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Water
The Forgotten Nutrient

This title sounds like another boring, wrap-over-the knuckles article on what we all know and should be doing. If I were to focus on the subject based on the all-too-common photo below, you'd be right. But before we pass over this issue, it would be timely to state that milk is 87% water, and troughs like this are not conducive to high milk production. Feed intake is directly related to water intake. Reduce water intake due to poor quality and presentation of water, and we automatically reduce feed intake and milk production.

A well researched figure I often quote is; cows will drink 60% of their daily water intake at a trough placed at the exit from the dairy. We have just dehydrated them by up to 15 litres plus fed them a dry grain mix. This dairy trough obviously also takes enormous pressure off the paddock trough and its supply capacity. About as common as the scene this photo portrays is the sight of 50 plus cows standing around a water trough in summer waiting for a drink instead of grazing, resting or ruminating.

Enough chastisment! The subject I do want to raise is water quality from its mineral content perspective. There is considerable research taking place in Northern Hemisphere dairying in this regard. The fate of inorganic minerals and the potential effects that minerals in water can have on rumen function and metabolism. Pure water is a simple compound until minerals from groundwater are added; it's chemistry then becomes complex.

There is a lot more going on in water than we imagine. There are two laws in water chemistry that must be obeyed: 1) Electroneutrality – positive and negative ions must balance out. 2) Water will achieve the lowest energy status. As soon as minerals (salts) are added to a solution compounds will split apart and recombine to form different combinations until these two laws are satisfied.

The rumen contains aqueous solution in which fermentation occurs and is subject to the same electrochemical principles. We add minerals in feed assuming they survive intact to be absorbed by the cow. This process of dissociation and recombination occurs whether minerals come from water or feed. Simply knowing minerals in water or feed tells us

nothing of possible availability to the cow, or potential toxicity. From this, a multitude of outcomes are possible in milk production, health and reproduction.

We are all relatively aquainted with the term DCAD (Dietary Cation (+) Anion (-) Difference) and its dramatic impact on preventing metabolic disease at calving (Lead Feeding DCAD). Lactating ration DCAD is of similar proportions in optimising health and production. A negative DCAD in springer cows will mobilise calcium and prevent milk fever. A positive DCAD in lactating cows will drive intake and milk production.

However, the greatest problem we face in grazing/ryegrass based diets, is a DCAD too high by virtue of our love affair with potassium fertilizer. In September this year pasture was around DCAD +450 when optimum for production and cow health is about +200 to +250. To highlight high DCAD's impact, we saw cases of hypermag and mid-lactation milk fever due to hinderance to magnesium and calcium absorption from high DCAD. The formula for calculating DCAD is (Na+K)-(Cl+S). All these elements are very common in our cow's diets and can have significant variations causing health/productivity issues.

A good example is a farm I was involved with during the drought year. In January I went out to look at the herd and witnessed cows going mad, running around the paddock. Classic magnesium deficiency induced hyper-activity. But why? I had not seen this in any other herd that week. The cause, we eventuially found: extremely high potassium content in the drinking water. All farm water came from a dam which was very low due to drought, causing a very high potassium concentration from previous run off in winter and fertilizer.

DCAD calculations should include minerals in water when total solids exceed 500 milligrams per litre. The most important variable to improve production efficiency is milk per cow. It is highly correlated to feed and nitrogen efficiency. We despirately need daily MUN (Milk Urea Nitrogen) data from milk processors to guide us through this maze also. Good feed and nitrogen efficiency means less manure and nutrient polution which will soon be regulatory matters for us.

The mineral content of water, when combined with the minerals we supplement in feed, can dramatically alter the form and availability of those minerals. The strong ions (- & +) from feed and water will effect rumen function and acid/base status of the whole cow with implications for both health and milk production. We really need to know a lot more about our water and take its mineral status into consideration with minerals fed in grain mixes.

There is no more vulnerable class of animal onfarm than calves. Calves whole growth and development can be severely handicapped by poor quality water. Water drives grain intake which determines rumen development. Rumen development is directly related to solid feed intake, which, due to higher nutrient density than milk, equates to calf growth rate. Calves can be effected more by water quality than many other negative influences they encounter.