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## A preliminary survey of parasitic infections among mammals and birds at Lucknow and Delhi zoos

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The present report deals briefly with the common parasitic infections detected on examination of fresh faecal samples of 25 mammals and 21 birds (out of 31 and 45 species, respectively, examined) at the Zoological Gardens, Lucknow, during 1967-68 and 1971-72, and of 21 mammals and 26 birds (out of 35 and 63 species, respectively, examined) at Delhi Zoo during July to September 1970 and 1971-72. A seasonal incidence was also studied after repeated examination of each host species.

Fresh faecal or rectal samples were collected in clean sterile containers. A part of each sample was fixed in 10% formalin and the rest mixed with 2.5% potassium dichromate solution. Direct examination and examination after concentration by centrifugation in Sheather's sugar solution revealed a variety of

helminthic eggs and coccidian oocysts. Besides, examination of blood smears and post-mortem cases of some of the hosts was also made at the zoos and the findings are recorded.

### *Lucknow Zoo*

Amongst helminthic infections in mammals, eggs of bursate worms in wild Bovidae and in species of Cervidae; toxascarids, hookworms and whipworms in species of carnivores; and whipworm (*Trichuris* sp.) in species of Primates were commonly encountered. A higher incidence of these infections was generally observed during rainy and winter seasons. In a post-mortem examination of a spotted deer, heavy infection with *Gastrothylax* sp. was found. In two other post-mortem cases of young wolves, prominent lesions of enteritis were detected with a large number of hookworms, *Ancylostoma braziliense*, found attached to the mucosa. A rhino, for the first time, showed tapeworm infection as revealed by typical anoplocephalid eggs. In birds, ascarid and capillarid infections

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Table 1. Infections detected at Prince of Wales Zoological Gardens, Lucknow

Hosts	Helminthic infection	Coccidian infection
<i>MAMMALS</i>		
Nilgai ( <i>Boselaphus tragocamelus</i> )	Bursate, Trichurid	<i>Eimeria yakimovi</i> , <i>E. nilgai</i> , <i>E. tragocamelis</i>
Spotted deer ( <i>Axis axis</i> )	Bursate, Trichurid, Amphistome	<i>E. cheetali</i>
Barking deer ( <i>Muntiacus muntjaka</i> )	Bursate	<i>Eimeria</i> sp., <i>Eimeria</i> sp. (unidentified)
Swamp deer ( <i>Cervus duvauceli</i> )	Bursate	Nil
Black buck ( <i>Antelope cervicapra</i> )	Bursate, <i>Strongyloides</i> sp.	<i>E. cheetali</i>
Mouse deer ( <i>Tragulus meminna</i> )	Bursate	<i>E. rangai</i>
Chinkara ( <i>Gazella gazella</i> )	Bursate, Trichurid, Amphistome	<i>E. chinkari</i>
Hogdeer ( <i>Axis porcinus</i> )	Bursate	<i>E. parahi</i>
Four-horned antelope ( <i>Tetracerus quadricornis</i> )	Bursate	<i>E. chausinghi</i>
Sambhar ( <i>Cervus unicolor</i> )	Bursate	Nil
Ghural ( <i>Memorhadus goral</i> )	Bursate	Nil
Hyaena ( <i>Hyaena striata</i> )	Bursate, Toxascarid	Nil
Wolf ( <i>Canis lupus</i> )	<i>Ancylostoma braziliense</i>	Nil
Slow loris ( <i>Nycticebus coucang bengalensis</i> )	Trichurid	Nil
Leopard ( <i>Panthera pardus</i> )	Bursate, Toxascarid	Nil
Tiger ( <i>Panthera tigris</i> )	Bursate, Toxascarid	<i>Isoospora</i> sp. (unidentified)
Lion ( <i>Panthera leo</i> )	Bursate, Toxascarid	<i>Isoospora</i> sp.
Sloth bear ( <i>Melurus ursinus</i> )	Trichurid	Nil
Brown bear ( <i>Ursus arctos</i> )	Bursate	Nil
Genda ( <i>Rhinocerus unicornis</i> )	Anoplocephalid tapeworm	Nil
Langoor ( <i>Semnopithecus entellus</i> )	Trichurid	Nil
Capped langoor ( <i>Presbytis pileatus</i> )	<i>Strongyloides</i> sp.	Nil
Lanted monkey ( <i>Macaca</i> sp)	Trichurid	Nil
Arabian baboon ( <i>Papio hamadryas</i> )	Bursate, Ascarid, Trichurid	Nil
Gibbon ( <i>Hylobates hoolock</i> )	Trichurid	Nil
<i>BIRDS</i>		
Red jungle-fowl ( <i>Gallus gallus</i> )	Capillarid	<i>E. dubeyi</i> , <i>E. vanmurghavi</i>
Grey jungle-fowl ( <i>Gallus sonneratii</i> )	Ascarid	<i>I. choudari</i>

Table 1 (Continued)

Hosts	Helminthic infection	Coccidian infection
Guinea-fowl ( <i>Numida meleagris</i> )	Capillarid	<i>E. gorakhpuri</i>
Peafowl and white peafowl ( <i>Pavo cristatus</i> )	Ascarid, Capillarid, Spirurid	<i>E. mayurai</i> , <i>E. mandali</i> , <i>I. mayuri</i>
Black partridge ( <i>Francolinus francolinus</i> )	Nil	<i>E. teetari</i>
Chakor partridge ( <i>Caccabis chakor</i> )	Ascarid, Capillarid	<i>E. teetari</i>
White and Black turkey ( <i>Meleagris gallopavo</i> )	Capillarid	Nil
Golden pheasant ( <i>Chrysolophus pictus</i> )	Ascarid, Capillarid, <i>Strongyloides avium</i>	<i>E. pictus</i>
Silver pheasant ( <i>Lophura nycthemera nippona</i> )	Ascarid, Capillarid	<i>E. pictus</i>
Peacock pheasant ( <i>Polypectron chinques</i> )	Ascarid, Capillarid	Nil
Amherst pheasant ( <i>Chrysolophus amherstiae</i> )	Ascarid	<i>E. meleagridis</i> or <i>E. adenooides</i>
Peacock pigeon ( <i>Columba</i> sp.)	Ascarid, Capillarid	Nil
Pouter pigeon ( <i>Columba</i> sp.)	Nil	} <i>Eimeria</i> sp. (unidentified)
Naqab pigeon ( <i>Columba</i> sp.)	Nil	
White pigeon ( <i>Columba livia intermedia</i> )	Capillarid	<i>E. tropicalis</i>
Javan parakeet ( <i>Psittacus javanicus</i> )	Capillarid	Nil
Greater lemon-crested cockatoo ( <i>Cacatua galerita</i> )	Capillarid	Nil
Red- and Blue-macow ( <i>Ara chloroptera</i> )	Capillarid	Nil
Saras ( <i>Grus antigone</i> )	Ascarid, Hymenolepid	<i>E. grusi</i>
Common crane ( <i>Grus grus</i> )	Hymenolepid	Nil
Painted stork ( <i>Ibis leucocephalus</i> )	Capillarid	Nil

were commonly detected in a variety of gallinaceous and a few other host species. Various infections against each host are tabulated (Table 1).

Amongst coccidian infections, a number of species of the genus *Eimeria* and *Isospora* were detected in a variety of mammals and birds. In mammals, 8 eimerian and 1 isosporan forms, described recently,

were detected as new species excepting *E. yakimovi* in nilgai. In birds, 10 eimerian and 2 isosporan species were described earlier as new forms, excepting *E. meleagridis* or *E. adenooides* in turkey, *E. tropicalis* in pigeon and *I. mayuri* in peafowl (Bhatia and Pande, 1966, 1967; Bhatia *et al.*, 1966; Bhatia, 1968a, 1968b; Pande *et al.*, 1970; Bhatia *et al.*, 1972).

Table 2. Infections detected at Zoological Park, Delhi

Hosts	Helminthic infection	Coccidian infection
<i>MAMMALS</i>		
Nilgai ( <i>Boselaphus tragocamelus</i> )	Bursate	Nil
Bison ( <i>Bison bison</i> )	Bursate	Nil
Eland ( <i>Taurotragus oryx</i> )	Bursate	Nil
Laddakhi goat ( <i>Capra ibex</i> )	Bursate	<i>E. arloingi</i> , <i>E. crandallis</i>
Impala ( <i>Apyceros melampus</i> )	Bursate	Nil
Sikka deer ( <i>Cervus nippon</i> )	Amphistomes	Nil
Black buck ( <i>Antelope cervicapra</i> )	Bursate	Nil
Panda ( <i>Eilurus fulgens</i> )	Hymenolepid	Nil
Tiger ( <i>Panthera tigris</i> )	Toxascarid, Hookworm	Nil
Panther ( <i>Panthera pardus</i> )	Toxascarid, Hookworm	Nil
Lion ( <i>Panthera leo</i> )	Toxascarid	Nil
American black bear ( <i>Ursus americanus</i> )	Bursate	Nil
Golden langoor ( <i>Presbytis geei</i> )	Hookworm	Nil
Nilgiri langoor ( <i>Presbytis johni</i> )	Trichurid	Nil
Grey langoor ( <i>Presbytis entellus</i> )	Trichurid	Nil
Pavan langoor ( <i>Presbytis entellus</i> )	Trichurid	Nil
Capped langoor ( <i>Presbytis pileatus</i> )	Trichurid	Nil
Chimpanzee ( <i>Pan troglodytes</i> )	Hookworm, <i>Strongyloides</i> sp. and Trichurid	Nil
Olive baboon ( <i>Papio papio</i> )	Trichurid, Spiruroid	Nil
Bonnet monkey ( <i>Macaca radiata</i> )	Trichurid	<i>Isospora</i> sp.
Nilgiri monkey ( <i>Macaca</i> sp.)	Trichurid	Nil
<i>BIRDS</i>		
Grey jungle-fowl ( <i>Gallus sonneratii</i> )	Nil	<i>E. vanmurghavi</i> , <i>I. choudari</i>
Guinea-fowl ( <i>Numida meleagris</i> )	Spiruroid, Ascarid, Capillarid	<i>E. gorakhpuri</i>
Burmese peafowl ( <i>Pavo munticus</i> )	Ascarid, Capillarid, Spiruroid	<i>E. mayurai</i> , <i>I. mayuri</i>
Peafowl and white peafowl ( <i>Pavo cristatus</i> )	Capillarid, Ascarid	<i>E. mayurai</i> , <i>I. mayuri</i> , <i>E. pavonis</i>
Lady Amherest pheasant ( <i>Chrysolophus amherstiae</i> )	Spiruroid, Capillarid	Nil

Table 2 (Continued)

Hosts	Helminthic infection	Coccidian infection
Korean pheasant ( <i>Phasianus colchicus</i> )	Ascarid	<i>I. koreani</i>
Kalitz pheasant ( <i>Lophura leucomelana</i> )	Ascarid, Capillarid	<i>Eimeria</i> sp. (unidentified)
Golden pheasant ( <i>Chrysolophus pictus</i> )	Ascarid	Nil
Silver pheasant ( <i>Lophura nycthemera</i> )	Capillarid	Nil
Japanese Green pheasant ( <i>Phasianus vericolor</i> )	Nil	<i>Isospora</i> sp. (unidentified)
Grey partridge ( <i>Francolinus pondicerianus</i> )	Ascarid, Capillarid	<i>E. teetari</i>
Black partridge ( <i>E. francolinus</i> )	Ascarid, Capillarid	<i>Eimeria</i> sp. (unidentified)
Pigeon ( <i>Columba livia</i> )	Nil	<i>E. tropicalis</i>
Red-checked bulbul ( <i>Pycnonotus jocosus</i> )	Ascarid, Capillarid	<i>Eimeria</i> sp., <i>Isospora</i> sp. (unidentified)
Ring dove ( <i>Streptopelia decaocto</i> )	Capillarid	<i>E. choudari</i>
Shah Baz ( <i>Spizaetus cirrhatous</i> )	Capillarid	Nil
Green parakeet ( <i>Psittacula eupatria</i> )	<i>Strongyloides</i> sp.	Nil
Black crow ( <i>Corvus splendens</i> )	Ascarid	Nil
Laughing thrush ( <i>Garrulax albogularis</i> )	Ascarid	Nil
Bagula ( <i>Babulcus ibis</i> )	Ascarid	Nil
Mandarin duck ( <i>Aix galericulata</i> )	Nil	<i>I. mandari</i>
Painted stork ( <i>Ibis leucocephalus</i> )	Capillarid	Nil
Manchurian crane ( <i>Grus japonensis</i> )	Ascarid, Capillarid	Nil
Hill Myna ( <i>Gracula religiosa</i> )	Nil	<i>Isospora</i> sp. (unidentified)
Budgeriger ( <i>Melopsittacus undulatus</i> )	Nil	<i>Isospora</i> sp. (unidentified)

Two eimerian forms in Barking deer ('Kankar'), 1 isosporan species in white tiger and 1 eimerian form in Pouter pigeon and Naqab pigeon, after detailed study, will be dealt with later. Host-wise infections are given in Table 1.

#### Delhi Zoo

Amongst helminthic infections in mammals, a high incidence of *Toxascaris leonina* and hookworms in panthers and tigers; bursate worms in wild Bovidae

and species of Cervidae; and whipworms (*Trichuris* sp.) in different species of Primates were detected. Besides, vomitus from clinical cases of panther cubs revealed live *T. leonina* worms. Blood smears from cutaneous lesions on hind legs of an elephant showed microfilariae which, on comparison, were indistinguishable from those of *Indofilaria pattabiramani* Alwar *et al.*, (1959). Treatment of this case with diethylecarbamezine ('Heterazan') proved effective. In birds, ascarid and capillarid infections were commonly

observed mainly among gallinaceous species. Hos-wise infections are given in Table 2.

Mammals showed a lower incidence of coccidian infections. A variety of eimerian and isosporan species were detected in different avian hosts. Of these, 8 eimerian and 5 isosporan species, among known forms, have been described earlier. Besides, 3 eimerian (1 each in Kaliz pheasant, Black partridge and Red-cheeked bulbul) and 4 isosporan species (1 each in Red-cheeked bulbul, Japanese green pheasant, Hill myna and Budgeriger) are being studied in detail and will be dealt with later. Hostwise infections are given in Table 2.

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## A note on the histological development of ruminal papillae in the early postnatal life of buffalo calf

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Wardrop (1961) studied in detail gross and microscopic structures of the ruminal mucosa during prenatal and postnatal life of lambs. He marked a persistent and rapid increase in the size of

the papillae with increase in age, particularly during 3 weeks after birth. Tamate *et al.* (1962) observed the presence of papillae at birth, their subsequent regression and renewal of their growth, but have not mentioned the histological process involved with the regression of the height of the ruminal papillae. The present report deals with the histological development of the ruminal papillae of

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