A questionnaire survey of the management and use of anthelmintics in cattle and antelope in mixed farming systems in Zimbabwe

O Madzingira[a], S Mukaratirwa[a], V S Pandey[b] and P Dorny[b]

ABSTRACT

A survey of the management of mixed farming of cattle and antelope and use of anthelmintics was conducted on eleven farms between August and December 1999 by a self-administered questionnaire. Seventeen antelope species ranging from grey duikers (*Sylvicapra grimmia*) to eland (*Taurotragus oryx*) occurred on the farms. Impala (*Aepyceros melampus*) was the most abundant antelope on the farms. Seventy-five per cent of the antelope species on the farms were grazers and mixed feeders and shared grazing with cattle. Most farmers ($n = 8$) did not consider the stocking density for cattle and antelope as an important management factor. Fifty-four per cent of the farmers ($n = 6$) routinely dewormed both cattle and antelopes. Albendazole and fenbendazole were the most commonly used drugs for deworming cattle (72.7 %) and antelope species (54.5 %). The deworming of antelope was carried out during the dry season, using albendazole-, fenbendazole-and rafoxanide-medicated supplementary feed blocks. Doramectin injections were given to antelopes on two farms. Cattle were dewormed preventively and according to the general body condition of the animal. Few farmers ($n = 4$) followed the recommended deworming programme for cattle in Zimbabwe and only one farmer followed a specified dosing programme for game. However, results from the survey on the deworming of game indicate that farmers perceived helminth infections in antelope to be important.

Key words: antelope, anthelmintics, cattle, mixed farming systems, questionnaire survey.

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INTRODUCTION

Game farming is an important source of revenue for Zimbabwe through trophy hunting and as a tourist attraction. National Parks and other wildlife land cover almost 12 % of the country[26].

The utilisation of game products in Zimbabwe officially started in 1960, when the government licensed farmers to sell game products[24]. Cattle-and-game rearing in a mixed farming system, however, officially commenced in 1985, when the government permitted farmers to introduce and rear game species on private farms[20]. Farmers on the highveld adapted and fenced parts of their farms not suitable for other forms of agriculture, such as areas with hills, and introduced game species, while on other farms, game species were introduced on cattle ranches. The main sources of the game acquired by the farmers were the lowveld national parks auction sales[20].

Helminth infections of the different species of antelope and their control by anthelmintic treatments have been described in South Africa[3–9,13,14,16,17,21], Zambia[27], Zimbabwe[11,18–20] and Brazil[10].

The mixed farming of cattle and antelope has brought about the possibility of cross-infection of helminth parasites. A high stocking density of antelope and domestic ruminants is known to favour such cross-infection[16]. Mixed farming has been associated with a random translocation of game, which may have broadened the endemic[16] and host ranges of internal parasites, a factor that may necessitate the control of helminth infections in antelope species.

As a preliminary investigation to a major study of helminth infections of cattle and antelope species on eleven mixed farming systems, a questionnaire survey was carried out with the objective of gathering information on farm management and use of anthelmintics. Such information is important in assessing the potential for the development of helminth diseases and in evaluating the efficiency of the control measures used on the farms, as well as in preventing the development of anthelmintic resistance.

MATERIALS AND METHODS

Eleven farms where cattle and antelopes are reared together were randomly selected from farming areas around Harare (Fig. 1). The rainfall pattern in the areas of study is seasonal with much of the rain falling from November to April, while the rest of the year is dry.

Between August and September 1999, a questionnaire was delivered to each participating farmer during visits for faecal sample collection. The questionnaire was designed to gather information about the farm and its management, the mixed farming of cattle and antelope, and the control of helminth infections in cattle and antelope, including the anthelmintic dosing programme followed.

RESULTS

All of the farmers responded. Results of the questionnaire survey revealed that antelope are a source of income for the farmers through trophy hunting, live game and venison sales and as a tourist attraction. Crop production was found to be the major activity on most of the farms, in particular tobacco and maize production.

It was established that most farmers started mixed farming of cattle and antelope between 1980 and 1990. National Parks auction sales were the main source of antelopes and a smaller contribution resulted from purchases from established mixed farms.

The areas occupied by the selected farms ranged from 1200 to 3000 ha (Table 1), with a mean size of 1950 ha. An average of 888 beef cattle were kept on the farms. Cattle of all age categories (calves, growing animals and cows) were run together. A total of 17 species of antelope ranging from grey duikers (*Sylvicapra grimmia*) to eland (*Taurotragus oryx*) were kept on the farms (Table 2). On any single farm, 5–12 species of antelopes were present (Table 1). Impala (*Aepyceros melampus*) were the most abundant species of game on the farms, with a mean of 301

[a]Department of Paraclinical Veterinary Studies, Faculty of Veterinary Science, University of Zimbabwe, PO Box MP167, Mount Pleasant, Harare, Zimbabwe.

[b]Prince Leopold Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerpen, Belgium.

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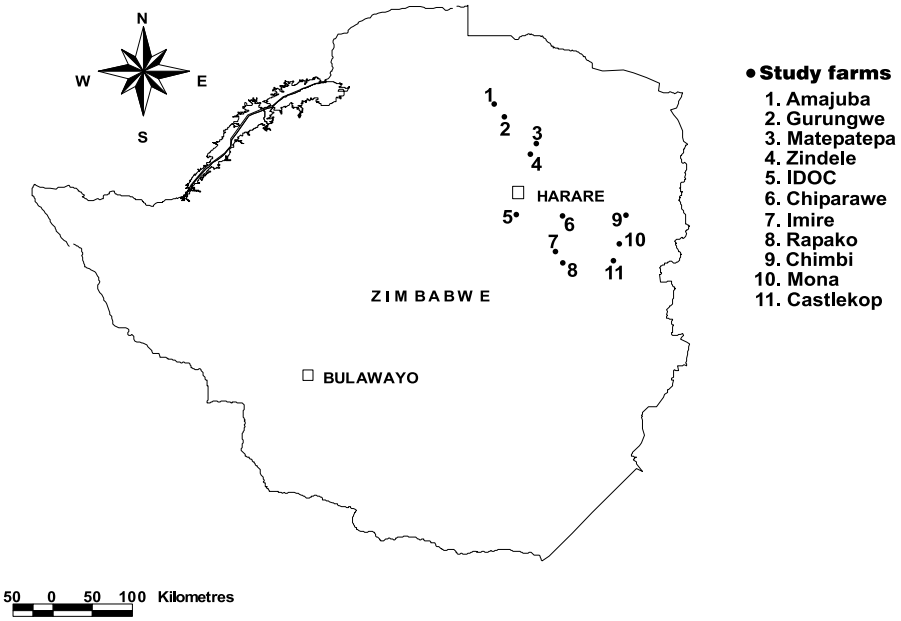

Fig. 1: **Map of Zimbabwe showing the location of the study farms.**

animals per farm (Table 2). Although the grey duiker occurred in small numbers, they were present on all the farms. The ratio of cattle to antelope numbers was 1:1 on 63.6 % (n = 7) of the farms (Table 1). Antelopes outnumbered cattle on two farms (Mona and Zindele). The bulk of the antelope species (75.8 %) present on these farms were mixed feeders and grazers (Table 1). Most farmers (n = 8) did not consider the stocking density for cattle and antelope species as an important management factor (Table 1).

Table 3 shows the deworming status for each farm. All the farmers dewormed cattle and 55 % (n = 6) dewormed both cattle and antelope. Antelope were given preventive anthelmintic treatment during the dry season using albendazole-, fenbendazole-, or rafoxanide-medicated supplementary feed blocks. Doramectin injections were given to immobilised roan antelope at Amajuba farm and antelopes at Imire farm. Cattle were dewormed with albendazole, fenbendazole, levamisole or oxyclozanide. Thirty-six per cent of the farmers (n = 4) dewormed cattle at the start and at the end of the wet season. The benzimidazole drugs were the most commonly used class of anthelmintics in both cattle (72.7 %) and antelope (54.5 %).

DISCUSSION

Crop production is known to be the major activity in the wet highveld areas in the northern parts of Zimbabwe where the study was conducted, while animal production activities dominate in the drier southern areas of the country.

Grazers and mixed feeders compete for grazing with the cattle, especially for the early flush of nutritious grass before the first rains[5]. There is, therefore, potential for close interaction between antelope and cattle at this time, which would facilitate the cross-infection of helminth parasites.

The impala (*Aepyceros melampus*) was the most abundant antelope species on all the farms perhaps because of its high adaptability to new environments[20] and its relatively high breeding capacity. Other studies in Zimbabwe have also indicated that the impala is the most abundant antelope species and that this species occupies diverse habitats[18,26]. Being mixed feeders that share grazing pastures with cattle, this species of antelope is expected to play an important role in the cross-infection of helminth parasites.

Although 72.7 % (n = 8) of the farmers in the survey did not determine the stocking density for cattle and antelope, the general observation from this study was that the stocking density was fairly low and, therefore, worm burden and the cross-infection of parasites are expected to be low. The few areas of good grazing such as around waterholes during the dry season as observed on most of the farms may, however, periodically result in temporary over-population due to a concentration of animals. This may lead to an acceleration in the transmission and cross-infection of helminths[21]. Studies in Zambia have shown that a stocking density of one large antelope per 4.7 ha is high enough to facilitate cross-infection[27]. On the basis of this criterion, the cross-infection of helminth parasites and helminth disease may be important on two farms (Imire and Matepatepa) in the survey.

Results from the survey show that helminth parasite control using anthelmintic treatment was the only method practised and that the benzimidazoles were the most frequently used anthelmintics in both cattle and antelope. The findings are in agreement with the results of similar studies in sheep in Zimbabwe[2,23]. The intensive and haphazard use of these drugs in low doses available in medicated supplement blocks during the dry season may speed up the develop-

Table 1: **Characteristics of the farms.**

Farm	Size (ha)	Ratio of cattle to antelope numbers	Number of antelope species	Stocking rate of cattle/antelope (LSU/ha)*	Grazer/mixed-feeder antelope (%)	Browser antelope (%)
Matepatepa	1700	1:1	9	1 LSU/5 ha	59	41
Amajuba	1800	1:1	5	Unknown	70	30
Mona	1500	1:3	11	Unknown	80	20
Rapako	1200	3:1	7	Unknown	68	32
Imire	3000	1:1	12	1 LSU/4 ha	93	7
Chiparawe	1200	1:1	8	1 LSU/9 ha	97	3
Zindele	2800	1:3	9	Unknown	90	10
IDOC	3000	14:1	9	Unknown	62	38
Castlekop	2200	1:1	5	Unknown	68	32
Chimbi	1600	1:1	6	Unknown	71	29
Gurungwe	1450	1:1	8	Unknown	76	24

*LSU/ha = livestock units per hectare.

Table 2: **Number of farms on which antelope species were present and the average number per farm.**

Antelope species	Number of farms	Average number/farm
Impala (*Aepyceros melampus*)	11	301
Wildebeest (*Connochaetes gnou*)	5	86
Kudu (*Tragelaphus strepsiceros*)	8	80
Duiker (*Sylvicapra grimmia*)	11	37
Eland (*Taurotragus oryx*)	8	33
Tsessebe (*Damaliscus lunatus*)	7	31
Sable (*Hippotragus niger*)	11	27
Reedbuck (*Redunca arundinum*)	7	27
Steenbok (*Raphicerus campestris*)	2	12
Waterbuck (*Kobus ellipsiprymnus*)	8	16
Bushbuck (*Tragelaphus scriptus*)	4	15
Blesbok (*Damaliscus pygargus dorcas*)	6	14
Roan antelope (*Hippotragus equinus*)	1	14
Klipspringer (*Oreotragus oreotragus*)	1	8
Grysbok (*Raphicerus sharpie*)	1	11
Nyala (*Tragelaphus angasii*)	1	35
Oribi (*Ourebia ourebi*)	1	15

ment of anthelmintic resistance[25]. This is because anthelmintic treatments during the dry season result in selection for resistant nematode parasites at a time when the proportion of the nematode population in refugia is too low to have a significant diluting effect on the resistant population[1]. Benzimidazole-resistant *Haemonchus contortus* and *Cooperia* species have been reported in sheep in Zimbabwe[2,23]. Reports of anthelmintic resistance in cattle parasites in Zimbabwe are limited. *Fasciola gigantica* has been incriminated in mortalities of sable antelope[18] and impala[20] in Zimbabwe and hence the justification for the use of rafoxanide-medicated blocks by some farmers. Doramectin was used on two farms only (Table 3), despite being effective against endoparasites and ectoparasites. The periodic alternating of anthelmintics with different modes of action to prevent the development of anthelmintic resistance and enhance efficacy was not practised on most farms. The farmers were not aware of management techniques such as the separation of age groups and the determination of the stocking density as methods for the control of helminth parasites.

Based on epidemiological studies in Zimbabwe, strategic deworming at the beginning and/or the end of the rains coupled with tactical treatments during the rainy season are recommended for the control of helminth infections[22]. Thirty-six per cent ($n = 4$) of the farmers in the survey dewormed their cattle according to the recommended strategic programme, but did not give tactical treatments during the rainy season. Failure by these farmers to implement tactical treatments during the rainy season as suggested by epidemiological studies places cattle at risk of heavy infections because the level of infective larvae on pasture is high during this period. However, the contrary can also be argued that the absence of tactical treatments reduces the frequency of anthelmintic treatments that may result in the emergence of anthelmintic resistant parasites. The rest of the farmers ($n = 7$) dewormed their cattle when general body condition was poor and were therefore at risk of production losses due to subclinical infections. It is important to note that all age categories of cattle (calves, growing and adult cattle) were run together and dewormed. This increases the cost of the control programme, as it may not be necessary to deworm cows as frequently as the calves, because the former may have acquired immunity to helminth parasites. In addition, the separation of age groups would prevent continued transmission of helminth parasites from resistant older animals to susceptible calves.

Fenbendazole and albendazole have a broad spectrum of activity against nematodes and cestodes[12], which justifies their incorporation into feed blocks. The advantages of using anthelmintic medicated feed blocks in antelope during the dry season are that much of the worm population is in the host and little infection is on pasture and antelope are more inclined to take feed blocks because of the seasonal shortage of grazing at this time[15]. The anthelmintics supplied in medicated feed blocks are in low concentrations and therefore animals need to consume the blocks over several weeks for optimal effect. Consumption by different species is unpredictable, especially with the shy

Table 3: **Summary of anthelmintic use on 11 mixed cattle and antelope farms.**

Farm	Deworming status		Anthelmintics used	
	Cattle	Antelope	Cattle	Antelope
Matepatepa	+	–	Albendazole (Valbazen, Pfizer)	–
Amajuba	+	+	Fenbendazole (Panacur, Hoechst) Oxyclozanide (ICI Liver fluke Remedy, Zeneca)	Fenbendazole-medicated blocks (SAFCO) Doramectin injections (Dectomax, Pfizer)
Mona	+	+	Oxyclozanide (as above)	Albendazole-medicated blocks (SAFCO)
Rapako	+	+	Oxyclozanide (as above) Levamisole (Tramisol, Milborrow)	Albendazole-medicated blocks (as above)
Imire	+	+	Albendazole (Valbazen, Pfizer) Fenbendazole (Panacur, Hoechst)	Fenbendazole-medicated blocks (Doramectin; as above)
Chiparawe	+	+	Fenbendazole (Panacur, Hoechst)	Albendazole-/Rafoxanide-medicated licks (SAFCO)
Zindele	+	+	Albendazole (Valbazen, Pfizer)	Albendazole-/Rafoxanide-medicated blocks (as above)
IDOC	+	–	Fenbendazole (as above)	–
Castlekop	+	–	Albendazole (as above)	–
Chimbi	+	–	Albendazole (as above)	–
Gurungwe	+	–	Fenbendazole (as above)	–

+, dewormed; –, not dewormed.

feeders such as duiker species as they need to be accustomed to supplementary feeding before the introduction of medicated blocks[15]. There was, however, no anthelmintic treatment of game during the rainy season because of difficulties in keeping the medicated feed blocks dry.

This survey showed that the farmers perceived helminth infections to be important on mixed cattle and game farming systems and that all eleven farmers interviewed were aware of the potential detrimental effects of helminths infection and disease on animal production in both cattle and antelopes. The farmers were not aware of the need to integrate the control of helminth parasites in domestic and antelope hosts. Any helminth control programme implemented in cattle must take into account the potential role of antelope as reservoir hosts. There is the likelihood of development of anthelmintic-resistant helminth parasites as a result of low doses of anthelmintics supplied to antelope through medicated feed blocks during the dry season.

It is difficult to recommend control programmes that are applicable to all farms owing to varied management systems practised on different farms. The effective separation of different age groups of cattle, erection of game fences, determination of stocking densities for both cattle and antelope species and breeding of resilient cattle may be a good starting point. It is recommended that preventive treatments be given to growing animals and that adult animals are dewormed if symptoms that suggest helminth infection are observed[9]. However, studies are necessary to determine the spectra of helminth species common to cattle and antelope in order to design and recommend appropriate control practices.

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REFERENCES

1. Besier R B 1997 Ecological selection for anthelmintic resistance: re-evaluation of sheep worm control programs. In *Workshop held at the 16th International Conference of the World Association for the Advancement of Veterinary Parasitology, Sun City, South Africa* 1997: 30–38
2. Boersema J H, Pandey V S 1997 Anthelmintic resistance of trichostrongylids in sheep in the highveld of Zimbabwe. *Veterinary Parasitology* 68: 383–388
3. Boomker J, Keep M E, Flammand J R, Horak I G 1984 The helminths of various antelope species from Natal. *Onderstepoort Journal of Veterinary Research* 51: 253–256
4. Boomker J, Anthonissen M, Horak I G 1988 Parasites of South African wildlife II, helminths of kudu, *Tragelaphus strepsiceros,* from South West Africa/Namibia. *Onderstepoort Journal of Veterinary Research* 55: 231–233
5. Boomker J, Horak I G, Flammand J R B, Keep M E 1989 Parasites of South African wildlife III, helminths of common reedbuck, *Redunca arundinum,* in Natal. *Onderstepoort Journal of Veterinary Research* 56: 51–57
6. Boomker J, Horak I G, de Vos V 1989 Parasites of South African wildlife IV, helminths of kudu, *Tragelaphus strepsiceros,* in the Kruger National Park. *Onderstepoort Journal of Veterinary Research* 56: 111–121
7. Boomker J, Horak I G, Knight M M 1991 Parasites of South African wildlife IX, helminths of kudu, *Tragelaphus strepsiceros,* in the eastern Cape Province. *Onderstepoort Journal of Veterinary Research* 58: 203–204
8. Boomker J, Horak I G, Flammand J R 1991 Parasites of South African wildlife X, helminths of red duikers, *Cephalophus natalensis,* in Natal. *Onderstepoort Journal of Veterinary Research* 58: 205–209
9. Boomker J, Horak I G, Watermeyer R, Booyse D G 2000 Parasites of South African wildlife XVI, helminths of some antelope species from the Eastern and Western Cape Provinces. *Onderstepoort Journal of Veterinary Research* 67: 31–41
10. Charles T P, Furlong J 1996 A survey of dairy cattle worm control practices in South East Brazil. *Veterinary Parasitology* 65: 65–73
11. Grobler J H 1981 Parasites and mortality of sable antelope, *Hippotragus niger niger* (Harris, 1938) in the Matopos, Zimbabwe. *Koedoe* 24: 119–123
12. Hansen J, Perry B 1994 *The epidemiology, diagnosis and control of helminth parasites of ruminants – a handbook.* International Laboratory for Research on Animal Diseases (ILRAD), Nairobi, Kenya
13. Horak I G 1978 Parasites of domestic and wild animals in South Africa X, helminths in impala, *Aepyceros melampus. Onderstepoort Journal of Veterinary Research* 45: 221–228
14. Horak I G 1979 Parasites of domestic and wild animals in South Africa XII, artificial transmission of nematodes from blesbok and impala to sheep, goats and cattle. *Onderstepoort Journal of Veterinary Research* 46: 27–30
15. Horak I G 1980 The control of parasites in antelope in small game reserves. *Journal of the South African Veterinary Association* 51: 17–19
16. Horak I G 1981 Host specificity and the distribution of helminth parasites of sheep, cattle, impala and blesbok according to climate. *Journal of the South African Veterinary Association* 52: 201–206
17. Horak I G 1983 Parasites of domestic and wild animals in South Africa XVI, helminth and arthropod parasites of blue and black wildebeest (*Connochaetes taurinus, Connochaetes gnou*). *Onderstepoort Journal of Veterinary Research* 50: 243–255
18. Jooste R 1987 Internal parasites of wildlife in Zimbabwe: impala, *Aepyceros melampus* (Lichtenstein, 1812). *Zimbabwe Veterinary Journal* 18: 44–45
19. Knottenbelt M 1989 Control of helminths in wildlife in Zimbabwe. *Zimbabwe Veterinary Journal,* 20: 1–10
20. Knottenbelt M 1990 Causes of mortality in impala (*Aepyceros melampus*) on 20 game farms in Zimbabwe. *Veterinary Record* 127: 282–285
21. Malan F S, Horak I G, de Vos V, van Wyk J A 1997 Wildlife parasites: lessons for parasite control in livestock. *Veterinary Parasitology* 71: 137–153
22. Moyo D Z, Bwangamoi O, Hendrikx W M L, Eysker M 1996 The epidemiology of gastrointestinal nematode infections in communal cattle and commercial beef cattle on the highveld of Zimbabwe. *Veterinary Parasitology* 67: 105–120
23. Mukaratirwa S, Charakupa R, Hove T 1997 A survey of anthelmintic resistance on ten sheep farms in Mashonaland East Province, Zimbabwe. *Journal of the South African Veterinary Association* 68: 140–143
24. Style C 1987 The economics of game ranching in Zimbabwe. In *Symposium – Wildlife management in sub-Saharan Africa, sustainable economic benefits and contributions towards rural development Harare, Zimbabwe* 1987: 180–188
25. Waller P J 1997 Sustainable helminth control of ruminants in developing countries. *Veterinary Parasitology* 71: 195–207
26. Wilson V J, Cumming D H M 1990 Zimbabwe. In East R (ed.) *Antelopes: global survey and regular action plans, Part 2, southern and south-central Africa.* IUCN Gland, Switzerland: 49–56
27. Zieger U, Boomker J, Caudwell A E, Horak I G 1998 Helminths and bot fly larvae of wild ungulates on a game ranch in Central Province, Zambia. *Onderstepoort Journal of Veterinary Research* 65: 137–141