

## GET THE BALANCE RIGHT

By Dr Carl Eden BVM&S MRCVS

Most people are aware that calcium is an essential nutrient and mineral in the development of strong, healthy bones and teeth. The increased requirement for dietary calcium in the nutrition of pregnant mares, young or growing horses, (especially if in training) is well known by most owners and trainers. It is not so commonly known however that the ratio of calcium to phosphorus in the diet is as crucial as the inclusion of calcium itself. It is also important to understand that certain foodstuffs, (despite containing adequate levels of calcium and phosphorus), contain calcium and phosphorus in forms that are unavailable to the horse. This is because certain chemicals in feeds such as oxalates and phytates bind calcium so that the horse can not digest it.

Calcium is not only involved in structural components of the body such as teeth and bones but is also extremely important in its dissolved form for processes such as muscle contraction, blood clotting and as a messenger molecule in cells within the body. So important is its role that the body keeps the levels of dissolved calcium between strictly controlled levels by a process known as homeostasis. The body regulates the dissolved calcium levels by drawing on that found in bone in times of need and by ensuring excess calcium is deposited in bone in times of good supply. A hormone called parathyroid hormone regulates this homeostatic process. Parathyroid hormone in conjunction with vitamin D helps to keep the balance of calcium to phosphorus in the bones in a ratio of 2:1.

### ***So what does calcium deficiency or imbalance cause?***

Calcium deficiency used to be very common in the days of yesteryear. In these times when people relied on horses for their transport and working needs it was commonplace to treat your horse to a nice warm bran mash after a hard days work. A mysterious disease called "bighead" was also very common in those times. Unbeknown to the horsemen was the fact that the disease and the feeding of bran mashes were inextricably linked. Bighead was eventually linked to the practice of feeding bran mashes and the term "bran disease" was coined. Bran disease, Big head or to give it its clinical name Nutritional secondary hyperparathyroidism is not seen as regularly these days but it still occurs more commonly due to calcium deficiencies or imbalances attributable to causes other than bran.

Bran adversely affects the calcium balance in more than one way. Firstly it is very high in Phosphorus, (as much as ten times the levels of calcium), and secondly this phosphorus binds to calcium forming the unabsorbable chemical calcium phytate. To further compound the problem the phytate can also inhibit the absorption of other nutrients such as zinc and copper. The combined effect of too much phosphorus and too little calcium promotes the reabsorption of calcium from bone to maintain the levels of dissolved calcium in the blood. The end result is weak rubbery bones that swell and cause the classic signs of big head. The bones of the head are not the only ones affected however as the long bones of the legs lose their mineral content too, lameness and fractures are encountered as well as the swollen head. Early in the disease process the only signs noted might be those of mild shifting lameness and the occasional swelling around a joint. Unfortunately bran is not the only foodstuff causing calcium balance problems with many grains and grasses also being attributable to cases of the disease.

Native Australian grasses are good sources of calcium for horses but unfortunately many horses are grazed on or fed hay made from introduced species of tropical and sub-tropical grasses. Many of these grasses contain a chemical that binds to calcium and makes it unavailable for absorption by the horse rather like phytates do in cereals such as bran. This chemical is called oxalate. The level of oxalate in different plants varies, but as a rule if the ratio between the calcium and oxalate is below 0.5:1 there is a risk of calcium deficiency. That is if the level of oxalates is more than twice that of calcium then the pasture may be unsafe. Feeding predominantly on these at risk pastures or hay from these pastures results in a calcium imbalance termed "oxalate poisoning". If plants contain very high levels of oxalates the poisoning can be very acute as it is absorbed into the blood where it lowers dissolved calcium levels. This leads to crystal deposition in the kidneys, muscle tremors, a staggering gait and lethargy. If treatment is not instigated death may ensue. Horses rarely eat plants that cause acute toxicity, as they are generally unpalatable.

To add to the problem many grains commonly fed to horses are also low in calcium and high in phosphate, (like bran) and majority contain some phytic acid which further reduces the availability of calcium by forming calcium phytate.

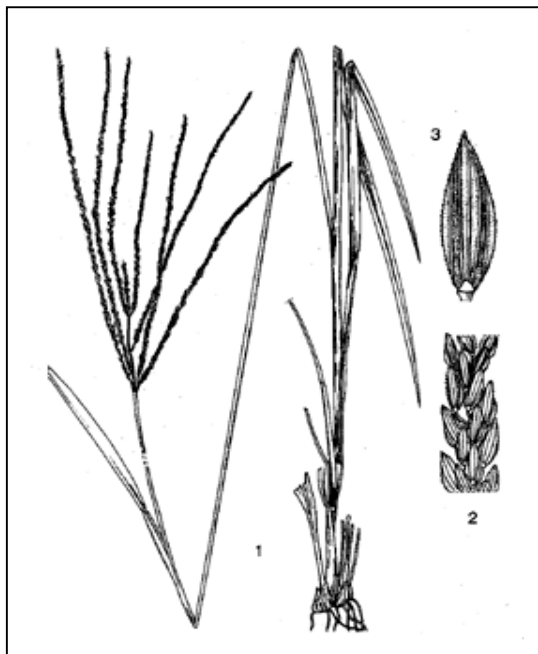
The end result in horses fed high grain diets on top of oxalate rich pastures is a chronic imbalance of calcium that may be attributable for shifting lameness, swollen joints and poor performance.

### ***What pastures should I be worried about?***

The main culprits are all introduced tropical or sub tropical species. The risk from these grasses is significant when they make up the bulk or all of the pasture or hay made available to a horse.

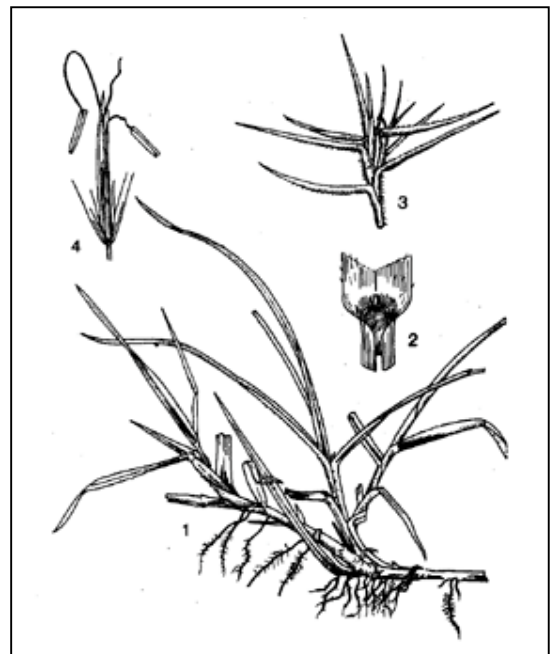
#### **PANGOLA GRASS**

This has a calcium to oxalate ratio of 0.37:1  
It is a low growing creeping perineal. It has an unusually high sugar content for a tropical grass, and is very digestible



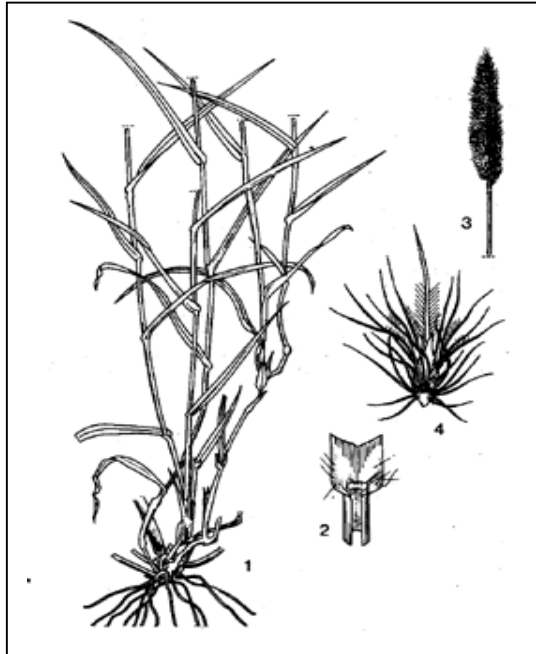
#### **KIKUYU GRASS**

This has a calcium to oxalate ratio of 0.27:1  
It grows well in summer when it goes off relatively quickly becoming unpalatable as it does. Kikuyu has been associated with the development of horse sick pastures.



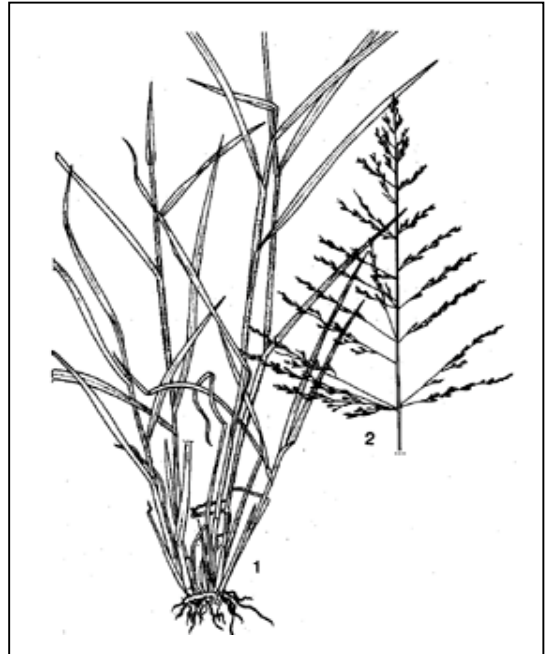
### BUFFEL GRASS

This has a calcium to oxalate ratio of 0.22:1  
It grows throughout Australia having bluish green to yellow leaves that taper to a fine point. It forms dense tussocks and has a tufted appearance.



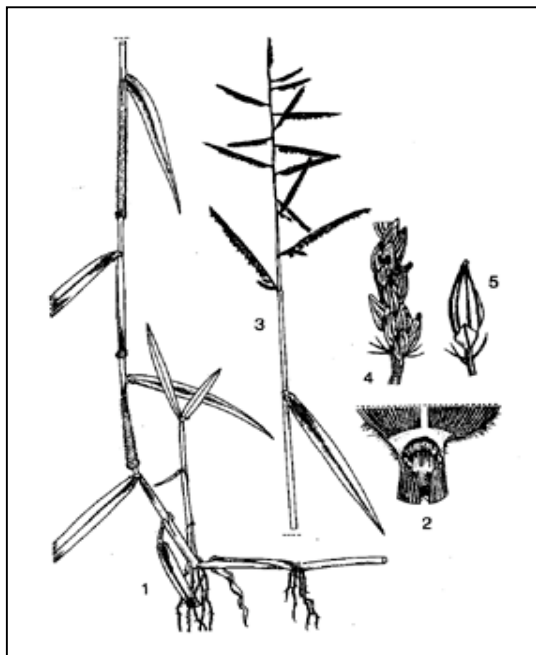
### GREEN PANICK

This has a calcium oxalate ratio of 0.31:1  
It has fine soft leaves, slender stems growing to 1.5 m and a richly branched root system that allows allowing rapid growth after light showers. The stem is hairy



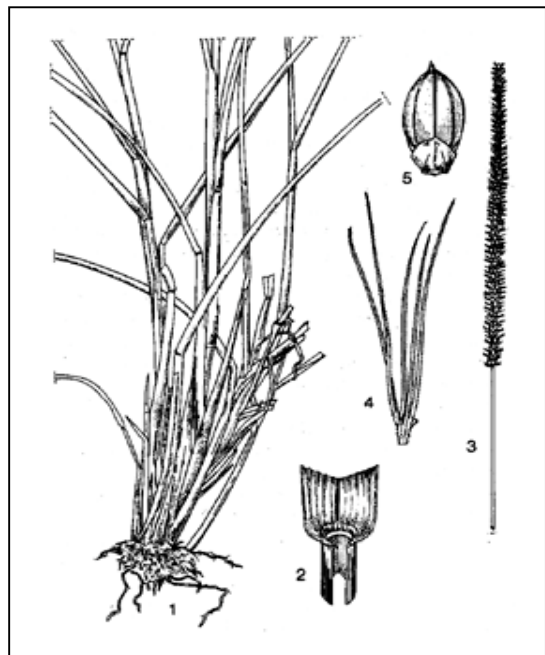
### PARA GRASS

This has a calcium oxalate ratio of 0.28:1  
A tall grass more common in the northern territories, Para grass is coarse with erect shoots bearing broad hairy leaves. Para grass is more commonly used in hay.



### SETANIA GRASS

This has a calcium to oxalate ratio of 0.15:1  
The setarias are tufted, with flattened and often red coloured leaf bases, and can grow to a height of over 2 m. They are found in most areas of Australia



### ***Prevention is better than cure.***

It goes without saying that it would be preferable to avoid pastures or hays containing the above grasses in significant proportions. However if this can not be avoided, (as is often the case) the effects of the oxalates can be countered by supplementing calcium and phosphate at a ratio of over 2:1. **This can be achieved through the use of products such as Cal-plus or Cal-plus with biotin.** It is also wise to avoid using fertilisers with high phosphate contents (eg chicken and turkey manure) to avoid upsetting the balance further with excesses of phosphate.

#### ***Handy Tip!***

Lucerne is an excellent choice of roughage for your horse. It contains excellent nutritive value as well as high levels of available calcium.

Horses on high-risk pastures, those fed a high proportion of grain, (such as racehorses), pregnant or lactating mares and animals less than one year of age or in training are at risk of calcium imbalances. Even with big head a relatively rare disease these days the appearance of mild or shifting lameness's, swollen joints and big knees due to progressive demineralisation of bones is still seen throughout the world. With the treatment period being up to a year for bones to regain their previous strength, prevention by supplementation remains the road to success. Couple this to the fact that too much calcium has no adverse effects on bone formation (provided that phosphate and energy intake are not extreme) and that deficiencies are regarded as a primary cause of weak bones and swollen joints during growth, can you afford not to supplement the diet.

#### ***What advantages does Cal-plus with Biotin have over Cal-plus?***



Hooves are made of the same substance as hair, Keratin. Dietary imbalances can also affect the quality of keratin produced by the horse with the end result of poor quality crumbly hooves. For the past ten or twenty years the importance of Biotin, Vitamin E, Zinc and calcium in the production of good quality hooves has been known. What have not been appreciated are the complex relationships between calcium and biotin in hoof formation however. Just as high phosphate low calcium balances have detrimental effects on the integrity of bone so too have hoof defects been attributed to phosphate excess and calcium deficiency. If you are considering calcium supplementation for your horse or horses and they currently have weak, Shaly, crumbling hooves or the tendency to throw shoes Cal-plus with Biotin provides the added advantage of biotin with the benefits of calcium to ensure you get the balance right.