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Original Article

An Outbreak of Intestinal Obstruction by Ascaridia Galli in Broilers in Minas Gerais

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ABSTRACT

Industrial broilers raised on helminthic medication-free feed were diagnosed with a severe disease caused by *Ascaridia galli*, characterized by intestinal hemorrhage and obstruction. *A. galli* was identified based on the morphological features of the nematode. Broilers were raised for a longer period (63 days) for weight recovery, grouped as stunted (n=500), had low body score and had fetid diarrhea. The duodenum-jejunum segment was the most severely affected with obstruction and had localized accumulation of gas. The intestinal mucosa was severely congested with petechial and suffusive hemorrhages. The outbreak resulted in morbidity of about 10% and mortality of up to 4% and was associated to the absence of preventive medication on feed and slack biosecurity. The reemergence of *A. galli* is discussed in view of the alternative poultry management and raising conditions for drug free and welfare.

INTRODUCTION

Ascaridia galli is returning to the relevant poultry diseases scene as alternative free-range broilers and cage-free layer chickens are progressively in higher demand by consumers. Floor and ground conditions enable the direct ingestion of eggs or larvae or mechanical vectors of *Ascaridia galli*, such as earthworms, which may concentrate and protect eggs (Augustine, 1974), although the transmission is mainly direct and the life cycle simple. Eggs develop infective larvae within about 12 days and are resistant to cold. The normal development and viability of *A. galli* eggs is highest in anaerobic conditions in feces at cold temperatures but lowest in feces or water at warmer temperatures, as eggs maintained in normal embryogenesis with little loss of viability in feces at 4°C, but with large viability losses in clean water at 25°C (Tarbiat *et al.*, 2018). Infection will result in reduced productive performance of meat or eggs, and high parasitic load will cause intestinal blood loss, increased mortality, and anemia, and may aggravate other conditions (Norton & Ruff, 2003).

In Germany, cage-free organic layers were shown to harbor, mostly subclinically, the nematodes *Ascaridia galli* (88%), *Heterakis gallinarum* (98%), and *Capillaria* spp (75.3%) (Kaufmann *et al.*, 2011). In Sweden, layers are challenged with genetically related *Ascaridia galli* strains, indicating recent and stationary flock infections (Höglund *et al.*, 2012). A more extensive study in eight European countries investigated helminthic infection, revealing *A. galli* with an overall prevalence of 69.5%, and that, in contrast to the general assumption, the outdoor pasture did not correlate to the infection (Thapa *et al.*, 2015).

In Brazil (São Paulo), adult chickens of different housing and management strategies, were shown most commonly infected by *A.*

galli and *Heterakis gallinarum* (Silva *et al.*, 2016). An outbreak of intestinal disease in *Pavo cristatus* causing diarrhea, dehydration, anorexia and weight loss, was associated to *A. galli* (Teixeira *et al.*, 2012). Wild native and exotic domestic avian species were investigated for the presence of endoparasites in feces and found *A. galli* in *Buteo magnirostris* and *P. cristatus* (Marietto-Gonçalves *et al.*, 2009; Andery *et al.*, 2013).

This manuscript aims to report an outbreak of severe infection by *Ascaridia galli* resulting in intestinal hemorrhage and obstruction and high mortality of industrial broilers raised on medication-free feed.

MATERIALS AND METHODS

Broilers (n=4) which were raised up to nine weeks of age were received for diagnosis, with history of morbidity of approximately 10% and mortality of approximately 4%. The flock was formed by gathering stunted chicks for separate management and characterized by low performance, stunted growth and low body weight. All birds in the sample were chosen considering the stunted growth. Broilers were raised on balanced nutrient but helminthic medication-free diet, with a total of 500 birds in the flock. Housing was in conventional brick house for industrial broilers, with industrial grade feeders and drinkers, forced ventilation, curtains, cemented floor and wood shavings bedding. However, biosecurity was not effective, without entrance control, allowing visitation, with no footbath or vehicle disinfection. Complete necropsies were performed, and nematodes collected, processed, mounted as described previously (Bowman, 2009), and identified according to the morphology and micrometry (Soulsby, 1982). Briefly, nematodes were immersed in warm buffered saline (PBS pH 7.4) and within a few minutes were subsequently transferred to a buffered formaline solution (formaldehyde 10% in PBS). Helminths were diaphanized in lactophenol (20% phenic acid, 20% lactic acid, 40% glycerine; 20% distilled water) and mounted onto glass slides with coverslip in melt phenol gelatin (10g gelatin; 60mL distillled water; 70ml glycerine; 0.5mL phenic acid) and visualized with an optical microscopy (Olympus B-H2) at 40 and 100 magnifications.

RESULTS AND DISCUSSION

Broilers were described with chronic fluid fetid diarrhea and showed low body score for the age, with prominent carina (sternum), as a result of reduced pectoral mass. Enlarged intestines with gas accumulations were seen at necropsy, where *Ascaridia galli* concentrated, mostly at the cranial part of the jejunum, causing obstruction and mucosal congestion (Fig. 1). The microscopic aspects of the morphology of *A. galli* adults and eggs are shown (Fig. 2).

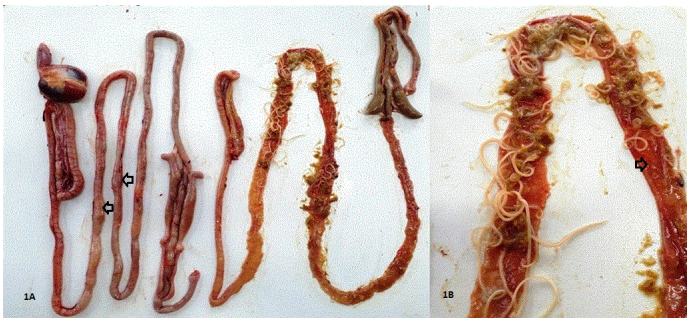

Figure 1 – A: Small intestines of broiler chicken. Intestinal segments are enlarged and with accumulations of gas (arrows), as a result of obstructions by *Ascaridia galli*, especially at the cranial part of jejunum. B: High burden of *Ascaridia galli* with congested mucosa (arrow) in the jejunum.

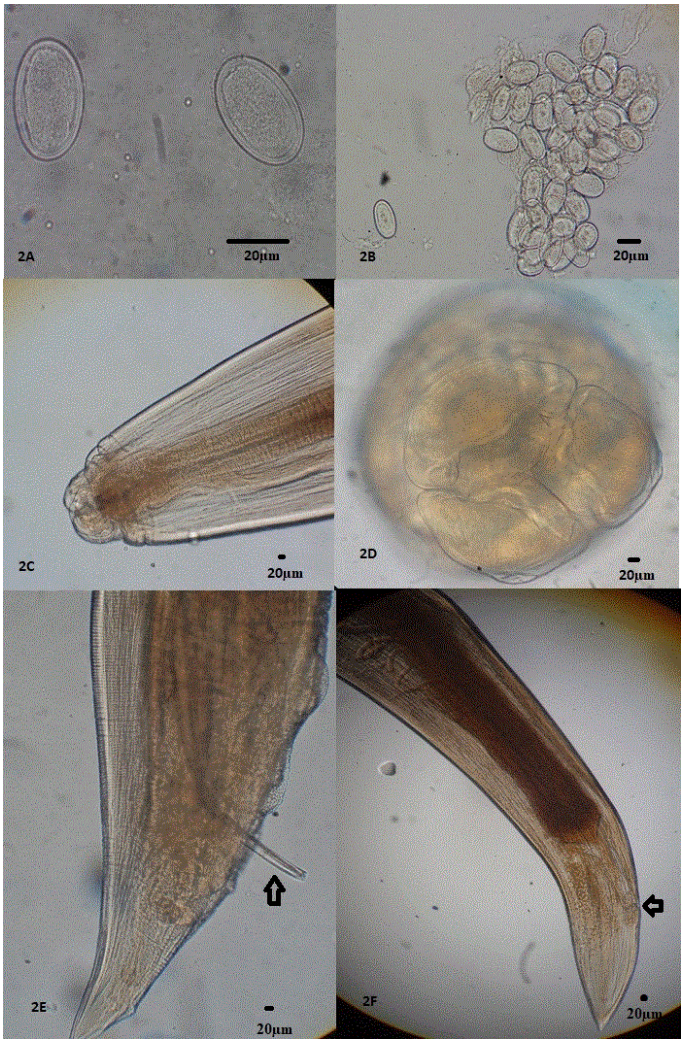

Figure 2 – *Ascaridia galli* 2A and 2B: Eggs; Note that eggs are characterized by a thick shell; 2C: Lateral view of the buccal apparatus of male; 2D: Frontal view of the buccal entrance of a male, showing three-independent lips. 2E: Ventral view of the male reproductive organs; the spicule is visible (arrow); 2F: Lateral view of the female caudal end, with the anus visible (arrow).

Ascaridia infections are known to be rare in caged chickens, including welfare cages, but common in non-caged systems, as here described for indoor broilers. In the outbreak here described, broilers were raised in conventional houses, but without adequate biosecurity, such as entrance control for visitors or vehicle disinfection, and were given feed with no anthelminthic medication. The improvement of management factors such as housing, litter and nutritional quality, schedule times of opening and closing popholes, alternation of pasture and supply of required materials may have a role in the reduction of the helminthic load (Thapa *et al.*, 2015), as free-range conditions enable the ingestion of eggs or larvae, or mechanical vectors of *Ascaridia galli*, such as earthworms (Augustine, 1974). Although free-range on grass did not correlate to *Ascaridia galli* infection in Europe (Thapa *et al.*, 2015), despite temperatures of 18.8°C or lower will stop larva development (Reid, 1960), but preserving its viability (Tharbiat *et al.*, 2018), the climatic and environmental conditions may have a role in other regions, such as cooler climates. *A. galli* has a broad avian host range and infection has been described in industrial and free-range chickens, and wild species (Marietto-Gonçalves *et al.*, 2009; Silva *et al.*, 2016; Teixeira *et al.*, 2012; Andery *et al.*, 2013).

Lesions by *A. galli* will harm intestinal function and performance, with retarded growth and production (Daş *et al.*, 2012), especially by larval stages (Luna-Olivares *et al.*, 2015), as here observed as intestinal hemorrhages and obstruction.

The introduction of *Ascaridia galli* infection in the premises might be associated to infected replacement chickens (Höglund *et al.*, 2011), although the established infection will maintain a local genetic profile identity, and with genetic variations among farms (Höglund *et al.*, 2012). Broilers in the present outbreak were raised in premises without entrance control, hence insufficient biosecurity. Visitor entry to the house or unit is a management error which results in eggs introduced horizontally into the farms (Jansson *et al.*, 2010).

Ascaridiosis seems to be reemerging in several countries due to alternative raising or housing. In Serbia, hens of organic egg production were found 15.6-24.0% positive for *A. galli* (Tamara *et al.*, 2019). In Argentina, broiler chicken flocks were evaluated and 25% of flocks were shown infected but no correlation was found between nematodes and coccidian infections (De Franceschi *et al.,* 2008). Previous studies in Brazil, have found broiler flocks infected by *Ascaridia galli* in 10/17 municipalities of São Paulo (Da Silva *et al.*, 2018), in free-range flocks in the neighboring state (Paraná), with 45% infected (Vieira *et al.*, 2015), and in Santa Catarina in 21.7% (Quadros *et al.*, 2015). In our study, we show that raising broilers in Minas Gerais, previously shown to naturally occur *A galli* by Mendes *et al.* (1976) and in our unpublished extension service, especially for longer and without preventive medication, may lead to highly significant infection.

The information available on the affected flock revealed the strategic use of mebendazole for treatment against ascaridiasis. However, more effective drugs have been recommended against *A. galli*, such as fenbendazole, dl-tetramizole, levamizole or pyrantel tartrate (Norton & Ruff, 2003), none of which are permitted in drug-free poultry.

The climatic conditions and change in Brazil may favor parasitism in most of the Brazilian territory, with the survival of eggs in feces, especially at cooler temperatures (Tharbiat *et al.*, 2018). The adoption of medication-free diet will demand for frequent fecal monitoring and strict biosecurity, in order to reduce the risk of helminthiasis. However, the use of antihelmintics has been considered a selective pressure for resistance. For instance, the subtherapeutic preventive dosage with benzimidazole has been involved in resistance by *Ostertagia ostertagi* in bovines (Knapp-Lawitzke *et al.* 2015).

CONCLUSIONS

The parasitism by *Ascaridia galli* in broilers is a growing concern worldwide, especially for alternative poultry, or in drug-free raising of broilers, as shown here. The growth of industrial broilers in medication-free diets will demand for all the adequate preventive veterinary medicine measures to be taken.

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