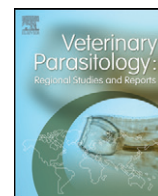




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Original Article

Evaluation of the presence of *Echinococcus granulosus sensu lato* in the environment and in hosts in a region endemic for hydatidosis in the province of Chubut (Argentina)

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ABSTRACT

In the province of Chubut (Argentina), hydatidosis is an endemic disease. This province has had a program for control of this disease since 1984. The aim of the present study was to evaluate the presence of *Echinococcus granulosus sensu lato* in the environment and hosts in a region characterized as endemic and inhabited by indigenous people whose sustenance economy is based on the extensive rearing of sheep. To this end, we carried out an observational, descriptive and transversal study. Sheep sera, water samples, soil samples and canine fecal matter collected from the environment and adult specimens of *E. granulosus s.l.* were analyzed for strain studies by genotyping. Also there were analyzed serum samples of resident persons to detect *E. granulosus* antibodies. The frequency of sera positive for hydatidosis was 17.5% in lambs and 28.57% in sheep older than one year of age. The frequency of canine echinococcosis was 25%, and the strain found corresponded to *E. granulosus s.l.* G1. Samples of canine fecal matter showed presence of taeniid eggs and three of the samples were positive for the coproantigen. The results indicate the circulation of the G1 strain and its presence in the environment under the dry climate conditions of Patagonia. These findings provide useful information for the evaluation of the effectiveness of control actions that may be implemented in a region endemic for hydatidosis.

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1. Introduction

Echinococcosis is a zoonosis caused by a complex of species of the genus *Echinococcus*. The species of major health importance is *Echinococcus granulosus lato sensu*, which develops in a diheteroxenous life cycle, involving a carnivorous definitive host and a herbivorous or omnivorous intermediate host. This cycle involves three coexisting biological forms of the parasite: eggs in the environment, adults in the definitive host and larvae (metacestode) in the intermediate host (D'Alessandro, 2002).

In Argentina, Cystic Echinococcosis or hydatidosis by *E. granulosus s.l.* is prevalent throughout the country, reaching higher frequency of appearance in sheep- and goat-raising areas. The endemic regions for this pathology are: Patagonia, the Humid Pampas, Mesopotamia, Cuyo and the High Mountains of the Northwest. Patagonia is the region with highest notification rates of human cases of hydatidosis. In the province of Chubut in Patagonia, the rate reached a value of 12.75 cases per 100,000 inhabitants in 2010, representing the highest hydatidosis notification rate nationwide (Ministerio de Salud, 2009; Ministerio de Salud, 2012a).

El Chalfá, a rural community located in the Río Senguer region in the province of Chubut, presents the greatest frequency of appearance of human cases of hydatidosis in this region. The inhabitants of El Chalfá are descendants of the Mapuche and Tehuelche peoples. In 2007, the frequency of occurrence of hydatidosis in humans was 39%, while the frequency of hydatidosis in the Río Senguer region was 6% (Jensen and Sanchez Thevenet, 2002; Sánchez Thevenet et al., 2008). This situation reflects that El Chalfá is within a region endemic for hydatidosis (Chin, 2001).

The factors influencing the dynamics of the transmission of hydatidosis are divided into: i) extrinsic parasitic factors, ii) intrinsic parasitic factors and, iii) socio-ecological environmental factors. Extrinsic parasitic factors include temperature and humidity and the dispersal of parasite eggs in the environment. Previous studies of our group carried out in the province of Chubut have shown that under natural conditions of inferior arid climate, the presence and dispersal of *E. granulosus* eggs are related to habits of defecation and transit of infected dogs (definitive host), the infection status of each dog, the prevailing wind direction, the topography of the terrain and the presence of surface water sources (Sánchez Thevenet and Souto, 2011).

The presence of the parasite in the environment and in its definitive and intermediate hosts, as well as the identification of extrinsic parasitic environmental factors and socio-ecological factors, may contribute to

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the development of predictive mathematical models of transmission of the disease in a particular geographic setting and may thus allow planning appropriate actions of control. This is especially relevant in scenarios as El Chalfá, due to its geographical, socio-demographic and cultural peculiarities. Because of the importance of *E. granulosus* s.l. in the maintenance of hydatidosis in this region, the aim of this study was to evaluate the presence of this parasite in the environment and hosts in the rural community of El Chalfá (province of Chubut, Argentina).

2. Materials and methods

2.1. Study area and population

El Chalfá is a rural community located in the Río Senguer region of the province of Chubut, Argentina (45° 41'S, 70° 59'W), which has a surface of 32,902 ha (Fig. 1). The natural water resources of El Chalfá are the Quinchamal Lake and the Chalfá Chico and Chalfá Grande Rivers.

The community is made up of descendants of the Mapuche and Tehuelche peoples, with 81 people distributed in 20 households. This population has great seasonal mobility because, from November to May, most men go out to work to cattle ranches (*estancias*) in the region and, from March to November, school-age children go to boarding schools in the village of Río Mayo (Chubut).

The accessibility to this community is limited due to geographic factors (vast zones and river floods), climatic factors (cold and dry climate, and snowfall during the winter months, which leave the inhabitants isolated for up to 8 months a year) and logistic factors (infrastructure of the roads). Sheep and goat breeding, with extensive exploitation mode, is the basis of the productive economy of the place. According to the official data provided by the Department of Zoonosis of the province of Chubut, El Chalfá has about 10,000 sheep and 1500 goats (Pinotti, 2001; Agronoa, 2015).

2.2. Study design

A descriptive, cross-sectional and observational design was applied.

2.3. Recognition of the local echinococcosis situation

The following aspects were considered to establish the echinococcosis situation:

1. Frequency of appearance of hydatidosis in sheep.
2. Frequency of occurrence of echinococcosis in dogs.
3. Presence of taeniid eggs in water samples.
4. Presence of taeniid eggs in soil samples.
5. Presence of taeniid eggs in canine fecal matter samples collected from the environment.
6. Presence of *Echinococcus* spp. antigens in environmental canine fecal matter.
7. Frequency of appearance of hydatidosis in people.

3. Determination of the frequency of hydatidosis in sheep

The frequency of occurrence of hydatidosis in sheep was determined by serology, from serum samples obtained in December 2007 and January 2008. Each serum sample was obtained from blood extracted by venipuncture, with subsequent centrifugation at 2000 rpm for 10 min. Serum was separated and conserved at -18°C until processing. The serological diagnosis for the detection of anti-*E. granulosus* antibodies was performed by ELISA according to Gatti et al. (2007). Forty serum samples obtained from 38 domestic sheep belonging to six households were processed.

In addition, seven serum samples taken from sheep older than one year of age were processed. Each of the samples came from different households.

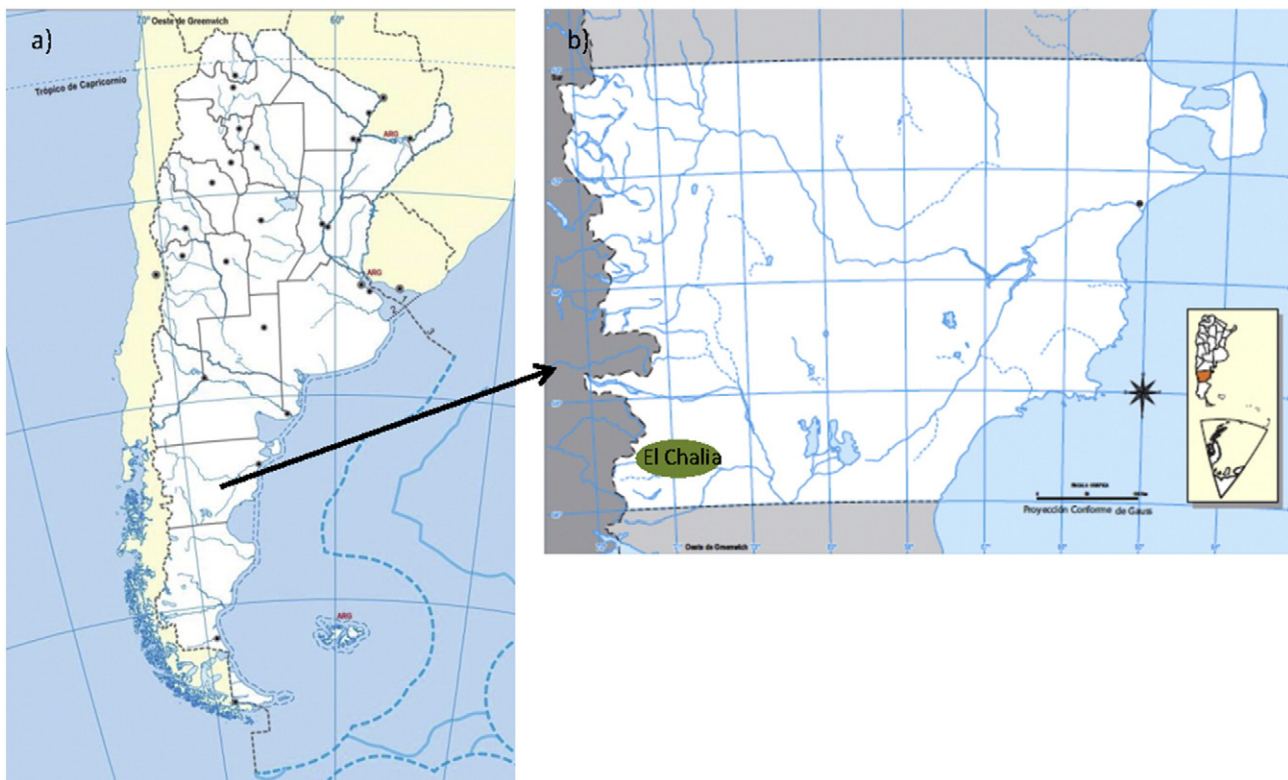


Fig. 1. Geographic localization of the study area: a) Argentina; b) the province of Chubut and El Chalfá. (Source: Instituto Geográfico Nacional).

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