Smooth witchgrass toxicity

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Background

Panicum sp. is an annual summer grass weed commonly found in the North Island. It is often found in areas which have been defoliated (for example by flooding or chemical or harvesting methods). It was first recorded in 1946 and it was believed to be introduced by aircraft returning from World War 2.

Panicum dichotomiflorum has been linked to crystal associated hepatopathy causing photosensitivity.

In 1991 the Ruakura MAF Tech laboratory identified the crystals after extracting bile from cannulated sheep fed a 95% diet of Panicum sp.

Case history

On 14 January 2013 Hunterville Vet Club (HVC) was called to investigate sudden death with signs of photosensitivity in Romney ram lambs grazing predominantly a grass species not seen on this farm previously.

The mob of 300 Romney ram lambs had been put on a paddock that had been sown with plantain in spring 2012. This paddock was previously a winter rape paddock and had been cultivated eight times over the last 20 years.

After sowing, grass weeds had emerged and a weed spray called Pycus (active ingredient 120g/L oxyfluorfen, 40g/L picloram) was applied to remove these weeds on 21 December 2012. After spray application an annual grass weed had grown extremely quickly in what was a very hot dry summer. It had established a dense carpet of estimated 4000kgDM/Ha in this paddock and was the predominant plant species.

Small quantities of other broadleaf weeds also identified in the paddock included Amaranthus, Mayweed, Water Pepper, and Storksbill. Some plantain was present under the grasses.

The lambs were moved into the paddock on 7 January 2013 and deaths were recorded from 13 January 2013. Post mortem examinations of some lambs were performed on 15 January 2013.

Gross findings were significant skin lesions of photosensitivity but no obvious changes to internal organs were noted.

Histological findings: Mild liver damage not considered significant enough to cause photosensitivity, coccidiosis, with several stages of the life cycle present in the intestine and some inflammation of the lymph nodes possibly from nematode challenge.

A differential diagnosis list was developed and included toxicity due to:

- Sporidesmin
- Blue green algae
- St John’s Wort
- Storksbill
- Parsley
- Parsnip
- Buckwheat
- Celery

The lambs were removed from this paddock. On 22 January 2013 grass samples were taken for plant identification.

The plant was identified at Massey University as Panicum dichotomiflorum, commonly known as Smooth Witchgrass.
I contacted Mark Collett at Massey University to determine if this plant had any known pathogenicity. The plant has been recognised in several publications to have a by-product of its metabolism by ruminants causing obstruction to the bile ducts of the liver and often secondary photosensitivity.

The picture therefore was now a bit unclear. The first histological report suggested no liver involvement and therefore a primary photosensitivity, but the obvious plant of choice had documented cases of secondary photosensitivity.

On 27/1/2013 blood samples were taken from three lambs and these were then humanely euthanased and autopsies were completed.

**Gross findings**

Two of the three lambs autopsied had significant jaundice through the entire body cavity. Skin necrosis was also significant on the face and axilla of all three lambs. No obvious swelling of the liver was visible. These findings further supported a secondary photosensitivity.

**Blood sample results**

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Reference Range</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Globulins</td>
<td>72</td>
<td>54</td>
<td>69</td>
<td>42–58</td>
<td>g/L</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>127</td>
<td>4</td>
<td>9</td>
<td>0–8</td>
<td>Umol/L</td>
</tr>
<tr>
<td>GGT</td>
<td>76</td>
<td>142</td>
<td>91</td>
<td>32–70</td>
<td>IU/L</td>
</tr>
</tbody>
</table>

Blood samples showed elevations in globulins and bilirubin and minor increases in GGT.

**Histological results**

*(copied from pathologist report)*

**Liver:** Small and medium bile ducts occasionally contain yellow-brown material, eosinophilic floccular material or clear radiating to acicular clefts. Similar clear clefts are occasionally seen within biliary epithelial cells. Other biliary epithelial cells are often swollen and crowded with large hyper chromatic nuclei (regeneration). Rare epithelial syncytial cells are observed. Occasional small bile ducts are surrounded by concentric fibrosis. Peribiliary connective tissue contains low numbers of lymphocytes, macrophages and plasma cells. Occasional multinucleated cells with clear clefts are present. Hepatocytes, Kupffer cells and occasional canaliculi multifocally contain yellow-brown pigment. Rare hepatocytes are hypereosinophilic and rounded up (apoptosis).

**Gall bladder:** The gall bladder wall is thickened by clear space (oedema) and ectatic lymphatics and eosinophilic fibrillar material (fibrin). Many neutrophils and fewer macrophages and lymphocytes transmigrate the mucosa, expand the submucosa and dissect between the layers of the muscular tunic.
Skin: Sections of ear and haired skin show areas of full thickness epidermal necrosis with deep infiltration of neutrophils, fibrin, karyorrhectic debris and myriad bacteria into the underlying dermis. Follicles and small vessels within the margins of affected areas are mineralised, while dermal arterioles and small arteries display fibrinoid necrosis and contain fibrin thrombi.

Kidney: Proximal tubule lumina and tubular epithelial cytoplasm multifocally contain yellow-brown globular pigment and rarely contain clear crystalline clefts. Cells lining affected tubules are occasionally vacuolated with vesicular nuclei (degeneration). Collecting ducts multifocally contain basophilic granular material (mineral). There are scattered interstitial aggregates of lymphocytes and plasma cells.

Colon: Crypts are multifocally ectatic and contain degenerate neutrophils and eosinophils admixed with mucin. Coccidial gametocytes and oocysts are scattered among the enterocytes. Moderate numbers of lymphocytes, plasma cells and eosinophils expand the lamina propria.

Heart/lung muscle: Unremarkable.

Outcome

After consultation with the pathologist about the identification of the plant as smooth witchgrass, a histological report confirmed that there was bile duct inflammation and obstruction with crystals detected in or near the ducts as well as in the kidney (which is the pathway of excretion of these crystals.) There were only minimal changes to the morphology of the liver.

One hundred and twenty one of the 300 lambs died or were euthanased.

The source of the Panicum spp. plant was up for discussion.

Conclusion

The lambs died of a secondary photosensitivity caused by Panicum dichotomiflorum (smooth witchgrass), due to crystal associated cholangiohepatopathy (bile duct obstruction by the epsimilagenin glucuronide crystals).

Discussion

This case raised two points:

1. When the obvious diagnosis is staring you in the face, but the samples/reports have not confirmed this diagnosis, then repeat the sample collection or ask for a repeat examination of the samples. The samples may not represent the full picture, or the lesions may be subtle, especially in an acute death situation.

2. Gross findings are just as important as histological findings at confirming a diagnosis.
Acknowledgements

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Hunterville Veterinary Club.

References
