



RESEARCH COMMUNICATION

Helminths in a giraffe (*Giraffa camelopardalis giraffa*) from a zoo in Spain

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ABSTRACT

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A pregnant female Cape giraffe (*Giraffa camelopardalis giraffa*) died from an unknown cause in the Aitana Zoo, Alicante, Spain. Neither clinical signs nor macroscopic lesions were observed at necropsy. The alimentary tract was removed and examined for parasites. A total of 2 724 nematodes were found, including *Camelostongylus mentulatus*, *Trichostrongylus axei*, *Ostertagia ostertagi*, *Teladorsagia circumcincta*, *Teladorsagia trifurcata*, *Marshallagia marshalli*, *Trichostrongylus vitrinus*, *Trichostrongylus colubriformis*, *Spiculoptera asymmetrica* and *Trichuris giraffae*. Only *T. giraffae* and *C. mentulatus* have been previously reported from giraffes. The other nematodes are common in mouflons, fallow and red deer, which can usually be found in the same paddock as the giraffes in Aitana Zoo. Although its occurrence is unusual in this host, *C. mentulatus* was the most abundant nematode in our giraffe. This parasite has been related to disease, and even death, in several wild ruminants.

Keywords: Gastrointestinal nematodes, *Giraffa camelopardalis giraffa*, helminths, Spain

INTRODUCTION

The interest in the parasitoses of wildlife must be related both to the increase in the number of game reserves and to the potential transmission of these parasites to domestic animals. Most of the available information is related to Artiodactyla, but little is known about that concerning giraffes (Round 1968; Pester & Laurence 1974; Boomker, Horak & De Vos 1986; Krecek, Boomker, Penzhorn & Scheepers 1990; Fukomoto, Uchida, Ohbayashi, Ikebe & Sasano 1996). The study of animals that have died in accidents or from other causes provides useful opportunities for advancing the knowledge of the parasites of artiodactylids. This is of particular impor-

tance in the case of the giraffe, a species which is considered to be significant in European zoos. This study provides data of parasites found in this species living in Spain and describes the presence of worms not usually found in giraffes.

MATERIALS AND METHODS

During November 2002, a 4-year-old pregnant (3rd month of gestation) female Cape giraffe (*Giraffa camelopardalis giraffa*) died from an unknown cause in the Aitana Zoo, Alicante, in the southeast of Spain. No clinical signs were observed. The feeding of the giraffes in the zoo is based on *Quercus rotundifolia*, *Daphne gnidium* and *Pinus halepensis* and lucerne is supplied in limited quantities. Both natural and artificial water resources are available to all animals.

The dead animal was sent to the Veterinary Science Faculty, University of Murcia, where it was necropsied. No macroscopic lesions were observed. The animal was in good condition as adipose tissue was present around the small and large intestines and the kidneys. The alimentary tract was removed and examined for parasites according to the method described by Ortiz, Ruiz de Ybáñez, Garijo, Goyena, Espeso, Abaigar & Cano 2001. In brief, the abomasum, small and large intestines were processed separately by scraping the mucosal surfaces and washing the material so gained as well as the gut contents through a series of mesh screens, the final one of which had apertures 0.3 mm in size. The material remaining on the sieves was collected separately and fixed in 10% formalin.

Each sample, divided into smaller portions, was examined under a stereoscopic microscope and the nematodes present were removed. Adult male parasites were cleared in lactophenol for 48 h, and identified with the aid of the keys of Skrjabin, Shikhobalova, Schulz, Popova, Boev & Delyaure (1961) and Durette-Desset (1983, 1989). Representative specimens of the nematodes recovered are deposited in the Faculty of Veterinary Science, University of Murcia's parasite collection.

RESULTS AND DISCUSSION

A total of 2 724 nematodes were found (1 158 males and 1 566 females). Ten nematode species were recovered and neither trematodes nor cestodes were found. The abomasum yielded a total of 1 109 helminths (593 females and 516 males). The study of the males gave the following distribution:

<i>Camelostrongylus mentulatus</i>	284
<i>Trichostrongylus axei</i>	101
<i>Ostertagia ostertagi</i>	84
<i>Teladorsagia circumcincta</i>	35
<i>Marshallagia marshalli</i>	4
<i>Trichostrongylus vitrinus</i>	3
<i>Spiculoptera asymmetrica</i>	3
<i>Teladorsagia trifurcata</i>	2

The small intestine harboured 1 601 nematodes, 967 females and 634 males, comprising 587 *T. vitrinus* and 47 *Trichostrongylus colubriformis*. Fourteen worms were found in the large intestine (six females and eight males). All those males were identified as *Trichuris giraffae*.

Little information is available in the literature on the parasites of giraffes, and all refer to those recovered from animals living in National Parks. Krecek

et al. (1990), in a study on six animals in the Etosha National Park, Namibia, recorded parasite loads ranging from 18 to 531. These numbers are much lower than those obtained in the present work. It should be mentioned that keeping the animals in paddocks, as the giraffe in this study was, makes re-infection easier. On the other hand, Boomker *et al.* (1986) recorded 2 621 and 19 157 helminths, respectively, in two giraffes in the Kruger National Park, South Africa, a much larger number than recorded for the animals from Etosha. Krecek *et al.* (1990) attributed these differences to the low rainfall at Etosha National Park.

Of the helminths recovered in our study only *T. giraffae* and *C. mentulatus* are reported as occurring in giraffe (Round 1968; Fukumoto *et al.* 1996). The remaining species are common nematodes in other ruminant species but constitute the first records for giraffe.

Under natural conditions giraffes are exclusively browsers (Dorst & Dandelot 1972). However, the nematodes found in the giraffe in this study are considered to be mainly those of grazers. The manner in which the animals are maintained in the zoo is probably the reason for this. The zoo can be considered as a type of safari park as the animals are kept in very large paddocks. In addition, they can even change paddocks if they wish to do so. In this respect mouflons, *Ovis musimon*, are frequently found in the paddocks of other animal species. Restricting animals to game reserves and parks facilitates infections between different animal species, and, in addition, many helminths of antelope are not very host specific (Boomker *et al.* 1986).

Although the feeding habits of giraffes, in general, makes it difficult to acquire helminths of other ruminant species, Boomker *et al.* (1986) consider that they could acquire these when forced to graze. In the Aitana zoo lucerne is provided to the herbivores and is placed on the ground. This procedure could explain the presence of nematodes considered uncommon in giraffes, but which are frequently seen in other species in the zoo such as mouflons, fallow deer, *Dama dama* and red deer, *Cervus elaphus*.

Other gastrointestinal parasites previously recorded in giraffes, i.e. *Moniezia expansa* (Pester & Laurence 1974), hydatid cysts (Kelly, Boray & Dixon 1968; Krecek *et al.* 1990), *Haemonchus mitchelli* (Sachs *et al.* 1973; Krecek *et al.* 1990), *Skrjabinema* spp. (Krecek *et al.* 1990) or *Parabronema skrjabini* (Boomker *et al.* 1986; Krecek *et al.* 1990), were not found in the present study.

Camelostrongylus mentulatus was the most abundant nematode species in our giraffe. Its occurrence is unusual and it has only once been referred to in giraffe in Japan. As Fukomoto *et al.* (1996) suggested, the infection might have been present in other ruminant species kept in the same paddock of the zoo. *Camelostrongylus mentulatus* has been found in many domestic and wild ruminant species such as camels, *Camelus dromedarius*, llamas, *Lama glama*, and red deer (Averbeck, Scholtthauer & Hinueber 1981; Kock 1986; Flach & Sewell 1987; Alani & Yahay 1993; El Azazy 1995; Molina, Gutiérrez, Rodríguez-Ponce, Viera & Hernández 1997; Rossi & Ferroglia 2001).

No information is available concerning the pathology of *C. mentulatus* infections in wild ruminants but disease caused by it has been described in sheep, camels, oryx, *Oryx gazella*, blackbuck, *Antilope cervicapra*, giraffe and Thompson's gazelles, *Gazella thomsoni*. The cardinal signs were diarrhoea and weight loss. There is one report of *C. mentulatus* infection which might have had a fatal outcome: this was in a dorcas gazelle, *Gazella dorcas neglecta*, in which a severe abomasitis occurred when hypobiotic larvae of the parasite emerged from mucosal nodules (Wisser, Tscherner & Jantschke 2001). However, the absence of clinical signs and an advanced state of decomposition of the alimentary tract of this animal made it impossible to determine whether the *C. mentulatus* infection was the actual cause of the death.

Cross-infection between different species of wild ruminants with the trichostrongylid nematodes found in this study is possible, as is cross-infection between domestic and wild ruminants. Live wild animals in game reserves are not always strictly monitored for helminth infection. The current report emphasizes the need for surveillance and control of parasites as a means of improving the health of sheltered animals.

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