Table 10: verminous parasites

Disease	Pathogenic agent	Infectious for / observed in: lorisinae	other prosimians	simians, humans; primates in general; other species	Symptoms	Detection / identification	Treatment	Source of infection / Prevention
Nematodes (roundworms)								
	Nematodes, no species mentioned by authors [17]	"Almost normal" in *Loris* [17]. One case of caecal nematodiasis found in a *Loris* after death in a zoo[32]. Nematodes in faeces of two *Loris* and four *N. coucang* [61]			Large numbers would undoubtedly cause symptoms. On one occasion, ... a veritable epizootic of helminthiasis, with many deaths" (in *Loris*) [17]	Eggs in faeces [63]. *N. coucang*: nematodes found in faeces [61].		Infection via cockroaches described in *Loris* [17]
	Ascaridoidae, unspecified		In wildcaught *Microcebus murinus* from Madagascar [33]		"Massive parasitic infestation" [33]			
Oxyuriasis [5]	*Enterobius spp.*, *Oxyurus spp.* [2, 5]	In *Nycticebus pygmaeus* (n=1), in *N. coucang* [61]			Symptoms: inflammation and itching (pruritus) of the anal and vaginal region [2]	In *Nycticebus pygmaeus:* detected in faeces [61] Eggs are deposited on the perianal skin; in faeces only seldom eggs (in 5% of samples), detection after concentration [4; 5]	*Mebendazol*, 10-20 mg/kg for three days, repeated several times at intervals of 2 weeks [3]	Oral infection. Cleaning of cages with hot steam [4]
Strongyloidosis	*Strongyloides spp.; S. fülleborni* [3]	In *Loris* imported from Sri Lanka (Dmoch, pers. comm.). In captive *N. coucang* [61]		Very common in nonhuman primates [3]; in humans [63]	Third stage larvae spread with the blood, usually causes little pathologic effect. Intestinal phase (parasites penetrating intestine) may be severe: bloody or watery diarrhoea, larvae in the faeces. Autoinfection possible: larvae reaching infective stage in the intestine penetrate bowel or perianal skin, are carried to the lungs by blood and enter intestine again via respiratory tract and mouth. [3]	Eggs in fresh faeces; later larvae [3, 5], after concentration (Baermann-method) [4]	*Mebendazol* (*Mebenvet*), 15-20 mg/kg body weight, or *Ivermectin* (*Ivomec*), one subcutaneous injection of 0,2 mg/kg [2]	Worldwide distribution. [5], common, highly infectious. Eggs in faeces, free-living stages in soil, third larval stage may infect hosts through skin or oral mucosa. Frequent cleaning of cages necessary [3]

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Nematodes (roundworms)								
	Pterygoderma -tites nycticebi, Riculariidae [21]	In *Nycticebus coucang* [21;] In *N. coucang* (n=3) [61]			*Nycticebus coucang:* in one case anemia secondary to blood loss from gastric parasitism by *Pterygodermatides*; death [61]	In *N. coucang:* in faeces (n=3), gastric parasitism found at postmortem examination (n=1) [61]		
	Subuluridae, unspecified. [33]		In wildcaught *Microcebus murinus* from Madagascar [33]		"Massive parasitic infestation" [33]			
	Subulura distans [18]	In *Loris* from India [18]						
	Subulura indica (synonym: *Allodapa sp.*) [20] (See figure 4.1).	In *Loris tardigradus lydekkerianus* [20]			Occurrence in the large intestine and vermiform appendix in 100% of the animals (n=14 *Loris*). Develops in the appendix. 90 % of specimens who died in captivity werer heavily infected with *S. indica*, no other cause of death found. [20]	See figure 4.1		
Trichuriasis [5;]	*Trichuris sp.* [1] (for example *T. vulpis)*	In *Nycticebus pygmaeus* (n=6) [61].	One case: in an *Eulemur mayottensis* [1]	Specialized species in a variety of mammal hosts [4]. *T. trichiura* in humans [5] Especially in baboons, rhesus monkeys, apes. [2]	In *E. mayottensis*: found in the caecum [1;]. Adults usually in the colon and caecum. Symptoms: diarrhoea, emaciation [4]. Colics [2]	Eggs in the faeces, after concentration [4] In faeces [61]. In necropsy	*Trichuris* do not eat every day; treatment for several days recommended. Broad-spectrum Benzimidazole. [4]	Oral infection from eggs with larvae (larval development in the eggs only after several weeks in moist surroundings). Sanitation, dry cages [4].

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Disease	Pathogenic agent	Infectious for / observed in: lorisinae	other prosimians	simians, humans; primates in general; other species	Symptoms	Detection / identification	Treatment	Source of infection / Prevention
Spirurida, filaria								
	Spiruruida sp.		One case: in *Varecia* [1]	Specialized species in a variety of mammal hosts [4]	In the esophagus or stomach, not very pathogenous [4]. Gastritis observed in *Varecia* [1] Death in maned tamarins	Eggs in the faeces [4]		Oral infection by free larvae or ingestion of intermediate hosts (snails, insects, crustacea, dependant on species) [4]
	Breinlia spratti sp. nov. [22], *B. sergenti* [23]	In a *Nycticebus* from Selangor [22]. *B. sergenti* in *Nycticebus coucang* from Yunnan, China [23]		*B. spratti*: in squirrels; similar species (*B. booliati*) found in various Malaysian rats [22]. (Experimental infection of *Macaca*, dogs, rabbits and rats with *B. sergenti* unsuccessful. [23])	In *Nycticebus*: microfilaria of *B. sergenti* in the peripheral blood, their density varying without obvious periodicity. In an experimentally infected *Nycticebus*, 169 adults were found in the peritoneum, 22 in the thoracic cavity and 3 in the pericardium. [23]	Detection: in blood smears [4, 5]	Against microfilaria: *Diethylcarbamazin, Ivermectin, Moxidectin*. No satisfactory chemotherapy against adult filaria [5]	*B. sergenti*: in experiments, infectious larvae developed in mosquito hosts (*Culex pipiens*, *Aedes albopictus*) . [23]
	Dipetalonema petteri and other filaria species [1]. *Dipetalonema sp.* [61]	In *Loris*, 1 case. [61], quoting Griner	In lemurs [1]		Microfilaria in the subcutis, the pectoral and abdominal cavity, blood and lymphatic vessels [1]. No symptoms or, in severe infections, disheveled fur, emaciation, respiratory problems, weakness [5] In Loris: "They were not thought to have any clinical significance" [61].			In warm countries; may be found in imported animals. Infection by eating infected mite; in other species by stings of infected ticks [5]
Filariosis	Microfilaria, unspecified (= forms of filaria found in the blood; adult forms see below)	*Nycticebus pygmaeus:* microfilaria in three wildcaught animals on arrival; other cases at Duke University Primate Center. *N. coucang*: in one wildcaught animal [61]		In squirrel monkeys (see also below)		*Nycticebus pygmaeus:* microfilaremia was found in blood samples or at necropsy; *N. coucang*: in blood samples [61]	*Nycticebus pygmaeus:* successfully treated with *Ivermectin* [61]	
	Filarioidae, unspecified (= adult forms of filaria		In wildcaught *Microcebus murinus* from Madagascar [33]	In squirrel monekys	"Massive parasitic infestation" [33] In the abdominal cavity without symptoms	Adult individuals in the abdominal cavity (hardly visible)		

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Spirurida, filaria								
	Physaloptera masoodi (synonym: *Clamydonema sp.*) [20] (See figure 4.1).	In *Loris tardigradus lydekkerianus* [20]				Eggs in the faeces, after concentration [4] Adult specimens: see figure 4.1		
	Physaloptera sp. [61]	In *N. coucang* [61]			One animal reportedly died of the infection. [61]			
	Spirura malayensis sp. nov., Malaysia and Borneo, *Sp. aurangabadensis,* Malaysia [19]	In *Nycticebus coucang*: *Spirura malayensis* sp. nov., *Sp. aurangabadensis* [19]	In Malagasy lemurs: a related species, *Spirura diplocyphos* [19]	In *Tupaia glis*: *Spirura malayensis* sp. nov. [19]	Parasites of the esophageal and gastric walls [19]			Oral infection [4]. Larval development (experimentally) observed in Blattelle germanica. In primitive hosts; *Sp. aurangabadensis* found in a microchiropteran in India [19]
	Spirocerca sp., [1; 4], in lemurs especially *S. lupi* [1; 4]		In lemurs [1]		In the final host: development in the aorta; adults in the oral mucosa, stomach and aorta, eggs excreted with faeces. Symptoms: problems with swallowing, vomiting, stenoses, ruptures of the aorta , dyspnoea [4]. In lemurs: in the thoracic cavity aneurisms, ruptures of the aorta, the animals may bleed to death [1]	Eggs in the faeces; pathology [63]	Attempt recommended with *Diethyl-carbamazin-Zitrat* (Coopers): *Banocide*R, *Wellcome, Notezine*R, *Specia*, 20 mg/kg body weight, 5-10 days; or *Benzimidazol* for several days [4]	Worldwide distribution. Eggs in the faeces of final hosts infect intermediate hosts (beetles; transport hosts: possibly rodents, reptiles) infection of final hosts by eating intermediate hosts. [4]
Cestodes (tapeworms)								
	Tapeworms, unspecified	In *Nycticebus coucang* (n=2) [61]	In wildcaught *Microcebus murinus* from Madagascar [33]		"Massive parasitic infestation" [33]	*N. coucang:* tapeworms diagnosed in faeces [61]		*Nycticebus coucang:* each of 3 animals was infected on two separate occasions [61].
Hydatid disease [24]	*Echinococcus granulosus* (Syn. *Taenia echinococcus*) [5]		In *Galago crassicaudatus, Eulemur catta* [24], E. mongoz [1]	In *Macaca mulatta* [24], Bladder worm (deutsch: Finne) in herbivorous and omnivorous mammals [4]. In *Macaca nemestrina*.	Secondary cysts may grow to large size, usually in the liver, lungs (echinococcus) or peritoneal cavity. [3]	Stages in inner organs: serological detection possible [4]	No successful treatment known. [3], surgically	Final hosts: dogs and other canids (intestine); infection by eggs from their faeces [4]. Contamination of branches

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Cestodes (tapeworms)								
	Taenia sp.		Lemurs (several species) intermediate hosts [1]		Bladder worms in lemurs found in lungs, liver and other organs. Possible symptoms: reduced food consumption, lethargy, distended abdomen with tense abdominal walls, signs of pain [1], no symptoms, stress, emaciation [5]	Proglottides in the faeces [4]	*Praziquantel* (*Droncit*, *Optidos*): once 5 mg/kg oral or subcutaneous [5]	Oral infection from raw mammal meat [5]
	Hymenolepis fraterna (Syn. *nana*), dwarf tapeworm [3, 4]	Most important cestode parasite of primates, worldwide		Infects humans. [3] *Hymenolepis spp.* frequent in domestic and wild birds, *H. fraterna* in rats, mice. [3.]	Diarrhoea, vomiting [3], anal pruritus (itchy skin. [3, 5])	Eggs in the faeces	Oral *nicolsamide* (*Yomesane*): 100 mg / kg body weight. [3]. *Fenbendazol* (*Panacur*): 300 ppm in the food for 5 days, or *Praziquantel* (*Droncit*), 5-25 mg/kg. [4]	Infection both via intermediate hosts (arthropods, for instance mealworms [4]) or direct infection without intermediate host [3]. Good sanitation and vermine control. [3]
	Hymenolepis - like eggs [61]	In *Nycticebus pygmaeus* (n=1) [61]				Eggs in the faeces		
Trematodes (flukes)								
	Phaneropso-lus sp. [17] (See figure 4.1).	*P. lakdivensis* in a wildcaught *Loris* from Ganewatta, N.-W. P., Sri Lanka; according to Nicoll 1927 *P. oviformis* in "*Nycticebus javanicus"*, [17]		*P. longipenis* recorded from an "ape", *P. orbicularis* from "*Nyctipithecus javanicus*" (quotation from Nicoll 1927) [17]	A wildcaught loris died after one month in captivity; its small intestine was heavily infested with trematodes which were firmly attached to the intestinal wall with an oral and ventral sucker. [17]	See figure 4.1. Detected postmortem. Oval shape, length up to 0.572 mm, breadth up to 0.332 mm. Cuticlewith small backwards-directed spines [17]		
Acanthocephala, spiny-headed worms								
	Echinorhynch us sp. [17]	Fairly common in *Loris* [17]			Usually occurs in minute cysts on the wall of the intestine or the surfaces of serous membranes; sometimes infects the whole belly cavity and then causes severe symptoms [17]. Acanthocephala may cause lesions of the intestine; possible consequences: diarrhoea, bloody faeces, secondary infections [5]	Detection: typical eggs in the faeces [5]	No therapy known; attempt with *Panacur* (*Fenbendazol*), 20 mg/kg for 5 days, or *Loperamid-hydrochlorid* [5]	*Loris* as a secondary host; infection by eating some other animal already infested with some earlier stage in the life cycle of the parasite [17]