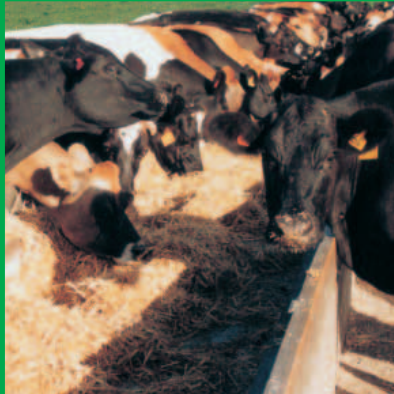


CALCIUM & THE DAIRY COW

S.M. Macky BVSc, MRCVS



Produced By:



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CALCIUM AND THE DAIRY COW

By M/S Sue Macky BVSc MRCVS - Principal Of Dairy Production Systems (DPS),
a leading dairying consultancy based in the Waikato.

McDonalds Lime Ltd is pleased to have Sue Macky write and now revise her classic booklet **"Calcium and the Dairy Cow"**. McDonalds Lime's aim has always been for New Zealand dairy farmers to have access to up-to-date and relevant information on liming and our Calcimate™ brand. As we are fine lime producers and not experts in animal nutrition, we are privileged to have Dr. Sue Macky to provide farmers with this relevant information.

"We hope you find this booklet very informative. Read it well!"

- *Duncan Clarke, Agricultural Lime Sales, Otorohanga*



Sue Macky BVSc (dist)
Director, Dairy Production Systems Ltd

With internationally recognised expertise in animal health, production and management, Sue Macky is able to demonstrate impressive credentials - particularly in matters relating to dairy nutrition and cow management.

In addition to her veterinary activities she also has an extensive background as a dairy farmer.

CALCIUM & THE DAIRY COW

Calcium is the major mineral in the body, about 98% of it present in bone and teeth. The remaining calcium in the body is essential for life - muscle activity, blood clotting, nerve transmission and the dynamics of enzyme function. Calcium is also essential for optimum milk production and growth rate.

Calcium is one of the main components of bone and so is an important but often overlooked factor in achieving proper growth in young cattle. Growth rate is slower if calcium intake is inadequate. Where intake is severely deficient rickets, weak skeleton or even bone fractures are possible.

Bone or skeleton is the framework that the muscles attach to, a bit like a hammock slung between the points of attachment. If you are feeding energy for 1 kg of muscle liveweight gain per day, but inadequate minerals for proportional bone growth there will not be enough "room" for 1 kg of muscle between the appropriate bony attachment points. There will be smaller muscle growth. The animal won't waste the extra energy - it will use it as fat over the muscle. Consequently you can achieve a similar weight gain but get a "butterball" instead of a proper proportionally grown heifer etc. Manipulating minerals in the diet needed for bone growth (calcium, copper and phosphate) is used in feedlots overseas to manipulate muscle (leanmeat) mass and fat depth. Because of this potential to influence the meat to fat ratio through **skeletal development**, it is important to consider liveweight gains in relation to height. Too much fat, and inadequate skeletal size at calving, will depress subsequent performance. Fully grown has as much to do with height as weight.

The pelvis is effectively the largest piece of bone in the body. A number of studies overseas have shown that pelvic size and diameter at first mating and beginning of first pregnancy is often the best guide to potential calving problems later on. If skeletal growth is inadequate at mating, it may not catch up by calving, despite otherwise good liveweight gains. Nutrients necessary for bone growth, calcium included, must therefore be present in the diet in adequate quantities from the beginning.



Skeleton of a Dairy Cow - Skeletal photos supplied by Institute of Veterinary, Animal and Biomedical Sciences, Massey University.

Once the foetus has reached significant size, much of its growth is also skeletal. Consequently, towards the end of pregnancy, calcium in the diet of growing heifers may be being split two ways. One of the reasons that weight gain at this time may be too much "outwards" and not enough "upwards" unless additional calcium is provided. Liveweight targets may be reached, but productive performance post calving may be impaired because too much fat is present in an animal that is actually still trying to grow.

Calcium metabolism at calving is one of the most important animal health factors influencing production, reproduction and feed conversion efficiency. Calcium is essential for proper muscle activity. Around calving, there are some big demands on the cows calcium reserves. The foetus is at peak growth demand. The initiation of milk production means increased calcium use. First milk produced, **colostrum**, contains approximately **twice as much** calcium as normal milk, so this demand is particularly significant. The whole process of labour and delivering a calf requires a large muscular effort, especially by uterine muscles - this requires a lot of calcium, as well as energy. Increased gut and digestive function is needed to process more feed for production. For most cows, the immediately available calcium, from blood and extracellular fluids, is less than 10 grams, yet calving and colostrum production uses 4 – 10 times as much, and possibly more as size and genetics improve. How that cow handles this deficit will determine her ongoing metabolic state, health and performance.

As calving approaches, hormonal and other factors depress appetite. The cow eats less just when she needs more. Less energy is absorbed predisposing the cow to subclinical ketosis before the lactation has even begun. Concurrently, less calcium may be absorbed because less feed is eaten yet demand is increasing. If the cow cannot correct or cope with this problem, subclinical hypocalcaemia occurs, becoming clinical milkfever if the severity increases. It is likely that all cows, including heifers suffer at least a mild degree of hypocalcaemia, even if for a very short time, over calving, which has implications for subsequent performance, quite apart from calving itself. Heat stress and high humidity exacerbate these problems.

Secondly we have an animal that has been in a period of limited dry matter intake, and no milk production, with limited calcium output or input. Calcium use in the cow is now having to gear up for much higher use - this is not always well co-ordinated.

Simply put, there are two areas of importance. The cow has, usually, some stored calcium reserves in bone, and she can increase the amount of calcium she absorbs from the diet but these mechanisms have to be "turned on". Essentially this is the main role of magnesium at this time. Insufficient magnesium may mean failure of the "on" switch, and hence hypocalcaemia. You must be supplementing adequate magnesium precalving - **check with your vet**. NB too much magnesium can be as much a problem as too little, and this is not the only role of magnesium in the cow. Vitamin D and PTH are part of this magnesium initiated switching mechanism. In some cows there are defects and deficiencies in this system, and in most cows there is a delay between "on" and working at fullspeed which has implications for calving and appetite post calving. Jerseys tend to be more affected than Holstein Friesians because they have fewer receptors in the gut, or less "calcium gateways", consequently the incidence of hypocalcaemia is potentially greater in Jerseys.

The second concern is that there must actually be calcium available to the cow. There must be calcium sources and no interference in their availability. Bone is a source of calcium but it is not unlimited - the cow who uses all her bone calcium will not stand up!

While dietary cation anion difference may not mean a lot to many of you, most will be aware that excess potassium in the diet will depress calcium metabolism. Potassium is one of the main cations measured when evaluating DCAD, the analytical equation that estimates the likelihood of any given diet predisposing the cow to hypocalcaemia. Where necessary your vet or nutritionist can evaluate the DCAD of the feed your close cows or springers consume, and suggest ways of minimising potential problems. With a grass based diet, there is always likely to be excess potassium, the cows requirement for potassium is less than the plants requirement for good growth.

Springer cow diets should aim to minimise DCAD problems, maintain drymatter intake, increase energy intake and enhance calcium metabolism and rumen function so as to optimise post calving health and performance. Appropriate calcium supplementation at calving and in early lactation is essential to minimise problems and to promote intake and production.

Precalving, there must be appropriate magnesium supplementation, in the correct form and quantity for each individual herd, to ensure proper calcium metabolism and function at calving. Do not forget the first calving heifers!

Calcium is essential for proper muscle activity. Falling calcium levels, or possibly diverted calcium, affects different muscles. One of the first groups to stop working are those that affect the gut. If the rumen and intestinal muscles slow down or stop, less food can be processed, less effectively. Less nutrients, including calcium and all energy sources, are absorbed when need is increasing. The cervix and uterine muscles are also affected. To casual observers, these cows appear normal, but they are not chewing cud as they should, or ruminating, and they are not getting on with calving. Some will calve on their own, just take longer, others may need assistance. When there is not quite enough calcium available, the cervix may appear inadequately dilated or there may not be as much "push" from the muscles of the uterus. Uterine contractions may be inadequate to keep the calf in the proper position, and inadequate to push it out quickly. In extreme cases there may be little uterine tone. It is easy for calves to become malpositioned in these cases, eg leg or head back, some breaches etc. Most assisted calvings do not involve calves that are too big, but cows that lack adequate calcium and energy to maintain proper alignment and prompt complete delivery. If calving is slow, both cows and calf are negatively affected. Tired, slower to stand, slower to feed, calves may be a bit anoxic – ongoing health and performance may be compromised. Cows being properly fed with the correct mineral supplementation can deliver very large calves (or twins) very quickly. Short labour means healthier, lively calves that are more likely to get adequate colostrum, quickly enough.

Lower calcium levels also mean slower involution or shrinkage of the uterus following calving. At its worst, this may mean that the placenta is not expelled. Slow uterine involution delays the return to oestrus and increases the chances of subclinical or clinical infections, all of which depress reproduction. These problems are increased where foetal membranes are retained. NB Low calcium is not the only cause of retained membranes – expulsion of the placenta depends on proper immune function, hence the importance of selenium and copper.

Cows with hypocalcaemia have elevated cortisol levels which can depress immune function. Cows with milk fever are more susceptible to other infections, including metritis and mastitis. Cows that have clinical hypocalcaemia are much more likely to get a whole range of other problems, than their healthy herdmates - the cost is ongoing.

Post calving, the speed and ease of calving, and degree of gut inactivity/activity will affect

how quickly the cow is up and about, and eating and drinking fully. The more the cow eats, the better the energy density of that feed and the sooner after calving that she is doing it, the less body condition she needs to mobilise, the lower and shorter of duration is any subclinical ketosis and appetite depression. She produces more, more quickly with less loss of condition. She reaches peak production and peak appetite more quickly, lactational persistence is likely to be greater, feed conversion efficiency is enhanced by better body condition as is reproductive performance. Consequently, paying attention to calcium metabolism (and energy, which is critical) over calving is economically important.

The sooner calcium requirements can be met at and/or immediately after calving, the sooner the cow can regain normal physiology and metabolic status, and the lower is any ongoing potential metabolic risk. **In most cases, 100 – 300 grams of Calcimate™ per cow per day for newly calved and early lactation cows will be adequate.** Depending on individual circumstances, **colostrum contains 2 – 10 times as much calcium** as the cow has immediately available, not including calcium required for delivery of the calf. Consequently, it is easy to see how "at risk" cows are of hypocalcaemia at calving. All cows, including first calving heifers, have at least transient depression of blood calcium levels at calving.

If calcium output is greater than calcium input, bone calcium reserves (bone density) may diminish. The calcium store must be replenished before the next calving, preferably before the end of lactation.

Milk contains significant amounts of calcium, and the individual cow can do little about changing how much she puts in each litre, unlike her ability to change fat and protein % according to diet and rumen function. Initially some calcium to maintain volume may come from bone reserves but ultimately the diet (including supplementation) must supply the required calcium. If not, production falls and/or the cow becomes hypocalcaemic - clinical milkfever may result at any stage of lactation. Activity ie being on heat, may be sufficient to reduce serum calcium and cause milkfever.

1 litre of milk at 4.0% milkfat contains approximately 1.22 grams of calcium. As the milkfat and milk protein percentage increase so does the amount of calcium per litre. Dietary calcium requirements therefore increase with both increase in volume produced and increase in milksolids percent.

The amount of calcium available to the cow depends on the dynamics of bone calcium metabolism and the amount absorbed from the gut which is related to calcium intake, age, current calcium status, breed, calcium requirements (growth, pregnancy, lactation), the type of calcium in the diet and other mineral and nutritional interrelationships. Generally calcium availability decreases as calcium intake increases and the absorption of calcium from the diet through the gut wall declines as the cow ages.

Ideally the diet should contain at least 0.6% calcium on a drymatter basis, although lower producing cows may survive on less. As production increases, more calcium may be required to maintain that level of performance, as much as **1% of drymatter intake**. **Many New Zealand dairy pastures contain less than 0.5% calcium**, insufficient to maintain peak production for long, even when sufficient drymatter of sufficient quality is consumed.

Where calcium intake is greater than 1% of dietary drymatter intake, total drymatter intake and / or performance may decline depending on other physiological metabolic and nutritional factors, although this is not common.

Supplements such as maize or cereal silages or grain, while providing more energy and hence ideally complementing high protein grass or plugging feed deficits, contain little or no calcium, amongst other things. Failure to provide all of the nutrients required for milk production, regardless of total energy or total drymatter intake will limit milk production and profitability.

Cows can be hypocalcaemic, and get clinical milk fever, at any stage of the season. Down cow and metabolic problems in lactating cows assumed to be low magnesium are frequently primarily due to inadequate calcium or a complex syndrome related to the interaction of magnesium, calcium and energy. Always consider all three. Do not assume that cows can only get milk fever around calving or in early lactation, or that only mature cows can be affected. Contributing factors influencing the incidence of hypocalcaemia unrelated to calving, include excess activity, oestrous, heat stress, sudden dietary changes, hypothermia, adverse weather – especially cold rain or snow with a high chill factor – poor rumen function (including rumenal acidosis – clinical and subclinical – lush pasture or “empty gut” syndrome), low calcium diet, failure to replenish bone calcium reserves depleted in early lactation, accidents (e.g. caught in an electric fence, fallen in drain), other illness depressing appetite and dry matter intake, an improper dry off process etc. NB Any calcium supplementation should remain until after the last

milking. Cows with clinical or sub clinical ketosis or rumenal acidosis will get secondary hypocalcaemia, and should receive additional calcium supplements. Cows with mastitis may benefit from additional calcium. Sick or lame cows with reduced drymatter intake will also have less calcium available from dietary sources.

Calcium supplementation is most often achieved by use of calcium carbonate or Calcimate™. Percentage of calcium in the product and fineness of grinding - smallest particle size - are important considerations for absorption and cost effectiveness. In particular circumstances more immediately absorbable calcium, such as calcium chloride, may be required also, but should be used only with veterinary advice.

Internationally, revision of the minimum calcium requirements of dairy cattle is currently underway, with previous recommendations being increased. As with many other minerals, we need to come to understand the differences between requirements for maintenance or survival, and the additional needs of higher producing animals of greater genetic merit and greater conversion efficiency. Recommendations based on requirements for dairy cows in a controlled environment being fed a diet that is constant in quantity, quality and composition can underestimate needs in cows kept outside, fed primarily grazed pasture, and required to walk long distances to collect that feed despite lower production requirements.

How do I know if my cows need calcium?

- Measure serum calcium levels in blood samples from 10 lactating cows.
NB: Cows will attempt to maintain adequate serum Ca levels as long as possible at the expense of other functions, so normal results do not mean that there cannot be a problem.
- Have all feeds including pasture, analysed for calcium levels, and other integrating and influencing minerals.
- Calculate pasture and food DCAD levels. (Refer to DCAD on page 12)
- A history of ‘down cows’ or other metabolic problems, especially where magnesium supplementation is adequate.
- High dietary potassium levels including supplements such as proliq or heavy effluent use as fertiliser.

- Failure to perform (milk production, reproduction, growth rate) to expectations in any given circumstances.

Note:

- Calcium is generally not necessary in New Zealand dry cows on pasture.
- Calcium is not a substitute for magnesium or vice-versa.
- Calmag, calcined magnesite, causmag and magnesium supplements are NOT calcium supplements.
- The above Magnesium products must be slaked (heat removed) before Calcimate™ is added (ie: mixed in water for drenching).
- Slaking - magnesium in the form of magnesium oxide (MgO) when added to water generates heat (slaking). Use when cold and then add Calcimate™ to avoid setting and clogging.
- Be aware that free oils in diets may form calcium salts in the rumen, making calcium unavailable to the cows.

Calcimate™ can be given directly to animals

- Can be dusted with Magnesium Oxide or other food additives, or on its own.
- Up to 100gms per cow per day can be mixed with water and used directly for drenching with magnesium. (Remember slaking of magnesium, refer above.)
- Added to silage (grass, maize, cereals - refer to page 16)
- Mixed with molasses and poured on hay or straw etc.
- Available in convenient 25kg bags at your local merchant stores.
- Pasture dust adequate quantities to give good coverage, ie. may need to use more than the minimum cow requirement.

In the absence of expert veterinary nutritional advice, the following examples will illustrate current supplementary requirements.

1a A 500kg cow, producing 25 litres of milk, 4.5% milkfat, 3.4% protein, needs 107 grams of calcium daily at least.

Assuming a daily drymatter intake of 20kgs of grass containing 0.45% calcium. This will supply 90 grams of calcium leaving a deficit of 17 grams of calcium.

For a while this cow can take calcium from bone to maintain milk production but ultimately the cow may become hypocalcaemic and / or production must decline or the extra calcium must be supplemented.

Calcium carbonate or Calcimate™ is approximately 38% calcium ie: 100 grams of calcium carbonate will supply 38 grams of calcium. To supply 17 grams of calcium, at least 45 grams of calcium carbonate is required.

1b If the pasture calcium content is 0.5%, then 20kgs drymatter will supply 100 grams of calcium but if pasture calcium content is 0.4%, only 80 grams will be supplied by the diet.

1c If the diet is 16kgs of pasture at 0.45% calcium, and 4kgs of maize silage drymatter at 0.15% calcium, this diet will only supply $72 + 6 = 78$ grams; a daily deficit of 29 grams of calcium or a minimum of 77 grams of calcium carbonate.

2a A 250 kilogram yearling growing at 0.7kgs per day will require 28 grams of calcium minimum in the diet. If the diet is pasture drymatter, with 0.4% calcium, and a daily intake of 6kgs drymatter, 24 grams of calcium will be supplied, nearly meeting requirements ONLY if it is all absorbed and is all available to the animal.

If intake is only 4.5kgs pasture drymatter then only 18 grams of calcium will be available in the diet - growth rate will decline. (Calcium won't be the only limiting nutrient).

NB In reality, the coefficient of absorption of calcium carbonate is less than 100%, so more needs to be supplemented to provide the cow with the amount she needs.

NB These equations greatly simplify the total nutritional requirements and interactions involved but they serve to illustrate the magnitude and complexity of the dairy cows requirements.

Applying calcium, such as lime, as fertiliser may increase the calcium content of pasture in some circumstances, depending on species, soil type, location etc. Most often this will not reliably increase calcium % sufficiently for high performance. However the application of lime to pasture has other major benefits in terms of pasture quality, density and drymatter intake. In any given circumstance, the more each cow eats, and the better the quality of that feed, the better the health and performance of that cow.

DCAD and Springers: The mysteries unravelled

The 1999 Dairying Seminar "Overcoming the past, building the future" written and addressed by Dr Sue Macky BVSc MRCVS. and Dr Charlotte Westwood BVSc MACVSc. Phd contained this DCAD information as part of that address.

Recently the term 'DCAD' has been part of many discussions involving dry cow and springer management. How often have you heard people talk about "a more negative DCAD" helping overcome metabolic problems around calving? There is nothing too mysterious about DCAD - the basics are discussed below...

What is DCAD?

'DCAD' stands for 'Dietary Cationic Anionic Difference' which describes the balance of cations and anions in the diet of dairy cows. This is often described as an equation:

$[(Na + K) - (Cl + S)]$ (expressed as milliequivalents per kg of dry matter)

CATIONS: Na = Sodium; K = Potassium

ANIONS: Cl = Chlorine; S = Sulphur

We can calculate the DCAD for a diet by entering concentrations of each ion into the equation. Different amounts of anions and cations can make the equation outcome positive or negative.

How does DCAD affect the cow?

The DCAD value from the equation (more negative or positive) affects the acidity (pH) of the cow's blood.

1. Negative DCAD: (more anions than cation), the cows blood becomes slightly acidic. This is because a cow wants to maintain her blood in an electrically neutral state. When there are more anions (Cl and S) in the diet, the cow responds by increasing levels of hydrogen ions (H+) in her blood. More H+ in blood makes it more acidic (lower pH).

2. Positive DCAD: (more cations than anions).

When there are more cations (Na and K) the cow tries to make her blood neutral by increasing bicarbonate ions [HCO₃⁻]. More HCO₃⁻ in blood makes it alkaline (higher pH).

Why is DCAD and acidity of a cow's blood important to her around calving?

We want a cow to have a negative or low positive DCAD before calving (Figure 1) so that her blood is slightly acidic. When a cow's blood is slightly acidic, she starts to mobilise bone calcium. We don't understand exactly how or why, but this may be in response to the cow shedding extra H+ in her urine, which is accompanied by increased loss of urinary calcium (Ca). Loss of Ca stimulates a series of hormonal events needed to 'crank up' the mobilisation of Ca before calving. By the time the cow is due to calve, her Ca mobilising system is primed, ready to go. When the calf drops and the first colostrum is removed, she is better able to mobilise bone and better at absorbing Ca from her gut. Blood levels of Ca are better maintained so cows are less likely to go down with milk fever.

What are typical DCAD values for NZ winter and spring pastures?

NZ pastures can be a problem because often they contain high concentrations of K, so that the DCAD balance is highly positive (Figure 2). Ryegrass plants naturally contain high concentrations of K, but this is often made worse by application of potash and effluent, both of which increase DCAD. DCAD values have been recorded up to + 650 milliequivalents / kg DM. To make sure cows are mobilising Ca before calving we like DCAD to be negative in a totally confined T.M.R. system, or at least a low positive value (less than + 200 meq / kg DM) if possible. The important fact is that we reduce the DCAD for springers or close cows. High DCADs mean NZ springers can have a neutral or slightly alkaline blood pH. This means efficiency of Ca mobilisation is poor; therefore cows are more likely to get milk fever. Even if clinical milk fevers aren't seen, sub-clinical milk fever can reduce productivity well into lactation and reduce fertility at mating.

Figure 1: Cows should have a balance of anions and cations so that DCAD is negative or low positive before calving.

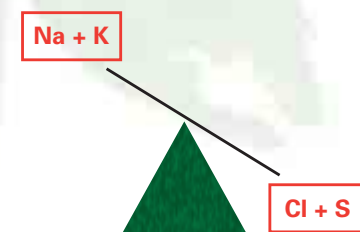
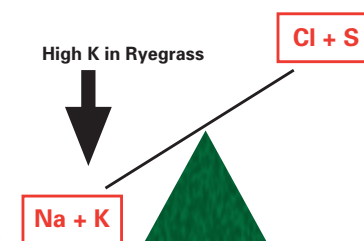


Figure 2: NZ dairy cows often have an imbalance of DCAD, with too many cations (high K content in pastures).



How can we change the DCAD of our cow's diets?

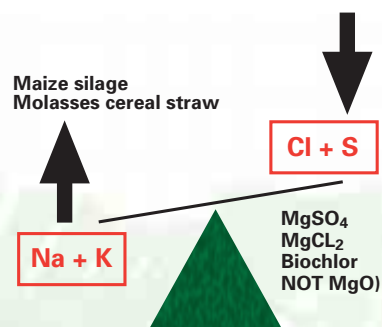
The pasture: We can't change the fact that ryegrass plants naturally contain high levels of K. We can help by avoiding the application of potash or effluent to paddocks intended for calving cows.

Other feeds: Providing feeds to dairy cows that are naturally lower in K can also reduce DCAD. For example, maize or whole crop cereal silage, cereal (but not ryegrass) straw and molasses as part of a strategic ration for springers can reduce DCAD, and dilutes the effect of high pasture K levels.

Feed additives: Sometimes these dietary measures aren't enough to reduce DCAD to a level where metabolic illnesses are avoided. Anionic salts are dietary additives that contain Cl or S, such as magnesium sulphate ($MgSO_4$) or magnesium chloride ($MgCl_2$). (Note: Magnesium Oxide, MgO is neutral and does little to alter dietary DCAD). Anionic salts can be applied to feeds or be fed as part of pre-mixed compounds; e.g. Himag contains molasses plus $MgSO_4$. Anionic salts can also be applied to pasture, or added to the water through an in-line dispenser. Care is needed with anionic salts as they can be unpalatable and may reduce water and / or feed intakes.

Achieving a negative DCAD on a pasture based diet is often unrealistic. Reducing the DCAD from the base level has been shown practically in New Zealand to significantly reduce hypocalcaemia.

Figure 3: Complementary feeding with feeds low in Na and / or K, or offering anionic salts can change the DCAD balance.



When do we want a negative DCAD?

To ensure a cow is up and running with her Ca mobilisation by calving, we need to aim for a negative or reduced DCAD (at least 10 days set up period). Importantly, we want a positive DCAD after calving; a negative DCAD during early lactation may cause metabolic problems and loss of production.

Why is magnesium important together with DCAD?

Giving cows magnesium (Mg) pre-calving (as well as after!) is essential on many NZ farms because Mg levels in pastures are low, and / or Mg may not be readily available to the cow due to high concentrations of nitrogen and K (both interfere with uptake of Mg from the gut). Low Mg causes not only classic Grass Tetany (Hypomagnesaemia), but can also reduce the efficiency of Ca mobilisation. Correction of DCAD problems should be combined with an ongoing magnesium supplementation programme appropriate for your property.

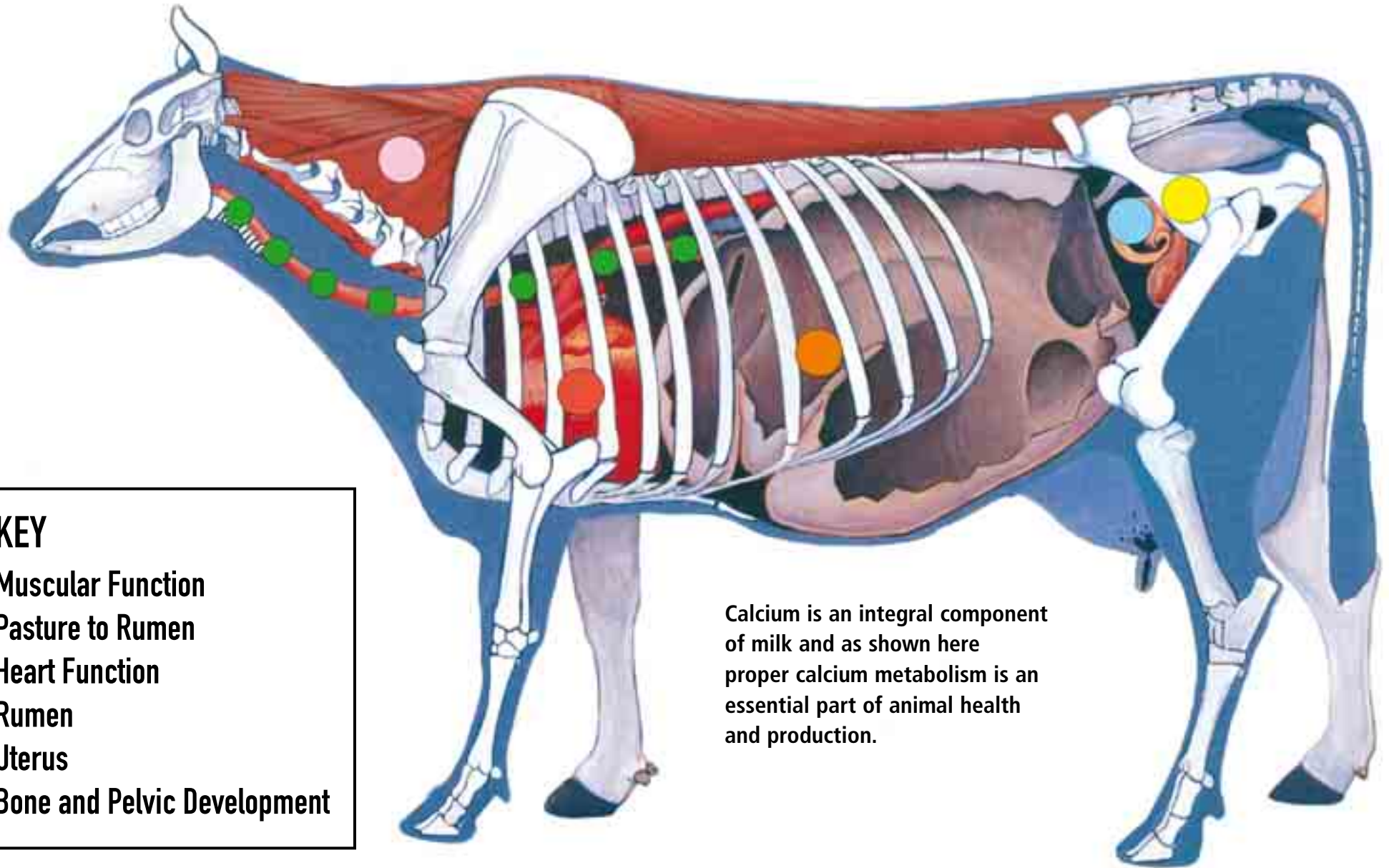
Where does Ca fit pre-calving?

Ideally, avoid feeding extra calcium pre-calving. These are circumstances where additional calcium is required or is advantageous pre-calving. Do not use Calcimate™, which is a high DCAD, or strongly alkaline form of calcium, consequently it will exacerbate the incidence of hypocalcaemia or milk fever. Anionic or negative DCAD forms of calcium include chloride and dicalcium phosphate. Get professional advice regarding use in springers.

Calcimate™ is however, the most appropriate calcium supplement to use after calving to elevate or replenish calcium, to ensure best cow health and performance. Most NZ pastures have suboptimal levels of calcium, especially in spring or when fast growing, so calcium supplementation is recommended.

Remember, DCAD is only part of good springer transition management. Fixing the DCAD problem won't solve metabolic problems if feed on offer is limiting, or is of inappropriate quality for cows. Discuss with your nutritionist or veterinarian to ensure that your springer management is setting your cows up for a healthy and productive season.

CALCIMATE™ FOR REAL ANIMAL HEALTH



KEY

- Muscular Function
- Pasture to Rumen
- Heart Function
- Rumen
- Uterus
- Bone and Pelvic Development

Calcium is an integral component of milk and as shown here proper calcium metabolism is an essential part of animal health and production.

Maximise the nutritional benefits of cereals and maize silage with suppliment Calcimate™

Calcium is an integral component of milk, and proper calcium metabolism is an essential part of optimum cow health and production. Consequently, insufficient available dietary calcium will have significant negative effects on the economic status of any particular farm.

When available dietary calcium does not meet their needs, dairy cows have a limited ability to maintain output by utilising "calcium" stores, by extracting calcium from bone. Calcium depletion becomes self limiting however, and in reality is not a desirable outcome. Practically, if energy intake is sufficient for the cow to produce 25 plus litres per day, but available calcium is only sufficient for 20 litres per day, the cow either reduces performance or becomes hypocalcaemic.

The most common situation in which calcium is the limiting factor is that where significant amounts of low calcium feeds such as maize silage, cereal silages or grain are being fed. **Depending on genetics and targeted production, daily calcium intake should equal 0.6% to 1% of total daily dry matter intake. Average calcium content of local pastures is usually less than 0.7% (often less than 0.55%).** If a proportion of the diet is a low calcium product such as maize silage, then it is highly probable that daily calcium intake will be less than that required for even a small cow of average production.

While the exact amount of calcium supplement required depends on a number of factors, especially total production, as a general guideline, maize and cereal silages should be supplemented at a rate of a **minimum 10 grams of Calcimate™ per kg of cereal or maize silage dry matter fed**. Obviously particle size and calcium content of the Calcimate™ used is important. In too many cases, much of the money spent on high value high energy crops such as maize silage is wasted because of lack of adequate supplementation of a few limiting nutrients, of which calcium tends to be one of the most important in lactating cows. Calcimate™ is an excellent product to enable dairy cows to properly utilise such high value feeds. Exact supplementation requires a knowledge of a number of factors, including calcium content of other feeds but using the general guidelines given will meet most circumstances.

General Warning

Calcium carbonate supplementation in dry cows in late pregnancy is not generally recommended except upon specific individual recommendations of your vet or nutritionist. In all instances consultation and advice re calcium supplementation should be sought from your veterinary nutritionist.

Important essential elements and their concentration in milk and ruminant body tissues

Macro-elements			Micro-elements		
	Milk (g/l)	Body tissues (g/kg)		Body tissues (mg/kg)	
Calcium	1.3	14	Iron	20-80	
Phosphorus	1.1	8	Zinc	10-50	
Potassium	1.6	2	Copper	2-5	
Sodium	0.5	1.5	Molybdenum	1-4	
Sulphur	0.4	1.5	Selenium	1-2	
Chlorine	1.0	1.0	Iodine	0.3-0.5	
Magnesium	0.1	0.5	Manganese	0.2-0.8	
			Cobalt	0.02-0.08	

Table extract from "Milk Production from Pasture" by CW Holmes and GF Wilson

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McDonald's Lime quarry is situated in the limestone rich Waitomo district and this unique high yielding deposit provides an extremely high grade of limestone. In most cases the purity exceeds 90% plus and this provides New Zealand farmers with significant benefits. These natural benefits are further enhanced by the quality controlled refining operation at McDonald's Lime which ensures lime is granulated to exacting specifications for easier application and faster absorption in the soil. For farmers this premium, M.A.F proven, agricultural product is an unbeatable investment for higher farming profits.

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