

# Preventing Milk Fever

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A Farm Advice Sheet from **SowtheSeed**

Milk fever has been the bane of the dairy farmer's life for many years. Remedies have varied from blowing the cow's udder up with air, to feeding hay before calving, to meddling with such arcane delights as anion salts in the diet.

## What are the signs of milk fever?

Milk fever or hypocalcaemia (literally low calcium in the blood) is nothing new, and as with most issues on the farm – prevention is better than cure. Milk fever is characterised by poor muscle tone, typically manifested as a cow unsteady on her feet (often unable to stand) due to the low level of calcium in her blood. Calcium is needed for muscle function, and not just skeletal muscle. Many organs in the body have muscle components which rely on calcium to work, such as the rumen and intestine (no muscle function – no movement of food within the digestive tract), and the heart (if the muscle isn't working well, blood flow is poor – no need to describe what the dire consequences are of this!).

These are the clinical signs of milk fever, but what about the sub-clinical signs? Sub-clinical means the disease is causing effects that are not directly noticeable as a disease process. These include low appetite, slow digestion and low production. Also associated with subclinical milk fever are calving difficulty (as the uterus is also a muscular organ), and poor reproductive performance. Low calcium levels can impinge on oestrus or cycling activity, as well as slowing the expulsion of foetal membranes, which can lead to endometritis and poor conception. These insidious effects of subclinical milk fever are more difficult to determine and associate a cost for.

Treatment is well known; thankfully we do not have to rely on the bicycle pump to inflate udders anymore. Calcium Borogluconate is our magic potion to restore blood calcium levels to their normal, functional range. But how do we prevent this metabolic disease in the first place?

## Increasing Calcium Levels

Logic would say that if the cow is low in calcium, surely we would give her calcium before she calves and the problem would be solved? Unfortunately, cows do not think that way.

The cow's demand for calcium increases dramatically at calving. At the same time, Dry Matter intake decreases which also decreases the intake of calcium.

A cow producing 10 litres of colostrum will lose 23 grams of calcium in one milking - this is 9 times the amount of calcium in her blood!, so it is essential she can draw on calcium from her body reserves (bone) and diet. Blood calcium levels are controlled by the parathyroid gland, producing parathyroid hormone which increases calcium absorption from bone and the intestine. Unfortunately this response may sometimes be slow and milk fever can result before the blood levels can be increased.

## Magnesium

Magnesium is essential for parathyroid hormone production, and the increase in the use of magnesium has been a large factor in our ability to reduce the amount of milk fever seen in our dairy herds in the last 40 years.

Magnesium can be supplied in many forms, all with differing concentrations of elemental magnesium, so care must be taken when determining the requirements of your cows.

- Magnesium oxide (Causmag) is approximately 50% elemental magnesium
- Magnesium chloride - 12%
- Magnesium sulphate - 10%

Magnesium chloride and magnesium sulphate are water soluble, and so are suitable for inclusion in a drinking water delivery system. Magnesium oxide is not water soluble, but can be mixed into a slurry and drenched, dusted onto pasture, or included in feed.

A good rule of thumb is to assume that the majority of dairy cows need 20 grams of elemental magnesium per day. Some high producing herds may need more than this. To estimate the required amount of magnesium supplementation, we need to calculate the amount of elemental Magnesium that we can supply.

For example, 40 grams magnesium oxide per day will supply 20 grams of elemental magnesium. However if dusted onto pasture, at least 50% of the dusted magnesium oxide is wastage, so we need to dust at least 80 grams per cow per day. If included in feed, some will be also wasted and this will depend on how it is delivered. While there is little wastage if included in a meal that is fed through an in-shed feeding system, there will be more wastage when added to maize silage fed in the paddock.

To supply enough elemental magnesium by using magnesium sulphate alone, we need to supply 200 grams per cow per day through the water system, and if using magnesium chloride, we need to add 165 grams per cow per day. All of these forms of magnesium are unpalatable at high rates. For example, once supplementing above 80 grams of magnesium chloride per cow per day through the water system, the water can taste bitter, and some cows will refuse to drink. This can be helped by

*We have often associated Jersey cows with an increased incidence of Milk Fever, but never really known why. It has been discovered that Jersey cows have less receptors for Parathyroid hormone in the kidneys than other dairy breeds, and so do not respond to the influence of Parathyroid hormone at calving as well as Friesians.*

*This doesn't mean that we cannot prevent milk fever in Jersey cows, but it does give us an answer as to why it is more prevalent in Jerseys.*

the use of water flavourings (anise oil etc). Magnesium oxide can cause some feed refusal if added at high rates.

A combination of these approaches can be used and you can use the same system to work out the required amount of oxide/sulphate/chloride to supply the recommended elemental magnesium. This is just a guide however, and the best way to determine the amount of supplementation needed is to sample the blood magnesium levels of the cows. A random sample of approximately 10 cows will give an indication of the herd levels and whether supplementation is adequate or needs to increase.

There are some competing factors for magnesium absorption within the feed. High potassium levels will decrease the absorption of magnesium in the cow, and this means that what works well on one farm will not necessarily work well on another, even neighbouring, farm.

### DCAD

Another way of increasing the blood calcium levels is manipulating the pH (or acidity) of the blood. By increasing the acidity, we also increase the calcium absorption from bone and the intestine. The acidity of the blood is affected by the **Dietary Cation-Anion Difference** (DCAD) of the feed eaten. This is the balance of the cations (positively charged ions – potassium (K) and sodium (Na)) compared to the anions (negatively charged ions – sulphate (SO<sup>4</sup>) and chloride (Cl)) in the diet.

The formula has been defined as

$$\text{DCAD} = (\text{Na} + \text{K}) - (\text{Cl} + 0.6 \text{SO}^4) \text{ mEq/Kg DM}$$

This is indicating that sulphate is a weaker negative than chloride, and so the chloride anionic salts are more effective at reducing DCAD. As a general rule, the lower the DCAD of the diet, the more acidic the blood is, and more calcium can be mobilised from the bone and intestine.

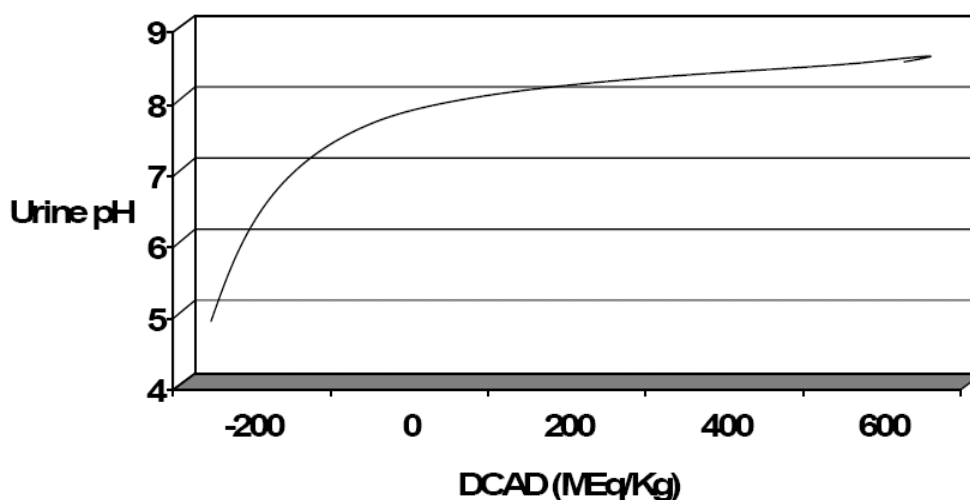
The DCAD of our typical pasture based diets are often high (over 500 *mEq/Kg DM*) due to high potassium in our pasture. Paddocks with effluent spread on them are higher than normal and should not be fed to pre calving cows. Crops (such as Swedes and Fodder Beet) have high DCAD measures (also due to high potassium levels), and should also be avoided for feeding to springing cows. Maize silage, PKE, straw and hay have lower DCAD than the majority of our pastures, so including these in the diet will help to reduce the overall DCAD. We can also add anionic salts (such as magnesium chloride and magnesium sulphate) to help reduce DCAD. Once the cows have been fed these salts for more than 3 weeks the homeostatic mechanisms of the cow are very efficient at coping with the change in the diet, and reverting the body back to the 'normal' values.

Thus concentrating on the diet and anionic salt supplementation of the springing cows 2-3 weeks pre calving will give the best results. If you supplement the entire herd in the same manner from 3 weeks pre calving, the early calving cows will get

the best results and as calving continues, the response will be diminished as the cows adapt to this manipulation.

Measuring urine pH is an indirect way of determining the effect of DCAD in the diet. A pH greater than 8 indicates that the DCAD of the diet is probably greater than 400. This can be manipulated to a degree by diet, using lower DCAD feeds such as hay, straw, maize silage etc and also anionic salts. We are aiming to achieve a urine pH of 6 for the best results. There is evidence that to get the same effect in Jersey cows we should be trying to achieve pH 5.5.

### RELATIONSHIP BETWEEN URINE pH AND DCAD



It takes approximately one week for dietary manipulation to show a change in urine pH, however the addition of anionic salts will be evident within a couple of days in the urine pH.

If urine pH is above 8, there are some major changes needed in the diet to reduce the DCAD. Once we can get the urine pH below 8 (for example, by the use of hay or maize silage), then anionic salts will have more of an effect in reducing the urine pH further. There are several proprietary products available that are pre mixed anionic salts, designed to help with this reduction.

### Vitamin D

Vitamin D is involved in the active resorption of calcium from the bone stores, and also in increasing calcium absorption from the intestine. This must be targeted close to calving, and with appropriate alterations to DCAD (or urine pH). Recent studies have shown that the addition of Vitamin D (in products such as Close Up) to cows with urine pH greater than 8 showed no effect, however once urine pH was reduced to 7 or below, the effect was marked. As with manipulating DCAD, this involves fine tolerances, and you should talk to your consultant to ensure this is practical for you, and to discuss the management of these groups of cows.

## Calcium

A general rule is not to supply calcium to cows before calving. When cows are supplied a diet high in calcium, the tendency is for their metabolic systems to assume that as there is plenty of calcium around, and that they don't need to 'switch on' the mechanisms that will increase blood calcium (resorption from bone and absorption from intestine). This can result in a sudden 'crash' in blood calcium levels after calving, as the output of calcium far exceeds the available pool. There are some situations where calcium supplementation pre-calving can work well, but these involve a very good management of the springer group and DCAD manipulation, so it is recommended that you talk to your advisor before adding calcium pre-calving.

Post-calving is another option, and supplementing your colostrum cows and milkers with calcium can help ensure that post-calving blood calcium levels do not lapse into a deficiency. Remember that sub-clinical milk fever may not manifest as overt problems, but can be a cause of production loss and poor reproductive efficiency. Limeflour is one of the simplest forms of calcium supplementation, and this can be added to feed, or dusted on pasture (as with magnesium oxide). Rates for supplementation vary from 100-200 grams per cow per day, depending on the method.

Another source of calcium can be via 'Starter Drenches'. These are typically a mixture of calcium enriched molasses, a magnesium source, mono-propylene glycol and rumen by-pass fat for energy, along with some trace minerals and other additives. These can be useful for cows that are at risk of milk fever in the very early lactation period (the colostrum period). Typically these would be drenched to suspect cows (in some cases the entire herd) as they calve, to ensure a ready supply of calcium at calving, and also energy over the immediate post calving period. These are not necessary for all cows, or all herds, but can be of great assistance in some situations.

## Summary

- Ensure 20 grams of elemental magnesium is supplied per cow per day
- Balance the DCAD to get urine pH as close as possible to 6 by using low DCAD feeds (maize silage/PKE) and supplement with anionic salts.
- Make sure you keep the diet as low as possible in potassium (avoid springers on effluent paddocks).
- Supplement the colostrum cows and milkers with extra calcium (limeflour at 100-150grams per cow per day).
- In high risk situations drench cows after calving with a starter drench.

If you have any further questions please contact your Intelact consultant or call Intelact Head Office on 0800 735 588.