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Ascaridia galli: A report of erratic migration in eggs for human consumption in Bucaramanga, Colombia – case report

[*Ascaridia galli: Um relatório de migração errática em ovos para consumo humano em Bucaramanga, Colômbia - relato de caso*]

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ABSTRACT

This case report describes how an erratic specimen of *Ascaridia galli* in the adult phase was recovered in an unusual way from a hen's egg intended for human consumption. Although the literature on similar events is limited, this appears to be the first case reported in Bucaramanga, Colombia. The parasite was identified directly under a light microscope as an adult female *A. galli*, 6.5-cm long with 3 trilobed lips. In addition, the remaining eggs of the same group were examined to determine if there were more cases of erratic migration in that same batch. This nematode can cause various pathological conditions, including enteritis, hemorrhage, diarrhea, anemia, weakness, and emaciation, that can lead to huge economic and production losses in the poultry industry.

Keywords: parasite; chickens; health; nematode; public health

RESUMO

Este relato de caso descreve como um exemplar errático de Ascaridia galli na fase adulta foi recuperado de uma forma incomum em um ovo de galinha destinado ao consumo humano. Embora a literatura sobre eventos similares seja limitada, este parece ser o primeiro caso relatado em Bucaramanga, Colômbia. O parasita foi identificado diretamente sob um microscópio leve como uma fêmea adulta A. galli, com 6,5 cm de comprimento e 3 lábios trilobados. Além disso, os ovos restantes do mesmo grupo foram examinados para determinar se existiam mais casos de migração errática nesse mesmo lote. Este nemátodo pode causar várias condições patológicas, incluindo enterite, hemorragia, diarréia, anemia, fraqueza e emaciação, que podem levar a enormes perdas econômicas e de produção na indústria avícola.

Palavras-chave: parasita; frangos; saúde; nematódeo; saúde pública

INTRODUCTION

In the poultry industry, breeding systems have evolved over the years (Rodenburg *et al.*, 2022), favoring the environmental conditions for many species that parasitize poultry housed in cage-free or semi-cage-free systems (Campbell *et al.*, 2020). Monoxenic cycle nematodes, such as *Ascaridia galli*, which represent the second most important parasite in the poultry industry, infect more frequently (Richard, 2015). *A. galli* mainly affects young chickens up to 3 months of age, possibly due to nutritional deficiencies such as a lack of proteins and vitamins. In contrast, long-living chickens develop a certain resistance that limits the damage because they have goblet cells in their intestinal mucosa (Fioretti *et al.*, 2016). This parasite causes pathological conditions, such as digestion disorders, delayed growth, and low production on different types of farms or among different types of poultry producers, as well as in the fattening, rearing, laying, and genetic material, leading to major economic losses (Hoyos *et al.*, 2015).

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The eggs of this parasite are found in feces and moist soil, where larvae in stage 1 develop into infective larvae in stage 2 (L2) in approximately 2–3 weeks based on whether the environmental conditions, such as temperature (22ºC–25ºC) and humidity (80%–85%), are appropriate (Guerrero and Vasquez, 2018). Chickens become infected by ingesting food or water contaminated with embryonated eggs containing L2, which hatch in the proventriculus or small intestine. There, they become larvae in stage 3 and remain in the intestinal lumen for a period of 8–10 days. Next, they penetrate the intestinal mucosa and live there for 2 weeks before returning to the intestinal lumen, where they completely develop into mature adults 6 weeks after the initial infection. The prepatent period (PPP) of *A. galli* is approximately 45 days (Figure 1) (Tarbiat *et al.*, 2020). These parasites are rarely found in the esophagus, crop, gizzard, or large intestine. They rarely migrate erratically to the oviduct, where they are present during the formation of the nutritive material (egg white), and remain inside the egg (Bharat *et al*., 2017). *A. galli* in its adult phase cannot multiply in humans; therefore, it does not cause parasitism. The health risk lies in the mechanical transmission of other pathogens via the parasite (Richard, 2015).

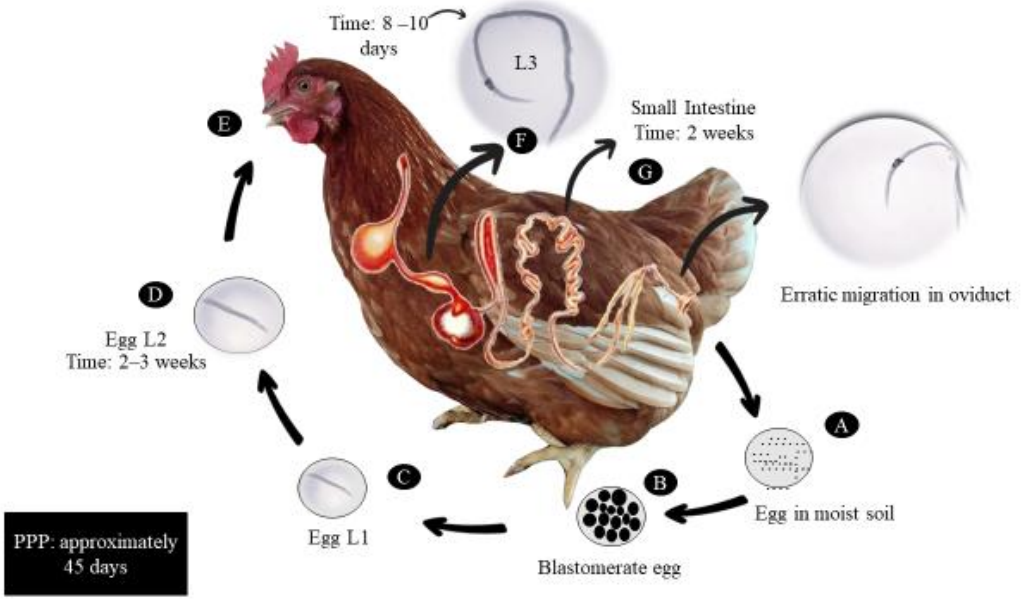

Figure 1. Biological cycle of Ascaridia galli. Created by the authors.

Nonetheless, the consumption of raw eggs can become a public health issue because they are a potential source of pathogenic organisms (Res *et al.*, 2017). In this study, we report a case of *A. galli* as an erratic parasite in eggs intended for human consumption.

CASUISTRY

A batch of 30 eggs was received at the food laboratory of the Universidad Cooperativa de Colombia, Bucaramanga Campus, to perform a freshness test. The eggs were acquired from a farm that uses a semi-cage-free production system. Three months before the test, the eggs presented a layer of mold and dark spots on the shell (Figure 2), but there was no bad smell indicative of decomposition. During routine laboratory testing, an elongated object present in the albumin covered in mucus was observed in one of the eggs (Figure 3). The object was sent to the BIOVET veterinary clinical laboratory for identification, where it was examined under a microscope. For its preservation, it was isolated and washed in distilled water, and for its transfer it was stored in a container with 10% glycerin and 90% ethanol.

Figure 2. Commercial eggs with mold and dark spots on the shell.

Figure 3. Nematode covered in mucus and albumin.

The morphological characteristics made it possible to identify a parasitic form. The parasite was identified as an adult female of the genus *Ascaridia*, measuring approximately 6.5cm in length (Figure 4). To determine its morphology under the microscope (Olympus CX21 model), a low magnification (10x objective) was used, then the object holder was explored to locate the area where it could be better visualized, and it was increased to the 40x objective which determined that. The esophagus lacked an upper bulb. The parasite had three lips (the dorsal lip being the most developed), and the vulva was in the middle region of the body. It was concluded that the parasite belonged to the species *A. galli* (Richard, 2015). To preserve the parasite, it was stored in 65% alcohol (Muñoz-Rodriguez *et al.*, 2021). The nematode was nonviable due to the time lag between the laying of the eggs and the testing for freshness of the egg batch.

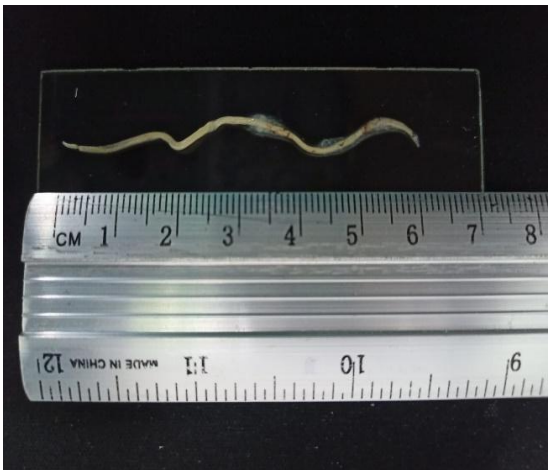

Figure 4. Macroscopic observation of the nematode.

The remaining eggs (29 units) were evaluated for parasite presence and freshness by placing them in beakers filled with water. Fresh eggs sink and remain in a longitudinal plane at the bottom of the beaker, whereas eggs unfit for human consumption float because as the egg ages, it loses moisture, which escapes through the pores. Consequently, the egg white and yolk gradually shrink while the air chamber expands, causing the egg to rise to the surface when submerged in water (Karoui *et al.*, 2006; Harnsoongnoen and Jaroensuk, 2021).

To compare the freshness of the eggs, another batch of 30 eggs laid a week earlier was purchased from the same production farm. The liquid albumin examined macroscopically indicated old eggs (Figure 5a) approximately 11 units (out of 30) were presented as follows, while dense albumin was observed in the fresh ones (Figure 5b) (Jaimes, 2019).

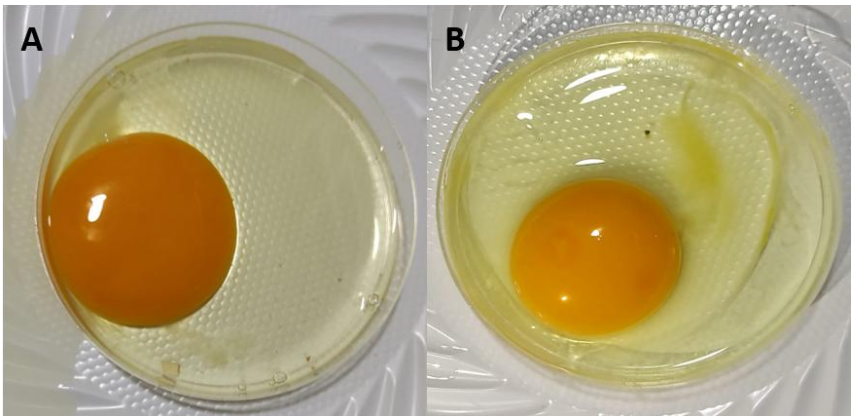

Figure 5. **A.** Liquid albumin. **B.** Dense albumin.

DISCUSSION

Gastrointestinal nematodes are re-appearing in countries where poultry production systems are becoming more popular. *A. gallis* is a major concern because of its direct life cycle and ability to persist in the environment. This parasite leads to huge economic losses because it causes a decline in health, welfare, immunity, and laying in hens (Sharma *et al.*, 2019). Gastrointestinal parasitism in poultry is especially related to inadequate sanitary practices, which is a determining factor in farms. As a result, regardless of the system or the size of the production farm, appropriate management of poultry is necessary (Elini *et al.*, 2019).

According to the Colombian Agricultural Institute (ICA), the department of Santander has 25% of the national poultry production, and according to the Ministry of Agriculture and Rural Development the egg production is 3,527 million units for 2020 (Aguillón-Páez *et al*., 2020), highlighting that the case report occurred in Bucaramanga being the capital of the department of Santander in the northeastern area of Colombia, despite the fact that this parasite has an immense impact on poultry in terms of prevalence and pathogenicity, in the area of Santander there are no samples where percentages of the frequency of gastrointestinal parasites in laying hens have been established, In comparison to other regions of Colombia, as in the department of Cordoba, where a sampling was carried out to determine the frequency of parasites in laying hens grazing in the municipalities of Purisima and Momil, showing all the flocks studied positive for the presence of gastrointestinal parasite eggs, among them A. galli with 45% frequency. galli with 45% frequency (Elini *et al*., 2019).

In production systems with laying hens having access to outdoor areas, *A. galli* is the most prevalent gastrointestinal nematode (31.25%), followed by *Capillaria spp.* (35.93%) and *Heterakis gallinarum* (21.87%) (Hoyos *et al.*, 2015). Although the literature on the erratic migration of this nematode to the oviduct is limited, it has been suggested that this event occurs more frequently in young hens with a high level of parasitic infection (Richard, 2015). However, this occurrence is imperceptible because boiled eggs are commonly consumed, making it difficult to detect parasites *in ovo* (Fioretti *et al.*, 2016).

Although *A. galli* does not cause parasitosis in humans, it poses a risk to public health because the parasitic specimen can transport *Escherichia coli*, *Salmonella* spp., *Campylobacter* spp., *Cryptosporidium* spp., *Giardia intestinalis*, and rotavirus, among others, during erratic migration, causing foodborne diseases (Bharat *et al.*, 2017).

Cases similar to the one reported in this study have been previously reported in the literature. In morphological tests conducted in India and Italy, parasites were identified as adult females belonging to the genus *A. galli* and were found erratically in chicken egg albumin. However, they differed slightly in size. Thus, nematodes measured 1 cm less and 3 mm more in reports from India and Italy, respectively, compared to the one presented in this report (Bharat *et al.*, 2017; Fioretti *et al.*, 2016).

In Italy, the flotation method with a sugar solution allowed for the conservation of the larvae in the albumin of the egg, thereby facilitating the identification of this parasite (Fioretti *et al.*, 2016). In this study, the egg from which the nematode was recovered could not be preserved. However, the remaining units of the same group of eggs for consumption were examined, and no parasites or larvae were found in the albumin examined microscopically.

CONCLUSION

Hen's eggs for human consumption may contain infectious agents that are harmful to public health, such as *A. galli*, which is not commonly detected because of the consumption of boiled eggs and appears due to erratic migration. Although the parasite does not cause diseases in humans, it can spread other pathogens that endanger public health. Therefore, it is necessary to maintain strategic biosecurity plans in production farms, particularly in semi-cage-free systems, to reduce the presence of pathogenic microorganisms.

Finally, as a recommendation, highlighting the importance of improving the flow of information, it is advisable to identify the quality of eggs where several parameters can be evaluated, classified into internal (albumin height and yolk color) and external (egg weight, reflectivity, thickness, resistance to breakage and translucency of the shell), easy to identify by the producer in charge of the demonstrable and constant guarantee to determine if what is being sold in the market is reliable, these biosecurity measures can generate interest from the consumer.

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