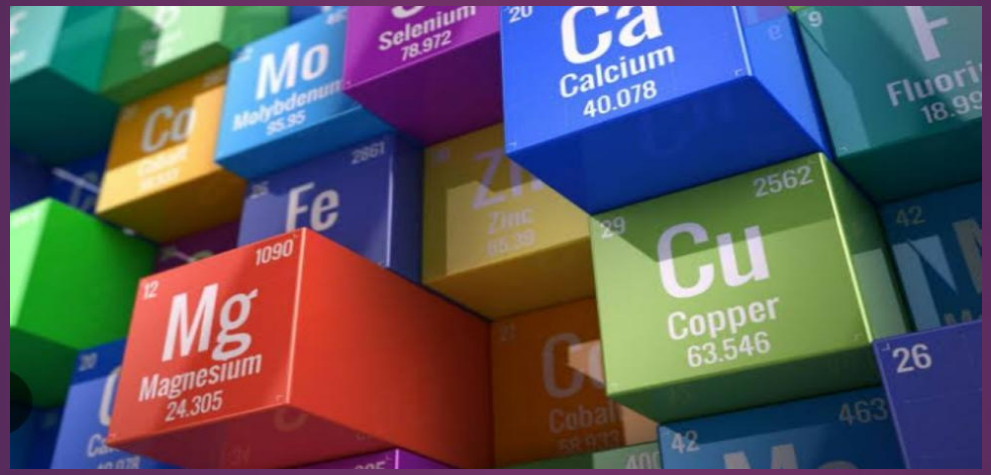
ROLES OF MICRO ELEMENTS ON ANIMAL IMMUNITY

DEPARTMENT OF ANIMAL NUTRITION



Micro elements :

- Micro elements refers to the nutritional elements added to production and companion animal diets in micro quantities.
  Ex; Zn, Se, Cr, Co, Fe, Mn, Co
- These are also known as trace elements
- Adequate trace mineral intake and absorption is required for a variety of metabolic functions.

IMMUNITY :

- Immunity refers to, reaction by an animal body to foreign substances such as microbes and various macro molecules.
- A collection of cells and molecules that protects the body against infection, malignancy and damaged cells is immune system.

Immune system is divided into :

1. Innate or non-adaptive immune system
2. Acquired Or specific or adaptive immune system

1. Innate or non-adaptive immune system :

The body's 1st line of defence against germs entering the body.

2.Acquired immune system :

- The basis of immunity is the ability of the immune system to recognize foreign molecules and respond appropriately to them.
- It is primarily effected by lymphocytes and phagocytes.

Adaptive immunity is further divided into:-

1.Humoral immunity:-

Mediated by B-lymphocytes

2.Cell-mediated immunity:-

Mediated by T-lymphocytes

Role of micro-elements in immune system:-

1. Zinc :

- Zn plays an important role in cell replication and proliferation
- It plays a role in both cell mediated and humoral immunity
- Recommended level of Zn is 40-60ppm in total diet.
- Zn is known to be essential for sexual maturity and onset of estrus.
- Fetus requires Zn for normal growth and development.
- Zn and vitamin A plays a similar role.

Zn is component of numerous enzymes :

- Superoxide dismutase
- RNA polymerase
- DNA polymerase
- Ribonuclease
- Thymidine kinase

Copper (Cu) :

- Cu is needed for proper development and maintenance of the immune system including the formation of antibodies and white blood cells.
- Dietary Cu affects phagocytic as well as specific immune function regulated by phagocytic cells .
- Two Cu dependent enzymes ceruloplasmin and superoxide dismutase, exhibit anti-inflammatory activity and may play critical roles in the prevention of oxidative tissue damage resulting from infection and inflammation
- Cu is involved in anti-oxidant system
- Recommended level of Cu is 20 ppm

Chromium (Cr) :

- Cr supplementation improves cell mediated and humoral immune response as well as resistance to respiratory infection in stressed cattle.
- Supplementation of organic Cr to stressed calves and early lactation dairy cows improved immune status and milk yield.
- Cr reduces the blood cortisol level during stress and improves sensitivity of target tissue like muscle, mammary gland.

Iron (Fe) :

- It is a constituent of blood pigment, haemoglobin, muscle protein, myoglobin, and enzymes, cytochrome c, peroxidase and catalse.
- In addition, it is stored in liver, spleen and kidney as ferritin(20%) and haemosiderin(35%).
- Necessary for Immune cell proliferation And maturation , particularly lymphocytes .

Selenium(se) :

- Se is a naturally occurring elements found in soil, rocks and water.
- It is also a product of volcanic activity.
- It has been shown to regulate many intracellular functions by being a chemical component of seleno-proteins
- These are selenium dependent enzymes such as glutathione peroxidase and thioredoxin reductase
- Se is also contained as selenomethionine.
- Se enhances the ability of lymphocytes to respond to the IL -2 by increasing the expression of IL-2 receptors on these cells.

Se and vitamin –E :

Vitamin E

- Vit-E reduces harmful lipid free radicals.
- Enhances phagocytic activity of neutrophils, macrophages and NK cells.
- It is major antioxidant in the blood.

Selenium and vitamin E :

- Both vitamin E and se influences the function of immune cells especially in mammary gland immunity.
- Cows are immuno supressed when plasma concentration vitamin E and se is low.

Manganese :

- Manganese is required to activate several enzymes such as arginase, thiaminase.
- It is necessary for the synthesis of chondritin sulfate, a major constituent of cartilage of bone.
- Manganese is needed in glucosyl transferase activity which is needed for the formation of mucopolysaccharides and glycoproteins.
- Mn deficiency is extremely rare I farm animals.

Reference : *U*mesh sontakke, Muneendra kumar (2014) Role of micro nutrients in Immunity and fertility of animals
D.V. Reddy(2022) PRINCIPLES OF ANIMAL NUTRITION AND FEED TECHNOLOGY 3rd edition