Project summary

Managing trace element deficiencies in sheep

Background

Soils of the coastal and red-gum plains of East Gippsland in Victoria, are known to be low in the trace elements selenium (Se), cobalt (Co) and copper (Cu). This can lead to deficiencies in livestock.

Most producers in the region treat stock with selenium and vitamin B12/cobalt* contained in various animal health products, but many are not confident they are implementing the most appropriate and cost-effective preventative program for their individual farms. Pastures are periodically top-dressed with fertiliser containing copper (and molybdenum) to overcome the deficiency for pasture production. Additionally, this has helped reduce the incidence of copper deficiency in stock.

*Cobalt is required by rumen microbes to synthesise vitamin B12.

The demonstration sites

The Bairnsdale Bestwool/Bestlamb group in East Gippsland set out to demonstrate best practice for the diagnosis of trace element deficiencies in sheep flocks and to conduct cost-benefit analysis of preventative treatment options. The trace element statuses of 10 flocks were determined from a blood testing program in spring 2020. Blood samples were collected from lambs pre-marking and pre-weaning.

Marginal blood selenium levels (GSHPx between 20 and 50 U/gHb) were found in composite, first-cross and Merino lambs on five farms and deficient levels (less than 20 U/gHb) were identified in Merino lambs on one farm. Marginal blood vitamin B12 levels (between 200 and 400 pmol/L) were found in lambs on one farm. Blood copper levels were also tested, and all flocks had adequate levels. However, as sheep can regulate blood copper from stores in the liver, liver samples are the best method to diagnose copper deficiency.

After weaning, five producer demonstration sites were established to assess the effect of selenium and vitamin B12/cobalt supplementation on sheep liveweight gains, wool production and reproductive rate. Copper was not included in the treatments. Caution is required if supplementing stock directly with copper as several sources can accumulate and become toxic.

Four farms compared a 'control' group of lambs (no trace elements), a 'farm practice' group (occasional use of short-acting products) and a 'long-acting' group (Se and Co rumen pellets). The fifth farm compared two different short-acting injection regimes and a long-acting treatment and did not have a control group (as lambs were deficient in selenium and cobalt). Trial sheep were blood sampled three months and 12 months post treatments.

Demo sites were monitored until June 2022. This included two springs and lasted until sheep were nearly two years old. During the trial period, above average rainfall and pasture growth were experienced – conditions which can increase the risk of a selenium or cobalt deficiency occurring.

Results

On the four farms with a control group, no major production responses were measured from administering selenium or cobalt. At the three and 12 month blood sampling times, none of the control sheep were deficient in selenium or vitamin B12 and were mostly at the low end of the normal range. The fifth farm, with no control group, found that the two regimes of short-acting injections used regularly were able to maintain adequate blood selenium and vitamin B12 as did the long-acting rumen pellets, but were a more expensive option and involved more labour to yard and inject sheep.

There were no production benefits from administering selenium supplements where sheep tested marginal or at the low end of the normal range for selenium. This is consistent with findings of experiments conducted in the 1970s and 1980s in Victoria (Department of Agriculture), where responses were only obtained in flocks with very low selenium nutrition (blood GSHPx < 20 U/gHb).

As a result, group members have modified their animal health programs to be more targeted with the use of selenium or vitamin B12/cobalt in their flocks.

Key outcomes

- The response trials highlighted that where lambs tested marginal or at the low end of the normal range for selenium or vitamin B12, there were no production benefits from supplementing selenium or vitamin B12 at weaning.
- Although the East Gippsland region has some soil types that are low in trace elements, deficiencies in sheep do not occur every year and different farms will have different risk factors. Blood testing is an important diagnostic tool to determine the trace element status of young sheep and to determine whether they are at risk.

Things to consider

- Managing the risk of a trace element deficiency in stock is not always straightforward. Even if a region has some soil types that are naturally low in selenium or cobalt, the occurrence of deficiencies in stock can be very sporadic, seasonal, and can be influenced by different pasture species/crops on the farm, fertiliser history or class of stock.
  Early diagnosis of a deficiency and treatment are essential. If not treated, trace element deficiencies cause sub-optimum growth rates in lambs and may lead to higher mortality. Conversely, treating sheep that are not deficient increases the cost of production of meat and wool and in the case of copper, could be toxic.
- If you are uncertain about whether your stock may be at risk of certain trace element deficiencies it is important to seek expert advice. A veterinarian can collect blood samples (for selenium or vitamin B12) or liver samples (for copper) for laboratory analysis. A veterinarian can then diagnose if selenium, vitamin B12 or copper are an issue or not and if so, can help work out which product/s will supply the required trace elements to cover the main risk period most efficiently and at the lowest cost.

Figure 1 Administering selenium and colbalt rumen pellets to lambs to set up the repsones trials.

Risk factors

In marginal Se and Co areas, rapidly growing lambs and weaner sheep are most at risk.

Conditions that can predispose sheep to selenium deficiency include:

- soil type – sandy or granite soils
- seasonal variation – lowest levels of selenium in pastures occur in spring and summer
- variation between years – white muscle disease in lambs and calves in spring is most prevalent in years when there is good autumn rainfall and abundant clover growth in spring
- heavy or long-term applications of fertilisers containing sulphur (e.g. superphosphate or gypsum), decrease the concentration of selenium in pastures and may also decrease the uptake of selenium by livestock
- Pasture type – clover dominant pastures: clovers have lower Se concentrations than grasses.

Conditions that can predispose sheep to vitamin B12 deficiency include:

- soil type – coastal calcareous sands, sandy or well drained soils
- seasonal variation – cobalt in pastures and plasma vitamin B12 in livestock is lowest in spring
- variation between years – seasons with lush pasture growth favour development of cobalt deficiency. This is due to animals ingesting less soil when grazing lightly stocked, rapidly growing pastures. Soil provides a more concentrated source of cobalt to the ruminant than pastures
- pasture type – grassy pastures: grasses have lower Co concentrations than clovers.

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