During a routine flock visit, a farmer observed that one of the eight tooth Bapedi rams had been losing body condition despite being separated from the flock and fed supplementary feed. The ram’s body condition score was assessed as 2 out of 5 (one point less than the average of the rest of the rams) and the teeth appeared normal with no excessive wear. The rumen was assessed by auscultation, palpation and ballottement where a foreign body (approximately 20 cm × 5 cm – 10 cm) was clearly palpated and ballotted. A rumenotomy was performed and a large mass of tightly compacted foreign matter and plant material was removed. The mass consisted of synthetic fibre, plant material and calcium phosphate (50.5%). It appeared to have formed as the result of the ingestion of a synthetic fibre which formed the nidus of a concretion. This was probably the result of deficient nutrition, with the rams eating the synthetic fibre in an attempt to increase feed intake. The ram recovered uneventfully after the rumenotomy was performed and supplementary feeding.
was assessed as 2 out of 5 and the teeth appeared normal with no excessive wear. On examination of the rumin by auscultation, palpation and ballottement, a foreign body (approximately 20 cm × 5 cm – 10 cm) was clearly palpated and ballotted.

**Surgical treatment**

The left paralumbar fossa and surrounding area was shaved and scrubbed. The ram was anaesthetised using a combination of ketamine (4.00 mg/kg) (ketamine base 100 mg [hydrochloride form], benzethonium chloride 0.01% m/v) (Anaket-V; Bayer AH, Isando, South Africa) and valium (0.25 mg/kg) (diazepam 10 mg, ethanol 19.20% v/v) (A-Lennon; Lennon Medicines, Sandton, South Africa). An inverted L block was administered in the area of the left paralumbar fossa using Lignocaine 2.00% (Lignocaine HCl 2.00%; Bayer AH, Isando, South Africa) and the area was surgically prepared. A rumenotomy was performed and a large mass of tightly compacted foreign matter and rumen contents was removed. The rumen papillae appeared healthy and the rest of the rumen contents appeared normal. The rumen was stitched with catgut and an inverting continuous suture pattern. The musculature and subcutaneous tissue was stitched with catgut and a simple interrupted suture pattern. The skin was stitched with nylon and a blanket stitch pattern. The ram made a full recovery and gained weight to a body condition score of 3 out of 5 within a few weeks. There were no other cases reported on the farm.

**Analysis of the rumenolith**

The ruminal concretion measured approximately 30 cm at its greatest length and was about 10 cm in cross-section. Its amorphous shape is better shown in Figure 2. It consisted of a tangled framework of synthetic threads, with plant fibres and irregular, hard, smooth, heavy, light grey concretions clinging to and binding the threads together. The weight after drying was 368 g and it was observed to be made up of a mass of commercial synthetic green fibres and plant material, interspersed with heavy concretions of greyish mineralised matter.

A representative sample of the rumenolith was sent for analysis to the Nutrilab Facility, Department of Animal and Wildlife Sciences, University of Pretoria, where standard analytical methods produced the results in Table 1.

Because organic matter was evidently not analysed, and other elements listed in Table 1, apart from calcium and phosphorus, were present in very low quantities, it is reasonable to ascribe the bulk of the residue, once calcium and phosphorus are excluded, to organic matter consisting

<table>
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<th>TABLE 1: Chemical analysis of the rumenolith.</th>
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<td>&gt; 10 000 (mg/kg)</td>
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<tr>
<td>Ca (274 777.3)</td>
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<tr>
<td>P (229 274.1)</td>
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<tr>
<td>Mg (20 803.7)</td>
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Ca, calcium; P, phosphorus; Mg, magnesium; Mn, manganese; Na, sodium; K, potassium; Fe, iron; S, sulphur; Al, aluminium; Zn, zinc; Pb, lead; Sr, strontium; B, boron; Cr, chromium; Ni, nickel; Cu, copper; Tl, thallium; Sb, antimony; Ti, titanium; V, vanadium; Se, selenium; As, arsenic; Li, lithium; Bi, bismuth; Hg, mercury; Ag, silver; Mo, molybdenum; Co, cobalt.
of complex molecules of carbon, hydrogen, oxygen and nitrogen. This interpretation is consistent with the observation of plastic threads and plant matter forming the matrix of the rumenolith.

Ethical considerations

The examination of the affected ram and the surgical removal of the rumenolith were at the owner’s request. Standard ethical considerations therefore did not apply in this case as the surgery was considered an emergency procedure – if we did not remove the foreign body, the ram’s body condition would have deteriorated and he would possibly have died as a result of the blockage of passage of food by the foreign body.

Discussion

Recent predator activity in the area had led the farmer to graze the sheep in an area situated closer to the house for ease of monitoring and, although the farm had sufficient grazing available, when the sheep were confined to a smaller grazing area it led to severe overgrazing. Bapedi sheep are also able to make use of browse material but this, too, was not able to sustain the flock in such a confined area, as can be seen in Figure 1 where the browse line is clearly visible.

Figure 3 shows the formation of a trichobezoar found in the abomasum of a calf. A trichobezoar is a relatively common finding (Radostits et al. 2000). An enterolith is described as a smooth, lamellated object consisting of ammonium, magnesium, phosphate occurring in mature animals (Blood & Studdert 1997). Bezoars often have rough edges owing to the hair or fibre of which they consist.

The appearance, site and composition of the calculus that was removed from the rumen and reticulum of the ram (Figure 2) is clearly different from the more commonly seen abomasal bezoars (Figure 3), but is very similar to enteroliths. Calcium, phosphorus and magnesium were the minerals that were found in the highest concentrations in the calculus and it can therefore be concluded that this was a rumenolith. The nidus appeared to have been some green synthetic fibre. The colour and physical structure of the fibre may be what caused the ram to ingest this foreign material in the absence of sufficient roughage. The nature of the fibre allowed sufficient retention time in the rumen for the rumenolith to form.

Conclusion

Investigation of weight loss must include a thorough rumen evaluation (auscultation, palpation and ballottement), otherwise foreign bodies such as rumenoliths, bezoars or other foreign bodies can easily be overlooked. Despite sheep being able to graze selectively during periods of food shortage or mismanagement, it is possible for them to ingest foreign material which may then lead to enterolith formation.

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Competing interests

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this paper.

Authors’ contributions

R.L. (University of Pretoria) treated, followed-up, requested testing and wrote up the case report. G.F.B. (University of Pretoria) contributed towards references, interpretation of results of the analysis and editing.

References


