

Calcium (Ca)

Calcium is the most abundant mineral present in the body as most of the body skeletal part is formed from it.

Major function of Ca in reproduction is assisting in **parturition, muscle contractibility, maintaining the muscle tone of the uterus and uterine involution**. Calcium present in the seminal plasma of buffalo bulls plays an important role in **preserving spermatozoa motility and viability** as well as **antioxidant status by protecting the sperm cells oxidative damage**. The increasing of ejaculation frequency may decrease the sperm motility **due to a reduction of Ca in the seminal plasma**.

If calcium deficiency occurs, it causes **decreased in muscle contraction** which in turn leads to less feed intake as rumen function decreases and hence leading to severe Negative Energy Balance (NEB). As a result, mobilization of fat increases which in turn causes fatty liver syndrome and ketosis. This will lead to impair fertility. Hence, **delays the uterine involution, dystocia, uterine prolapse, retained placenta, and postpartum anestrus is enhanced**.

Excess of calcium can also affect the reproductive performance by causing secondary deficiency of various **minerals and Vitamin D**. If dietary Ca levels are **extremely high, P availability is reduced**. Conversely, **high levels of P impair Ca absorption**. In addition, other complex macro and micro mineral interactions occur: **high levels of P and Mg reduce Ca absorption while high levels of Ca reduce the absorption of Fe, Mg, Mn, P, Zn and I**. This result in a decline in the conception rate.

In dairy cows requirements of calcium must be met within stipulated times to avoid production loss and reproductive problems. Ca: P ratios between 1.5:1 and 2.5:1 are adequate for lactating cows. The ration for dairy cow should preferably contain 0.75 to 0.80 per cent Ca on dry matter.

Magnesium (Mg)

Magnesium plays an important role in maintaining normal bone growth, various enzyme systems and nervous system. It helps in degradation of fiber in rumen.

Magnesium usually does not have direct impact on the reproductive status of animals, since in body it remains in almost antagonistic relation with **Ca** and any disturbance in Ca-P-Mg homeostasis can impart some influence on reproduction. Moreover, reduced reproductive efficiency encountered loss of appetite due to **magnesium deficiency**.

On the other hand, the presence of Mg is necessary for capacitation, hyper activation and acrosome reaction of spermatozoa. Mg level in the seminal plasma increases with sperm concentration. A positive effects of Mg on the sperm motility and morphology.

Potassium (K)

Potassium is the third most abundant mineral element in the animal body after Ca and P. Potassium concentrations in cells exceed the concentration of Na by 20 to 30 times. Outside the cell the reverse is true.

Deficiency of K is well known to **cause muscular weakness and thereby affect the musculature of female genital tract causing impairment in the normal reproductive process.**

The dairy cow's minimum requirement for K is 0.90% to 1.0% of the ration on DM basis (NRC 2001). The maximum tolerable level is about 3.0%.

Feeding of high levels of K (5% DM basis) may **low fertility, delay the onset of puberty, delay ovulation, impair corpus luteum (yellow body) development and increase the incidence of anestrus.** K requirement increases in diets with higher Na and Cl levels. K is **essential for rumen microorganisms.** The suboptimal level of K in the ration **decreases feed intake** in ruminants.

Salt (NaCl)

Salt contains sodium (Na) and chloride (Cl) and is often supplemented in concentrate or as free lick. Na and Cl content of feedstuffs often are not enough to meet animal requirements and should be provided free choice at all times. It is recommended 1.2 g of Na/kg of DM for dairy cows under tropical conditions. The daily salt requirements for dairy cattle are met easily by adding 1 percent salt to concentrate mixture and offering additional salt lick. Lactating cows need 2 g salt/kg milk production. Dry cows need 40 g salt daily or 0.3% Na per kg DM. Lactating dairy animals in the tropics may require more Na due to **the hot and humid climatic conditions**.

Na functions are maintaining osmotic balance, cellular uptake of glucose and amino acid transport (NRC, 2001).

Salt deficiencies can affect the efficiency of digestion and indirectly the reproduction performance. **Na** and **Cl** are indirectly related to reproduction in animals as the **deficiency of sodium** can affect the normal reproductive physiology by preventing the utilization of **protein** and **energy**. In addition, may cause **infertility and embryonic mortality**.

On the other hand, **high levels of Na ion** were associated with **low percentages of motile sperm, and such semen was considered to be of lower quality**.