Rumenolith formation in a Bapedi ram

Authors:
Rhoda Leask[1]
Gareth F. Bath[1]

Affiliations:
[1]Department of Production Animal Studies, University of Pretoria, South Africa

Correspondence to:
Rhoda Leask

Email:
rhoda.leask@up.ac.za

Postal address:
Private Bag X04, Onderstepoort 0010, South Africa

Dates:
Received: 28 May 2012
Accepted: 28 Oct. 2012
Published: 13 Dec. 2012

How to cite this article:
Leask, R. & Bath, G.F., 'Rumenolith formation in a Bapedi ram', *Journal of the South African Veterinary Association* 83(1), Art. #218, 4 pages. http://dx.doi.org/10.4102/jsava.v83i1.218

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.

Introduction

Abomasal concretions have been described in small ruminants, especially goats (Bath 1978; Bath & Bergh 1979; Bath *et al.* 1992; Bath *et al*. 1992; Schneider & Hugo 1980). These have been shown to consist either mainly of plant material (phytobezoars) (Bath 1978; Bath & Bergh 1979; Bath *et al.* 1992; Bath *et al*. 1992; Schneider & Hugo 1980) or hair fibre (trichobezoars) (Kellerman, Coetzer & Naudé 1988; Steyn 1931), but their site and composition clearly differentiates them from the rumen concretion described here. Although rumen foreign bodies are common in cattle (Radostits *et al*. 2000) and, to a lesser extent, in goats (Deshmukh 2001; Smith & Sherman 1994), they are usually seen as less of a problem in sheep (Aitkin 2007; Kimberling 1988). In one unusual case, Van Tonder (1975) recorded a rumen foreign body that transferred writing onto the rumen wall of a sheep, but with no deleterious effects. In Nigeria (Abdullahi, Usman & Mshelia 1984; Igbokwe, Kolo & Egwu 2003; Remi-Adewunmi *et al*. 2011), Sudan (Hayder, Bakhiet & Mohammed 2006), India (Hailat *et al*. 1997) and South Africa (and probably in many other countries), the unavailability of grazing in cities and the litter of plastic bags containing scraps of food has led to rumen impaction by synthetic plastic bags in small ruminants, including sheep (Hailat *et al.* 1997). The lignification of plastic or other foreign body structures in the rumen is less often reported.

An enterolith is defined as 'a calculus in the intestine; they achieve their greatest importance in horses where they cause obstruction of the large intestine' (Blood & Studdert 1997). By the same reasoning, a rumenolith can be defined as a mineralised calculus in the rumen. A rumenolith that caused weight loss in a Bapedi ram is described in this paper.

Case history

During a routine flock visit, a farmer reported his concern that one of the Bapedi rams had been losing body condition despite being separated from the flock and fed supplementary feed. Examination of the flock revealed that the average body condition score of the ewes was 1.5 out of 5. In general, the flock was very thin with no fat reserves in the tail. The rams averaged a body condition score of 3 out of 5. The sheep were kept on natural pasture and minimal supplementation was given. The lucerne hay given as a supplement was of poor quality (mostly stalks and no leaves seen). The paucity of nutrition was further indicated by examination of the natural grazing. A browse line in unpalatable trees and bushes could clearly be seen in the veld and the basal cover was poor (Figure 1). The sheep in the holding pens were observed to be nibbling up what little spilt lucerne hay was lying on the floors. This indicates the poor nutrition that probably led to ingestion of synthetic threads and the formation of the rumenolith.

Clinical evaluation of the ram

A routine clinical examination was performed. Temperature, pulse and respiration were all within normal limits and the ram appeared clinically healthy. The ram's body condition score was assessed as 2 out of 5 and the teeth appeared normal with no excessive wear. On examination of the rumen 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

Source: Photograph by Rhoda Leask

FIGURE 1: The clearly visible browse line in the pasture.

Source: Photograph by Rhoda Leask

FIGURE 2: The amorphous mass removed from the affected ram, approximately 30 cm long and 10 cm wide (ruler marked in centimetres for size comparison).

TABLE 1: Chemical analysis of the rumenolith.

> 10 000 (mg/kg)	1000–9999 (mg/kg)	100–999 (mg/kg)	10–99 (mg/kg)	1–9 (mg/kg)	< 1 (mg/kg)
Ca (274 777.3)	Mn (4415.0)	S (763.5)	Pb (82.7)	Cu (9.3)	Mo (0.4)
P (229 274.1)	Na (2836.6)	Al (183.8)	Sr (48.8)	Tl (6.8)	Co (0.1)
Mg (20 803.7)	K (2040.1)	Zn (183.6)	B (22.7)	Sb (5.5)	-
-	Fe (1207.0)	-	Cr (16.1)	Ti (3.7)	-
-	-	-	Ni (10.0)	V (3.6)	-
-	-	-	-	Se (2.8)	-
-	-	-	-	As (2.1)	-
-	-	-	-	Li (2.1)	-
-	-	-	-	Bi (1.7)	-
-	-	-	-	Hg (1.3)	-
-	-	-	-	Ag (1.1)	-

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.

Source: Photograph by Rhoda Leask

FIGURE 3: A trichobezoar (approximately 5 cm in diameter) removed from the abomasum of a calf. The structure and constituents are completely different from the rumenolith described. Hair is clearly palpable on the surface and there are no concretions.

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 decribed 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.

Acknowledgements

The authors would like to thank the Nutrilab Facility, Department of Animal and Wildlife Sciences, University of Pretoria, for analysis of the rumenolith.

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

Abdullahi, U.S., Usman, G.S.H. & Mshelia, T.A., 1984, 'Impaction of the rumen with indigestible garbage in cattle and sheep reared within urban and sub-urban environment', *Nigerian Veterinary Journal* 13, 89–95.

Aitkin, I.D., 2007, *Diseases of sheep*, 4th edn., Blackwell, Oxford. http://dx.doi.org/10.1002/9780470753316, PMid:17804832

Bath, G.F., 1978, 'Abomasal phytobezoariasis of goats and sheep', *Journal of the South African Veterinary Association* 49, 133. PMid:569708

Bath, G.F. & Bergh, T., 1979, 'A specific form of abomasal phytobezoar in goats and sheep', *Journal of the South African Veterinary Association* 50, 69–72. PMid:551195

Bath, G.F., Botha, P., Vorster, H.J. & Cross, R.H.M., 1992, 'Physical structure and chemical composition of abomasal phytobezoars of goats and sheep', *Journal of the South African Veterinary Association* 63, 103–107. PMid:1328636

Bath, G.F., Smith, F.J., Vorster, H.J. & Cross, R.H.M., 1992, 'Experimental reproduction of phytobezoars', *Journal of the South African Veterinary Association* 63, 108–112. PMid:1328637

Blood, D.C. & Studdert, V.P., 1997, Baillière's comprehensive veterinary dictionary, 7th edn., Baillière Tindall, London.

Deshmukh, S.P., 2001, 'Successful management of severe ruminal impaction in goat: A case report', *Indian Veterinary Journal* 78,146–147.

Hailat, N., Nouh, S., Al-Darraji, A., Lafi, S., Al-Ani, F. & Al-Majali, A., 1997, 'Prevalence and pathology of foreign bodies (plastics) in Awassi sheep in Jordan', *Small Ruminant Research* 24, 43–48. http://dx.doi.org/10.1016/S0921-4488(96)00938-8

Hayder, A.M., Bakhiet, A.O. & Mohammed, A.A., 2006, 'Retrospective study on the prevalence of foreign body in goats' rumen: Omdurman Province, Khartoum State, Sudan (1998–2002)', *Journal of Animal and Veterinary Advances* 5, 449–451.

Igbokwe, I.O., Kolo, M.Y. & Egwu, G.O., 2003, 'Rumen impaction in sheep with indigestible foreign bodies in the semi-arid region of Nigeria', *Small Ruminant Research* 49, 141–146. http://dx.doi.org/10.1016/S0921-4488(03)00074-9

Kellerman, T.S., Coetzer, J.A.W. & Naudé, T.W., 1988, *Plant poisonings and mycotoxicoses of livestock in Southern Africa*, Oxford University Press, Cape Town.

Kimberling, C.V., 1988, *Jensen and Swift's diseases of sheep*, Lea & Febiger, Philadelphia.

Radostits, O.M., Gay, C.C., Blood, D.C. & Hinchcliff, K.W., 2000, *Veterinary medicine*. *A textbook of the diseases of cattle, sheep, pigs, goats and horses*, 9th edn., Elsevier Health Sciences, London.

Remi-Adewunmi, B.D., Olukosi, J.O., Gyang, E.O. & Abdullahi, U.S., 2011, 'The economic implications of rumen foreign body impaction in small ruminants in northern Nigeria', Proceedings of the 5th Pan-Commonwealth Veterinary Conference, Accra, Ghana, 20–25 March 2011, *Journal of Commonwealth Veterinary Association*, Special Issue 27(2), 214.

Schneider, D.J. & Hugo, L., 1980, 'Mortaliteit in lammers as gevolg van verstopping van die abomasums deur *Ornithopus sativus* Brot. (seredella) haarballe [Mortality in lambs due to blockage of the abomasums by *Ornithopus sativus* Brot. (seredella) hairballs]', *Journal of the South African Veterinary Association* 51, 245–247. PMid:7241496

Smith, M.C. & Sherman, D.M., 1994, *Goat medicine*, Lea & Febiger, Philadelphia.

Steyn, D.G., 1931, 'Investigations into the cause of alopecia (kaalsiekte) in kids and lambs', *17th Report of the Director of Veterinary Services and Animal Industry*, Part 2, Department of Agriculture, Pretoria, p. 729.

Van Tonder, E.M., 1975, 'Writing on the (rumen) wall', *Journal of the South African Veterinary Association* 46, 300.