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Research for foreign bodies located in the rumen in goats by rumenotomy and after slaughter: The case of Mushweshwe

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Abstract

In a sub-regional context, environmental pollution is a problem for which solutions are needed to clean up peri-urban or rural grazing areas. A case study was carried out on pollution by various wastes such as rubber which is on the rise. In Mushweshwe, Bushumba area, in eastern DRC, animals stray especially in the dry season when grass becomes scarce. Animals eat anything they encounter in the environment, including non-digestible and non-biodegradable waste. The autopsy reveals the presence of foreign bodies of different sizes in the stomach. This work aims to make a clinical diagnosis of gastric obstruction in goats and then confirmed after ruminotomy on the one hand and on the other hand to make a finding after the slaughter of the presence of foreign bodies in the gastric reservoirs. A ruminotomy on 15 goats showed 9 cases of foreign bodies of different kinds (60%) and at the slaughter of 28 goats, 16 goats or 57.1% presented with foreign bodies.

Keywords: Ruminant, foreign bodies, ruminotomy, slaughterhouse, Mushweshwe

Introduction

In the Democratic Republic of Congo, open-air landfills receive thousands of tons of solid household and industrial waste, plastic, without any development every day. This form of environmental pollution has negative effects on the health of animals [1]. In Congolese society, the goat is of great importance not only for giving meat but also as a gift that can be given to a friend [2]. Goats play a major role in developing countries through their production system. They are very popular animals because they easily adapt to a wide variety of climatic conditions [3].

In these countries, the breeding of goats is extended to large towns, cities, villages. However, this extensive breeding system is characterized by low yield. Insufficient feed causes goats to eat whatever they can find in the environment. In this case, the goats even ingest foreign bodies and other non-digestible and non-biodegradable substances: bags, fabrics, pieces of wood, etc. [4, 5].

Goats, feeding on low-mineral feed on poor pasture, are straying and others come from imports whose travel feeding system is problematic. This farming system predisposes them to pick up non-food litter which they ingest [6]. The place where all these foreign bodies are stored is the digestive tract, which can lead to various digestive problems [11, 12]. The presence of foreign bodies leads to digestive disturbances with the consequence of lowering productivity [5, 7]. The issue of indigestion in ruminants is known in various ways and the results of which go beyond mechanical discomfort or nervous affection [6, 9], their management being essential [8, 10].

Our study aims to identify foreign bodies found in the rumen in goats in the Kabare territory in South Kivu province. This will allow us to determine the causes of gastric obstruction in goats, to identify the risk factors during gastric obstruction and to suggest a course of action to be taken in front of a foreign body located in the rumen in the goat.

Materials and Methods

Location

The territory of Kabare is located between 28 ° 45 "and 28 ° 55" east longitude and 2 ° 30 "and 2 ° 50" south latitude. It is made up of two communities (Chiefdoms) which are in particular the collectivity of Nindja and that of Kabare. The latter is subdivided into fourteen groupings: Bushumba, Bugorhe, Irhambi-Katana, Bugobe, Bushwira, Cirunga, Ishungu, Lugendo, Luhihi, Kagabi, Miti, Mudaka, Mudusa and Mumosho. The study relates to the extent of a group, namely: Bushumba (97 km²) which is part of 14 groups in the community-chiefdom of Kabare, which bears the same name of the territory and is located about 30 km from Bukavu; the capital of the province of South Kivu. The Bushumba group is administratively made up of 6 villages or localities officially recognized by the hierarchy which is the chiefdom of Kabare including Bushumba center, Murama-muganzo, Buhehe, Cishoke I, Cishoke II, and Lwngoma. Buhehe / Mushweshwe, one of the localities of Bushumba constitutes the reference site and is located between 28 °, 33', 32' of East longitude and 2 °, 18', 58" of South latitude, at 1534 m altitude. This site is separated from Katana by 15 km and from Birava by 7 km. It is bounded to the north by the Luhihi grouping, to the south by the village of Lwngoma, to the east by Lake Kivu, and to the west by the village of Nyabulongwe. The Bushumba grouping with the locality of Buhehe is illustrated in table 1, below.

Table 1: Statistics of the population of Bushumba by the village.

No	Villages	Men	Women	Boys	Girls	Total
1	Bushumba centre	3299	3885	5668	6653	19472
2	Murama/ Muganzo	1558	1666	2622	2693	8539
3	Buhehe	7246	1389	2162	2455	13252
4	Cishoke I	1027	1018	2053	2028	6126
5	Cishoke II	724	1010	1270	1331	4335
6	Lwngoma	6232	1112	1843	1985	1235

Civil status of the Bushumba grouping office, 2017 ^[13].

Climate and vegetation

The Bushumba grouping enjoys a humid tropical climate, comprising a long rainy season of 9 months (from September to May) and a short dry season of 3 months (from June 14 to August). The average annual air temperature is 19.5 ° C, the relative humidity varies between 68 and 75% (Climate Service of CRSN-Lwiro, 2016) and the annual rainfall is 1500 mm. The vegetation consists of cultivated savannah, which replaced the forest in *Albizia grandibacteata*.

Population activities

Agriculture is the main activity of 92.6% of households, although the soil is increasingly depleted. In addition, the high population density has transformed the landscape into a checkerboard of very small plots, cultivated without respecting the soil's rest period (fallow). Moreover, in the virtual absence of improved varieties, plant protection products, and chemical fertilizers, the only way out is to bring the organic matter to the soils and gradually correct their acidity (pH) by applications of travertine or lime, two difficult, slow and expensive operations ^[14]. Thanks to the presence of a national road partly in good condition (asphalted from Bukavu to Kavumu), which links the localities to the capital of the Province (the city of Bukavu), trade is the second activity that attracts households and thus promotes a high concentration of the population along this

route.

Methods

Physical examination

The anamnesis corresponds to the various information collected from the owner of the animal. For the majority of breeders, these animals eat well but their health continues to deteriorate: The target animal is the goat. Overall we retained 15 goats after clinical diagnosis for surgery and 28 goats for slaughter consulted before being slaughtered in two slaughterhouses near Mushweshwe (Kabiguli and Kakumbo). Clinical exam consisted of the remote review and the close review. The remote examination allowed after careful observation to recognize a sick and suspicious animal. In general, animals in poor health were characterized by very pronounced thinness or even cachexia, a sometimes even exaggerated good appetite, apathy, or even nonchalance in the gait. The close examination focused on the digestive system especially the abdominal part which was examined by palpation-pressure and by rumen succussion on the flanks thus providing enough information. Abdominal palpation made it possible to detect foreign bodies generally having a different consistency from that of ingesta. This method is easy for very thin goats but difficult for healthy animals.

Ruminotomy

Suspected goats were subjected to ruminotomy. This technique made it possible to confirm the presence of foreign bodies in the rumen in the suspected animals. The equipment consists of the necessary for the ruminotomy and for the weighing, notably a surgical kit, consumables and medicines as well as the scale.

This surgical method allows confirmation of the clinical presumption and the extraction of foreign bodies. The foreign bodies were first weighed globally and then after sorting by nature, the latter were weighed separately.

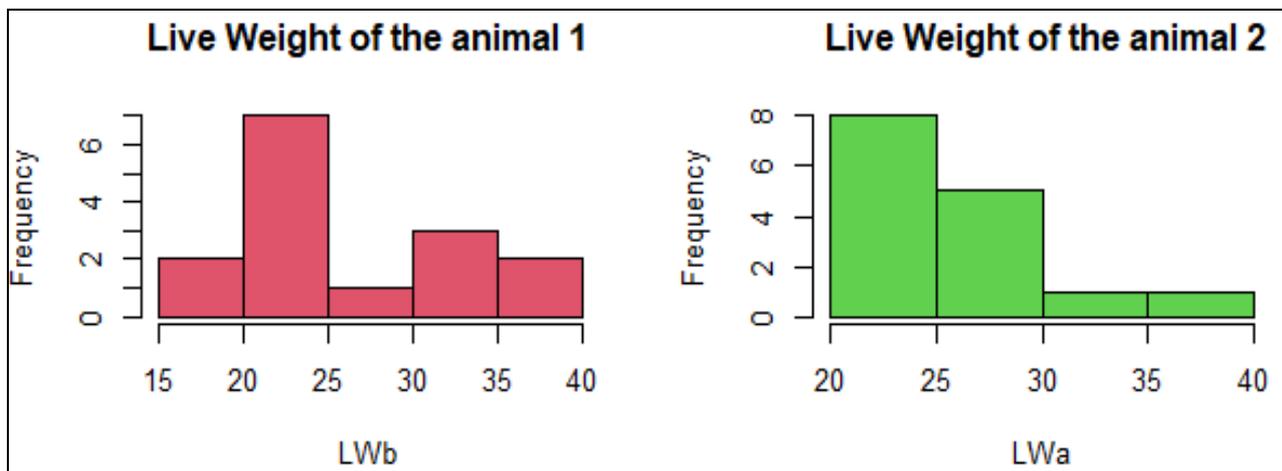
Statistical analysis

One-way ANOVA statistical analysis was done to compare nature of foreign bodies found during ruminotomy or after the slaughter of the animals and Tukey multiple comparisons of means was done too at 95% family-wise confidence level.

Results

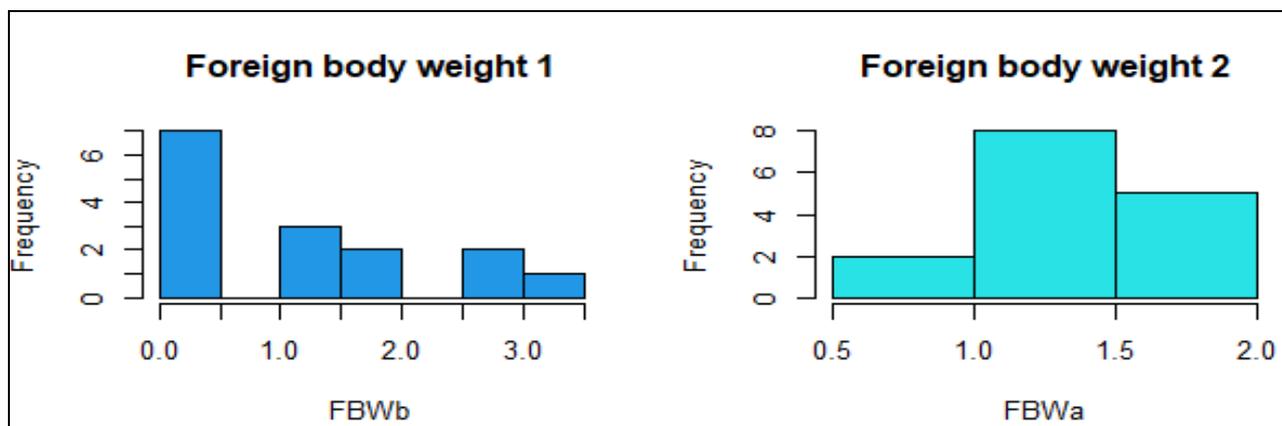
The results of our study include the foreign bodies found after ruminotomy and those collected during the various killings. We found various foreign bodies including rubber bags, mosquito nets, linens. Depending on the longevity of their stay in the rumen, they are found twisted, coiled on top of each other forming tangled cords.

Out of 15 animals, we found foreign bodies in 9 cases; 14 recovered and 1 succumbed. According the nature and weight of foreign bodies removed from the rumen of goats, the rubbers were the most common foreign bodies with 1.07 ± 0.49 comparatively to mosquito (0.72 ± 0.53) and linens /ropes (0.52 ± 0.30) i.e for an average weight of goats 26.7 ± 6.69 corresponds to an average weight after ruminotomy of $1.93 \text{ Kg} \pm 0.94$. In fact, the nature and weight of foreign bodies removed from the rumen of goats after slaughter, the rubbers are more abundant up to 1.03 ± 0.37 followed by mosquito nets 0.33 ± 0.15 and 0.29 ± 0.10 for linens and ropes i.e., for an average weight of goats 26 ± 4.59 corresponds to an average weight after slaughter of 1.41 ± 0.36 (Figure 1 and 2)



Legend LW: Live Weight of the animal, 1: After rumenotomy, 2: After slaughter

Fig 1: Live weight of the animal



Legend FBW: Foreign body weight, 1: After rumenotomy, 2: After slaughter

Fig 2: Foreign body weight

The figure 3 present the report into foreign body weight and Live Weight of the animal (FBWLW)

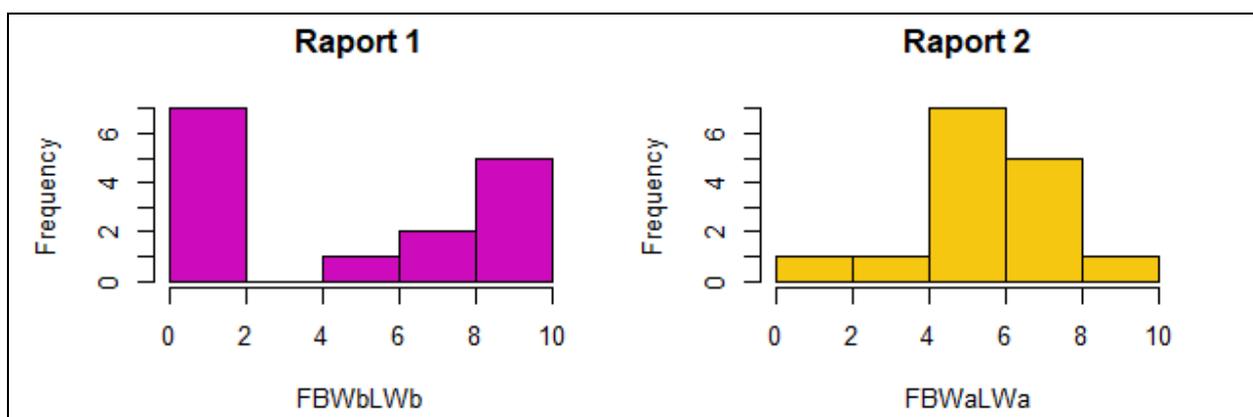


Fig 3: Report into foreign body weight and Live Weight of the animal

Table 3: Summary ANOVA of nature of foreign bodies

Variable source	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Foreign bodies found after ruminotomy					
Nature	2	1.729	0.8647	3.283	0.0474 *
Residuals	42	11.063	0.2634		
Foreign bodies found after slaughter in the Kakumbo and Kabuguli killings					
Nature	2	7.062	3.531	49.12	4.86e-12 ***
Residuals	45	3.235	0.072		

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

There is a difference according the nature foreign bodies. The table 4 presented the Tukey multiple comparisons of means.

Table 4: Tukey multiple comparisons of means.

Nature of foreign bodies	Diff	lower	upper	p adj
Foreign bodies found after ruminotomy				
Mosquito_net-Linens_Ropes	0.1666667	-0.28862576	0.6219591	0.6499358
Rubber-Linens_Ropes	0.4733333	0.01804091	0.9286258	0.0400292
Rubber-Mosquito_net	0.3066667	-0.14862576	0.7619591	0.2418588
Foreign bodies found after slaughter in the Kakumbo and Kabuguli killings				
Mosquito_net-Linens_Ropes	0.0500	-0.1797467	0.2797467	0.8583266
Rubber-Linens_Ropes	0.8375	0.6077533	1.0672467	0.0000000
Rubber-Mosquito_net	0.7875	0.5577533	1.0172467	0.0000000

The rubber was observed in large quantities then Linens and Ropes, and Mosquito net. Mosquito net was in large quantities then Linens and Ropes.

Discussion

Our study was carried out in the area of Mushweshwe contiguous to the locality of Buhehe. It allowed us to find foreign bodies in the rumen in goats whose clinical diagnosis led us to go further by choosing to operate on them. Apart from animals that have already manifested weight loss, it is difficult, without a specialist examination, to make an accurate clinical diagnosis. However, as the environment is constantly polluted with various wastes, animals consume it by default. The choice of animals was made either based on a complaint from the owner for having seen the animal ingested the non-food body, in particular, rubber bags; or the animal is in poor health without alterations in essential vital functions.

Having taken into account all the animals, the reflection of the differences in the weight of the foreign bodies seems disproportionate to the average weight of the animals which is 25.6 kg and whose FBW / LW ratio is 7.41%. For the latter, the calculation related only to animals in which foreign bodies were found. A certain paraclinical diagnosis would contribute to the detection of these 6 negative cases observed after the intervention; thus, the real average weight of foreign bodies would rather be 1.74 kg. All the animals being adults, we observe that the average weight of the animals is 26 kg. Although the differences in the live weight-body weight ratio found are significant, the average is 5.44%.

Indeed, breeders are interested in the health of their herds and consequently use either drugs or remedies in the care of animals. If this is not successful, they have to think about intoxication or the presence of bodies that interfere with the transit of food through the gastric reservoirs. On this assumption, exploration was necessary.

The situation of waste management and the breeding system in the middle of our study predispose animals and mainly small ruminants to ingest non-biodegradable bodies thrown in the rangelands, particularly in makeshift bins, along easements, in pastures as well as neutral areas where wandering goats pick them up.

By ruminotomy of the suspect animals, the finding on the ingestion of rubber materials and linens by goats met our concern. However, this opens the door to studies on the involvement of the gastric branches of the pneumogastric nerve [7]. The presence of foreign bodies in the environment which has negative effects on the state of health of the animals which consume them [1] predisposes to pica observed in these goats such as the percentage observed after slaughter and during ruminotomy has de the extent. Therefore, the more the animal's condition is degraded, the more the disease can be detected clinically.

The importance of our study is to be carried out in an artisanal

mining area with a large built-up area without rational waste management. Approaching the subject from the angle of undernourishment which causes ruminants to ingest non-food substances and often the cause of indigestion appearing in the context of vagal distress [6], this thesis meets with approval on the subject of 'vagal indigestion, the disorders of which lead to functional complications of the emptying of the pre-stomachs or the abomasum due to the total or partial arrest of the motor skills of the stomach wall [17]. This disorder manifests as distension of the abdomen with sometimes signs of paralysis of the gastric reservoirs; even though we have ruled out any form of parasitism [15]. The affection causes the network to evacuate only sufficiently crushed food particles, even large particles arrive in the abomasum causing the pylorus to be blocked, which was not the case during the ruminotomy which gave results positively.

Indeed, it is rather a mass of foreign body observed and which experiences a deformation in the form of braided and coiled ropes. Out of 28 documented post-mortem cases in two sites, 16 were positive. These are the results of the killings in Kakumbo and Kabuguli where the incidence of foreign bodies is 57.1. According to the nature of what was found, the rubber was observed in large quantities then linens and ropes, and mosquito net. Mosquito net was in large quantities then linens and ropes. In a study on obstruction of the digestive tract of ruminants by plastic foreign bodies, a diagnostic and treatment trial model was proposed [5].

During its work, an investigation was carried out on 1270 cases in four killings in South Kivu in the Democratic Republic of the Congo of which 179 cases were found with foreign bodies distributed as follows: in the killing of Mugogo 13.4%, Mudaka 12.1%, at Beach Muhanzi 13, 4% and 22.5% specific to small ruminants marketed as grills in restaurants and bars. The importance of our study is to be carried out in an artisanal mining area with a large built-up area without rational waste management. Approaching the subject from the angle of undernourishment which causes ruminants to ingest non-food substances and often the cause of indigestion appearing in the context of vagal distress [6], this thesis meets with approval on the subject of 'vagal indigestion, the disorders of which lead to functional complications of the emptying of the pre-stomachs or of the abomasum due to the total or partial arrest of the motor skills of the stomach wall [18]. This disorder manifests as distension of the abdomen with sometimes signs of paralysis of the gastric reservoirs; even though we have ruled out any form of parasitism [15]. The affection causes the network to evacuate only sufficiently crushed food particles, even large particles arrive in the abomasum causing the pylorus to be blocked, which was not the case during the ruminotomy which gave results positively. Indeed, it is rather a mass of foreign body observed and which experiences a deformation in the form of braided and coiled ropes. Out of 28 documented post-mortem cases in two sites,

16 were positive. These are the results of the killings in Kakumbo and Kabuguli where the incidence of foreign bodies is 57.1. According to the nature of what was found, the rubber bags gave an average weight of 16 kg or 72.7%, the mosquito net 3.4 or 15.3%, and the linens 2.6 or 12%. In a study on obstruction of the digestive tract of ruminants by plastic foreign bodies, a diagnostic model and treatment trial were proposed [5]. During its work, an investigation was carried out on 1270 cases in four killings in South Kivu in the Democratic Republic of the Congo of which 179 cases were found with foreign bodies distributed as follows: in the killing of Mugogo 13.4%, Mudaka 12.1%, at Beach Muhanzi 13, 4% and 22.5% specific to small ruminants marketed as grills in restaurants and bars.

A study of foreign bodies in the rumen in house sheep in the Dakar region [10] through a survey carried out on 8,252 sheep from Dakar slaughterhouses and 18 house sheep obtained in ambulatory clinics, foreign bodies were found ie 0.58% of animals sacrificed at slaughterhouses and 10.28% in the second case. They are made of plastic bags 100% of the case, the pieces of fabric 61.1%, the wicks of braids 55%, various threads 55.5%. Foreign bodies by their presence in the rumen cause congestion of up to 23.3% of the ruminal volume resulting in weight loss despite the animal eating [5]. This study focused on animals that have consumed foreign bodies and this is observed first of all through more or less vague clinical symptoms, a state of health evolving into physiological misery. When trying to palpate the belly, foreign bodies are often noticeable in the advanced case of rumen mixing. As a result of this study, the Mushweshwe goats raised in the wild did not receive any food supplements. Animals find few of the microelements found in agricultural harvest by-products during the harvest period. The poor breeding condition predisposes animals to ingest non-food substances. The situation becomes more and more a perversion of taste or a mania. It is difficult to diagnose a recent case of foreign body ingestion in a herd. Disorders caused by foreign bodies in the digestive tract of ruminants are considered to be pathological cases with a chronic course except in cases of placentophagy.

Conclusion

Capri culture in Mushweshwe is characterized by poor breeding behavior, straying. Much of the environment is polluted by bags. They are found in makeshift bins, along paths to grazing areas. This poor husbandry system exposes animals to eat anything they encounter. This collection of foreign bodies exposes animals to various pathologies including those due to foreign bodies. The study is carried out on the one hand on 15 cases after a clinical diagnosis which led to proceed with a ruminotomy to search for foreign bodies, and on the other hand, a post-mortem observation of foreign bodies found after slaughter.

At the end of this research, it turns out that

- The animals which underwent the ruminotomy, out of 15 cases, 9 were positive with foreign bodies of different nature, bag, mosquito net, linen. These substances found in the rumen constitute much more of a mechanical discomfort, nevertheless, it is not excluded as a source of intoxication or predisposition to other pathologies. This discomfort ultimately affects health until the animal's death.
- Bodies found in various post-slaughter killings can be

seen in 18 goats out of a total of 28. We limited ourselves to highlighting the incidence, which is 57.1. Further study is needed in the region to assess plastic and miscellaneous waste on grazing areas and the prevalence of ingestion in goats.

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