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Abomasal and small intestinal nematodes from captive gazelles in Spain

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Abstract

The abomasal and small intestinal helminth fauna of three species of captive gazelles (*Gazella dama mhorr*, *G. cuvieri* and *G. dorcas neglecta*) kept in captivity in Almería (southeast Spain) have been studied, and the following species were identified: *Nematodirus spathiger*, *N. filicollis*, *N. helvetianus*, *Camelostrongylus mentulatus*, *Trichostrongylus vitrinus*, *T. probolurus*, *T. colubriformis*, *Ostertagia ostertagi*, *O. harrisi*, *Teladorsagia* (*Ostertagia*) *circumcincta*, and *T.* (*Ostertagia*) *davtiani*. *Camelostrongylus mentulatus* and *N. spathiger* were the most prevalent and abundant parasites. *Ostertagia ostertagi*, *O. harrisi*, *N. helvetianus*, and *T.* (*Ostertagia*) *davtiani* were identified for the first time in the genus *Gazella*. In addition, *O. harrisi* and *Trichostrongylus probolurus* are new records for Spain.

Introduction

The Estación Experimental de Zonas Aridas (CSIC, Almería, Spain) keeps three species of African gazelles (*Gazella dama mhorr*, *G. cuvieri* and *G. dorcas neglecta*) in captivity. *Gazella dama mhorr* was originally found in the western tip of the Sahara desert from the south of the Anti-Atlas mountains to the desert of Senegal, and from the Atlantic coast to about 250 km inland, but it disappeared in the wild after 1968 (Cano, 1980). Although *G. dorcas* and *G. cuvieri* are still present in their natural area of distribution, savannah and semi-desert plains of the western Sahara and Algerian desert, and the mountain regions of Morocco, Algeria and Tunisia, respectively (Alados, 1987; Abáigar, 1993; Escós, 1993), they are endangered. Their numbers are decreasing everywhere due to hunting, trapping and habitat degradation (Aulagnier *et al.*, 1986; Abáigar, 1993; Escós, 1993). Since 1970, approximately 300 of these three species have been maintained by a captive breeding programme with the main objectives being prevention of extinction and eventual reintroduction into their original areas of distribution.

There has been much research into internal parasites in wild ungulates but only a few studies have involved members of the genus *Gazella*. Eslami *et al.* (1980) reviewed nematodes found in *G. subgutturosa* in Iran, including *Marshallagia marshalli*, *Camelostrongylus mentulatus*, and different species of the genus *Ostertagia*, *Trichostrongylus* and *Nematodirus*. In South African gazelles located in Italian zoos and Natural Parks, Quesada & Maggio (1982) identified *Haemonchus* sp. and *Nematodirus* spp. However, the gastrointestinal helminths in *G. dama*, *G. cuvieri* or *G. dorcas* have not been widely studied.

The aim of the present study was to determine the prevalence and intensity of abomasal and small intestinal nematodes in these African gazelles.

Material and methods

Study area and animals

Material came from a breeding group of gazelles maintained since 1971 in captivity on the farm La Hoya of the Estación Experimental de Zonas Áridas (EEZA) in Almería (southeast Spain). This farm is isolated, and

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Table 1. Prevalence and abundance of abomasal and small intestinal nematodes from the gazelles *Gazella cuvieri*, *G. dama* and *G. dorcas*.

Nematode species	*G. cuvieri* (n = 15)		*G. dama* (n = 19)		*G. dorcas* (n = 13)	
	Prevalence (%)	Abundance ($\bar{x}$±SE)	Prevalence (%)	Abundance ($\bar{x}$±SE)	Prevalence (%)	Abundance ($\bar{x}$±SE)
Camelostrongylus mentulatus	87.5	29.8±13.1	79.0	25.8±8.0	75	10.7±5.4
Nematodirus filicollis	6.3	0.4±0	10.5	1.4±1.2	8.3	2.1±0
N. helvetianus	6.3*	1.0±0	–	–	–	–
N. spathiger	87.5	115.2±60.9	84.2	34.3±9.3	4.7	27.7±21.3
Ostertagia harrisi	6.3*	1.5±0	5.3*	0.2±0.2	–	–
O. ostertagi	6.3*	0.4±0	–	–	–	–
Teladorsagia (*O.*) *circumcincta*	18.8	0.7±0.4	–	–	–	–
T. (*O.*) *davtiani*	6.3*	0.2±0	–	–	–	–
Trichostrongylus colubriformis	–	–	5.3	0.4±0	–	–
T. probolurus	–	–	5.3	0.4±0	16.5	0.9±0.7
T. vitrinus	6.3	0.3±0	10.5	1.2±0	8.3	0.4±0

* New host records for the genus *Gazella*.

contact between gazelles and any other wild or domestic ruminant is not possible.

The gazelles are distributed in reproductive groups, each containing one male, several females and their offspring, and located in large enclosures. Males not suitable for reproductive purposes are kept in individual enclosures. The gazelle population is treated with anthelmintics (mebendazole) once a year (March), concurrently with their annual vaccination.

The climate in Almería is characterized by moderate winters (December–February), warm springs and autumns (March–May and October–November), and hot dry summers (June–September). The average annual precipitation is less than 250 mm^3, with rainy periods in spring and little or no rainfall in summer. The average annual temperature is 18.4°C, minimum in January (12.1°C) and maximum in August (25.6°C) (Capel, 1986).

Forty seven gazelles (19 *G. dama*, 15 *G. cuvieri* and 13 *G. dorcas*) of different ages and sexes died in the Parque de Rescate de la Fauna Sahariana from 1994 to 1998. Following necropsy, the digestive tracts were conserved at −20°C for later investigations.

Collection of nematodes

The alimentary tracts were separated into two separate parts: abomasum and small intestine. The contents were examined separately by scraping, sieving and sedimentation processes. The sediment was preserved in 10% formalin. This material was diluted with water to make up two litres, and thoroughly mixed. One aliquot, representing 10% of the volume of the ingesta was examined in small portions under a stereoscopic microscope to collect the nematodes. When there were sufficient worms for identification purposes (100 individuals), one or two more aliquots (up to a total of 30% of the volume) were analysed.

Nematodes were collected, fixed, and cleared for examination with lactophenol. When the worm burden was high, 100 males were identified, and when the burden was low, as many males as could be recovered were examined. The percentage of male worms in the sample was considered in order to calculate the total number of each species. The morphology of adult male parasites was examined to determine species composition according to Skrjabin *et al.* (1961) and Durette-Desset (1989).

The prevalence, intensity and abundance of infection for each nematode species was determined using the terminology of Margolis *et al.* (1982).

Results

Necropsies showed differences in the nematode species found in the three species of gazelles. Prevalence, intensity and abundance of infection of the gazelle hosts, with up to 11 species of nematodes are presented on table 1.

The majority of gazelles (89.36%) were infected with one or more species of abomasal or small intestinal nematodes. The most abundant nematode was *N. spathiger*, followed by *C. mentulatus*, whereas the most prevalent species was *C. mentulatus*, followed by *N. spathiger* (table 1). In contrast, the remaining species were found in fewer than 15% of the gazelles. Most (42.9%) of the parasitized gazelles harboured two nematode species. Only 23.8% of the infected gazelles harboured one nematode species, while 21.4%, 9.5% and 2.4% were infected with three, four or five nematode species, respectively.

Although *C. mentulatus*, *N. filicollis*, *N. spathiger* and *T. vitrinus* were described in all gazelles examined, the remaining nematode species appeared only in one gazelle species (*O. ostertagi*, *Teladorsagia* (*Ostertagia*) *circumcincta*, *T.* (*Ostertagia*) *davtiani* and *N. helvetianus* in *G. cuvieri*, and *Trichostrongylus colubriformis* in *G. dama mhorr*) or two gazelle species (*O. harrisi* in *G. dama mhorr* and *G. cuvieri*, and *T. probolurus* in *G. dama mhorr* and *G. dorcas*).

Discussion

The results revealed that most gazelles harboured nematodes in the alimentary tract. According to Schultz *et al.* (1993), there was a large variation in worm contents

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within animals, both within and between different species of gazelles. The absence of previous data reduced the number of comparisons with those described for *G. subgutturosa*. According to Eslami *et al.* (1980), gazelles harboured a relatively small number of nematodes. Seven of the identified nematodes were previously described in *G. subgutturosa* (Eslami *et al.*, 1980). However, in the present study, the most prevalent genus was *Camelostrongylus*, while Eslami *et al.* (1980) found *Marshallagia*, *Nematodirus* and *Nematodirella* to be the most prevalent. Although *Nematodirus spathiger* was identified with a lower prevalence in the present study, it was more abundant than *C. mentulatus* (table 1). Furthermore, *O. ostertagi*, *O. harrisi*, *N. helvetianus* and *Teladorsagia* (*Ostertagia*) *davtiani* were identified in the genus *Gazella* for the first time (Skrjabin *et al.*, 1961; Eslami *et al.*, 1980).

Most of the nematodes reported in the present study were previously cited in Spain. *Camelostrongylus mentulatus* has been found in red deer (*Cervus elaphus*) and domestic goats (Cordero *et al.*, 1994; Gómez-Calcerrada, 1996; Molina *et al.*, 1997). Furthermore, *N. filicollis*, *Trichostrongylus vitrinus*, *O. ostertagi* and *T. circumcincta* were previously reported from both wild and domestic ruminants. However, *N. helvetianus*, *N. spathiger*, *T. colubriformis* and *Teladorsagia* (*Ostertagia*) *davtiani* have only been recorded in domestic ruminants in the Indice Catálogo de Zooparásitos Ibéricos (Cordero *et al.*, 1994). Species of *Ostertagia* and *Trichostrongylus*, which are the most prevalent genera in sheep and goats in Spain (Reina *et al.*, 1987; García *et al.*, 1996) were found in small numbers in the gazelles. This fact is not surprising since domestic ruminants are not able to enter EEZA's compartments.

The distribution of nematodes in the three species of gazelles, *G. dama*, *G. dorcas* and *G. cuvieri* did not show a common pattern. Hence, differences in their helminth fauna could be due to the maintenance of gazelles under abnormal confined conditions, or to the small number of hosts examined rather than a matter of parasite–host specificity. Further studies using larger samples of gazelles are therefore needed.

Trichostrongylus probolurus and *O. harrisi* have not been previously described in Spain. This fact pointed to the African origin of the gazelle species and their isolation from other ruminants since their arrival in Spain in 1971.

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