

Dying for some selenium

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A dramatic reminder of the extent White Muscle Disease (WMD) can affect beef cattle and the importance of maintaining appropriate selenium supplementation.

HISTORY

Three 4-6 week old Angus beef calves born out of first calving heifers died acutely over the span of a week in mid-December 2018. The mob of approximately 80 heifers was being grazed separately on the flats and monitored every one to two days. The farmer hadn't noticed any indication of illness in the calves prior to death. The calves and heifers were on good quality pasture behind a break, plenty of feed was available and good pasture residuals left behind. Very few, if any, toxic weeds were evident in the paddocks. The weather had been calm recently. Previous to this case, the only selenium supplementation provided was through fertiliser.

CLINICAL FINDINGS

Three dead calves were presented for examination with the freshest having died sometime in the last 48 hours. For relevance and dependability of findings only the freshest calf was autopsied, however the other two calves were still in okay condition with mild-moderate diffuse emphysema, despite being dead for 5-7 days.

On presentation, the freshest calf was in rigor-mortis with no other noteworthy post-mortem changes

evident externally. Upon opening the thoracic cavity, several litres of clear, straw-coloured watery transudate spilled from the pleural space. Some of this was collected into a sterile pottle – within which the fluid coagulated after thirty minutes or so. Pale striations were evident grossly on the heart muscle and a sample of affected muscle was collected for histopathology alongside samples of lung, liver, spleen, kidney, skeletal muscle, rib, blood and brain. No other significant findings were evident on post-mortem examination.

RESULTS & DIAGNOSIS

Initially the pleural fluid was cultured, however no significant bacterial isolates were detected ruling out acute bacterial pleuritis. On histopathology the lung was markedly congested with pronounced interlobular

ANIMAL I.D.	SERUM SELENIUM (nmol/L)	
Calf 1	80	L
Calf 2	111	L
Calf 3	112	L
Calf 4	142	
Calf 5	173	
Cow 1	54	L
Cow 2	43	L
Cow 3	42	L
Cow 4	91	L
Cow 5	54	L
Mean	90.2	
Adequate Range	140 - 2000	

Table 1: Serum selenium levels in the mixed age cows and their calves

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oedema. The heart muscle was severely compromised, with advanced mineralisation of roughly 60% of the myofibers and localised areas of fibrosis and cardiac necrosis. Based on these findings a diagnosis of severe, chronic, nutritional cardiac myopathy was made - likely due to severe selenium deficiency of the calf during development in utero.

Liver selenium tested on the fresh sample submitted from the calf was undetectable by the lab ($<30\text{nmol/kg}$); an incredible result considering the adequate reference range of liver selenium is approximately $850 - 15,000 \text{ nmol/kg}$. On the 27th of December, 2018 follow-up bloods were taken from the mixed age cows and their calves, grazing on the hill blocks. These calves had been given a short acting selenium injection at the recommended dose rate approximately one week prior to this testing, no supplementation had been given to the MA cows as of yet.

In mid-February, five ovine liver samples from fattened lambs were tested at the works – all liver selenium levels were well within the reference range. These lambs had not received any additional selenium supplementation and grazed the same paddocks as the cattle.

DISCUSSION

Selenium deficiency, also known as White Muscle Disease, is a widely understood condition in New Zealand. The impact of low selenium levels in cattle ranges from ill-thrift in young stock to muscular dystrophy – both cardiac and skeletal, compromised immune function, embryonic mortality, retained foetal membranes and Heinz body anaemia. Muscular dystrophy can materialise in a variety of ways including:

- Sudden death – due to myocardial dysfunction
- Lameness – if skeletal muscle is significantly impaired
- Pharyngeal paralysis – with the animal appearing to be “starving”
- Dyspnoea if the diaphragm is affected, which can also lead to aspiration pneumonia

In this instance calves were dying due to myocardial dysfunction, with no other definitive manifestation of clinical deficiency being reported on this farm. Unusually the selenium levels in the lambs were adequate despite no additional supplementation – typically sheep are more susceptible to WMD than cattle.

The only consistent selenium supplementation provided to the cattle up until this time has been via fertiliser, however from now on they will be giving a long acting selenium injection to breeding stock at



Heart of the affected calf, showing the pale striations that are characteristic of white muscle disease.

scanning time. The farm hasn't pregnancy scanned their cattle before, but will be doing so this season. Historically they have averaged roughly 90% at calf marking.

Advice at the time of diagnosis of selenium deficiency was to administer short-acting supplementation to the heifers and cows to get them through mating, with a long-acting selenium injection to be given at scanning time. Nevertheless, no short-acting selenium was given to the breeding cattle. The calves were given a short-acting selenium injection in late December which was repeated in January, with a long-acting selenium injection to be given at weaning. Although no further testing was performed following their second selenium injection, the calf growth rates have been the best the farm has had for some years.

REFERENCES

Watt B & Appleston J. *Selenium deficiency in cattle and sheep*. Proceedings of the AVA Annual Conference, Cairns, 2013. Page H2.1.1

