

Role of Minerals & Vitamins in Milk Production

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Vitamins and minerals play a crucial role in maintaining the health, productivity, and reproductive efficiency of livestock. They support essential bodily functions such as bone development, immune response, milk production, and metabolic activities. Deficiencies can lead to issues like poor growth, reduced fertility, and lower milk yield. Proper supplementation enhances overall animal performance and disease resistance. A well-balanced diet with adequate vitamins and minerals is key to maximizing livestock productivity and longevity.

1. Major Minerals for Milk Production

a) Calcium (Ca) & Phosphorus (P) – Bone Strength & Milk Synthesis

Role

- Calcium is a primary component of milk (1.2 g/L) and is crucial for muscle contractions and nerve function.
- Phosphorus supports energy metabolism (ATP production) and bone health.

Deficiency Signs

- Milk fever (hypocalcemia), weak bones, reduced feed intake, infertility.

Veterinarian Recommendations

- Maintain a Ca:P ratio of 2:1 in the diet.
- Supplement with limestone, dicalcium phosphate (DCP), bone meal.

b) Magnesium (Mg) – Rumen Function & Milk Secretion

Role

- Involved in enzyme activation, muscle function, and nerve transmission.
- Prevents grass tetany in lactating cows grazing lush pastures.

Deficiency Signs

- Low milk yield, muscle tremors, excitability.

Veterinarian Recommendations

- Supplement with Magnesium oxide (MgO) or Magnesium sulfate at 0.2-0.4% of DM intake.

c) Sodium (Na) & Chlorine (Cl) – Milk Volume & Water Balance

Role

- Maintains osmotic balance, acid-base balance, and milk secretion.

Deficiency Signs

- Reduced water intake, lower milk yield, weight loss.

Veterinarian Recommendations

- Provide free-choice salt (NaCl) at 0.5% of DM intake.

d) Potassium (K) – Heat Stress Management & Udder Health

Role

- Regulates fluid balance, enzyme activation, and heat stress tolerance.

Deficiency Signs

- Reduced feed intake, muscle weakness, udder dysfunction.

Veterinarian Recommendations

- Supplement Potassium chloride (KCl), ensuring 1.0-1.2% of diet DM.

2. Trace Minerals for High-Quality Milk

a) Zinc (Zn) – Udder Health & Hoof Integrity

Role

- Supports immune function, keratin production in teats, and mastitis prevention.

Deficiency Signs

- Mastitis, cracked hooves, slow wound healing.

Veterinarian Recommendations

- Provide chelated zinc (organic Zn) for better absorption (40-50 mg/kg DM).

b) Copper (Cu) – Immunity & Milk Fat Synthesis

Role

- Enhances milk fat production, hemoglobin formation, and immune response.

Deficiency Signs

- Anemia, poor fertility, faded hair coat.

Veterinarian Recommendations

- Supplement Copper sulfate or Organic Cu (10-15 mg/kg DM).

c) Selenium (Se) – Antioxidant & Mastitis Prevention

Role

- Works with Vitamin E to boost immune function and reduce somatic cell count (SCC).

Deficiency Signs

- Retained placenta, increased mastitis cases, weak calves.

Veterinarian Recommendations

- Provide Sodium selenite (Se) at 0.3 ppm in diet.

3. Essential Vitamins for Milk Production

a) Vitamin A – Udder Health & Reproductive Performance

Role

- Maintains epithelial integrity (udder, reproductive tract) and prevents mastitis & metritis.

Deficiency Signs

- Dry skin, increased infections, weak calves.

Veterinarian Recommendations

- Supplement Vitamin A (Beta-carotene) at 20,000-30,000 IU/day.

b) Vitamin D – Calcium Absorption & Milk Fever Prevention

Role

- Enhances calcium & phosphorus metabolism for bone health and milk production.

Deficiency Signs

- Milk fever, weak bones, reduced milk yield.

Veterinarian Recommendations

- Ensure 4,000-6,000 IU/day of Vitamin D through sunlight exposure & supplementation.

c) Vitamin E – Udder Health & Immunity

Role

- Works with Selenium (Se) to prevent mastitis and oxidative stress.

Deficiency Signs

- High SCC, increased mastitis cases.

Veterinarian Recommendations

- Vitamin E requirement: 1,000-2,000 IU/day for lactating cows.

Table 1. Recommended Mineral & Vitamin Supplementation for Dairy Cows

Nutrient	Lactating Cows (Per Day)	Source
Calcium (Ca)	100-120 g	Limestone, DCP
Phosphorus (P)	40-60 g	DCP, bone meal
Magnesium (Mg)	20-30 g	Mg oxide
Sodium (Na) & Chloride (Cl)	50-60 g	Salt (NaCl)
Potassium (K)	1-1.2% of DM	K chloride
Zinc (Zn)	40-50 mg/kg DM	Zn sulfate
Selenium (Se)	0.3 ppm	Sodium selenite
Vitamin A	20,000-30,000 IU	Beta-carotene
Vitamin D	4,000-6,000 IU	Sunlight, D3 supplements
Vitamin E	1,000-2,000 IU	Green fodder, supplements

Conclusion

Veterinarians should ensure proper mineral-vitamin balance to optimize milk production, fertility, and udder health. Routine blood & milk testing helps detect deficiencies early.

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