

Calcium and Oxalate Pastures

By Dr John Kohnke BVSc RDA

Oxalate chemicals are contained in the leaves of rapidly growing tropical grasses and hay, such as Setaria, Buffel, Pangola, Para Grass, Guinea Grass, Kikuyu, Signal Grass and Green Panic. When consumed by horses, oxalates bind to calcium liberated from feeds or supplements during digestion in the small intestine. The oxalates form a calcium-oxalate complex which is not digested in the small intestine by enzymes. The complex then carries the calcium into the large intestine where it is liberated during microbial digestion. **Unfortunately, 90% of calcium is absorbed from the small intestine of the horse. The calcium-oxalate complex is not digested so that inadequate calcium is absorbed to maintain blood levels for muscle and tissue function.**

The lower blood calcium triggers the release of the parathyroid hormone from the pituitary gland, which then reabsorbs calcium from bone stores, especially the non-weight bearing bones of the upper face and skull. This results in weakening of the face bones, which are pushed out by the nasal contents as the horse grazes, to result in an enlarged nose and forehead, or 'Big Head'.

Handy Hint

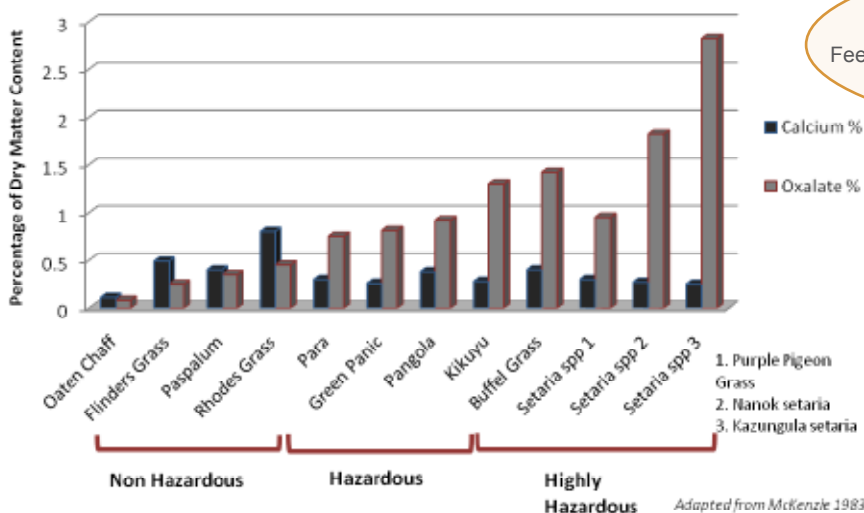
Rapidly Growing Grasses have high Oxalate Content

Some sub-tropical pasture grasses, such as kikuyu, contain more oxalates during periods of rapid, lush growth, such as during warm weather following rain or irrigation in spring or summer. Oxalate content increases when pastures are fertilised with nitrogen and phosphates, such as poultry manure or N-P-K fertilisers. However, kikuyu grass which is short and dormant is generally not dangerous, even if large quantities are grazed, as the oxalate content is low. Even lucerne contains some oxalates, but studies indicate that the amount taken in by horses even on lucerne based diets, does not cause oxalate-induced NSH.

Large quantities of oxalate chemicals in tropical grass consumed by grazing horses can cause a significant reduction in calcium uptake and over a 4-6 week period can lead to the development of weakened bones and the appearance of 'Big Head' or 'NSH'.

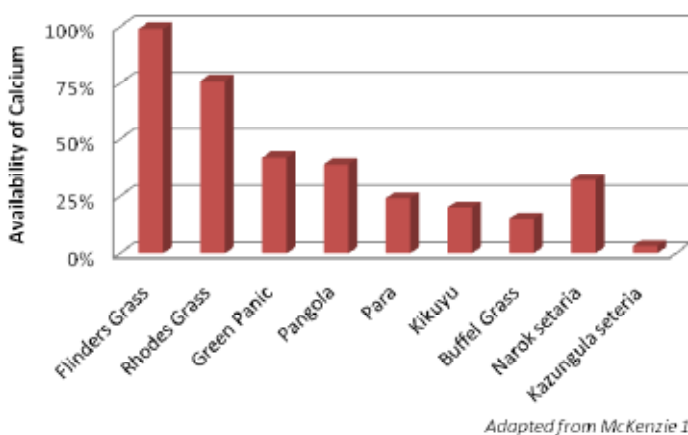
The tables below illustrate the relative calcium and oxalate content of common grasses and the comparative availability of calcium that can be absorbed from these grasses.

Calcium and Oxalate Content of Tropical Grasses

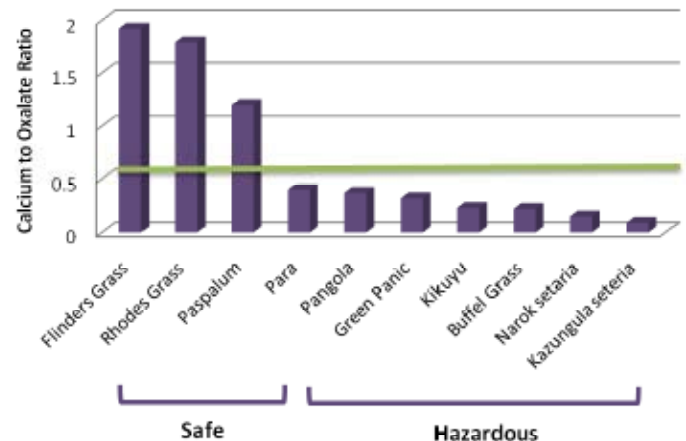


Grasses become hazardous when the oxalate content is greater than twice the calcium content (i.e. calcium:oxalate is less than 0.5) usually when total oxalate exceeds 0.5% on a dry matter basis.

Estimated Calcium Availability



Calcium to Oxalate Ratio



Handy Hint

Wheat Bran Based Feeds

Feeding large amounts, or more than 20% of the ration by weight, of wheat bran containing phytate and phosphorus can also result in calcium binding, producing similar symptoms to oxalate binding.

Handy Hint

Dolomite is not a suitable calcium source

Dolomite (an insoluble natural mineral mix of calcium and magnesium carbonate) is not effectively absorbed from the small intestine of horses and provides no worthwhile protection against 'Big Head'. Superfine limestone or calcium carbonate, mixed in a ratio of 2 parts dicalcium phosphate to 1 part limestone, and supplemented at the rate of 20-40g/100kg bodyweight daily on high oxalate feeds is more effective, as DCP acidifies the small intestine and promotes calcium uptake.

Kohnke's Own CAL-Xtra is an ideal bone mineral supplement for horses grazing long term on oxalate pastures.

Supplementation for Horses at Risk of 'Big Head' Syndrome

Where horses have no alternative other than to graze oxalate dominate plants in pasture, it is important to provide supplements of calcium and phosphorus, as well as vitamins A & D to counteract the reduced uptake of available calcium from the feed.

It is important to feed calcium supplements mixed into a small amount of hard feed, rather than allow horses to consume supplements by themselves provided in paddock feeders, or by high calcium blocks which are a 'hit and miss' way of supplementing calcium. Intake of oxalates just prior to or following the supplement can reduce the calcium absorption as oxalates taken in will bind the calcium released in the small intestine as pasture is grazed. It is best to bring horses into a yard and provide a hard feed containing calcium to ensure the optimum uptake of calcium in a 'bolus' of feed, not mixed with oxalates.

Symptoms of Oxalate Binding of Calcium

Ingestion of large amounts of oxalate chemicals from hazardous tropical grasses reduces calcium uptake and triggers parathyroid hormone to demineralise bone calcium stores.

Early Signs:

- Shifting, intermittent lameness
- Failure of young horses to grow to expected height

Advanced Signs:

- Fractures of pelvic bones, ribs and splint bones
- Spinal column collapse and hind limb in-coordination

'Big Head'

- Swollen forehead, nasal and jaw bones
- Loose teeth and inability to chew food, horse may 'slobber' when eating
- Distortion of the nose and noisy breathing due to restricted nasal passages and often a nasal discharge due to altered nasal drainage.

Once the symptoms of 'Big Head' are established, further bone demineralisation can be halted by supplementing with calcium, phosphorus, magnesium, Vitamin A and Vitamin D. However, severe facial distortion cannot be reversed in adult or aged horses.

Handy Hint

Replacement of Calcium into Bone Stores

In severe cases of NSH involving the limb bones and joints of working and growing horses, X-rays of the bones to determine their relative density should be taken before the horse is put back into training. It can take up to 12 months for calcium stores to be replenished and re-mineralisation is completed, to return bone strength and density. During this time, it is unwise to ride affected horses as bone fracture may occur, resulting in a fall and injury to the horse and rider.

Supplement Recommendations

High calcium commercial feed mixes are available in tropical areas, but to meet the need for energy and protein in horses grazing tropical pastures, these are expensive and have to be fed at the recommended amount on the bag label. Calcium lick blocks are an ineffective 'hit and miss' method of providing calcium. Economical mixes of calcium and phosphorus include 2 parts of dicalcium phosphate to 1 part of fine limestone, fed at up to 125gm (1/2 cupful) per 500kg bwt per day to high risk horses. Up to double this amount may be needed for 2-3 months to correct calcium deficiency and replenish calcium stores in severely affected horses. Molasses contains 10.3g calcium per litre and feeding up to 2 Litres of molasses per week to supplement pregnant and lactating mares is an optional additional source of calcium.

A new generation calcium supplement, Kohnke's Own Cal-Xtra™ is now available. It is formulated to provide a palatable low waste source of calcium, phosphorus, magnesium and Vitamins A and D. It is recommended for horses grazing on high oxalate pastures. It is the only acidified calcium supplement available to help assist calcium uptake from the small intestine.

- For **working horses**, a trace-mineral and vitamin supplement is recommended to make up shortfalls in the diet. Suitable supplements include **Kohnke's Own Cell-Vital®**, **Cell-Provide®** or **Aussie Sport™**.
- For **growing horses, breeding and lactating mares**, a supplement containing trace-minerals including copper, zinc, manganese, selenium, iodine and iron, as well as Vitamins A, D and E is recommended, such as **Kohnke's Own Cell-Grow®**. The unique 3 Supplet® pellet blend eliminates sift-out, dust and nutrient interaction when mixed into a hard feed and it is formulated to NRC (2007) nutritional standards for growing and breeding horses.

Handy Hint

Calculate Calcium Intake from Lucerne Hay

If you are providing lucerne hay as a paddock roughage, the rate of calcium supplementation can be reduced. Lucerne contains 12g/Kg of calcium or 24g per average biscuit, slice or wafer portion from a small bale. The **Kohnke's Own Cal-Xtra™** label provides specific information on calcium balances from lucerne and other supplements containing calcium.



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