Minerals play an important role in the regulation of reproduction and production of domestic animals. The productive animals most commonly suffer from the **nutritional imbalances**, **toxicity**, and **deficiencies** due to **high production** and **deficient feeding** or **accident supplementation** ultimately leading to **poor reproductive performance**. Minerals are essential for growth and reproduction and are involved in a large number of digestive, physiological and biosynthetic processes within the body. In addition, minerals are structural components of body and play significant role in activities of enzyme, hormone, as constituents of body fluids and tissues, and they act as electrolytes. After energy and protein, minerals and vitamins are the major nutrients required and should be given priority in order to optimize reproduction in ruminant animals. They therefore fulfill several important functions for the maintenance of animal growth and reproduction as well as health status.

Proper herd management should be designed to optimize the production of the highest quality product, while minimizing any adverse effects on the health and welfare of the animals. As per their requirement, minerals are divided in to two categories i.e. **macro** minerals required in large quantities (more than 100 ppm) in diet and these are ***calcium, phosphorus, magnesium, potassium, sodium and chloride.***

The second category is trace or **micro** minerals such as ***cobalt, copper, iodine, manganese, selenium, zinc, molybdenum, chromium, iron, sulfur, silicon and vanadium***; and is required very small amount (less than 100 ppm) diet of animals. Minerals such as arsenic, beryllium, lead and tungsten are **toxic** to the animals. Animals obtain minerals through the **consumption of natural feeds, fodders** and **supplementation of inorganic salts in the ration**.

An important concept surrounding macro-mineral balance is dietary cation-anion difference (DCAD). DCAD measures the level of four macro-minerals: **sodium and potassium**, which are **cations** and carry a **positive charge**, and **chloride and sulfur**, which are **anions** and carry a **negative charge**.

The equation for calculating DCAD balance is:

(Sodium + potassium) – (chloride + sulfur) = DCAD in mEq/100g of ration dry matter

Feeding a negative DCAD diet tends to slightly decrease blood pH, which has been shown to improve the responsiveness of the target tissues to PTH, increasing calcium release from bone and vitamin D activation in the kidney. This is another reason why negative-DCAD diets work to support calcium status around calving.

Negative DCAD prior to calving helps cows successfully join the milking string, decreasing the incidence of metabolic disorders postpartum and increasing early lactation production. By helping cows moderate the challenges of the transition period, a negative DCAD helps maintain **reproductive integrity for future lactations**.

Reproductive performance of livestock is determined by four factors — **genetic, environment, nutrition and management**. Nutritional factors are perhaps the most crucial, in terms of their direct effects on the reproductive phenomenon, and the potential to moderate the effects of other factors. Thus, adequate nutrition could encourage mediocre biological types to reach their genetic potential, alleviate the negative effects of a harsh environment, and minimise the effects of poor management techniques. Poor nutrition on the other hand, will not only reduce performance below genetic potential, but also exacerbate detrimental environmental effects. In general, affect the various stages of the reproductive event, going from delayed puberty, reduced ovulation and lower conception rates, through high embryonic and foetal losses to excessively long post-partum anoestrus, poor lactation, high perinatal mortality and poor neonatal performance.

In relation to their role in male reproduction, chemical elements may be essentially divided in the following three groups:

1. Essential minerals, with high concentrations and crucial functions present in semen: **Na, K, Cl, Ca, Mg, P, S**.

2. Trace elements, which are critical to maintain proper functions of biomolecules, but are required in relatively low amounts, as their elevated concentrations may have a toxic impact on the sperm development, structure or function: **Fe, Cu, Mn, Se, Zn, Co, I, Mo**.

3. Heavy metals-associated detrimental effects on semen quality and fertility rates either by a direct impact on the testicular function or mediated via hormonal imbalances or toxicant-induced oxidative stress. Male fertility-associated toxicity has been observed especially in the case of **Pb, Hg, Cd, As and Al**.

Organic minerals have a beneficial role to play in resumption of follicular growth and fertility in animals. Replacing sodium selenite with organic selenium resulted in fewer services per conception in cows. The use of organic chromium compared with inorganic forms, has been shown to enhance the survival rate and to increase litter size in gilts and sows. The key to the effectiveness of a mineral supplement is not necessarily its biological availability, but its biological activity. Organic minerals have been shown to have several beneficial effects in ruminant and monogastric animals. There are still discernible differences among chelated minerals, mineral proteins and other organic minerals complexes. Proteinated minerals can possibly improve female reproduction through increased fertilization, lower embryo mortality, improved uterine environment and/ or increased intensity of estrous behaviour. The importance of these minerals in reproductive performance of livestock is given below

Phosphorus (P):

Phosphorus is one of the most important minerals in animal nutrition, with 80% of the element found in the **bones** and **teeth** and the remainder located in body **fluids** and **soft tissue**. P plays a key metabolic role and has more physiological functions than any other mineral.

Phosphorus is present in the **ATP which is the energy source** of majority of metabolic processes. It is also a **component of cell wall in the form of phospholipids**. A deficiency of phosphorus is frequently associated with anorexia, retarded growth, decreased milk production and **reproductive insufficiency**. It is mainly involved in altering or disturbing the **estrous cycle**, **decreased fertility rate**, **decreased ovarian activity**, increased occurrence of **cystic ovaries**, **delayed sexual maturity** and **low conception rates** have been reported when phosphorus intakes are low. When heifers fed with 70-80% of required phosphorus, and then the number of **services per conception** was high approx. **3.7** this number reduced to **1.3** when adequate phosphorus supplementation was done. The ration containing **0.45 to 0.50 percent** phosphorus on dry matter basis should be provided to high producing cows. On the contrary the excess of phosphorus **renders the endometrium susceptible for infection**.