RESEARCH COMMUNICATION

Oral administration of mebendazole failed to reduce nematode egg shedding in captive African gazelles

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ABSTRACT

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Idiosyncracies are observed in captive wild animals as regards the pharmacokinetics and efficacy of anthelmintics. This could be attributed to such factors as differences in host's metabolism, irregular distribution of anthelmintics due to the way they are administered and worm resistance to anthelmintics. Previously mebendazole was found to be poorly effective when administered in feed. An experiment was conducted to evaluate the efficacy of mebendazole when administered at the dosage rate of 15–20 mg/kg body weight to gastrointestinal nematodes in captive gazelles. Fifty-eight adult gazelles (*Gazella cuvieri*) were divided into four groups: T1 (animals dosed orally, directly into the mouth), T2 (treated orally, mixed in the water of a herd), T3 (treated orally, mixed in the water of one animal), and T4 (not treated). Individual faecal samples were taken before treatment, and 15 days thereafter. Mean percentages of reduction of egg shedding were calculated for *Nematodirus* spp., other trichostrongyles, total trichostrongylids, *Trichuris* spp. and total nematodes. No statistically significant differences were detected between the treatment groups and the control group or among the animals in the three treatment groups.

Keywords: *Gazella cuvieri*, gazelles, mebendazole, nematodes

INTRODUCTION

The role of parasitic diseases is an increasingly prominent theme in studies conducted on captive wild animals in zoological gardens (Kaneene, Taylor, Sikarskie, Meyer & Richter 1985). At present, anthelmintics are the principal means for the prevention and control of clinical and subclinical nematodosis in captive wild ruminants. However, there is little consensus as to the specific treatment schedule or evaluation of the effectiveness of various parasite control programmes in these animals. After the macrocyclic lactones, the benzimidazoles are the most commonly used class of anthelmintics for the control of nematodes. Most institutions use the oral route, or a combination of oral and subcutaneous routes, for the administration of such drugs (Isaza, Courtney & Kollias 1990).

A previous study showed that subcutaneous administration of ivermectin greatly reduced faecal nematode egg counts in captive wild ruminants (Abaigar, Ortiz, Cano, Martinez-Carrasco, Albaladejo & Alonso 1995). However, oral application of mebendazole failed to reduce the number of trichostrongylid eggs in the faeces. Further studies have revealed that ivermectin mixed with the feed can be a successful alternative to treat captive herds of gazelles (Ortiz, Ruiz de Ybáñez, Abaigar, Goyena, Espeso, Alonso & Cano 1999). It remains unclear, however, whether the failure of mebendazole can be attributed to the drug itself or to the route of administration used in that study. The aim of this work was to determine the

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efficacy of the compound when given orally by different methods to captive gazelles.

Since 1971 three endangered species of African gazelles (*Gazella dama mhorr*, *Gazella cuvieri* and *Gazella dorcas neglecta*) have been kept in captivity in the Parque de Rescate de la Fauna Sahariana (CSIC, Almería, S.E. Spain), as a part of a breeding programme of which the main objectives are the preservation of species and their reintroduction into their areas of origin.

MATERIALS AND METHODS

For this study, 58 adult *G. cuvieri* were selected, of which 41 were in herds each containing from 2–10 animals, and the other 17 gazelles were kept individually. All of them were easily identified by their ear-tags.

A suspension of mebendazole (OvitelminÒ, Esteve Veterinaria) was tested. Three different methods of oral administration were compared (Table 1), namely drenched orally into ten animals' mouths (group T1), added to the drinking water of a herd of 32 gazelles (T2), and mixed in the water of each of eight individual animals (T3). For groups T1 and T3, the product was used at a dosage rate of 15–20 mg/kg body mass. The dosage rate for the animals in T2 group was calculated taking the number of animals and their mass into account. For groups T2 and T3, the product was carefully distributed in the water supply. Water was frequently stirred, and the mixture remained in the drinking troughs until it had been completely consumed. Eight gazelles that did not receive any anthelmintic treatment served as the control group.

One faecal sample was collected directly from the rectum of each animal when they were initially captured for placing into the various treatment groups, as well as 15 days thereafter. The animals were tracked by telescope, and their faeces were collected from the soil soon after being eliminated. The samples were labelled, transported to the laboratory and stored at –20 °C until the analyses were performed. Faecal egg counts were determined using a modified McMaster method (Davies 1990) employing a saturated Sheather's sucrose flotation solution (specific gravity = 1.27). The eggs were variously classified as "*Nematodirus* spp.", "other trichostrongyles", and "*Trichuris* spp.", as "total trichostrongylids" (*Nematodirus* spp. + other trichostrongyles) and as "total nematodes" (total trichostrongylid + *Trichuris* spp.). The results were expressed as eggs per gram of faeces (epg). The minimum detection level of the technique was 20 epg.

Treatment efficacy was estimated according to procedures recommended by the World Association for the Advancement of Veterinary Parasitology (WAAVP) (Coles, Bauer, Borgsteede, Geerts, Klei, Taylor & Waller 1992). The percentages of reduction in the faecal egg counts were calculated using mean egg counts of the control group as a correction factor (FECRT = 100 (1-T2/C2 x C1/T1). The nematode egg counts were transformed to the natural logarithm (counts + 1) (Zar 1984) and the means were compared using the Kruskal-Wallis test. All computations were carried out using SPSS software (Ferrán 1996).

RESULTS

The results of the reduction of egg shedding are shown in Table 1. No statistically significant differences ($P > 0.05$) were found between the results of the reduction tests and the mean egg counts of the three different treatment groups and in those of the control group.

DISCUSSION

Ortiz, Ruiz de Ybañez, Espeso, Goyena, Vicente & Cano (1998) described the presence of the following species: *Nematodirus spathiger, Nematodirus filicollis, Nematodirus helvetianus, Camelostrongylus mentulatus, Trichostrongylus vitrinus, Trichostrongylus probolurus, Trichostrongylus colubriformis, Ostertagia ostertagi, Ostertagia harrisi, Teladorsagia circumcincta*, *Teladorsagia davtiani* and *Trichuris* spp. in the gastrointestinal tract of gazelles kept in the Parque de Rescate de la Fauna Sahariana.

The attempt to find alternative ways of administering mebendazole failed since poor results were obtained by all routes tested, including drenching according to the manufacturers' recommendations. Our results are similar, or even worse, than those that were previously described by Abaigar *et al.* (1995), when unsing the direct oral route.

Although Goldman & Johnson (1950) found that freezing could seriously damage hookworm eggs and cause a decrease in the egg counts, this does not necessarily mean that the same occurred in this case. Even that possibility does not modify the conclusions of this study.

Reports of the poor efficacy of benzimidazoles against nematodes have increased during the recent years, both in wild and domestic animals (Isaza *et al.* 1990; Oosthuizen & Erasmus 1993; Chartier & Pors 1994; Williams, Derosa, Nakamura & Loyacano 1997). This lack of effectiveness may be due to several factors. The use of incorrect dosage levels of the drug is one of the most widely accepted explanations. Most of the pharmacokinetic assays are performed in sheep, and their results are applied to other species such as goats and gazelles. Several authors have pointed out that this practice could result in

TABLE 1 Mean faecal nematode eggs excretion (eggs per gram of faeces) before and after treatment administration and percentage of reduction of shedding (mean ± standard deviation)

Parasite group	Treatment								
	T1			T2			T3		
	$\bar{x}$ before	$\bar{x}$ after	% R (± SD)	$\bar{x}$ before	$\bar{x}$ after	% R (± SD)	$\bar{x}$ before	$\bar{x}$ after	% R (± SD)
Nematodirus	72.6	35.6	44.40 (± 42.3)	92.4	42.1	47.4 (± 42.3)	143.4	35.0	75.80 (± 35.9)
Other trichostrongyles	64.6	20.0	63.10 (± 49.6)	92.2	34.0	53.3 (± 45.6)	124.6	2.8	85.70 (± 37.8)
Total trichostrongyles	107.6	44.5	57.9 (± 38.6)	143.8	56.9	54.2 (± 42.7)	234.5	33.2	67.74 (± 42.9)
Trichuris	528.4	187.4	52.7 (± 39.2)	729.8	387.5	43.9 (± 36.1)	1 042.5	124.9	73.00 (± 41.5)
Total	663.8	209.1	59.77 (± 33	864.6	440.8	46.6	1 146.7	142.7	66.70

subtherapeutic, ineffective anthelmintic dosage rates (Maingi, Bjorn, Thamsborg, Bogh & Nansen 1996; Escudero, Cárceles, Galtier & Alvinerie 1997). Mylrea, Mulley & English (1991) proposed that wild ruminants could metabolize and excrete benzimidazoles faster than domestic ones do. Moreover, several studies have revealed failures of benzimidazoles even when different species were treated with an adequate dosage levels (Obendorf, Nicholls, Koen & Lacy 1991; Chartier & Pors 1994; Maingi *et al.* 1996; Waruiru 1997). The above authors ascribed the inefficacy to the development of resistance to the benzimidazoles.

On the other hand, other authors (Ali & Hennessy 1996; Hennessy 1997) have stressed the importance of feed withdrawal prior to treatment with benzimidazole drugs, as this improves the efficacy of oxfendazole in sheep. They pointed out that a large intake of feed, especially one of high water content, increases its speed of transit through the gastrointestinal canal and the duration of drug availability is corresponding reduced. Feed was not withheld in the present trial, but both the effect of reducing feed intake for 24 h before treatment and the possibility of anthelmintic resistance in the nematode strains in these captive gazelles should be investigated for a better understanding of the efficacy of mebendazole in this population of captive gazelles.

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