## STRONGYLOIDIASIS

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<th>Animal Group(s) Affected</th>
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<td>Primates, especially young, captive orangutan. Various <em>Strongyloides</em> spp. can affect humans, canids, felids, suids, equids, ruminants, rodents</td>
<td>Larvae or ova shed in feces, develop into free-living infectious larvae, or those that can penetrate skin. They then migrate to intestines then to lungs; also some species transmitted transmammary. Some species can autoinfect within intestines, and produce pulmonary hyperinfection.</td>
<td>Often insidious; acute lethargy or sudden death, diarrhea, abdominal distension and discomfort, nausea, anorexia, cough, shortness of breath.</td>
<td>Can cause severe disease and death from hyper-infection in young animals; typically subclinical in immune-competent adults.</td>
<td>Usually unsuccessful in severe symptomatic cases. However, can attempt to treat with ivermectin or benzimidazoles</td>
<td>Ivermectin and/or benzimidazoles; improve hygiene to reduce fecal contamination</td>
<td>Yes (S. stercoralis, <em>S. fuelleborni</em>)</td>
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**Fact Sheet compiled by:** Ellen Bronson  
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**Fact Sheet Reviewed by:** Joseph Smith, Thomas Nolan  

**Susceptible animal groups:** All vertebrates. Primates, especially captive orangutans < 5 yr; also canids, felids, suids, ruminants, equids, rodents.  

**Causative organism:** *Strongyloides stercoralis* in primates, domestic dog; *S. fuelleborni* in Old World primates; *S. cebus* in New World primates. Other *Strongyloides* spp. reported in other primates, suids, felids, equids, ruminants, rodents, birds, and reptiles.  

**Zoonotic potential:** Yes (S. stercoralis and S. fuelleborni); infective larvae can penetrate intact skin, also feco-oral transmission possible.  

**Distribution:** Worldwide with different geographic strains and species. It is most prevalent in tropics and subtropics, also endemic in Southeastern US.  

**Incubation period:** 1-2 weeks in most species; individuals can be chronically affected.  

**Clinical signs:** *Strongyloides* spp. infections are usually subclinical in adult immunocompetent animals. In young or immunocompromised primates with disseminated hyperinfestations due to autoinfection, sudden death without premonitory signs is seen. Other clinical signs include abdominal pain, diarrhea, paralytic ileus, constipation, cough, shortness of breath, urticaria, and rash.  

**Post mortem, gross, or histologic findings:** Petechiae and ecchymoses in lungs, pulmonary hemorrhage, erosive or ulcerative enterocolitis. Adult parasites, larvae, and eggs in pulmonary (very rare) and intestinal mucosal tissue on histologic exam and can also be found in other tissues (lymph nodes, liver, etc) in disseminated infections. In hyperinfections, secondary bacterial septicemia, pneumonia, and meningitis are common.
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**Diagnosis:** With *S. stercoralis* infection, rhabditiform (or less frequently filariform) larvae can be seen in feces with Baermann fecal exam or direct wet mount or fecal culture, but diagnosis often challenging due to infrequent shedding in feces. In infants, severe tissue destruction and death can occur before fecal shedding begins. Eggs can be seen in feces with *S. fuelleborni* infections. In hyperinfections, may be able to detect larvae in sputum or respiratory tract mucus. Eosinophilia possible during acute and chronic stages. *S. stercoralis* ELISA and other serology available for humans, ELISA has been used in orangutans; levels shown to decrease after treatment in humans.

**Material required for laboratory analysis:** Fresh fecal material for fecal exam; serum for ELISA antibody testing.

**Relevant diagnostic laboratories:** Most reference laboratories can perform Baermann fecal exams.

ELISA antibody test available through CDC for select cases with prior approval:
Contact: Patricia Wilkins, Ph.D., Chief, Reference Diagnostics Laboratory, Division of Parasitic Diseases and Malaria, Center for Global Health, Tel. 404-718-4101, pwilkins@cdc.gov

**Treatment:** Difficult in symptomatic or chronically infected animals but can reduce burdens with ivermectin, albendazole, other benzimidazoles. Ivermectin treatment is usually 2 doses one week apart resulting in rapid amelioration of clinical signs. Treatment with benzimidazoles usually is daily for two weeks with no change in clinical signs expected before 3 to 5 days. Aggressive combination treatment recommended for hyperinfection cases. A second dosing a week after the end of the first treatment is usually needed to kill adults developing from larvae that were migrating in the tissues during the first treatment. Treatments should always be performed in combination with control measures to prevent reinfection during treatment since the larvae are not killed by the same dosages as the adults.

**Prevention and control:** Daily removal of feces to break cycle; if animals on soil will not be able to break cycle. Can keep burdens low with a regular program of prophylactic anthelmintics, but may induce resistance if used long-term.

**Suggested disinfectant for housing facilities:** Mechanical removal of feces most important, cleaning with soap and water and complete drying is recommended. Quaternary ammonium products containing N-alkyl dimethyl benzyl ammonium chloride or didecyl dimethyl ammonium chloride will kill infective larvae very rapidly and are suitable for hard solid surfaces. Steam cleaning also effective for disinfecting housing areas.

**Notification:** None

**Measures required under the Animal Disease Surveillance Plan:** N/A

**Measures required for introducing animals to infected animal:** Consider prophylactic deworming regimen during introduction phase and frequent fecal examinations, but transmission likely difficult to avoid; goal should be to avoid clinical signs, especially in groups with young primates.

**Conditions for restoring disease-free status after an outbreak:** If animals have access to soil it will be impossible to eliminate parasite. If area can be completely disinfected, can attempt daily complete removal of feces, cleaning and drying area, but if chronically infected animal is present, will be unlikely to eliminate infection.

**Experts who may be consulted:**
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References:


