Research Note

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# Parasitic helminths of the digestive system of wild boars bred in captivity

Helmintos parasitas do sistema digestório de javalis criados em cativeiro

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## Abstract

This study aimed to identify the parasites that inhabit the digestive system of *Sus scrofa scrofa* from a commercial breeding facility in southern Brazil, and reports the first occurrence of *Trichostrongylus colubriformis* in wild boars. The gastrointestinal tracts of 40 wild boars from a commercial breeding facility were collected and individualized during slaughter in a cold-storage slaughterhouse. Out of this total, 87.5% were parasitized by the helminths *Ascaris suum*, *Trichostrongylus colubriformis*, *Oesophagostomum dentatum* and *Trichuris suis*. *T. colubriformis* presented a prevalence of 45%, mean intensity of 28.4 and mean abundance of 12.8. The data from this study showed that *T. colubriformis* not only has a capacity to develop in the small intestines of wild boars, but also adapts well to animals raised in captivity, thus representing a possible cause of economic loss in commercial wild boar farming.

**Keywords:** Wild boar, *Sus scrofa scrofa*, helminths, *Trichostrongylus colubriformis*. gastrointestinal tract.

## Resumo

O estudo teve por objetivo identificar os parasitos que habitam o sistema digestório de *Sus scrofa scrofa* provenientes de criatório comercial do sul do Brasil, reportando a primeira ocorrência de *Trichostrongylus colubriformis* em javalis. Foram coletados e individualizados os tratos gastrintestinais de 40 javalis oriundos de criatório comercial durante abate em frigorífico. Destes, 87,5% estavam parasitados por helmintos, sendo eles, *Ascaris suum*, *Trichostrongylus colubriformis*, *Oesophagostomum dentatum* e *Trichuris suis*. *T. colubriformis* apresentou prevalência de 45%, intensidade média de 28,4 e abundância média de 12,8. Os dados deste trabalho demonstram que *T. colubriformis* além da capacidade de desenvolvimento no intestino delgado de javalis, adapta-se bem às criações, representando uma possível causa de perdas econômicas nas criações de javalis.

**Palavras-chave:** Javali, *Sus scrofa scrofa*, helmintos, *Trichostrongylus colubriformis*, trato gastrointestinal.

## Introduction

Commercial breeding of wild boars in Brazil started in the late 1980s in the south with animals purchased from zoos and from Argentina. The meat was well accepted by consumers and the market expanded with the introduction of purebreds from France. Commercial farms currently exist in several Brazilian states (GIMENEZ et al., 2003).

The breeding method most used in Brazil is the outdoor intensive rearing system. In this system, the animals are kept in outdoor paddocks, allowing them to express their natural behavior. However, this practice facilitates helminth infection, which impairs the development and reproductive potential of the animals due to easy access to intermediate hosts, paratenic hosts, eggs and larvae that are in the environment.

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The availability of eggs and larvae in the environment and the abundance of intermediate hosts are directly influenced by temperature and humidity conditions, among other factors (JESUS; MÜLLER, 2000). Therefore, it is important to investigate the dynamics of parasite populations in different climatic regions.

This study aimed to identify the helminths that inhabited the gastrointestinal tract of specimens of *Sus scrofa scrofa* at commercial breeding facilities in southern Brazil, and estimate parameters for the prevalence, mean intensity and mean abundance of parasitism.

Studies on the gastrointestinal helminth fauna of wild *Sus scrofa scrofa* have been carried out in several European countries (HUMBERT; HENRY, 1989; DE-LA-MUELA et al., 2001; RAJKOVIĆ-JANJE et al., 2002; FERNANDEZ-DE-MERA et al., 2003; JÄRVIS et al., 2007; SENLIK et al., 2011), in Asia (ESLAMI; FARSAD-HAMDI, 1992; SATO et al., 2008) and in North America (SHENDER et al., 2002). However there are only a few studies relating to identification of gastrointestinal

parasites in wild boars from commercial farms, and these were conducted in Poland (POPIOŁEK et al., 2010) and in southeastern Brazil (MUNDIM et al., 2004; GOMES et al., 2005). Only Gomes et al. (2005) performed morphological identification on adult parasites recovered through necropsy, while the others authors made diagnoses only through detection of eggs in fecal examinations. In addition, all previous studies were undertaken in tropical or temperate regions, unlike southern Brazil, which has a subtropical climate. This factor directly affects the helminth infection parameters, and also leads to different management on each farm, particularly for animals reared outdoors.

## Materials and Methods

Digestive systems were collected from 40 wild boars aged between seven and eight months, during slaughter in a cold-storage slaughterhouse. There were two collections of 20 gastrointestinal tracts each, the first in August 2010 and the second in May 2011.

The wild boars were from a commercial breeding facility situated in the city of Antônio Prado, in the northern part of the state of Rio Grande do Sul, Brazil (28° 51' 28" S and 51° 16' 58" W), which has a subtropical climate with an average annual temperature of 15 °C. The number of animals per paddock varied between 50 and 60 individuals, all from the breeding farm itself. Regarding the use of anthelmintics, after weaning (at the age of approximately 60 days), 1% ivermectin was used together with the feed daily, every month during the spring and summer, and every second month in the fall and winter (i.e. it was used for a month and paused for the next month).

The stomach and intestine were opened individually under running water in buckets, and the contents were washed in 500 µm and 150 µm sieves. The material retained in the sieve was stored in bottles for later identification, sexing, and counting of helminthes using a stereomicroscope. The esophagus and liver were directly examined under a stereomicroscope. The helminths were processed for identification in accordance with the techniques described by Amato and Amato (2008). The parameters of mean abundance and mean intensity of parasitism were evaluated in accordance with Bush et al. (1997).

## Results and Discussion

A total of 87% of the 40 animals analyzed were parasitized by the following gastrointestinal helminths: *Ascaris suum*, *Trichostrongylus colubriformis*, *Oesophagostomum dentatum* and *Trichuris suis* (Table 1).

*Trichostrongylus colubriformis* showed a prevalence of 45% and mean intensity of 28.4, and was recorded for the first time parasitizing wild boars. This occurrence is also rare for domestic pigs, since *T. colubriformis* is more commonly found parasitizing the intestine of ruminants (VICENTE et al., 1997). In Brazil, *T. colubriformis* has been described parasitizing the small intestine of *Sus domesticus* in the states of Bahia and Goiás and in the Federal District (FREITAS; COSTA, 1962; COSTA, 1965; CARNEIRO et al., 1980). The effects of parasitism by *T. colubriformis* in pigs have not been clearly studied; however, based on research on ruminants, higher intensity infections can cause loss of absorption and diarrhea, thus resulting in weight reduction (URQUHART et al., 1996).

The data from this study show that *T. colubriformis* not only has a capacity to develop in the small intestines of wild boars, but also adapts well to wild rearing. This differs from modern pig farming, in which the animals are confined in a room with a concrete floor, which hinders larval development (the eggs hatch into L1 larvae which complete their development in soil until the L3 stage). In wild boar farming, in which the animals are kept in outdoor paddocks, the environment favors the development of these larvae and facilitates animal infection. Therefore, *T. colubriformis* represents a possible cause of economic loss in wild boar rearing, due to trichostrongylid resistance to the drugs available in the market (MOLENTO, 2004; COLES, 2005), and the survivability of larvae in the soil.

Furthermore, there have been sporadic reports of human infections with *T. colubriformis* (SATO et al., 2011; LATTÈS et al., 2011). For this reason, breeders need to be attentive particularly regarding appropriate disposal of animal feces, because use of feces as fertilizer for home gardens can be a source of human infection (LATTÈS et al., 2011).

*Trichuris suis* was present in 67.5% of the animals, and had the highest prevalence ever recorded in wild boars, considering animals bred both in captivity and in the wild. However, the mean intensity (178.1 ± 414.3) was lower than the level of 644.3 that was recorded by Gomes et al. (2005) in a breeding facility in the northwest of the state of São Paulo, Brazil. In other studies on wild boars, the mean intensity of infection previously described was lower than what was recorded in the present study. The highest intensity ever (117.67) was described by Fernandez-de-Mera et al. (2003) in wild boars in France. This may have been due to great availability of eggs within a small area in the breeding facilities, and also to egg resistance in the environment, where they may remain viable for up to four years (URQUHART et al., 1996). *T. suis* also presented highly variable intensity (Table 1), such that

**Table 1.** Parameters for gastrointestinal helminth infection in wild boars (n = 40) bred in captivity in southern Brazil.

| Parasite | Organ | Prevalence (positive) | Mean intensity (standard deviation) | Range of infection intensity | Mean abundance (standard deviation) |
|---|---|---|---|---|---|
| *Ascaris suum* (adults) | SI and LI | 12.5% (5) | 1.4 (0.5) | 1.0-2.0 | 0.2 (0.5) |
| *A. suum* (immature forms) | SI and LI | 42.5% (17) | 5.12 (9.1) | 1.0-38.0 | 2.2 (6.4) |
| *Trichostrongylus colubriformis* | SI | 45.0% (18) | 28.4 (48.4) | 1.0-163.0 | 12.8 (35.0) |
| *Oesophagostomum dentatum* | LI | 5.0% (2) | 1.0 (0.0) | 1.0-1.0 | 0.05 (0.2) |
| *Trichuris suis* | LI | 67.5% (27) | 178.1 (414.3) | 1.0-1640.0 | 120.2 (348.7) |

SI = small intestine. LI = large intestine.

some animals were infected with only a few parasites and others had a high degree of parasitism. These data coincide with findings from the state of São Paulo (GOMES et al., 2005), and may be due to either lower resistance of the animals to infection with *T. suis* or possible resistance of the parasite to the anthelmintic used. A high infection rate can cause losses to wild boar rearing, because animals with a high intensity of infection can have serious intestinal disorders that impair their development.

*Ascaris suum* showed prevalence of 47.5%. Only 26.3% of the animals were parasitized by adult forms. Large variation in the intensity of larval infection and low intensities of adults (Table 1) are common among ascarids because of their population dynamics. *A. suum* seems to be highly immunogenic. A great quantity of larvae is expelled from the small intestine over a period of 14-17 days after infection. Larvae that remain in the organism migrate through the liver and lungs, because a large number of adult parasites of this species could cause the death of the animal, which would not be advantageous for the parasite (MIQUEL et al., 2005; NEJSUM et al., 2009; ROEPSTORFF et al., 2011). This could explain the occurrence of larvae in the large intestine. However, occurrences of adults in this organ may be explained by parasite migration after host death due to adverse conditions in their habitat.

Among the helminths found, *Oesophagostomum dentatum* had the lowest prevalence (5.0%) and mean intensity (1.0), far below what was reported in the state of São Paulo by Gomes et al. (2005) (22.2% and 13.3, respectively). This variation can be attributed to the climates of these regions, due to the low survival of *O. dentatum* larvae in the soil during the hottest and driest summers and coldest winters (ROEPSTORFF; MURRELL, 1997; THOMSEN et al., 2001; ROEPSTORFF et al., 2011). However, the presence of this parasite indicates that there is a potential risk because of the easy dissemination of eggs and larvae in the paddocks, and the difficulty in controlling this environment. Moreover, *O. dentatum* presents resistance to the drugs available in the market (COLES, 2005). Except for *O. dentatum*, the other species in this report were recorded for the first time parasitizing wild boars in a subtropical region.

## References


Amato JFR, Amato SB. Técnicas gerais para coleta e preparação de helmintos endoparasitos de aves. In: Accordi I, Straube F, Von Matter S. *Ornitologia e conservação:* ciência aplicada, técnicas de pesquisa e levantamento. Rio de Janeiro: Technical Books; 2008. p. 367-394.

Bush AO, Lafferty KD, Lotz JM, Shostak AW. Parasitology meets ecology on its own terms: Margolis et al. revisited. *J Parasitol* 1997; 83(4): 575-583. PMid:9267395. http://dx.doi.org/10.2307/3284227

Carneiro JR, Pereira E, Martins W, Freitas MG. Contribuição para o estudo do diagnóstico de leucemia bovina. Lista de helmintos parasitos de animais domésticos do estado de Goiás. *Rev Pat Trop* 1980; 9(1-2):61-71.

Coles GC. Anthelmintic resistance – looking to the future: a UK perspective. *Res Vet Sci* 2005; 78(2): 99-108. PMid:15563915. http://dx.doi.org/10.1016/j.rvsc.2004.09.001

Costa HMA. Alguns aspectos sobre helmintos parasitos de *Sus domesticus* Linnaeus, 1758, procedentes do estado da Bahia, Brasil. *Arq Esc Vet* 1965; 17(1):11-44.

De-la-Muela N, Hernández-de-Luján S, Ferre I. Helminths of wild boar in Spain. *J Wildl Dis* 2001; 37(4):840-843. PMid:11763752.

Eslami A, Farsad-Hamdi S. Helminth parasites of wild boar, *Sus scrofa*, in Iran. *J Wildl Dis* 1992; 28(2): 316-318. PMid:1602589.

Fernandez-de-Mera IG, Gortazar C, Vicente J, Höfle U, Fierro Y. Wild boar helminths: risks in animal translocations. *Vet Parasitol* 2003; 115(4): 335-341. http://dx.doi.org/10.1016/S0304-4017(03)00211-5

Freitas MG, Costa HMA. Sobre alguns nematóides de *Sus domesticus* no estado da Bahia (Brasil). *Arq Esc Vet* 1962; 14(1):177-190.

Gimenez DL, Mota LS, Curi RA, Rosa GJM, Gimenes MA, Lopes CR, et al. Análise cromossômica e molecular do javali europeu *Sus scrofa scrofa* e do suíno doméstico *Sus scrofa domesticus*. *Braz J Vet Res Anim Sci* 2003; 40(2):146-154. http://dx.doi.org/10.1590/S1413-95962003000200009

Gomes RA, Bonuti MR, Almeida KS, Nascimento AA. Infection of heminths in wild boar (*Sus scrofa scrofa*) raised in captivity in São Paulo State, Brazil. *Cienc Rural* 2005; 35(3):625-628. http://dx.doi.org/10.1590/S0103-84782005000300021

Humbert JF, Henry C. Studies on the prevalence and the transmission of lung and stomach nematodes of the wild boar (*Sus scrofa*) in France. *J Wildl Dis* 1989; 25(3):335-341. PMid:2788229.

Järvis T, Kapel C, Moks E, Talvik H, Mägi E. Helminths of wild boar in the isolated population close to the northern border of its habitat area. *Vet Parasitol* 2007; 150(4): 366-369. PMid:17964726. http://dx.doi.org/10.1016/j.vetpar.2007.09.015

Jesus LP, Müller G. Helmintos parasitos do estômago de suínos na região de Pelotas, RS. *Rev Bras Agrocienc* 2000; 6(2): 181-187.

Lattès S, Ferté H, Delaunay P, Depaquit J, Vassallo M, Vittier M, et al. *Trichostrongylus colubriformis* nematode infections in humans, France. *Emerg Infect Dis* 2011; 17(7): 1301-1302. PMid:21762594 PMCid:PMC3381412. http://dx.doi.org/10.3201/eid1707.101519

Miquel N, Roepstorff A, Bailey M, Eriksen L. Host immune reactions and worm kinetics during the expulsion of *Ascaris suum* in pigs. *Parasite Immunol* 2005; 27(3): 79-88. PMid:15882234. http://dx.doi.org/10.1111/j.1365-3024.2005.00752.x

Molento MB. Resistência de helmintos em ovinos e caprinos. *Rev Bras Parasitol Vet* 2004; 13(S1): 82-87.

Mundim MJS, Mundim AV, Santos ALQ, Cabral DD, Faria ESM, Moraes FM. Helminths and protozoa in wild boars (*Sus scrofa scrofa*) feces raised in captivity. *Arq Bras Med Vet Zootec* 2004; 56(6): 792-795. http://dx.doi.org/10.1590/S0102-09352004000600015

Nejsum P, Thamsborg SM, Petersen HH, Kringel H, Fredholm M, Roepstorff A. Population Dynamics of *Ascaris suum* in Trickle-infected pigs. *J Parasitol* 2009; 95(5): 1048-1053. PMid:19673589. http://dx.doi.org/10.1645/GE-1987.1

Popiołek M, Knecht D, Szczęsna-Staśkiewicz J, Czerwińska-Rożałow A. Helminths of the wild boar (*Sus scrofa* L.) in natural and breeding conditions. *Bull Vet Inst Pulawy* 2010; 54(2): 161-166.

Rajković-Janje R, Bosnić S, Rimac D, Dragičević P, Vinkovic B. Prevalence of helminths in wild boar from hunting grounds in eastern Croatia. *Z Jagdwiss* 2002; 48(4): 261-270.

Roepstorff A, Murrell KD. Transmission Dynamics of Helminth Parasites of Pigs on Continuous Pasture: *Oesophagostomum dentatum*

and *Hyostrongylus rubidus*. *Int J Parasitol* 1997; 27(5): 553-562. http://dx.doi.org/10.1016/S0020-7519(97)00023-4

Roepstorff A, Mejer H, Nejsum P, Thamsborg SM. Helminth parasites in pigs: New challenges in pig production and current research highlights. *Vet Parasitol* 2011; 180(1-2): 72-81. PMid:21684689. http://dx.doi.org/10.1016/j.vetpar.2011.05.029

Sato M, Yoonuan T, Sanguankiat S, Nuamtanong S, Pongvongsa T, Phimmayoi I, et al. Short Report: Human *Trichostrongylus colubriformis* infection in a rural village in Laos. *Am J Trop Med Hyg* 2011; 84(1): 52-54. PMid:21212201 PMCid:PMC3005505. http://dx.doi.org/10.4269/ajtmh.2011.10-0385

Sato H, Suzuki K, Yokoyama M. Visceral helminths of wild boars (*Sus scrofa leucomystax*) in Japan, with special reference to a new species of the genus *Morgascaridia* Inglis, 1958 (Nematoda: Schneidernematidae). *J Helminthol* 2008; 82(2): 159-168. PMid:18328113. http://dx.doi.org/10.1017/S0022149X08936191

Senlik B, Cirak VY, Girisgin O, Akyol CV. Helminth infections of wild boars (*Sus scrofa*) in the Bursa province of Turkey. *J Helminthol* 2011; 85(4): 404-408. PMid:21114894. http://dx.doi.org/10.1017/S0022149X1000074X

Shender LA, Botzler RG, George TL. Analysis of serum and whole blood values in relation to helminth and ectoparasite infections of feral pigs in Texas. *J Wildl Dis* 2002; 38(2): 385-394. PMid:12038138.

Thomsen LE, Mejer H, Wendt S, Roepstorff A, Hindsbo O. The influence of stocking rate on transmission of helminth parasites in pigs on permanent pasture during two consecutive summers. *Vet Parasitol* 2001; 99(2): 129-146. http://dx.doi.org/10.1016/S0304-4017(01)00454-X

Urquhart GM, Armour J, Duncan JL, Dunn AM, Jennings FW. *Veterinary Parasitology*. Oxford: Blackwell Science Limited; 1996.

Vicente JJ, Rodrigues HO, Gomes DC, Pinto RM. Brazilian Nematodes. Part V: Nematodes of Mammals. *Rev Bras Zool* 1997; 14(S1): 1-452.