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Dairy Briefs

The Latest Information on Dairy Cattle Nutrition

Milk Fever and Low Blood Calcium in Dairy Cows. Part II

By Pedro Nogueira

In the last article we showed how hypocalcaemia can impact different interrelated systems and how this interrelation can cause a very negative chain reaction. Problems like displaced abomasum, retained placenta, mastitis, ketosis and even foot problems can be linked to low blood calcium making the prevention of this problem a key factor on the dairy operation.

Dr. Jesse Goff, from the US National Animal Disease Center, says that mechanisms for maintaining normal blood Ca concentration perform efficiently most of the time, but occasionally these homeostatic mechanisms fail and hypocalcaemia ensues. Put simply, hypocalcaemia and milk fever occur when cattle do not extract enough Ca from their bones and diet to replace the Ca lost to milk. Understanding how and why they fail may allow to develop strategies to avoid these disorders.

Prevention of Hypocalcaemia

Figure 1 shows a simple representation of calcium metabolism in the periparturient dairy cow.

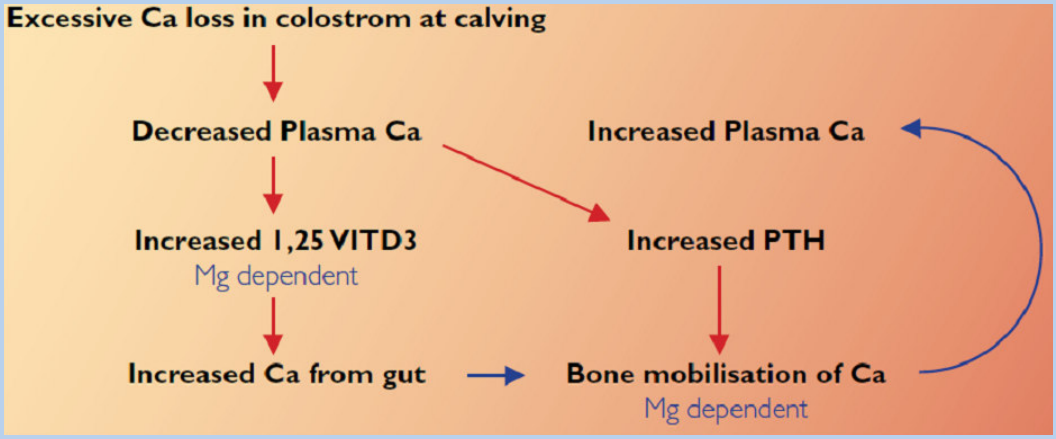

Figure 1 – Representation of calcium metabolism in the periparturient dairy cow. (Irish Veterinary Journal, 2006).

One important aspect in the prevention of hypocalcaemia is having a good management of Body Condition Score (BCS) of the cows. We all know that fat cows don't do as well as cows in proper body condition. Research seems to indicate that proper body condition at calving and drying-off should be around 2.75 to 3.25, on a 1 to 5 scale (5 being a very fat cow). In fact it has been reported that dairy cows that are over-conditioned at calving are up to

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four times more likely to develop milk fever. Although it is unclear why this is the case, researchers from the University of Dublin, Ireland, advance several hypotheses to explain this effect:

- Dairy cows with higher BCS at calving have a higher Ca output in milk, making them more prone to milk fever.
- Over-conditioned dairy cattle have a reduced feed intake relative to thinner cows, in the last week or ten days pre-calving. This may reduce their intake of Ca and Mg to levels which predispose them to the development of hypocalcaemia.
- It has been shown, in human patients suffering from non-alcoholic fatty liver disease, that serum concentrations of the active form of Vitamin D3 are lower than healthy controls. Based on this information it may happen that over-conditioned dairy cows are not capable of producing sufficient amounts of the active form of Vitamin D3 to prevent hypocalcaemia.

From the scheme above we can see that **Magnesium** plays a role in the prevention of this problem. In fact ensuring adequate magnesium supplementation is vital for the prevention of milk fever. Magnesium (Mg) plays a very important role in Ca metabolism, for example it is a key intermediate in the resorbtion of Ca from bone by parathyroid hormone. According to a review of studies on this issue done by researchers from Australia, increasing Mg supplementation was found to have the greatest influence amongst dietary strategies for the prevention of milk fever. Those researchers indicate that increasing Mg supplementation from 0.3 to 0.4% of the diet DM reduced milk fever incidence by 62%. The reference book from the National Research Council (2001) indicates that dietary Mg concentration for pregnant dairy cattle should be in the region of 0.35 to 0.4% of dry matter, to prevent a decline in the concentration of magnesium in the blood at parturition.

Another tool that is used to control hypocalcaemia is the use of Anionic Salts. In terms of electric charge, minerals can be divided into anions (negatively charged) and cations (positively charged). Research has been showing that dry cow diets that have high levels of cations can predispose cows to hypocalcaemia. These type of minerals (calcium and potassium) are abundant in forages like alfalfa and legumes in general. So diets with high levels of alfalfa can increase the risk. This is one of the reasons we see more and more dry cow diets with increased levels of corn silage and straw. Corn silage is very low in calcium and potassium making it ideal to dry cow diets. The negative of it is that due to its high energy level we may be controlling calcium and potassium levels but we also may be over-conditioning the cows. This is where straw enters. Straw "dilutes" the energy of the corn silage, being also relatively low in calcium and potassium (although more variable than corn silage). Because sometimes we have to use alfalfa or high potassium feeds in dry cow diets, researchers developed products based on minerals that have a strong negative charge, the anionic salts. Anionic salts are simply minerals that have a high proportion of anions. Living tissues maintain a balance of anions and cations to maintain neutrality. Thus, the net sum of anions and cations in a feed should be near neutral. When we feed anionic salts they should be fed at quantities that will force the electric balance to be negative. Because this is not a normal situation, the cow is forced to mobilize calcium (which is positively charged) from the bones to keep the electric balance neutral. By doing this, she keeps this mechanism of calcium mobilization fully active thus when she approaches calving and she needs to put a lot of calcium into the colostrum and, after calving, into the milk, she has the ability to do so. The theory behind anionic salts is very good and consistent, but as always there are some problems. One of them is the higher cost of diets, although this can be largely compensated by better health and less fresh cow problems. The second one is that anionic salts, depending on their source, are relatively unpalatable and can reduce dry matter intake. If there is something we don't want to happen in close-up dry cows is a reduction in dry matter intake. So if you are going to feed anionic salts you should monitor how much your cows eat to be sure that the salts are not depressing intake. A relatively new and very interesting approach to feeding anionic salts, is to try to incorporate the anionic salts (namely chloride) directly into the feed. Researchers from Quebec have been doing studies on this and concluded that timothy is the most appropriate forage due to its low level of sodium and potassium. If on top of this natural characteristic timothy is fertilized with

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calcium chloride, the chloride is incorporated into the hay making it an "anionic hay". This is very promising because the studies done so far show a positive response in the prevention of hypocalcaemia without any decrease in dry matter intake. If you want to know more about this, OMAFRA has a Factsheet called "Timothy Rated Tops for Dry Cows".

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