

Calcium (C-Mix)

Bone Growth and Vigor

Calcium is necessary, along with phosphorus, for sturdy bones and teeth, and for maximum growth, gain and production. Calcium regulates how well tissue cells absorb nutrients and is vital in the blood clotting process. Calcium is necessary for muscle contraction, normal nerve function, cell permeability (movement of nutrients into cells and waste materials out of the cells), and milk and egg shell production.

Calcium and phosphorus team up together in a ratio of approximately one or two parts calcium to one part phosphorus.

Vitamin D is necessary for proper utilization of these minerals. Vitamin D is involved in the absorption of calcium and deposition of the calcium into bone; excess phosphorus decreases calcium absorption; excess magnesium decreases calcium absorption and excess magnesium can replace calcium in bone and increase calcium excretion from the body. Calcium absorption occurs mainly in the small intestine. Absorption in the digestive tract, re-absorption from the bones and control of urinary losses in the kidney are controlled by the parathyroid hormone (PTH), Vitamin D-3, calcitonin, and to a lesser extent by growth hormone and sex hormones.

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Parathyroid hormone acts upon bone and kidneys to increase plasma calcium and decrease plasma phosphorus. In turn, low plasma calcium and magnesium result in increased production of PTH. Vitamin D-3 increases bone re-absorption and increases intestinal absorption of calcium and phosphorus by reducing bone re-absorption. Calcitonin and PTH control mechanisms very significant factors during growth, pregnancy and lactation.

Calcium absorption efficiency changes based on body requirements and levels of dietary calcium. This also becomes significant during pregnancy and lactation. Calcium excretion is mainly in the feces. Under normal conditions, very low calcium levels are found in urine.

The optimum amount is in a range of 0.45 – 0.53% of the total dry matter.

Calcium is alkaline.

Calcium ions in the blood regulate production of the calcium regulating hormones. This is called a feedback mechanism for calcium homeostasis.

- High Ca levels in the diet reduce the absorption of Mn, Zn and Fe.**
- An excess of either Ca or P interferes with the absorption of the other due to the formation of insoluble tri-calcium phosphate.**
- Large intakes of either Ca or Mg increases the urinary excretion of the other; but both Ca and P prevent the absorption of excess Mg.**
- SO₄ increases the excretion of Ca.**

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EFFECT OF AN EXCESS OF CALCIUM

- **Decreases availability of protein, phosphorus, iodine, iron, manganese, zinc and magnesium.**
- **Birth paralysis.**
- **Depresses rate and economy of gain.**
- **Increased incidence of milk fever.**
- **Ties up fatty acids in a form which is not usable.**

EFFECT OF A DEFICIENCY OF CALCIUM

- **Bone growth severely impaired, resulting in lameness.**
- **Increases need for Vitamin D2.**
- **Depraved appetite.**
- **Arched back.**
- **No vigor.**
- **Reduced milk production.**
- **Calcium deficiency results in rickets in young animals, osteomalacia in older animals, milk fever in dairy cattle, tetany in beef cattle and reduce egg production in birds.**
- **In ruminants, phosphorus deficiency reduces calcium absorption.**

MILK FEVER IN CATTLE

The actual cause of milk fever is a deficiency of phosphorus in the ration during the last 3 weeks of pregnancy. The animal will reduce calcium absorption to maintain a proper Ca:P ratio. When calving occurs there is a sudden demand for more calcium but it takes 72 hours to re-establish calcium metabolism at normal levels. The result is clinical hypocalcemia – low blood calcium or milk fever.

During the last weeks of gestation in dairy cows, the fetus requires about 6 grams of calcium and 2 grams of phosphorus per day. At the onset of lactation, the daily loss (mainly due to milk production) is about 15 grams of calcium and 16 grams of phosphorus. There is a sudden and large demand for calcium and phosphorus ions and, as a result, it is very difficult for the cow to maintain normal calcium and phosphorus homeostasis. The low plasma calcium and phosphorus levels result in muscle weakness and the cows cannot stand.

Intravenous calcium therapy by veterinarians is helpful. Parathyroid hormone, calcitonin, Vitamin D-3 and cation-anion balance may all be involved. This is not a simple, straight forward problem that is easily controlled or cured.

Downer sows are experiencing the same homeostatic control problems.