

Big Head or Bran Disease

(Nutritional Secondary Hyperparathyroidism)

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This condition occurs in horses when they are:

1. **Fed high phosphorus diets.** These include diets high in grain or bran. Grains and bran are high in phosphorus and low in calcium. They also contain chemicals called **phytates**, which bind to calcium in the gut, forming **calcium-phytate** compounds which cannot be absorbed by the horse.
2. **Grazing tropical and subtropical grasses** that are high in oxalates which bind calcium and prevent its absorption. Many plants contain oxalates as well as calcium. For the pasture to be 'safe', ie it will not cause a calcium deficiency, the oxalate levels must not be more than double the calcium levels. This means the **calcium to oxalate ratio** should be greater than **0.9: 1**. The table below shows the *calcium to oxalate ratios* of some common grasses. The unsafe grasses all produce a calcium deficiency in horses and in most cases a phosphorus deficiency as well.

GRASS	TOTAL OXALATES	CALCIUM:OXALATE RATIO
SAFE		
Flinders Grass	0.25	1.92
Rhodes Grass	0.45	1.79
UNSAFE		
Pangola	0.92	0.37
Green Panic	0.81	0.32
Kikuyu	0.75	0.29
Buffel	1.42	0.22
Setaria	2	0.09

STAGES IN THE DEVELOPMENT OF BIG HEAD:

1. Oxalates in grasses and phytates in oats and bran bind calcium in the gut.
2. The calcium in the feed is not absorbed from the gut into the blood.
3. Low blood calcium levels (hypocalcaemia) stimulate the parathyroid gland to release parathyroid hormone. This hormone dissolves the calcium in the bones so it can go into the blood to keep blood calcium levels at the correct level for heart and muscle function. The facial bones are replaced with fibrous tissue which appears swollen compared to bone.
4. Limb and facial bones become demineralised - worse in heavy-sweating horses and those with a higher calcium demand - such as pregnant and lactating mares.
5. Clinical disease.

CLINICAL SIGNS: include, but not limited to the following -

- loose teeth and shifting, intermittent lameness
- failure to reach expected height in weanlings and yearlings
- swollen facial bones, thickened jaw bones and difficulty chewing
- ruptured tendons and increased risk of traumatic and spontaneous fractures
- obstruction of nasal passages, which may cause a noise and/or a discharge

TREATMENT AND PREVENTION:

1.. Veterinary diagnosis - X rays may be required to rule out other possible causes and to determine the severity and degree of involvement of other structures.

2. Blood, urine and faecal tests may be necessary to confirm the diagnosis and assess response to treatment. It can take up to 12 months for remineralisation of bone to occur, and horses must not be regarded as sound and safe for riding until this has occurred.

3. Limestone or dolomite at 300 grams per day may be necessary to correct the calcium deficiency.

4. If grazing hazardous pastures, a calcium supplement such as limestone should be fed at a rate of 100 grams per day. This should be undertaken with veterinary supervision to ensure that adequate supplementation is occurring, as the dose will vary depending on seasonal and dietary conditions.

5. Caution should be exercised when considering fertilizing pastures such as kikuyu with high phosphorus fertilizers such as poultry manure or superphosphate.

6. The daily dietary **calcium to phosphorus ratio** should exceed **1.2 : 1**. It should be up to **2.5 - 3:1** in high risk situations.

PASTURE AND LIME: Plants absorb minerals such as calcium and phosphorus from the soil. The best absorption occurs when soils are not too acid (pH range 5.5 to 6.5). Lime will raise the pH of acid soils so that the plants can absorb the soil nutrients better, but it will not affect soil phosphorus levels. To be of any value, lime must be cultivated into the ground and it may still take up to 2 years for a change in soil acidity to occur. Lime which is top-dressed onto pastures, without cultivation, may take over 12 months to reach the root zone of the plants. Further applications of lime are required every 4 to 5 years.

SUPPLEMENTATION: This offers a better chance of raising calcium levels than liming paddocks. Several different systems for horses on unsafe pasture have been trialed in Australia. One that has been successful in correcting nutritional secondary hyperparathyroidism and big head in horses grazing hazardous buffel grass is as follows:

330g CaCO₃ (calcium carbonate or lime)
+
670g dicalcium phosphate (DCP)
+
1.5kg molasses per horse per week.

An excellent review on pastures and oxalates has been published by Dr Ross McKenzie from the Queensland Dept of Primary Industries.