

Capillariid nematodes in Brazilian turkeys, *Meleagris gallopavo* (Galliformes, Phasianidae): pathology induced by *Baruscapillaria obsignata* and *Eucoleus annulatus* (Trichinelloidea, Capillariidae)

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The pathology induced in turkeys (Meleagris gallopavo) by two capillariid nematodes, Baruscapillaria obsignata and Eucoleus annulatus is described together with data on prevalences, mean infection and range of worm burdens. B. obsignata occurred with a prevalence of 72.5% in the 40 examined hosts in a range of 2-461 nematodes and a mean intensity of 68.6, whereas E. annulatus was present in 2.5% of the animals, with a total amount of five recovered parasites. Gross lesions were not observed in the parasitized birds. Lesions due to B. obsignata mainly consisted of the thickening of intestinal villi with a mild mixed inflammatory infiltrate with the presence of mononuclear cells and heterophils. The lesions induced by E. annulatus were represented by foci of inflammatory infiltrate with heterophils in the crop epithelium and esophagus of a single infected female. These are the first pathological findings related to the presence of capillariid worms in turkeys to be reported in Brazil so far. Capillaria anatis, although present, was not pathogenic to the investigated turkeys.

Key words: *Baruscapillaria obsignata* - *Capillaria anatis* - *Eucoleus annulatus* - *Meleagris gallopavo* - turkeys - pathology

Data on helminths of turkeys (*Meleagris gallopavo* Linnaeus, 1758) are relatively very few and thus, the action of the parasitism affecting these hosts is little known. In Brazil, investigations related to the pathology induced by helminths in turkeys are restricted to those of the pioneer paper by Barretto and Mies-Filho (1942) and more recently to the results reported by Brener et al. (2006a, b), describing the pathogenic action of the trematode *Paratanaisia bragai*, the nematodes *Cheilospirura hamulosa*, *Heterakis gallinarum* and the protozoan *Histomonas meleagridis* infecting this avian host. In despite of representing the most frequent and relevant worms to parasitize Galliformes with reports worldwide, the capillariid nematodes (formerly included among the Trichiuroidea) were only listed in Brazil, occurring in several avian hosts, including turkeys, with no data on associated pathology (Costa et al. 1986, Vicente et al. 1995), except for the results obtained by Pinto et al. (2004) related to the pathological changes observed in pheasants infected with *Eucoleus perforans*, *Eucoleus annulatus* [= *Capillaria annulata*], *Capillaria phasianina* and *Baruscapillaria obsignata* [= *Capillaria obsignata*]. Interestingly, gross and microscopic lesions were absent in the ring-necked pheasants parasitized with *E. annulatus*

and *B. obsignata*. This paper deals with the first data on the induced pathology of the two capillariid nematode species *B. obsignata* (Madsen, 1945) Moravec, 1982 and *E. annulatus* (Molin, 1858) Lopez-Neyra, 1947 in Brazilian turkeys. *Capillaria anatis* (Schrank, 1790) Travassos, 1915, although present, was not pathogenic to the investigated birds.

MATERIALS AND METHODS

From May 2004 to October 2005, 40 adult turkeys, 19 males, 21 females, weighting between 950-8,870 g, obtained from backyard flocks of different states and cities of Brazil were investigated for helminths in the digestive tract: a) Minas Gerais (19 animals), namely Candeias (20°46'01"S, 45°16'35"W), Caratinga (19°47'23"S, 42°08'21"W), Juiz de Fora (21°45'51"S, 43°21'01"W), Teixeiras (20°39'04"S, 42°51'24"W) and b) Rio de Janeiro (21 animals), namely Cantagalo (21°58'52"S, 42°22'05"W), Maricá (22°55'10"S, 42°49'07"W), Niterói (22°53'00"S, 43°06'13"W) [Várzea das Moças district], Pirai (22°37'45"S, 43°53'53"W), Rio de Janeiro (22°54'10"S, 43°12'27"W) [Campo Grande district], Teresópolis (22°24'44"S, 42°57'56"W). After individual clinical evaluation, birds were killed and submitted to necropsy in accordance to the technique of Zander et al. (1997). Organs were opened in Petri dishes containing 0.85% NaCl solution. Nematodes were fixed in hot AFA (ethanol 70%, 93 ml; formaldehyde, 5 ml; acetic acid, 2 ml). Sections of the parasitized organs were removed and immediately fixed in 10% buffered formalin, to be further routinely processed for paraffin embedding. Five micrometers thick sections were stained with hematoxylin and eosin (HE). The recovered nematodes were counted under a

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stereomicroscope and after, stained with alcoholic chloride carmine, dehydrated in an ethanol series (70%-100%), cleared in phenol and mounted in balsam. Helminths were deposited in the Helminthological Collection of the Instituto Oswaldo Cruz (CHIOC). Classification of nematodes follows Vicente et al. (1995). Micrographs were obtained in a Zeiss Axiophot brightfield microscope. The development of this study has been authorized by the Ethics Committee on Animal Use (CEUA-Fiocruz, no. P0095-01).

RESULTS

Thirty-three (82.5%) out of 40 turkeys were positive for capillariid worms. Gross lesions were not detected in animals either infected with *B. obsignata* or *E. annulatus*.

B. obsignata was mostly found in the small intestine and was observed in 29 turkeys (72.5%) and in two out of these worms were also present in the large intestine. The mean intensity of infection was of 68.6 worms in a range of 2-461 parasites. The turkey with the highest worm burden (461) was an adult female specimen (from Rio de Janeiro, RJ), weighting 4,300 g, followed by younger animals, two males (from Niterói, RJ) weighting 950 g and 1,150 g, with 314 and 197 worms, respectively. In the animal with the highest worm burden, it was observed, mainly in the area of the intestinal crypts, in addition to portions of the parasites among the villi, thickening of the villi, together with a mild mixed inflammatory infiltrate, in the presence of mononuclear cells and heterophils were also observed (Fig. 1). Studied material deposited in the CHIOC no. 36891 a-d (whole mounts).

Five specimens of *E. annulatus* were recovered in the upper digestive tract and in the crop of a single young female (from Maricá, RJ), weighting 1,500 g. This finding represented a prevalence of 2.5%. Infiltrating heterophils were seen in the crop epithelium, with the presence of parasite eggs among these leucocytes that were filling tunnels lined with keratin (Fig. 2). In the esophagus, heterophils foci were observed, in the absence of eggs or parasite debris. Studied material was also deposited in the CHIOC no. 36894 a-d (whole mounts).

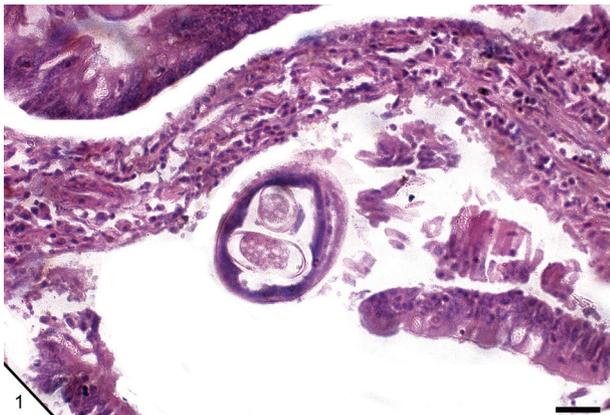


Fig. 1: histological section of the small intestine of *Meleagris gallopavo* showing a section of an adult female of *Baruscapillaria obsignata* with bioperculated eggs in utero among the villi together with a mild mixed inflammatory infiltrate in the mucosa. HE. Bar = 0.03 mm.

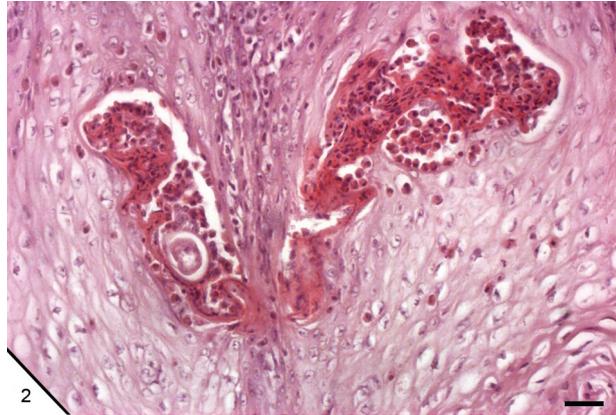


Fig. 2: histological section of the crop of *Meleagris gallopavo* parasitized with *Eucoleus annulatus*. Detail of a tunnel in the epithelium lined with keratin together with heterophils and an egg of the nematode. HE. Bar = 0.08 mm.

C. anatis (Schrank, 1790) Travassos, 1915, although present in 22.5% of the animals, with a mean intensity of 31.8 and a range of infection of 16-91 worms, was not pathogenic to the investigated birds. Co-infections with *B. obsignata* and *C. anatis* were observed in 12.8% of the turkeys. The specimens were deposited in the CHIOC no. 36890 a-e (whole mounts).

DISCUSSION

The first data on the pathology induced by *C. annulatus* in turkeys were reported by Hung (1926), describing the results based on five animals that had died apparently due to the presence of the parasites. This is a study of the alterations of the aspect of the walls of esophagus and crop with early hyperemia and thickening of the esophageal lining, next to the mucosal areas of embedding parasites. In a subsequent phase, the lymphoid follicles increased, together with an extensive and severe wall thickening followed by loss of elasticity. In a late stage, the mucosa collapsed and there was the formation of a fibrinous pseudo-membrane that, interfering in the functions of the crop, forced the birds to avoid grains and ingest soft food, instead. Microscopically, these stages showed hyperemia and lymphocytary infiltrate, flask-shaped enlargement and necrosis of lymphoid follicles. A great amount of parasite eggs could be observed in the mucosa where the parasites deeply burrowed reaching the muscular layer.

Graham (1935) described similar lesions occurring in pheasants (*Phasianus colchicus*) except for a larger amount of plasmatic cells than lymphocytes. Also, it was suggested that the parasite penetration into the esophagus wall was stimulated by abnormal and poor dietary conditions of the hosts (Cram 1936).

The prevalence and the intensity of infection reported here for *E. annulatus* were low, similar to those reported for pheasants by Pinto et al. (2004) in Brazil and by Tampieri et al. (2005) in Europe. Although gross and microscopic alterations induced either by *E. annulatus* or *B. obsignata* were not described in studies of the former authors, there is the description of lesions caused by *E. perforans* in pheasants that are similar to those provoked by *E. annulatus* presently

observed in turkeys and that consist of a mild esophagitis and epithelium elongated-lined (tunnels) of the crop lined with eosinophilic material, in the presence of cellular debris and eggs of the parasites.

These alterations, apparently had no effect for the feeding process of the birds, and the absence of clinical signs associated to the parasitism with *E. annulatus* observed here, are probably related to the low parasite burden (5 nematode specimens) harbored by the single infected turkey, what is in accordance with Pinto et al. (2004), since this nematode is known to be highly pathogenic to turkeys. According to Hurst et al. (1979) that reported to the death of 23 young (6-10 weeks) turkeys out of the 56 observed and infected with *E. annulatus*; the infection was the cause of inappetence, loss of weight and lethargy. Carcasses were emaciated and crops distended. The lesions in the crops were described as layer corrugations of the mucosa with a mild thickening evolving to a compact necrotic diphtheric membrane that covered the entire surface of the mucosa. A severe infection due to *E. annulatus* in the crop squamous epithelium of the animals was observed, in the presence of heterophils, lymphocytes and plasmocytes. Connective tissue and glands were affected as a result of inflammatory infiltrates and necrosis. The squamous epithelium was thickened and irregular spine-like projections on the surface were evident.

Data after Pinto et al. (2004) suggest that the tunnels formed by the migration of capillariid worms in the epithelium of the crop and esophagus of infected birds may promote the settlement of secondary infections that, intensifying the severity of the lesions, can cause the death of the host.

In the case of infections with *B. obsignata*, the only available data are those referring to drug assays to investigate the efficacy of the treatment of pigeons (Jha 1977, Zuchowska 1994, Ibrahim et al. 1995, Sridhar et al. 1999, Toro et al. 1999) geese, pheasants, and chickens (Enigk et al. 1973) most of them experimentally infected with this nematode species, without description of induced lesions. To our knowledge, this is the first reported histological lesions associated with *B. obsignata* in turkeys.

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