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Short Communication

First report of *Libyostrongylus douglassii* (Strongylida: Trichostrongylidae) in ostriches (*Struthio camelus*) from Mexico

Juan R. Sánchez-Ayala[a,c], Irene Cruz-Mendoza[a,c,*], Juan A. Figueroa-Castillo[a,c], Cuauhcihuatl Vital-García[b]

[a] *Laboratorio de investigación parasitológica, Departamento de parasitología, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Mexico*

[b] *Universidad Autónoma de Ciudad Juárez, Departamento de Ciencias Veterinarias, Anillo Envolvente y Estocolmo s/n Colonia Progresista CP 32310, AP 1729-D Cd. Juárez, Chihuahua, Mexico*

[c] *Avenida Universidad # 3000, Ciudad Universitaria, Delegación Coyoacán, Ciudad de México, Mexico*

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ABSTRACT

Nematodes of the *Libyostrongylus* genus are hematophagous parasites found under the ostrich's proventriculus membrane: they are frequent and can cause 50% of mortality in chicks and occasionally death in adults. With the aim of determining the presence of the *Libyostrongylus* genus in two private collections, one located in Ayapango, State of Mexico and the other in Amacuzac, Morelos, a total of 27 fecal samples were collected between August and December of 2016. Samples were analyzed using the flotation technique. The eggs were quantified using the McMaster technique. Positive samples were cultured to obtain infective larvae and to be identified by their morphometric characteristics. Only 18 samples collected in Ayapango were positive to *Libyostrongylus douglassii*. This is the first time that *L. douglassii* is reported in Mexico.

1. Introduction

In Mexico the importance of ostrich (*Struthio camelus*) breeding has grown in recent years (Lozano Santillán et al., 2008); however, there is little knowledge of diseases that can affect them. Ostriches belong to the ratites group; they originate in Africa and today their trade has gained worldwide economic importance due to their versatility to different environments (Braga et al., 2013) and to the meat production and high skin quality (Ponce Gordo et al., 2002). One of the most common problems in breeding ostriches is the control of parasitic diseases, particularly those caused by parasites that have a direct life cycle (Huchzermeyer, 1999). Different ectoparasites and endoparasites such as ticks, protozoa and helminths can affect ostriches (Bonadiman et al., 2006; Ederli and Rodrigues de Oliveira, 2014; Huchzermeyer, 2002; Ponce Gordo et al., 2002), producing large economic losses due to reduced productivity, product quality or mortality (de Oliveira et al., 2012; Lelis et al., 2014). The most frequent parasites reported in ostriches are helminths, particularly, *Libyostrongylus* spp., *Houttuynia struthionis* and *Codiostomun struthionis* (Ederli et al., 2008a, 2008c).

Nematodes of the *Libyostrongylus* genus are small hematophagous worms found below the ostrich's proventriculus membrane (McKenna, 2005). Parasitosis by *Libyostrongylus* spp. can cause anemia, weight loss, anorexia, proventriculitis, gastric stasis and a process known as 'rotten stomach' or being asymptomatic in adults (Huchzermeyer, 2002; Mackereth, 2004). The diagnosis of *Libyostrongylus* spp. in live ostriches is based on clinical manifestations and the identification of strongylid eggs in feces; however, these are similar to *Codiostomum struthionis* eggs, considered non-pathogenic, and can cause an erroneous diagnosis (Ederli et al., 2008b). For definitive identification of the *Libyostrongylus* genus, a coproculture technique is required in order to obtain the infecting larva which is morphologically distinguishable (Ederli et al., 2008a, 2008b, 2008c). Within the *Libysotrongylus* genus, we find 3 species (Ederli and Oliveira, 2009): *L. magnus* which has only been reported in South Africa, *L. douglassii* which has a worldwide distribution (Ederli and Rodrigues de Oliveira, 2014), and *L. dentatus* which has been reported in the United States (Hoberg et al., 1995) and Brazil (Bonadiman et al., 2006; Ederli et al., 2008a, 2008b); although given the morphological similarities of the adult parasite in the two latter species, *L. dentatus* has probably not been diagnosed elsewhere (De Andrade et al., 2011; Hoberg et al., 1995; McKenna, 2005). Additionally, mixed ostrich infections with *L. dentatus* and *L. douglassii* have been reported (de Andrade et al., 2011; De Andrade et al., 2011; Hoberg et al., 1995).

* Corresponding author at: Laboratorio de investigación parasitológica, Departamento de parasitología, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Mexico.
E-mail address: irenecruz50@yahoo.com.mx (I. Cruz-Mendoza).

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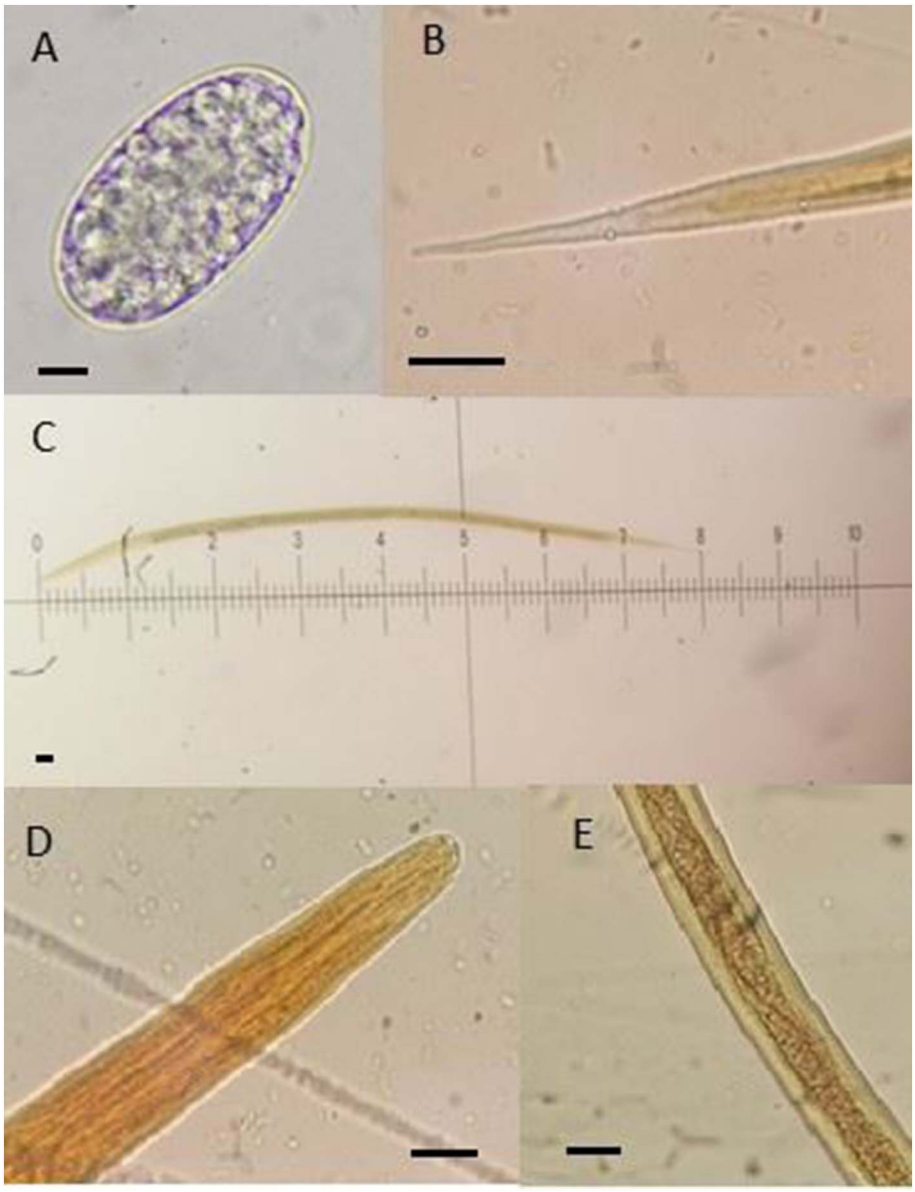

Fig. 1. A) Strongile-type eggs, B) Posterior end of Infective larva, C) Total length of the infective larva, D) Filariform esophagus and, E) Triangular intestinal cells. (A–E; Bar – 10 μm).
Source: original.

L. douglassii is considered the most pathogenic species of the *Libyostrongylus* genus because it causes high mortality in chicks less than three months old (50%) and birds up to six months (20–30%), even in adult individuals (˜10%) (Bastinello et al., 2005; Bonadiman et al., 2006; de Andrade et al., 2011; Sotiraki et al., 2001). *L. douglassii* is considered an exclusive parasite for ostriches (Craig and Diamond, 1996), although it has not been investigated whether this parasite can be transmitted to other birds, mainly to other ratites (Hoberg et al., 1995). There is an infection report of this parasite in an emu (*Dromaius novaehollandiae*) from Sweden (Ponce Gordo et al., 2002). Previously, the species differentiation of the *Libyostrongylus* genus was only possible by the characterization of adult parasites obtained in the proventriculus and gizzard during necropsy, but recent investigations have confirmed that it is possible to contrast the morphology of the infective larva (Ederli et al., 2008b). Therefore, the aim of the present study was to identify parasites of the *Libyostrongylus* genus in ostriches from two private collections in Mexico.

2. Materials and methods

Sampling was performed in two private collections. The first collection is located in Ayapango, State of Mexico, where two groups of ostriches were sampled; each group consisted of two adults: one female and one male. In this collection, a total of 18 fecal samples collected between August and October of 2016 were analyzed. The second collection is located in Amacuzac, Morelos, where a group of ostriches consisting of one male and four adult females was sampled. In this collection, a total of 9 fecal samples collected during October and December of 2016 were analyzed. Fecal samples were collected in the morning using a properly identified plastic bag. Samples were taken directly from the floor, immediately after the bird defecated. Later, they were transported in a thermal icebox with temperature between 4 and 6 °C, to the Veterinary Parasitology Laboratory (National Autonomous University of Mexico) and analyzed within the next 24 h.

For the flotation technique, three grams of feces of each sample were used in a saturated sodium chloride solution (density of 1.200). Positive strongylide egg samples were analyzed using the McMaster technique to determine the number of eggs per gram of feces (Gordon and Whitlock, 1939). The rest of the positive samples were analyzed through the larval culture technique, using sawdust as a substrate and an incubator (27 °C, 60% RH). Every third day the culture was