

# Secondary Nutritional Hyperparathyroidism

## Big Head - Bran Disease - Oxalate containing plants

Big Head, as it is commonly referred to, is a complex nutritional problem that has its origins in a calcium – phosphorus imbalance in the diet. This is different to an absolute lack of calcium in the diet which results in different clinical signs.

Calcium and phosphorus are macro-minerals that are needed by the body in absolute amounts to perform the jobs required by the body. In addition they are required to be present in the correct ratio to each other in the diet.

Calcium and phosphorus are present in bone in a ratio of approximately 2:1 and bone is a reservoir of these minerals for a period of time if the diet is deficient. Blood levels of calcium are rigidly maintained at between 2.9-3.9 mmol/litre; phosphorus has a far wider range of measured values in the blood with no adverse effects.

### What causes Bran Disease?

When bran was traditionally a large part of the horse's diet, it was observed that many horses developed a "big head" which progressed over time to poor work performance and ultimately to fractured bones and euthanasia. The reason for it was unknown. It is only comparatively recently that the role bran plays in the development of big head has become understood.

Bran has ten times more phosphorus than calcium which immediately upsets the required ratio; in addition the phytic acid in bran binds both calcium and phosphorus and decreases absorption from the gut. Copper, zinc and manganese absorption are also affected by phytic acid so that big head becomes a multifactorial mineral imbalance. Grain also has high phosphorus and low calcium levels and contains phytic acid.

### Why do oxalate containing plants cause Big Head?

Some pasture plants contain oxalic acid which binds the calcium in the plant to form calcium oxalate which is stored in the leaf and stem. This insoluble form of calcium oxalate means that very little calcium is available in the plant for the horse to utilise. Some oxalate plants contain a large amount of calcium and if the calcium to oxalate ratio is 0.5:1 then it is relatively safe to graze. A flush of growth after rain tends to increase the oxalate levels – anecdotal evidence is that there is a higher incidence of Big Head after rain.

Some pasture plants contain a soluble form of calcium oxalate which can lead to acute oxalate poisoning. There is rapid binding of serum calcium to the oxalate which leads to a precipitous drop in blood calcium. Affected animals develop muscle tremors, staggers, depression and ultimately death due to heart failure. These plants have more than 2% dry matter oxalic acid and are generally very unpalatable. Horses have to be starving to eat them – it is a sign of very bad horse husbandry to have this situation develop.

### What are the clinical signs of Big Head?

It takes approximately two months on high oxalate pastures for signs to develop – generally it is six to eight months for most horses on moderate oxalic pastures. The chronically low blood calcium levels due to inadequate intake of calcium causes the parathyroid gland to release parathyroid hormone. This hormone stimulates the release of calcium from the bones to increase the levels in the blood stream. The calcium is mainly sourced from the long bones of the legs and

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the bones of the head. Over time as the bones become demineralised there is lameness, weight loss, swelling of the lower jaw bone, stiffness and short stepping. As the condition progresses both jaw bones and facial bones increase in size due to the laying down of fibrous tissue in place of bone. Arthritis develops and the parathyroid glands become enlarged – hence the correct name for this condition is secondary nutritional hyperparathyroidism. Left untreated, the bones fracture and horses need to be euthanased.

## What is the treatment for this condition?

Veterinary examination is needed to confirm that this is indeed the problem and then attention is directed to correct the dietary deficiencies and imbalances. Adding calcium alone is often inadequate especially in long standing chronic cases. A balanced multi-mineral and vitamin supplement is required to address the overall nutritional status of affected horses.

Some swellings of the head may never totally resolve and it takes up to twelve months for bones to remineralise. Horses must not be worked in this time and they must be given absolute paddock rest to recuperate. It is important that they have some free ranging movement as the bone remineralises in order to strengthen and remodel the bones back to normal anatomy and physiology.

## What pasture plants contain oxalates?

Native pasture plants do not contain oxalates – the problem plants are subtropical pasture plants introduced for grazing cattle on. Cattle are more resistant to oxalic acid activity due to their rumen digestion in the foregut.

If horses are on these pastures make grassy hay a major part of their diet – do not fertilise with poultry manure or superphosphate – place the horses on a well-balanced multi-mineral vitamin supplement – and where possible reseed pastures to non oxalic acid containing plants.

The following is the average calcium to oxalic acid ratio in different pasture plants:

- Kikuyu 0.23:1 – there is rapid summer growth and it becomes rank and unpalatable fairly quickly – widespread pasture plant
- Buffel 0.22:1
- Pangola 0.37:1
- Green Panic 0.32:1
- Para Grass 0.29:1
- Pig Weed 4.5 -9.4% dry matter –causes the acute oxalate poisoning.
- Setaria 0.15:1

Setaria has four main cultivars – Nandi, Naok, Solander and Kazungula. The latter has the highest level of oxalic acid and can be up to 7% DM. It grows only in high rainfall areas and needs more than 1100mm rain annually. It is extremely toxic to horses and lactating cows. It is highly recommended that horses do not graze this cultivar at all as no amount of mineral supplementation appears to be able to stop Big Head developing.

Oxalates in general are more concentrated in the leaves than in the stems of plants, the levels are higher in younger plants, and phosphorus and nitrogen fertiliser stimulate higher oxalate levels.

Don't graze horses on fertilised pastures, don't graze at night when oxalate levels are elevated and do not graze equines for more than one month in any summer on Kazungula Setaria pastures.

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