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Short communication

# *Lamanema chavezi* (Nematoda: Molineidae): Epidemiological data of the infection in South American camelids of Northwest Argentina

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ABSTRACT

Faecal samples from llamas ($n = 708$), vicuñas ($n = 171$) and guanacos ($n = 4$) were obtained between December 2004 and May 2009 in three Provinces of Northwest Argentina (Jujuy, Salta and Catamarca) to know the distribution, prevalence and intensity of *Lamanema chavezi* infection in these South American camelid species (SACs). Faeces were examined by a sedimentation-flotation technique using a $Cl_2Zn + ClNa$ solution (specific gravity = 1.59). Eggs of *L. chavezi* occurred in 30.3% of 89 llama herds and in 18.5% of 708 llamas sampled with a mean intensity of 271.8 eggs/g (EPG) of faeces (range 20–2120). The highest values for all parameters of the infection were registered in llamas from Catamarca Province. Significant differences ($P < 0.001$, Fisher's exact test) were detected only for the lower prevalence in llamas from Jujuy respect to those from the other two Provinces. The overall individual prevalence of *L. chavezi* in llamas was lower than in reports from adult domestic camelids of neighbour countries while mean intensity was higher. The individual prevalence of *L. chavezi* in guanacos was 75.0%, with a mean intensity of 66.0 EPG (range 40–120) while no vicuñas were detected as infected. Most of infected SACs were located at the phytogeographical region of Andean Patagonic Domain with a dispersion ranging between 22°10′ and 26°40′ South latitude.



## 1. Introduction

*Lamanema chavezi* is a nematode first described from the small intestine of alpacas and vicuñas from Peru and placed in the Trichostrongylidae family (Becklund, 1963). Later, *L. chavezi* was transferred to Molineidae within the Nematodirinae subfamily (Durette-Desset and Chabaud, 1977), and finally reassigned within the Molineinae subfamily (Rickard and Hoberg, 2000). In spite of the possibility that *L. chavezi* belongs to the typical parasite fauna of South American rodents (Rickard and Hoberg, 2000), it is nowadays considered specific from the four species of South American camelids (SACs): domestic alpacas and llamas and wild vicuñas and guanacos, in which has been found (Becklund, 1963; Cafrune et al., 2001; Castillo et al., 2008). *L. chavezi* is a rather unique strongyloid nematode in which the parasitic third- and fourth-stage larvae undergo an enterohepatic migration (Guerrero et al., 1973). This migration causes catarrhal and haemorrhagic enteritis with areas of mucosal necrosis (Guerrero et al., 1973; Cafrune et al., 2001). In acute infections, the liver is congested, with multiple small foci of coagulative necrosis and petechial haemorrhages. Later, these lesions become fibrotic, giving a characteristic mottled appearance to the liver (Guerrero et al., 1973), which often is condemned (Rojas et al., 1993). Other

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**Table 1**
Number of herds and South American camelids (SACs) sampled in different Departments of three Provinces of Northwest Argentina.

| SAC species | Province | Department | No. of herds | No. of SACs |
|---|---|---|---|---|
| Llama | Jujuy | Cochinoca | 27 | 242 |
| | | Humahuaca | 2 | 15 |
| | | Rinconada | 9 | 83 |
| | | Santa Catalina | 8 | 93 |
| | | Susques | 2 | 33 |
| | | Tumbaya | 1 | 24 |
| | | Yavi | 8 | 53 |
| | Salta | Chicoana | 1 | 23 |
| | | La Poma | 2 | 9 |
| | | Los Andes | 2 | 15 |
| | | Santa Victoria | 2 | 13 |
| | Catamarca | Antofagasta de la Sierra | 13 | 42 |
| | | Belén | 2 | 9 |
| | | Pomán | 2 | 8 |
| | | Santa María | 8 | 46 |
| Vicuña | Jujuy | Cochinoca | 1 | 63 |
| | Salta | Molinos | 1 | 98 |
| | Catamarca | Belén | 1 | 10 |
| Guanaco | Salta | Cachi | 1 | 4 |

pathological signs of the infection include anaemia, anorexia, emaciation and prostration (Guerrero et al., 1973; Cafrune et al., 2001).

*L. chavezi* infection has not been reported outside South America, where it was found only in four countries that sustain important SACs populations: Peru (Becklund, 1963; Chávez et al., 1967), Chile (Alcaíno et al., 1991), Argentina (Cafrune et al., 2001) and Bolivia (Spörndly and Nissen, 2008). Most diagnostics have been made after necropsies of SACs (Chávez et al., 1967; Alcaíno et al., 1991; Cafrune et al., 2001; Spörndly and Nissen, 2008) and rodents (Sutton and Durette-Desset, 1985; Digiani and Durette-Desset, 2007). However, eggs of *L. chavezi* have such distinctive features that clearly allow to differentiate them from eggs of other nematode species of SACs. Thus, Rojas et al. (1993) informed coprological prevalence of this nematode in domestic SACs from Chile using the modified McMaster technique. Notwithstanding, because of their weight, eggs of *L. chavezi* are better detected using flotation solutions of higher specific gravity than ClNa saturated solution (Cafrune et al., 2008).

This paper presents epidemiological data based on coprology of *L. chavezi* infection in adult SACs of Northwest Argentina (NWA), a region of this country that supports almost 95% of the llama stock and about 75% and 10% of the vicuña and guanaco populations, respectively.

## 2. Materials and methods

Faecal samples of llamas were obtained between March 2006 and May 2009 in 15 Departments of three Provinces of NWA (Jujuy, Salta and Catamarca). Additionally, vicuñas from each Province were sampled on December 2004 (Salta), May 2008 (Jujuy) and December 2008 (Catamarca). Faeces from llamas and vicuñas were collected directly from the rectum. On September 2005, four faecal samples of guanacos were collected from fresh dung deposited on ground in Salta Province. The number of herds and SACs sampled for each Department and Province are shown in Table 1. All llamas and most of vicuñas sampled were adults (>1 year of age). The age of guanacos was unknown.

Samples were individually assessed by the sedimentation-flotation technique formerly described by Cafrune et al. (2009). Five g of faeces were crushed and placed in a 350 ml bottle. Wire mesh of 250 μm aperture was incorporated into the lid and about 250 ml water poured into it. The bottle was shaken upside down into a 50 ml conic shape tube through another wire mesh of 180 μm aperture disposed over a funnel. Thus, 4/5 of material was discarded. The sample was left to stand for 5 min and then the supernatant was siphoned off. The faecal sediment was washed with water another two times discarding the supernatant. Finally, a 1 ml sample was withdrawn, mixed with a 1 ml flotation fluid (105 g $Cl_2Zn$ + 20 g ClNa, water to 100 ml, specific gravity 1.59), placed in a modified McMaster slide and examined microscopically for detection of *L. chavezi* eggs. All of them were counted and multiplied by 20 to determine the number of eggs per gram (EPG) of faeces. Descriptions and photographs of *L. chavezi* eggs have been provided elsewhere (Leguía and Casas, 1999). Briefly, they are large (176 μm × 76 μm), yellowish-brown in colour, containing a developed morula with at least 64 blastomere (Guerrero et al., 1981) (Fig. 1).

Herd prevalence was defined as the number of herds infected in relation to the total number of herds studied while individual prevalence was calculated as the number of SACs showing *L. chavezi* eggs in relation to the total number of each host species sampled (Bush et al., 1997). Mean intensity of the infection was defined as the arithmetic mean of *L. chavezi* EPG per infected SAC (Bush et al., 1997).

Fisher's exact test and a non-parametric Kruskal–Wallis test were applied to determine significant differences between herd and individual prevalence and intensity of the infection, respectively. The significant level was set at $P < 0.05$.