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**The first report of severe intestinal capillariosis caused by  
*Baruscapillaria obsignata* in farmed helmeted  
guinea fowls (*Numida meleagris*)**

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**BARATHIDASAN, R., S. D. SINGH, V. GOWTHAMAN, A. LATCHUMIKANTHAN,  
K. DHAMA: The first report of severe intestinal capillariosis caused by  
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**ABSTRACT**

Capillarid worms are known to cause severe infection of the gastrointestinal tract and mortality, especially in Galliformes. In the present study, guinea fowl carcasses received from an organized poultry farm were investigated for the cause of death. The clinical history reported included reduced feed intake, diarrhea, lethargy and weakness in the flock. On necropsy examination, excess catarrhal exudate in the duodenal lumen (catarrhal enteritis), diphtheritic membrane formation, petichiae or ecchymotic haemorrhages on the mucosa of the duodenum were consistent findings. Mucosal scrapings and worms collected from dead birds examined microscopically revealed the presence of numerous thin adult worms, larvae, and barrel-shaped eggs with prominent bipolar plugs consistent with the morphology of *Capillaria* spp. Histopathologically, duodenal epithelial desquamation, mucosal thickening, blunting and clubbing of villi, goblet cell hyperactivity, and prominent thickening of the tunica muscularis were observed. Severe intestinal capillariosis resulted in reduced appetite, poor nutrient absorption, unthriftiness, diarrhea, and finally the death of the birds. This paper highlights the importance of regular screening and deworming in farmed guinea fowls. This appears to be the first report with regard to the intestinal form of capillariosis caused by *Baruscapillaria obsignata* in farmed helmeted guinea fowls.

**Key words:** *Baruscapillaria obsignata*, capillariosis, duodenum, guinea fowls, India

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## Introduction

The family *Capillaridae* includes a large group of trichurid nematodes, with approximately 300 species, which are widely distributed and are parasites of all vertebrate groups (MORAVEC, 1982; MORAVEC et al., 1987; YABSLEY, 2008). Avian capillarids belong to the genera *Baruscapillaria*, *Capillaria*, *Echinocoleus*, *Eucoleus*, *Ornithocapillaria*, *Pterothominx* and *Tridentocapillaria*. The capillarids are small thin nematodes (hair worms) in the superfamily Trichinelloidea, family Trichuridae, and subfamily Capillarinae. They parasitize various tissues including the gastrointestinal (GI) tract, respiratory system, urinary bladder, subcutaneous tissues and liver. Capillarids are known to cause severe infection of the gastrointestinal tract, and mortality, especially in Galliformes (RICKARD and POHL, 1969; HURST et al., 1979; BARUŠ and SERGEJEVA, 1989; De ROSA and SHIVAPRASAD, 1999; SINGH, 2010). A few reports were traced regarding the occurrence of non-intestinal form of capillariosis in guinea fowls (BARUŠ and SERGEJEVA, 1989; De ROSA and SHIVAPRASAD, 1999); however, infection and mortality associated with *intestinal* capillariosis in domesticated guinea fowls has not been reported earlier. In *B. obsignata* infections, eggs are passed in feces, the L1 larva develop inside the egg in 6 to 8 days at 20-24 °C; when these infective eggs are consumed, 4-5 moltings may occur in the host intestine before they become adult in 19 to 22 days, depending on the host species (MORAVEC et al., 1987). This paper reports the first data on the occurrence and pathology associated with intestinal capillariosis caused by *Baruscapillaria obsignata* in farmed helmeted guinea fowls.

## Materials and methods

*Case description.* In the present study, an organized farm in Bareilly, India, maintaining around 2000 helmeted guinea fowls in a deep litter pen rearing system, was investigated to find the cause of mortality. During the present investigation, in the winter of 2011, 4 month-old birds showed clinical signs including loss of appetite, reduced growth rate, weakness, diarrhea and emaciation, followed by death. A total of 62 birds died in a span of two weeks. No history of deworming was reported. Carcasses were presented for necropsy to the post mortem facility of the Division of Pathology, Indian Veterinary Research Institute, Izatnagar, for disease investigation.

*Laboratory investigation.* Birds were necropsied systematically and findings were recorded. Tissue samples, viz. duodenum, caecal tonsil, spleen, heart, lung and trachea, were collected for histopathology and virus isolation. Duodenal contents and mucosal scrapings were taken from different birds for estimation of worm load. The morphology of the bursal sheath, spicule and caudal alae in males, vulvular appendage in females, type of esophagus, and predilection site in the host were the key diagnostic features used for species identification.

## Results

Microscopic examination of fecal samples revealed the presence of numerous barrel-shaped eggs with prominent bipolar plugs, consistent with the morphology of trichurid eggs. Necropsy findings were dehydrated and emaciated carcass, vent soiling and matting of feathers, retarded growth, atrophic breast muscles, excess catarrhal exudate in the duodenal lumen (catarrhal enteritis), diphtheritic membrane formation, petichiae or ecchymotic haemorrhages on the mucosa of the anterior duodenum in most of the birds (Fig. 1), and in a few cases with severe thickening of the duodenum wall, careful examination of mucosal content revealed thin hair-like nematode worms. Lesions were almost always limited to the anterior duodenum. Mucosal scrapings from the duodenum and collected worms, examined microscopically, revealed the presence of numerous thin adult worms, larvae and barrel-shaped eggs consistent with the morphology of *Capillaria* sp. A few larvae could be detected from the caecal contents of some birds, but without any gross changes in the mucosa. Between 84 and 166 worms were present in the duodenum of different birds. The worms possessed stichosome esophagus (glandular esophagus) consisting of a variable number (35 to 43) of stichocytes at their anterior end, typical of capillariid nematodes (Fig. 2). The caudal end of the adult males had well developed bursa, with a single, long nonspiny sheathless spicule rarely extending beyond the body; two prominent lobes were observed on either side of the spicule, and caudal alae were absent (Fig. 3). The female worms had a very prominent vulvular appendage, and the eggs had prominent bipolar plugs (Fig. 4). The morphometrics of the male and female worms examined during this study are given in Table 1. Based on the morphology of the bursal sheath, the long nonspiny sheathless spicule and the absence of caudal alae in male worms, the prominent vulvular appendage in females, and the predilection site in the host (anterior duodenum), they were identified as *Baruscapillaria obsignata* (MORAVEC, 1982; MORAVEC et al., 1987; PERMIN and HANSEN, 1998; YABSLEY, 2008; PARK and SHIN, 2010; D'ÁVILA et al., 2011). Extreme sex bias was observed, as more than 80% of the examined worms were females.

Histopathologically, duodenal epithelial desquamation with sections of worms (Fig. 5), mucosal thickening, blunting and clubbing of villi, congestion and moderate to severe expansion of lamina propria with mononuclear cell infiltrate, excess mucous layer in lumen containing desquamated epithelium and sections of nematodes, goblet cell hyperactivity, and prominent thickening of tunica muscularis were observed (Fig. 6). However, the nematodes were not found to have penetrated deep into the mucosa or underlying layers.



Fig. 1. Anterior duodenum of an affected bird with severe congestion, petechial hemorrhages, and diphtheritic membrane on the mucosal surface



Fig. 2. Portion of the stichosome of a female *B. obsignata* showing elongated individual stichocytes with central nucleus. Scale bar = 100  $\mu\text{m}$

Table 1. Micrometry of adult male and female *Baruscapillaria obsignata* from *Numida meleagris* (Galliformes, Numidae)

| Micrometry parameter | Observations |
|----------------------|--------------|
| Body (L) ♂           | 8.6 - 10.4   |
| Body (L) ♀           | 10.8 - 12.3  |
| Body (W) ♂           | 0.040        |
| Body (W) ♀           | 0.051        |
| Oesophagus (L) ♂     | 4.4 - 5.6    |
| Oesophagus (L) ♀     | 4.9 - 6.0    |
| Egg (L) ♀            | 45 - 52      |
| Egg (W) ♀            | 27 - 30      |
| Spicule (L) ♂        | 1.16 - 1.28  |
| Spicule (W) ♂        | 0.01         |

(L), Length; (W), Width; ♂, Male; ♀, Female; All measurements are given in millimeters, with the exception of egg length and width, which are given in micrometers



Fig. 3. Caudal end of a male *B. obsignata* showing a portion of the long nonspiny sheathless spicule. Two well-developed lobes are present on either side of the spicule in the copulatory bursa. Scale bar = 50  $\mu$ m.

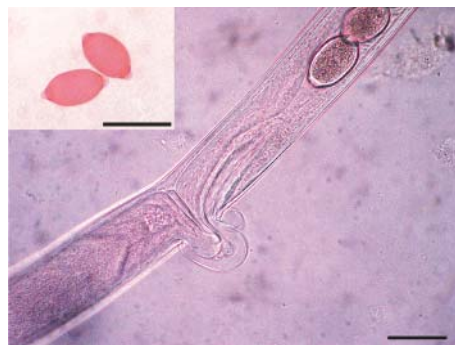


Fig. 4. Female *B. obsignata* with prominent vulvular appendage, and eggs in uterus. Bar = 50  $\mu$ m. Inset: Barrel-shaped eggs with prominent bipolar plugs. 1% Eosin staining. Scale bar = 50  $\mu$ m.

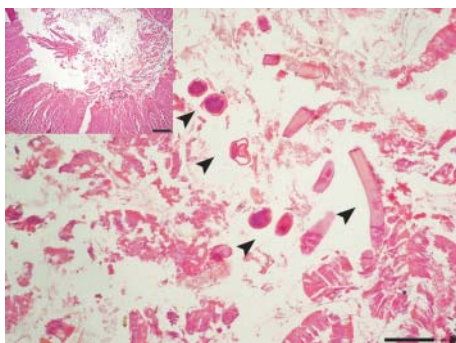


Fig. 5. Sections of nematodes (arrow heads) in a diphtheritic duodenal mucous membrane. H&E stain, Scale bar = 50  $\mu$ m. Inset: overview of the mucosa. Note the diphtheritic membrane, clubbing of villi and expansion of lamina propria. H&E, scale bar = 500  $\mu$ m.

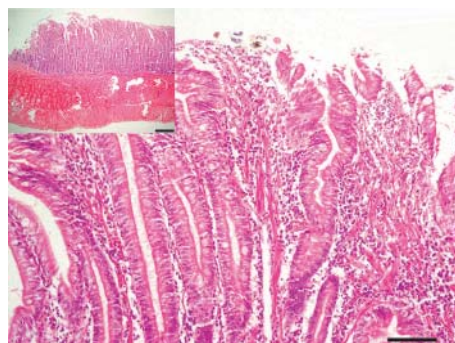


Fig. 6. Duodenum; increased goblet cell activity, and moderate expansion of lamina propria by mononuclear cell infiltrate. H&E stain, Scale bar = 100  $\mu$ m. Inset: overview of the lesion. Note the hypertrophy of the longitudinal and circular muscle layers. H&E, scale bar = 500  $\mu$ m.

### Discussion

The *Baruscapillaria* is one of the new genera, and the species *Baruscapillaria obsignata* is known to occur in birds belonging to the Order Anseriformes, Ciconiiformes,

Columbiformes, Galliformes, Piciformes and Psittaciformes (JORTNER et al., 1967; RICKARD and POHL, 1969; PINTO et al., 2004; PINTO et al., 2008; YABSLEY, 2008; PARK and SHIN, 2010; D'ÁVILA et al., 2011). Apart from causing death, capillarids are also responsible for lower growth rates, decreased egg production and decreased fertility of the flock (RICKARD and PHOL, 1969). Only a few reports could be traced on the intestinal pathology and disease caused by *B. obsignata* infections, in chickens (JORTNER et al., 1967), turkeys (PINTO et al., 2008), and rock partridges (PARK and SHIN, 2010). However, *B. obsignata* has not been reported to occur in the intestine of guinea fowls. Scrapings from the duodenum of affected birds revealed numerous adult, larvae and eggs of *B. obsignata*. Intestinal thickening, owing to mucosal and muscular thickening, was attributed to chronic repeated infection, high worm load and frequent diarrhea. The confined intensive system of rearing tends to favor those helminths with short or direct life cycles, such as *Ascaridia*, *Heterakis* and *Capillaria*. Since, *B. obsignata* infection spreads by direct transmission (WAKELIN, 1965; SHLIKAS, 1966 and 1967; MORAVEC et al., 1987), continuous litter contamination and wet litter helped the repeated exposure of birds to infective L1 larvae in eggs in the current outbreak. JORTNER et al. (1967) observed that the nematode *B. obsignata* in chickens, with burdens of over 30 worms, provoked epithelial desquamation, blunting and shortening of villi, and inflammation of lamina propria, probably resulting in decreased digestion and absorption.

Guinea fowls are more susceptible to capillarid infections than other Galliformes (LEÓN and SOLDEVILA, 1978; MATHEY and GUTTER, 1979; De ROSA and SHIVAPRASAD, 1999). In the present study, severe intestinal infection with the parasite was observed with heavy worm burden in duodenum. The extreme sex biasness has been reported previously in capillarid infections of birds and other vertebrates. It is suggested that since most birds infected with capillarid infections have few adult worms, a bias that favors adult females will increase the parasite's reproductive potential (D'ÁVILA et al., 2011). However, in this study heavy infection in birds involving good numbers of adult worms was noticed, yet more than 80% were females. The mechanism by which this sex bias develops is still unknown. The biology of capillarids at the micro habitat level still remains obscure. Fenbendazole, febantel, and levamisole are highly efficacious for treatment of capillariosis (SOULSBY, 1982; EL-KHOLY et al., 2006) in numerous avian species, including chickens, turkeys, pheasants and partridges (YABSLEY, 2008). Since the prepatent period is 19-22 days, two cycles of anthelmintic treatment, scheduled 20 days apart, would be appropriate. In the current outbreak, the flock was effectively treated with levamisole (SOULSBY, 1982; EL-KHOLY et al., 2006). The drug was administered to the entire flock at the rate of 60 ppm in drinking water for 3 days, and 2 cycles of treatment were given 20 days apart.

Severe intestinal infection of *Baruscapillaria obsignata* nematodes in guinea fowls caused clinical disease and mortality in the present outbreak. The current study highlights



the importance of regular screening and deworming, and proper litter management in farmed guinea fowls. Further detailed studies on the prevalence, pathology and treatment of capillariid infections in farmed guinea fowls are warranted.

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**BARATHIDASAN, R., S. D. SINGH, V. GOWTHAMAN, A. LATCHUMIKANTHAN, K. DHAMA: Prvo izvješće o jakoj crijevnoj kapilariozi uzrokovanoj obličem *Baruscapillaria obsignata* u farmski uzgojenih biserki (*Numida meleagris*). Vet. arhiv 84, 529-536, 2014.**

**SAŽETAK**

Poznato je da su oblici porodice *Capillariidae* uzročnici jakih invazija probavnog sustava i uginuća ptica, osobito reda Galliformes. Istraživanje se temelji na rezultatima postmortalnih pretraga biserki uginulih na farmi. Iz povijesti bolesti bilo je vidljivo da su ptice slabije uzimale hranu, imale su proljev, bile potištene i slabe. Razudbom uginulih ptica dokazan je obilni kataralni eksudat u lumenu dvanaesnika (kataralni enteritis), tvorba difteričnih membrana te petehijalna ili ekhimotična krvarenja na sluznici dvanaesnika. Mikroskopiranjem strugotina sluznice uginulih ptica uočeni su mnogi tanki oblici te jaja bačvasta oblika s izraženim bipolarnim čepovima što se podudaralo s izgledom jaja oblika roda *Capillaria*. Patohistološkom pretragom ustanovljena je deskvamacija epitela dvanaesnika, zadebljanje sluznice, zadebljanje crijevnih resica, hiperaktivnost vrčastih stanica te izraženo zadebljanje mišićnog sloja. Jaka kapilarioza imala je za posljedicu smanjeni tek, slabu apsorpciju hranjivih tvari, slab prirast, proljev i uginuće ptica. U radu se naglašava važnost redovitog pretraživanja i dehelmintizacije farmski uzgajanih biserki. Ovo je prvi nalaz objektivno dokazane crijevne kapilarioze uzrokovane obličem *Baruscapillaria obsignata* u farmski uzgojenih biserki.

**Ključne riječi:** *Baruscapillaria obsignata*, kapilarioza, dvanaesnik, biserke, Indija

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