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Maintaining Adequate Levels of Blood Calcium to Prevent Milk Fever

Milk fever is a metabolic disease affecting about 8% of adult dairy cows. The first mention of milk fever in scientific literature occurred in 1793. It was associated with the initiation of lactation – hence the "milk" in its name. Although there is only a transitory fever, the name has stuck. The scientific name for milk fever is parturient paresis. The first successful treatment in 1897 involved inflating the udder with an air pump – thus stopping milk secretion, but the risk of mastitis was high. Prepartum milking has also reduced the incidence of milk fever. In 1925, data was presented linking milk fever with low blood levels of calcium.

Blood levels of calcium are replenished via three sources:

- **Passive absorption from the small intestine.** The more calcium (Ca) fed, the more is absorbed but at a sharply declining rate.
- **Bone mobilization** – Bone is a big repository of calcium, and mobilization is stimulated by parathyroid hormone and blocked by the hormone calcitonin.
- **Active absorption from small intestine.** Under stimulation of vitamin D which reaches out and grabs calcium for absorption, the intestinal wall produces a calcium-binding protein.

Normally a cow is able to maintain blood calcium levels using all three sources. During the dry period, her calcium requirement is much reduced and can usually be met only by passive absorption. The other two processes are "shut-down" and require varying amounts of time to be reactivated.

The initiation of lactation greatly raises the demand for calcium and triggers the onset of lower blood calcium. Calcium is vital to muscle contraction, and symptoms include loss of coordination and inability to stand. Dr. Guard, a veterinarian on staff at Cornell University, has estimated each case of milk fever results in a loss of $334. Intravenous treatment with calcium may seem to be a miracle treatment, bringing the cow back from the brink of death.

Recently, Lean et al Journal of Dairy Science 89:669, 2006 published a paper analyzing 137 published studies involving 2,545 calvings to learn nutritional factors affecting the incidence of milk fever. High potassium rations fed precalving have led to more milk fever, but there was no direct link between potassium and calcium. Rather, potassium has its influence via a dietary cation-anion difference since it is the most variable. With an excess of anions (chlorides and sulfates) relative to cations (potassium and sodium), blood pH falls. To counter this life threatening pH drop, the cow mobilizes internal calcium much like farmers use lime to raise pH in soil. Feeding a ration lower in potassium or feeding anionic salts will reduce incidence of milk fever. Changing the prefresh ration from +25 milliequivalents per 100 milligrams of ration dry matter to -25 lowers milk fever incidence by more than half. Urine pH should be checked to determine if anionic salts are being fed correctly. Urinary pH of Holsteins fed anionic salts should be 6.0-6.5 and even slightly lower for Jerseys. Anionic salts should not be fed for more than three weeks as it can deplete the readily available calcium in bones.

Calcium levels in the prefresh ration should be below 60 grams (0.5%) unless anionic salts are fed.

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Raising calcium in the ration from 0.5% to 0.6% while maintaining all other factors equal increased incidence of milk fever by 37%. Raising ration calcium from 0.5% to 1.0% increased risk by 327%.

High ration phosphorus levels interfere with vitamin D metabolism. The authors found increasing the level of dietary phosphorus from 0.3% to 0.4% increased risk of milk fever by 18%. There was no link between milk fever and dietary calcium to phosphorus ratios. Higher magnesium levels prefresh lower the incidence of milk fever. Raising dietary magnesium from 0.3% to 0.4% should reduce incidence of milk fever by 62%. The authors also reported that the length of time cows were fed a "bad" ration before calving affected the risk of milk fever.

As a cow ages, the likelihood of milk fever increases. Once a cow has had milk fever, she is very likely to have it again at the next calving. Controlling prefresh dietary levels of potassium, calcium, phosphorus, and magnesium can greatly affect the incidence of milk fever. Many producers raise or purchase low potassium hays to control milk fever. If milk fever is a herd problem and there is little opportunity to change mineral feeding levels, feeding anionic salts can help.