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Minerals Explained

In our scurry to lower cost of production, as the spirit of the last few articles has emphasised, my concern is being aware of what each cost does contribute to current milk production and profit. Often this is quite obtuse and can not be directly related to immediate milk production, but science verified by experience tells us that removal of additives may have no immediate apparent consequence, but the longer term consequences can be costly: infertility, reduced milk performance due to primary health issues like lameness and mastitis. These often pass as not being associated with reduced mineral nutrition months prior to the manifestation of the issues and the associated costs.

The major macro minerals are calcium, phosphorous, magnesium, sulphur, potassium, sodium and chlorine. All are essential for both skeletal structure to bones and cells, and many chemical and enzymatic reactions in the body. They play vital roles in the maintenance of acid-base balance, osmotic pressure, membrane electric potential and nervous transmissions. As a result of this activity, the balance of macro minerals is also important as interaction between them produce these necessary roles for health and productivity.

DCAD, or Dietary Cation Anion Difference, most farmers are familiar with as this is the basis of lead feed formulation to avoid metabolic disorders at calving. DCAD also is just as important during lactation, but as a positive (+) value rather than negative (-) in lead feed. In pasture based diets (grass or silage) due to high potassium content, our main concern in lactating rations is with DCAD being too high. Silage frequently tests out at DCAD +600 when optimum for a lactating cow is around +200. Needless to say, we must have some negative charged ions in the ration to control this potentially very high DCAD, or suffer mineral deficiency problems due to absorption capacity being severely retarded. The most common symptom know to all dairy farmers is staggers from magnesium deficiency even when adequate magnesium is in the ration.

As a rule of thumb, we aim for 4.5 parts potassium to 1 part magnesium to avoid imbalance/lock-up; 3 parts potassium to 1 part sodium to maintain electrolyte balance which can affect intake and production. And greater than 3 parts calcium to 1 part magnesium to avoid imbalance. The balance between calcium and magnesium is critical for absorption of both.

Phosphorous is rarely deficient in cows fed pasture and grain. Potassium is regularly excessive and a cause of high DCAD mentioned above affecting most noticeably magnesium absorption, and less noticeably calcium, but just as damaging. Magnesium and calcium are routinely added to grain mixes to meet their shortfall, along with salt. Salt has a significant impact on feed intake and supplies both sodium and chlorine in correct proportions. Low salt intake is one of the most common problems in dairy diets.

Sulphur is very necessary in times of high nonprotein nitrogen. June, July and August commonly have very high levels of nonprotein nitrogen in pasture (CP% as high as 35%). To address these issues all my clients have 100 gm of lime, 50 gm MagOx, 50 gm salt and 30 gm Magnesium Sulphate /cow/day in the grain mix, unless circumstances deem otherwise, or evidence suggests alterations to these figures, eg seasonal.

Trace minerals: copper, zinc, selenium, cobalt and iodine are commonly added to grain mixes in the form of a trace mineral pellet. Frequently Rumensin/Tylan and vitamins are also included, and recommended in this premix pellet. The milk response from Rumensin/Tylan easily covers the cost of the whole premix. Although minute by their amounts in a ration, they can impact both milk production and health to the same degree as energy and protein deficiency. Young stock growth rates are frequently handicapped by mineral deficiency when not supplemented, and I encourage all my clients to feed 2 kgs of the dairy grain mix to all young stock. The results are dramatic in growth but even more so in lifetime production measured in both litres and longevity.

As with macro elements, balance between all trace minerals plays an important role in each mineral's effectiveness. Again, based on science and experience we manufacture a premix pellet containing an effective balance of all the above requirements.

I must stress that it is paramount these minerals be fed ALL lactation. In the first 100 days we cannot feed enough minerals to meet rapidly increasing milk production. The second 100 days intake (as prescribed above) usually meets requirement comfortably. The third 100 days, when farmers are tempted to remove minerals from the grain mix to reduce cost, only sets the cow up for mineral related disease in early lactation. During this third trimester, although minerals are in excess of immediate need, they are deposited in body fat and skeletal bones and tissues for utilization in the first 100 days of next lactation. As the cow draws on body fat to supplement energy deficiency she is drawing mineral enriched fat to supplement mineral deficiency also.

Magnesium and calcium are reabsorbed from skeletal structure during this same period. Failure to restore bone reserves of these two minerals advances osteoporosis and is the cause of higher milk fever risk in mature cows. Many of us would be content with eliminating clinical milk fever at calving through lead feeding, but the unseen embezzler of significant milk production and profit is sub-clinical diseases of milk fever and ketosis, although ketosis is connected to excessive negative energy balance. No article of mine would be complete without mentioning vitamin F – FEED; by far the greatest cause of lost profit and health issues in Australian dairy farming.