A grain feeding hint: add finely ground limestone

Peet

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A grain feeding hint—add finely ground limestone

When sheep are fed cereal grain diets only, as is often the case in Western Australia, calcium deficiency can occur. This can appear as hypocalcaemia—deficiency of calcium in the bloodstream—in lactating ewes within 20 days of going on to diets of cereal grain only. These animals may collapse and die from milk fever if untreated.

Other categories of sheep of all ages and sex, eating only cereal grain diets, can react similarly when they are driven, yardsed, transported or temporarily deprived of feed or water for management procedures.

A less obvious and possibly more economically important factor associated with cereal grain feeding has emerged from recent trial work at the Animal Health Laboratories. This is illthrift—the failure to grow to expected potential—and lack of appetite in sheep on an oats-only diet. In the trials, such sheep were compared with control sheep on identical grain diets but supplemented with 1 to 2 per cent of finely ground limestone—"limestone flour".

Background

The practice of handfeeding sheep with oats, wheat and barley during summer and autumn for survival during drought, and for carcass weight gain for the export shipping trade, is commonplace in Western Australia. Also, farmers have been using more land for cereal crop production, so more sheep are carried on cereal stubble paddocks as pasture paddocks disappear.

Pastures, especially those containing clover plants, weeds such as capeweed and edible bushes, contain adequate calcium for sheep.

Cereal grains contain as little calcium as 0.04 to 0.07 per cent. They also contain disproportionately high amounts of phosphorus ranging from approximately 0.26 to 0.38 per cent. This can cause a dietary imbalance if not corrected by supplementation. Lupin seed also contains little calcium, but the imbalance with its phosphorus component is not as marked.

Calcium deficiency effects

Calcium and phosphorus are essential components of the animal's body, stored in bones and teeth.

Calcium plays a vital role in muscle contraction, maintenance of the conscious state and other essential body functions.

When no adequate source is available from the diet, the animal draws on its bone reservoir. This reaction is brought about by the parathyroid gland secreting hormones. These calcium reserves are unavoidably linked with phosphorus, and apparently magnesium, in the bone reservoir and are mobilised into the bloodstream to restore the deficient blood calcium levels.

The excess phosphorus is eliminated in phosphate form through the urine, a predisposing factor to the formation of phosphate stones in the kidney, bladder and urethral tract, causing water-belly in male sheep.

Sheep of all ages and sexes on unsupplemented cereal grain diets are susceptible to the acute form of hypocalcaemia—"milk fever"—mentioned earlier. The longer term effects—over four to five months—of these diets were discovered originally by CSIRO in drought feeding trials to produce bone and teeth deformities. Such deformities are often irreversible due to the continual leaching of calcium and phosphate from these reservoirs.

Recent research

Field investigations have shown illthrift and mortalities in sheep of all ages and body condition feeding on cereal grain diets and with no access to calcium over the past several seasons. Muscle damage—myopathy—was also a common finding in these animals, and could not be related to the usual predisposing factors such as selenium and vitamin E deficiency, lupinosis, inherited muscular dystrophy and over-dripping.

Previous small trials designed to investigate other problems at the Animal Health Laboratories, but all coincidentally on grain-based unsupplemented diets, have associated illthrift and deaths with lowered blood calcium levels.

Severe bone softening was evident in 12 of 20 sheep which died in one trial after four to five months on the calcium deficient ration. This result confirmed the original CSIRO work.

Blood calcium levels from similar sheep in "on farm" situations did not show the expected obvious severe hypocalcaemia reproduced in the laboratory sheep until just before death.

An explanation may be that the laboratory sheep had been housed indoors so a vitamin D deficiency resulting from inadequate sunlight...
exposure may have complicated the experiment. Vitamin D is essential for healthy bone and tooth development. Its deficiency was identified recently in stud rams in Western Australia which had been housed for six months on an otherwise adequate diet.

The single calcium deficiency factor in cereal grain diets was then further investigated at the Animal Health Laboratories using weaner wether sheep. These were dosed with vitamins A, D and E, drenched for worms, bailed against cobalt and selenium deficiency and divided into two groups.

Both groups were fed identical oats-only diets after a three week gradual transition from cereal chaff to prevent “grain poisoning” or acidosis. Then one group was supplemented with 1 per cent finely ground limestone, added to their ration of 0.8 kg oats per head per day. This was increased to 1 kg per head per day after two months, and the limestone increased to 2 per cent in the supplemented sheep. The analysis of the oats showed a calcium content of 0.07 per cent, phosphorus 0.31 per cent and crude protein 11 per cent.

Each group comprised six sheep. The total weight of Group 1 sheep (no calcium) was 178 kg compared with 166 kg in Group 2. Three months later Group 1 sheep weighed 198 kg compared with 219 kg for Group 2.

The Group 2 sheep supplemented with calcium gained about 11 kg per head while the unsupplemented group actually lost weight at first, then finally gained about 5 kg per head—less than half the supplemented group average.

An obvious lack of appetite effect in Group 1 was evident two weeks after both groups started their oats-only diets. Group 2 rapidly consumed their daily allowance while Group 1 always left grain. The summarised weekly consumption differences are evident in Figure 1.

Blood calcium levels after three months showed relatively normal values. This tended to reflect the field experience and the balancing action of the parathyroid glands. Apparently it is only when these animals are stressed in situations described above, that the sudden hypocalcaemia—“milk fever” form—occurs. Only then do their blood calcium tests become a valid and reliable tool to diagnose the problem.

Long term—five to five months—cereal grain feeding may produce relatively low blood calcium levels in some of the sheep, but damage to bone, teeth development and growth rate may have occurred already. Unusual lameness involving front and/or back legs has been reported from field cases. This may be another symptom or indicator of the problem.

Prevention
Finely ground limestone—calcium carbonate—contains about 33 to 34 per cent calcium. It coats grain like talcum powder. It can be poured over grain troughs or on grain trails but may need dampening down on windy days. It is cheap, non-toxic and can prevent the ill thrift and eventual deaths observed by the Department of Agriculture’s Animal Health Laboratories and by CSIRO.

Responses in field situations are encouraging, but long term leaching of calcium causes bone and tooth damage which will not repair quickly. Permanent stunting can occur on unsupplemented grain diets fed over four to five months. Prevention is the answer, and calcium should be fed from the start of grain feeding.

Builders’ slaked lime, coarsely ground limestone and sterilised bone meal are not recommended. Previous results have shown that finely ground limestone which can pass through a 100 mesh sieve is best. Superphosphate is not recommended since it has been shown to produce kidney damage and deaths in sheep.

These sheep (above left) were the same weight when the trial started. The bigger sheep gained 11 kg in 3½ months, the other gained 5 kg. Finely ground limestone (above right) coats grain like talcum powder.

References

