Veterinary Research Communications, 5 (1981/1982) 343—348
Elsevier Scientific Publishing Company, Amsterdam — Printed in The Netherlands

A STUDY OF PARASITIC INFECTIONS IN MAMMALS AND BIRDS AT THE DUBLIN ZOOLOGICAL GARDENS

V. GERAGHTY, J. MOONEY AND K. PIKE

Veterinary Research Laboratory, Department of Agriculture, Abbotstown, Castleknock, Co. Dublin (Ireland)

(Accepted 15 April 1982)

ABSTRACT

Geraghty, V., Mooney, J. and Pike, K., 1982. A study of parasitic infections in mammals and birds at the Dublin Zoological Gardens. Vet. Res. Commun., 5: 343-348.

The present report deals with the parasitic infections detected on examination of fresh faecal samples of 48 mammals and 4 birds at the Zoological Gardens, Dublin during 1978 - 79. 1,822 faecal samples were received over the two year period and 171 of these samples contained helminth eggs. Ninety-five percent of these positive findings were confined to the Carnivore and Herbivore groups with the Primates, Marsupials and Avians showing a low level of intestinal parasites.

INTRODUCTION

The occurrence of parasites in animals housed in zoological gardens presents problems which vary according to the different types of husbandry involved, disease prophylaxis and treatment. Intensive husbandry of animals produces conditions under which the spread of parasites is enhanced. Frequent use of anthelmintics can cause resistant strains to evolve. In addition the nutritional status of captive animals can enhance or diminish their resistence to disease.

Parasite burdens encountered in these animals are not necessarily a reflection of the parasitological status of animals living in the wild. The present study demonstrates certain effects of containing animals in a zoo situation.

MATERIALS AND METHODS

Fresh faecal samples were received from the Dublin Zoological Gardens every week. The faecal egg counting technique used was a modification of that devised by Gordon & Whitlock (.939). This method involves the vigorous mixing of 3 grams of faeces with 42 ml of water in a graduated cylinder until an even emulsion is obtained. The suspension is passed through a mesh sieve (size 60 meshes/linear inch) and 15 ml of the filtrate is centrifuged for five minutes at 1500 rpm. The supernatent is decanted and replaced with saturated salt solution (sp. gravity 1.200) up to a total volume of 15 ml. The suspension is

mixed well and allowed to stand for 2 - 5 minutes. An aliquot is withdrawn from the top of the tube with a pasteur pipette and transferred to both chambers of a McMaster counting slide (Hawksley and Sons Ltd., London . W.1). The number of eggs in the two chambers is counted. The volume contained in each chamber is 0.15 ml. The number of eggs per gram of faeces is calculated as follows:

$$\text{epg}^{*} \quad \frac{\text{total number of eggs in both chambers}}{2 \quad \text{(number of chambers)}} \times 100$$

* epg = eggs per gram of faeces

RESULTS

The results of faecal examinations of the Carnivores and Herbivores are presented in tabular form giving details of the type of housing, parasitic burdens and frequency of infestations.

TABLE I Carnivores

Animal	Parasite	$\frac{X}{N}$ [4]	Animal	Parasite	$\frac{X}{N}$ [4]
Cheetahs [1] (Acinonyx jubatus)	Toxascaris	11/58	Lions [1] (Panthera leo)	Toxascaris	6/24
	Trichuris	3/58			
Siberian tigers [1] (Panthera tigris altaica)	Toxascaris	2/19	Lionesses [1] (Panthera leo)	Toxascaris	7/24
Siberian tigresses	Toxascaris	3/24	Lion cubs [1]	Toxascaris	4/8
Palm civit cat [2] (Nandinia binotata)	Negative	0/20	Northern lynx [2] (Felis lynx)	Negative	0/27
Clouded leopards [2] (Neofelis nebulosa)	Toxascaris	1/44	Coatimundi [2] (Nasua nasua)	Negative	0/22
Leopards [2] (Panthera pardus)	Toxascaris	5/60	Kinkajou [1] (Potos flavus)	Toxascaris	1/26
	Trichuris	2/60		Toxocara	1/26
	Toxocara	1/60		Ascaris	1/26
Leopard cubs [2] (Panthera pardus)	Toxascaris	3/12	Caracal lynx [2] (Felis caracal)	Negative	0/27
	Toxocara	1/12			
Snow leopards [2] (Panthera uncia)	Toxascaris	11/20	Jaguars [2] (Panthera onca)	Toxascaris	1/42
	Trichuris	1/20			
Pumas [2] (Felis coacolor)	Toxascaris	3/15	Servals [2] (Felis serval)	Negative	0/28
Black panthers [2] (Panthera pardus)	Negative	0/28	Racoons [1] (Procyon lotor)	Ascaris	1/24
Black bears [3] (Ursus americanus)	Ascaris	1/24	Pine martins [2] (Martes martes)	Toxascaris	1/17
				Trichuris	1/17

1 = Grassed enclosure 2 = Caged 3 = Concrete enclosure

4 = $\frac{X}{N}$; X = number of times parasite was detected.
N = number of samples tested per animal.

In the Primate group, twelve of the fifteen species in the zoo were caged. A low incidence of parasitic infection was found in this group; the following caged primates showed no parasitic infection on any occasion: gorilla (Gorilla g. gorilla), agile gibbon (Hylobates agilis), colobus monkey (Colobus abyssinicus), white-throated capuchins (Cebus capuchinus), brown capuchins (Cebus apella), ring-tailed lemurs (Lemur catta), mayotte lemurs (Lemur m. mayottensis), squirrel monkey (Saimiri sciureus). One of the housed primates, the orang utan (Pongo pygmaeus), showed no parasitic burden at any time.

The marsupials also had a low incidence of parasitism with parasite eggs being found on only two occasions.

Faecal samples were received from four species of birds - emu (Dromiceius novaehollandiae), ostrich (Struthio camelus), rhea (Rhea americana) and crane (Grus antigone). The rheas were the only birds in which parasite eggs were detected.

Tabel II Herbivores

Animal	Parasite	$\frac{X}{N}$[4]	Animal	Parasite	$\frac{X}{N}$[4]
Hippopotamus[1] (Hippopotamus amphibius)	Strongyle	2/25	Bisons[1] (Bison bison)	Negative	0/16
Bactrian camels (male)[1] (Camelus bactrianus)	Strongyle	6/23	Guanacos (Lama guanicoe)	Nematodirus	1/27
	Nematodirus	1/23			
Bactrian camel (female)[1] (Camelus bactrianus)	Strongyle	7/24	Tapirs[1] (Tapirus terrestris)	Strongyle	1/23
	Nematodirus	1/24			
Giraffes (male)[1] (Giraffa camelopardalis)	Strongyle	4/50	Duikers[1] (Sylvicapra grimmia)	Strongyle	1/28
Giraffes (female)[1] (Giraffa camelopardalis)	Strongyle	2/23	Porcupine[1] (Erethizon dorsatum)	Negative	0/4
Gnus[1] (Connochaetes taurinus)	Negative	0/28	Elephants[3] (Loxodonta africana)	Negative	0/16
Arabian camels (male)[1] (Camelus dromedarius)	Strongyle	4/28	Black buck[1] (Antilope cervicapra)	Nematodirus	11/24
	Trichuris	1/28		Strongyle	6/24
Arabian camels (female)[1] (Camelus dromedarius)	Strongyle	3/28	White rhinocerous[1] (Ceratotherium simum)	Strongyle	2/25
	Trichuris	1/28			
Zebras (male)[1] (Equus burchelli)	Ascaris	9/53	Zebras (female)[1] (Equus burchelli)	Ascaris	2/38
	Parascaris	2/53		Parascaris	2/38
	Strongyle	9/53		Strongyle	6/38
Prarie dogs[1] (Cynomys ludovicianus)	Hookworm	3/16			
	Strongyle	1/16			

1 = Grassed enclosure 2 = Caged 3 = Concrete enclosure

4 $\frac{X}{N}$; X = number of times parasite was detected.
N = number of samples tested per animal.

DISCUSSION

Five of the twelve caged primates showed parasitic burdens on one occasion each - whipworm (Trichuris sp.) was found in the white-handed gibbon (Hylobates lar), siamang gibbon (Symphalangus syndactylus), patas monkey (Erythrocebus patas) and lion-tailed macaque (Macaca silenus) as found by Chauhan et. al. (1973) while enterobius eggs were found on one occasion in the spider monkey (Ateles paniscus). Primates in grassed enclosures also had a low incidence of internal parasitic infection. One factor contributing to the very low level of parasitic infection in the caged primates is the cleaning regime. These cages are cleaned daily which helps to prevent the availability of faecal parasite eggs.

In the Carnivore group six of the ten caged species showed parasitic burdens with persistent ascarid burdens in the snow leopards (Panthera uncia) and leopards (Panthera pardus) (Table 1). All of the Carnivores kept in grassed enclosures carried parasitic burdens on more than one occasion, the lions (Panthera leo) and cheetahs (Acinonyx ubatus) having persistent burdens. Ascarid infections have also been found in zoo housed members of the cat family by other workers (Sen Cupta, 1974; Chauhan et al., 1973). Again some of the caged species showed no worm burden on any occasion; the practice of cleaning out the cages of the Carnivores once a week is certainly of importance here. Ascarids, however, can be a problem for the Carnivores in grassed enclosures because they can remain dormant and viable in the soil or pasture for years so that eradication of infections in species on such pastures is very difficult.

With regard to parasitic infections in the Herbivore group, a high incidence of bursate worm eggs was seen; ascarid burdens were confined to the zebras (Equus burchelli); whipworm eggs (Trichuris sp) were seen in the arabian camels (Camelus dromedarius) and prairie dogs (Cynomys ludovicianus), the latter also carried hookworm eggs (Ancylostoma sp) on a few occasions. The gnus (Connochaetes taurinus) and bisons (Bison bison) did not show burdens on any occasion while the porcupines (Erethizon dorsatum) were also negative although samples were only received from these on four occasions.

It has been found that Indian elephants (Elephas maximus) in the zoological park Kanpur carried large numbers of strongyles. (Gaur et. al. 1979). However the african elephants (Loxodonta africana) in the Dublin zoo, did not give positive faecal egg counts at any stage during this study. It is not known whether breed,susceptibility or husbandry methods account for this difference.

Camels were dosed with Fenbendazole ("Panacur", Hoechst, 14.3 mg/kg B.W.) every two months yet they frequently carried bursate and Trichuris eggs. This practise of dosing at constant intervals with the same anthelmintic may have allowed resistant parasitic strains to occur and could account for the frequency with which the camels were infested.

The Marsupials showed little evidence of internal parasitic infection. Bursate eggs were found on only one occasion in the wallaby (Protemnodon rufogrisea) and the western grey kangaroo (Macropus fuliginosus). The eastern grey kangaroos (Macropus giganteus) did not show parasitic burdens on any occasion. The low incidence may be due to the relatively large outdoor area available to these animals.

In the Avian section only the rhea (Rhea americana) showed evidence of parasitic infection with bursate burdens being found on two occasions. However, the diet of these birds is almost entirely processed nuts and pellets which reduced the chances of parasitic infection through ingestion.

An interesting feature of this study is that no tapeworm eggs or coccidial oocysts were recovered from any of the animals or birds sampled in the Dublin zoo. Tapeworms have been found in other zoos in herbivores, (Chauhan et. al., 1973) and in carnivores and birds (Sen Gupta, 1974). Oocysts of coccidia have been found in birds (Sen Gupta, 1974, Chauhan, 1973) and in rodents (Sen Gupta, 1974).

It is interesting to note that during the writing of this paper, the Dublin zoo imported a new female elephant (Loxodonta africana) which was kept in isolation. Faecal samples were taken and revealed eggs of Paragonimus kellicotti - a lung fluke not found in Ireland. As this fluke requires a snail - Pomatiopsis lapidaria - to produce cercariae and a crayfish to produce metacercariae, the nature of the epidemiology of this disease makes it impossible to spread the infection to other elephants within the confines of the Dublin zoo. This factor combined with treatment with the anthelmintic albendazole ("Valbazen", Smith, Kline & French 7.5 mg/kg B.W.) cleared the infestation within three weeks.

The results of this paper show that even with high standards of husbandry at Dublin zoo coupled with regular faecal examinations by the Veterinary Laboratory there remains a detectable level of parasitic infection. It is felt that if standards were lowered or husbandry or examination levels relaxed a higher degree of infestation would become evident.

ACKNOWLEDGEMENTS

Thanks are due to the Director, Veterinary Research Laboratory, for permission to publish, and to D.J. O'Brien, Head of Parasitology, for advice and help during the various stages of this study. Thanks are also due to the Director and the staff of Dublin zoo for their co-operation and interest in this work.

REFERENCES

Chauhan, P.P.S., Bhatia, B.B., Arora, G.S., Agrawal, R.D. and Ahluwalia, S.S. 1973.
A preliminary survey of parasitic infections among mammals and birds at Lucknow and Delhi Zoos. Indian J. Anim. Sci. 43 (2), 163-168.

Gaur, S.N.S., Sethi, M.S., Tewari, H.C. and Prakash, O.M. 1977. A note on the prevalence of helminth parasites in wild and zoo animals in Uttar Pradesh. Indian J. Anim. Sci. 49 (2), 159-161.

Gordon, H. Mcl. and Whitlock, H.V. 1939. A new technique for counting nematode eggs in sheep faeces. J. Counc. Sci. ind. Res. Aust. 12 (1), 50-52.

Sen Gupta, M.R. 1974. A preliminary report on diseases and parasites of zoo animals birds and reptiles. Indian J. Anim. Health 13 (1), 15-24.