Keep potassium under close watch during transition!

It was long believed that monitoring the level of calcium in the transition ration was the key to preventing milk fever. Instead, it's the potassium level that needs close watching.

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Milk fever is a metabolic disorder that usually occurs in the hours following calving, but the problem may occur at other moments as well. Some producers have encountered milk fever in the middle of lactation or at dry-off, for example. The disorder is characterized by a rapid drop in the level of calcium in the blood, attributable to the production of colostrum. A cow producing 10 L of colostrum loses 23 g of calcium in a single shot, which is about nine times more calcium than is present in the cow's blood. The calcium drawn from the blood and directed to the cow's mammary gland must be replenished; this is accomplished by increasing calcium absorption in the intestine or by absorbing calcium from the bones, or both.

In high producing cows, some decrease in the calcium concentration in the blood is virtually inevitable in the hours following calving, as the animal's metabolism adjusts to the demand for calcium. The question is whether the calcium level will continue to drop or not. The consequences of a severe decline in calcium are well-known: the cow is out of action. In 2010, the incidence of milk fever reported in DSAHR records was 2.6 per cent. Taking into account the costs related to treatment, production loss, the negative effect on reproduction, culling and mortality, a single case of milk fever has a price tag of over $500. And if that isn't enough, a cow with milk fever is eight times more likely to suffer from ketosis and mastitis, not to mention an increased risk of distocia, retained placenta, displaced abomasum, and prolapsed uterus. It's obviously important to do all you can to prevent such costly problems.

Potassium in the dock

It was long assumed that controlling the level of calcium in the ration was the key factor in preventing milk fever. The results of an experiment, published in 1997, showed that it is instead the potassium level that warrants scrutiny. Goff's study was conducted during the three week period prior to calving, with Jersey cows that were starting at least their 4th lactation so as to emphasize the effect of the ration on the incidence of the problem. Because their colostrum is so rich, Jersey cows are more susceptible to milk fever than animals of other breeds, and older cows are more at risk than younger ones.

The results: Table 1 clearly shows that while the variation in the calcium concentration in the transition ration has almost no effect, the potassium concentration needs to be kept closer to 1.1 per cent, as opposed to 2.1 per cent, in order to avoid trouble. On the other hand, it seems obvious that hypocalcemia is practically inevitable. It is also evident that milk fever can be avoided. In practical terms, researchers are working to formulate rations with acceptable potassium levels, between 1.3 and 1.5 per cent.[1]

Table 1. A comparison of the effect of calcium and potassium concentrations in transition rations on the number of cases of milk fever/number of calvings

Ca (%)	K (%)			Effect of Ca
	1.1	2.1	3.1	
0.5	0/10	4/11	8/10	12/31
1.5	2/10	6/9	3/13	11/32
Effect of K	2/20	10/20	11/23	

Source: Horst, R.L., et al., J. Dairy Sci., 1997, pp. 1269-1280

Potassium in forages

It's not a secret any more: the potassium concentration of forages (hay and grass silages) is extremely variable. Some forages contain as little as 0.8 per cent potassium while others contain up to 5.5 per cent. There's no need to mention that forage containing 5.5 per cent potassium should be kept well away from cows approaching calving. So why does the potassium concentration of forages vary so much? There are three sources of variation:

1. Species (root system)
2. Soil composition
3. Pluviometry

It's clear that the potassium concentration varies between species. Species with a highly developed root system—such as alfalfa or orchardgrass—have the capacity to absorb greater amounts of available potassium from the soil than do species with a more limited root system, such as timothy. A word of caution however: the potassium content of the soil is also a major source of variation, so much so that timothy may be very rich in potassium (up to four per cent) and alfalfa much poorer (less than two per cent). **So it's important to be careful: just because you have a timothy-based forage doesn't guarantee that it is well-suited to a transition ration.**

The data presented in Figure 1 clearly illustrates the effect of soil potassium content on the potassium concentration of the forage. The values are averages for two years of production (2003 and 2004) and two nitrogen fertilizer application rates (70 and 140 kg N/ha). The proportion of timothy in the forage was very nearly 100 per cent, with the exception of the Sainte-Perpétue site where the forage was composed of 40 per cent timothy and 60 per cent Kentucky bluegrass.

Pluviometry has some effect on the potassium concentration of forages, since potassium must be in solution in order to be absorbed. A plant growing in dry conditions will therefore have a lower potassium concentration than if it had been growing in a soil with greater water availability.

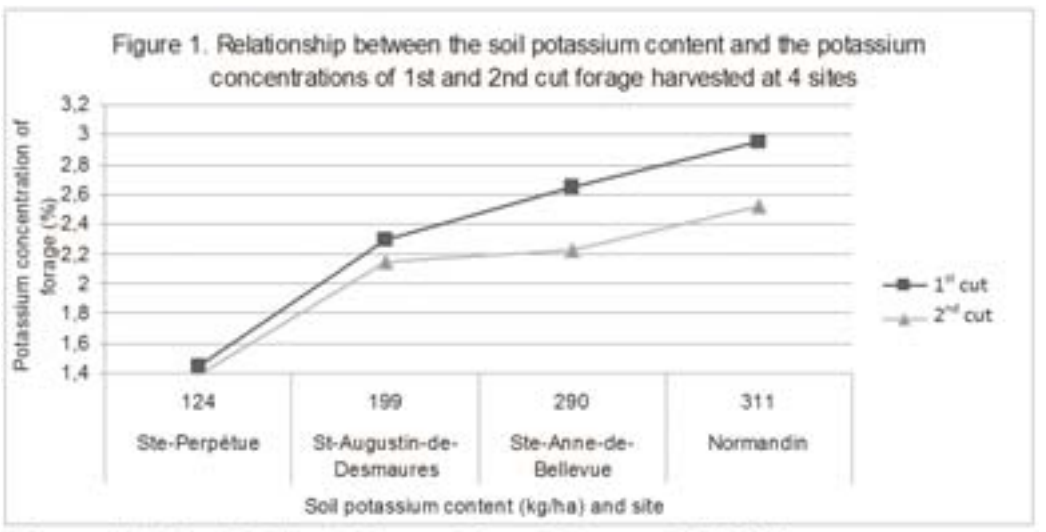
Potassium in Quebec forages

Valacta has some interesting data on the potassium concentrations of forages. Figure 2 is based on more than 45 500 analyses of the potassium concentration of forages included in dairy cattle rations in Quebec in 2010. The colours show the proportion of forages with low (green), average (yellow) or high (red) potassium concentrations. How do you interpret the figure? If you take legume silages, for example, you see that 15 per cent of the samples contain less than two per cent potassium while nearly 20 per cent exceed three per cent. Forages with "green" potassium concentrations are safe to use in feed for cows preparing to calve. On the other hand, you need to be more careful when using "yellow" forages. And "red" forages should be avoided as a feed source for transition cows whenever possible. **Regardless of the type of forage you have, an analysis of its chemical composition is essential.**

The recipe: potassium content of the ration below 1.5 per cent

Preventing milk fever requires keeping a close check on the potassium concentration of the ration fed to cows during the transition period. If you can manage to keep the concentration below 1.5 per cent, you're on the right track. A good understanding of the factors that affect potassium levels in forages will enable you to make the right choice for your transition rations. It's clear that any forage lots likely to be used for feeding during transition should be carefully sampled.

[1] These results were presented in the training course *A Good Dry-Off for a Better Start-Off*, given by Valacta across Quebec and the Atlantic provinces during the winter of 2010-2011.



Source: adapted from Pelletier et al., Grass and Forage Science, pp. 62-67, 2007.