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Use of pooled faecal samples in assessing nematode egg shedding in captive gazelles (*Gazella* species)

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MANAGEMENT of wild animals in captivity is always complicated. Data collection (such as biometry and ear-tag marks), clinical manipulation and vaccination require individual immobilisation, with the subsequent distress and risk of traumatic injury. Indeed, traumatic injuries are one of the most important causes of clinical diseases, and even mortality, in gazelles, especially nervous species such as *Gazella dorcas* (Espeso and others 1995).

Gastrointestinal parasites are another significant cause of disease in wild ruminant populations. Previous studies carried out in the Parque de Rescate de la Fauna Sahariana, CSIC, Almería, Spain, revealed the coexistance of a gastrointestinal nematode population comprising *Camelostrongylus mentulatus, Nematodirus spathiger, Trichostrongylus vitrinus, Trichostrongylus probolurus, Ostertagia ostertagi, Trichuris ovis, Trichuris globulosa* and *Oesophagostomum venulosum* (Ortiz and others 1998). Low burdens of these parasites did not lead to severe disturbances in wild populations. However, the condition of captivity increases the risk of reinfestations, and so the appearance of clinical digestive pathologies could be possible. Most zoological institutions perceive parasite control to be an important aspect of the husbandry of wild ruminants. These control programmes require an initial faecal sample collection, the employment of wide spectrum anthelmintics, and the subsequent evaluation of the effectiveness of the treatment (Isaza and others 1990, Abaigar and others 1995).

Individual animal faecal samples for parasitological surveys may be obtained directly from the rectum or from the ground if it can be proved to come from an identified animal. Both procedures are quite impractical for herd sampling due to the risk of trauma and stress to restrained animals and the long tracking time needed, respectively. The aim of this study was to evaluate the reliability of an alternative method for estimating nematode eggs elimination in wild ruminants, such as sampling on a herd basis and collecting faeces from the ground of the herd enclosure, thus avoiding the previous problems.

Ninety-four gazelles (23 *Gazella cuvieri*, 49 *Gazella dorcas neglecta*, and 22 *Gazella dama mhorr*) divided into 13 herds of four to 12 individuals (Table 1) were sampled. The evening before sampling, all faeces from the ground of each enclosure were removed. Line transects were done to assure the study of the whole surface of the enclosure. Sampling was carried out early in the morning, and 1·5 to 2·0 g of faeces were collected from each group of fresh excrements. Considering that there were four to 12 animals in each herd, and that there were approximately two groups of faeces per animal at this point in time, 14 to 42 g of excrements were collected per herd. The faeces were pooled in labelled plastic bags, carefully mixed, and preserved at 4°C until analysed. Additionally, all individuals were captured and faeces were collected directly from the rectum, and stored as before.

Analyses were performed by the flotation method using Sheather's sugar solution (Sheather 1923), and the faecal egg count was determined using the modified McMaster's technique (Davies 1990). Egg counts of *Nematodirus* species, other trichostrongyles and *Trichuris* species were performed separately. The values for trichostrongyles are the results of the addition of the corresponding records of *Nematodirus* and other trichostrongyles. In the same way, total egg counts were the sum of all the nematode eggs counted. Two different values of eggs shedding were recorded for each herd: herd values (H, that is, the average values of faeces collected from the ground), and individual values (I, that is, the average values of individual samples).

To assess the efficacy of the ground sampling method, both H and I values were are compared using the Mann-Whitney

TABLE 1: Total nematode eggs shedding in samples collected from the soil (H value) versus samples collected from the rectum (I value). Values are expressed as arithmetic mean (sd) egg count

Species	Herd	Number in herd	H value	I value	P
Gazella cuvieri	1	7	621·4 (30·2)	653·9 (818·5)	0·77
	2	12	650·6 (41·6)	813·1 (632·4)	0·71
	3	4	210·0 (14·1)	580·4 (357·7)	0·35
Total		23			
Gazella dorcas neglecta	4	7	29·9 (14·0)	13·4 (35·3)	0·82
	5	10	10·0 (14·1)	82·9 (79·9)	0·37
	6	7	0	54·5 (80·0)	0·30
	7	6	49·8 (14·0)	32·5 (50·4)	0·48
	8	11	0	232·9 (377·2)	0·15
	9	8	49·8 (13·9)	76·1 (119·4)	0·80
Total		49			
Gazella dama mhorr	10	4	59·9 (28·2)	72·8 (108·9)	0·64
	11	6	30·1 (42·6)	126·6 (126·6)	0·50
	12	4	50·0 (14·1)	105·6 (111·2)	1·00
	13	8	10·0 (14·1)	18·7 (17·1)	0·34
Total		22			

Veterinary Record (2000) **147,** 196-197

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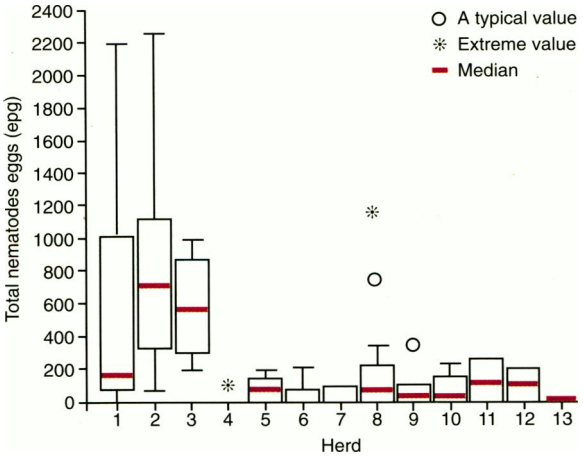

FIG 1: Pattern of faecal egg counts in each herd, with the box plots representing the 5, 25, 50, 75 and 95 percentile values, plus additional values outside the 95 percentile. Bars sd

U test for each herd. Statistical analyses were performed using SPSS software (Norusis 1993).

The pattern of faecal egg counts in a herd was overdispersed (Fig 1). Results of the comparison between H and I values are summarised in Table 1. The non-significance of the values suggests that there were no differences between the means obtained for each herd in 96·15 per cent of the analysed categories. Only when H and I values were compared for other trichostrongyles eggs shedding in herd 7 and for *Trichuris* eggs shedding in herd 9 (both herds comprising *G d neglecta*), did the arithmetic means show statistically significant differences (P=0·009 and P=0·05, respectively). However, it should be pointed out that no statistical difference was found between both means of each herd when the test was performed for total nematode eggs shedding. There was no attempt to correlate these results with host's characteristics since previous analyses revealed that there are no statistically significant differences between the eggs shedding of any of the nematodes studied and the species, sex or age of the gazelles (Ortiz and others 1993).

Isaza and others (1990) showed that 42 per cent of the questioned zoological institutions collected pooled faecal samples in herd enclosures. However, most of them usually made an individual (27 per cent) or both individual and herd (31 per cent) collection of specimens. The present method can avoid the complicated sampling procedures followed by most zoological institutions.

Sometimes, parasitoses should be considered as a problem of collectiveness, rather than as an individual circumstance of its members. In this sense, values for the nematode eggs shedding of a herd could be more useful than more accurate data of the elimination by a specific individual animal, even though, according to Tarazona (1986), eggs per gram (epg) of faeces counts are influenced by many factors, including differential fecundity of parasites species, ingesta volume, age of worms and host resistance. It is evident that the variation around a given epg value can be significantly reduced by multiple samples from a host (Gasbarre and others 1996), but this practice becomes troublesome and dangerous when dealing with wild ungulates. To make matters worse, these authors showed that since faecal epg values follow an overdispersed distribution, the sample must be obtained from a minimum of 15 to 20 individuals to assess accurately the epg profile of the herd. This means that, in a situation such as this study, all the individuals should be captured to determine the parasitological status of a herd. All of these problems suggest that a management method which combines the possibility of taking values of nematode eggs shedding on a herd basis with a rapid and suitable procedure would be useful. The sampling method described in this study allows clinical digestive signs to be related to the presence of parasites, and avoids the dangers involved in capturing the animals and the time-consuming telescopic tracking of the animals. The use of practices like the one described in this study and alternative ways of treating the collections (Ortiz and others 1999) should provide easier management of wild animals in captivity.

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