



## STRONGYLOIDOSIS

ANIMAL GROUP AFFECTED	TRANSMISSION	CLINICAL SIGNS	FATAL DISEASE ?	TREATMENT	PREVENTION & CONTROL
Mainly Old World nonhuman primates, man	Percutaneous-ly	Cutaneous itching, urticaria At pulmonary passage: dyspnoea, cough, at intestinal parasitism diarrhea, vomitus, anorexia, weight loss, depression	Occasionally	Thiabendazole, Mebendazole, Albendazole, Ivermectin	<i>In houses</i> Drainage/steam disinfection of floor bedding/soil.  <i>in zoos</i> drainage / steam disinfection of floor bedding / soil.

<b>Fact sheet compiled by</b> Manfred Brack, formerly German Primate Center, Göttingen / Germany.	<b>Last update</b> 22.11.2008
<b>Susceptible animal groups</b> Mainly Old World nonhuman primates, man.	
<b>Causative organism</b> <i>Strongyloides stercoralis</i> , <i>S.fülleborni</i> , <i>S.cebus</i> .	
<b>Zoonotic potential</b> Yes.	
<b>Distribution</b> World- wide, preferentially in subtropical and tropical regions.	
<b>Transmission</b> Percutaneously. The adult <i>Strongyloides</i> females live in the large intestines of the host animals (or man!), produce embryonated eggs, which in <i>S.fülleborni</i> and <i>S.cebus</i> are faecally excreted as such, whereas in <i>S.stercoralis</i> the larvae may hatch already in the original hosts large intestine, thus causing autoinfections. In the other <i>Strongyloides</i> spp. the larvae hatch in the environment, proceed through 2 molts to reach the infective filariform larval stage or to develop into free-living male and female adults, which start one or more new external larval cycles. Both the directly and the indirectly generated filariform larvae penetrate the skin, or at being swallowed, the epithelia of the upper digestive tract. Subsequently they migrate via the circulation to the lung, burrow through the alveolar capillaries and alveolar walls, migrate actively up to the larynx and pharynx, are swallowed and, on reaching the small intestine of the new host become again adult embryonated eggs producing females. Migrating larvae may cross the placental tissues, thus leading to infections already of newborn apes. That migration stage, regardless of the <i>Strongyloides</i> - species involved, applies to only a percentage of infecting larvae. The others convert to a resting stage somewhere in the new hosts tissues after epithelial penetration, surviving there for decades and eventually becoming reactivated after stress (pregnancy, social stress etc.).	
<b>Incubation period</b> Prepatent period: 11 – 18 days.	
<b>Clinical symptoms</b> The skin-penetrating larvae cause itching sensations, and eventually urticaria, those burrowing through the lung dyspnea, cough or even pneumonia. The adults living in the small intestine cause haemorrhagic-mucoid diarrhea, anorexia, vomitus, depression, weight loss and occasionally paralytic ileus.	
<b>Post mortem findings</b> Multifocal or diffuse pulmonary haemorrhages, catarrhal to haemorrhagic- necrotic enterocolitis. In hyperinfections subacute eosinophilic interstitial pneumonia, eosinophilic vasculitis and perivasculitis.	
<b>Diagnosis</b> Repeated oviagnosis in <i>S. fülleborni</i> / <i>S. cebus</i> infestations, repeated larval demonstrations in <i>S.stercoralis</i> – infestations of great apes and man, using Baerman Wetzel funnels. In necropsies of great apes larval emigration tests from the duodenal tissues and histological examination of the duodenum are advisable	



<b>Material required for laboratory analysis</b> Faecal samples.
<b>Relevant diagnostic laboratories</b> Local veterinary laboratories.
<b>Treatment</b> Thiabendazole (50 – 100 mg/kg/day for several days) Mebendazole (50 mg/Kg) Albendazole (16 mg/kg/day for 3 days) combination with Ivermectin (200 mg/kg). Ivermectin (2 x 100 mg)- in man. Moxidectin (0.5 mg/kg)
<b>Prevention and control in zoos</b> Drainage and steam-desinfection of outdoor-housing and floor-beddings .
<b>Suggested disinfectant for housing facilities</b>
<b>Notification</b>
<b>Guarantees required under EU Legislation</b>
<b>Guarantees required by EAZA Zoos</b>
<b>Measures required under the Animal Disease Surveillance Plan</b>
<b>Measures required for introducing animals from non-approved sources</b>
<b>Measures to be taken in case of disease outbreak or positive laboratory findings</b>
<b>Conditions for restoring disease-free status after an outbreak</b>
<b>Experts who may be consulted</b>
<b>References</b> <ol style="list-style-type: none"><li>1. Appleton, C. C., R. C. Krecek, A. Verster, M. R. Bruorton, and M. J. Lawes . 1994. Gastro – intestinal parasites of the Samango monkey, <i>Cercopithecus mitis</i> , in Natal, South Africa. J. Med. Primatol. 23 : 52 – 55.</li><li>2. Brack, M. 1987. Agents Transmissible from Simians to Man. Springer, Berlin.</li><li>3. Brack, M., und W. Rietschel. 1986. Ivermectin zur Strongyloidose fülleborni – Bekämpfung bei Rhesusaffen – Kurzmitteilung. Kleintierpraxis 31 : 29.</li><li>4. Dufour, J. P., F. B. Cogswell, K. M. Phillippi-Falkenstein, and R. P. Bohm. 2006 Comparison of efficacy of moxidectin and ivermectin in the treatment of <i>strongyloides fulleborni</i> infection in rhesus macaques. J. Med. Primatol. 35 : 172 – 176.</li><li>5. Mojon, M., and P. B. Nielsen. 1987. Treatment of Strongyloides stercoralis with Albendazole. A cure rate of 86 per cent. Zent. bl. Bakteriol. Hyg. A 263 : 619 – 624.</li><li>6. Muriuku, S. M: K., R. K. Murugu, E. Munene, G. M. Karere, and D. C. Chai. 1998. Some gastro – intestinal parasites of zoonotic ( public health ) importance commonly observed in Old World non – human primates in Kenya. Acta Trop. 71 : 73 – 82.</li><li>7. Naquira, C., G. Jimenez, G. G. Guerra, R. Bernakl, D. R. Nalin, D. Neu, and M. Aziz. 1989. Ivermectin for human strongyloidosis and other intestinal helminths. Am. J. Trop. Med. Hyg. 40 : 304 – 309.</li><li>8. Nielsen, P. B., and M. Mojon. 1987. Improved diagnosis of Strongyloides stercoralis by seven consecutive stool specimens. Zent. bl. Bakteriol. Hyg. A 263 : 616 – 618.</li><li>9. Rietschel, W. 1991. Zum Einsatz von Ivermectin bei mit Strongyloides spp. befallenen Primaten. Verh. ber. Arb. tag. Zootierärzte Dtsch. sprach. Raum. 11 : 57 – 59.</li><li>10. Viney, M. E., R. W. Ashford, and G. Barnish. 1991. A taxonomic study of <i>Strongyloides</i> Grassi, 1879 ( Nematoda ) with special reference to <i>Strongyloides fülleborni</i> von Linstow, 1905 in man in Papua New Guinea and the description of a new subspecies. Syst. Parasitol. 18 : 95 – 109.</li></ol>