

## Intestinal parasitism in the animals of the zoological garden “Peña Escrita” (Almuñecar, Spain)

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### Abstract

Gastrointestinal parasites cause serious diarrhoea in captive animals. Therefore, we have undertaken this study to establish programmes to prevent, control, and treat intestinal parasitism in the animals of the zoological garden “Peña Escrita” of Almuñecar (Granada). An annual survey was conducted to estimate the occurrence of gastrointestinal parasites and the seasonality of this parasitism. Between June 2006 and May 2007, 432 samples were collected from primates, carnivores, perissodactyla, artiodactyla, rodentia, diprotodontia, galliformes, anseriformes and struthioniformes. One or more intestinal parasites were identified in 72.5% of the animals. The most frequent pathogenic endoparasites were *Eimeria* spp. (17.3%), *Trichuris* spp. (5.1%), *Strongyloides* spp. (4.5%), *Cyclospora* spp. (4.5%), *Cryptosporidium* spp. (3.2%) and *Isospora* spp. (2.6%). *Iodamoeba butschlii*, *Parascaris equorum* and *Trichuris* spp. did not vary with season and *Cryptosporidium* spp., *Dicrocoelium dendriticum*, *Metastrongylus* spp. and *Cylicospirura* spp. appeared exclusively in Artiodactyla. Multiple parasitic infections were common, 70% of animals presented with at least two parasites (maximum = 6). The most frequent cases of multiple parasitism were *Eimeria* spp. plus *Blastocystis* spp. and *Eimeria* spp. plus *Nematodirus* spp., in the last case the animals presented explosive diarrhoea. In accord with our results, after each sampling, some of the affected animals were treated and the corresponding programmes of prevention and control were designed.

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### 1. Introduction

Gastrointestinal parasites cause serious diarrhoea in mammals. Under natural conditions, excessive infections of endoparasites seldom occur, whereas in caged or corralled animals, as in a zoo, the stress to which the animals are subjected weakens their immunological

system, making them more susceptible to parasite infection. Crowding, hygiene, and feeding are also key factors in the development of endoparasites in zoo animals (Malan et al., 1997).

Indigenous parasites are normal components of a natural environment but foreign parasites and host which are not indigenous to the ecosystem are considered alien and should as far as possible be excluded (Malan et al., 1997).

In Spain, law “31/2003 de 27 de octubre”, regulates the conservation of wild fauna in zoos, considering that

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these collections should be a source of scientific knowledge to be placed at the disposal of research institutions in order to contribute to the conservation of zoo species. For this, it is important to take appropriate measures to prevent diseases and parasites from the exterior or towards the exterior, as well as among the zoo animals. Also, there are endoparasites that the animals can transmit to humans (zoonotic), both to visitors as well as the workers at the zoo.

Despite the above, prevalence data of gastrointestinal parasites in zoological gardens remain scarce. Only a couple of studies have comprehensively examined parasites of primates in captivity, one of them in a Belgian zoos (Antwerp zoo, Animals Park Planckendael, Olmen zoo and Park Paradisio) and the other one in the Parque Zoológico Nacional of Cuba (Leveck et al., 2007; Polo et al., 2007). In contrast other studies restricted their focus to examine specific parasites for example the seroprevalence of *Cryptosporidium* (Graceña et al., 2002), *Toxoplasma gondii*, and *Neospora caninum* (Sedlák and Bártová, 2006; Thiangtum et al., 2006), and *Gongylonema pulchrum* (Sato et al., 2005).

This study reflects the prevalence of gastrointestinal parasites in the fauna of the zoological garden Peña Escrita (Almuñecar, Granada), where different animal species live under semi-free conditions (in broad mountain areas and separated by kinetic nets). As an outcome of this all the sick animals and those affected by endoparasites have been treated and a prevention and control programme is being designed.

## 2. Materials and methods

### 2.1. Study site and animals

This study was conducted in the zoological garden Peña Escrita, located in the Sierra Almirajara in Almuñecar (Granada, Spain), a zoo of over 600 ha with an average altitude of some 1200 m. The park is divided into different sections by wire fences and the animals, distributed by species, live in nature. There is no crowding and the animals have open natural zones adapted with feeders, watering troughs, and hiding areas or caves.

This zoo contains autochthonous as well as exotic specimens, of which 21 species were studied (Table 1), representing 9 different orders. All the animals were more than 2 years old.

### 2.2. Sampling and coprological examination

From June 2006 to May 2007, the species in the zoo were faecal sampled bimonthly, by fresh deposit. At

Table 1

Animal species studied in the zoological garden Peña Escrita (Almuñecar, Spain)

Scientific name (common name)	Number of animals
<b>Diprotodontia</b>	
<i>Macropus euginii</i> (Dama wallaby)	2
<b>Primates</b>	
<i>Papio hamadryas</i> (Baboon)	4
<b>Carnivora</b>	
<i>Vulpes fulva</i> (Red fox)	5
<i>Canis lupus hudsonicus</i> (Hudson Bay Wolf)	10
<i>Canis lupus signatus</i> (Iberian wolf)	4
<i>Ursus arctos</i> (Brown bear)	8
<b>Perissodactyla</b>	
<i>Equus burchelli</i> (Burchell's zebra)	3
<i>Equus caballus</i> (Horse)	8
<b>Artiodactyla</b>	
<i>Sus scrofa</i> (Feral pigs)	10
<i>Hippopotamus amphibius</i> (Hippopotamus)	2
<i>Camelus dromedarius</i> (Dromedarian camel)	3
<i>Lama glama</i> (Llama)	2
<i>Kobus ellipsiprymnus</i> (Waterbuck)	1
<i>Ammotragus lervia</i> (Aoudad)	4
<i>Taurotragus oryx</i> (Common eland)	4
<i>Capra pyrenaica</i> (Spanish bies)	5
<b>Rodentia</b>	
<i>Hystrix africae australis</i> (Pine)	5
<b>Strutioniformes</b>	
<i>Strutio camelus</i> (Ostrich)	6
<b>Anseriformes</b>	
<i>Anser cygnoides</i> (Swan goose)	2
<b>Galliformes</b>	
<i>Gallus gallus</i> (Red jungle fowl)	10
<i>Phasianus colchicus</i> (Pheasant)	2

each sampling occasion, three samples were taken from each animal species. One sample was stored without preservative while the other two were preserved in potassium dichromate at 2.5%. Samples were transported to the laboratory and preserved at 4 °C until examined.

First, a macroscopic study was made of all the samples to determine their characteristics and the possible presence of nematodes and/or cestodes, as well

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