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Short communication

A wide diversity of zoonotic intestinal parasites infects urban and rural dogs in Neuquén, Patagonia, Argentina

Silvia Viviana Soriano [a,*], Nora Beatriz Pierangeli [a], Irene Roccia [b], Hector Fabián Jesus Bergagna [c], Lorena Evelina Lazzarini [a], Alejandra Celescinco [c], Mónica Susana Saiz [a], Alejandra Kossman [a], Pablo Adrián Contreras [a], Cecilia Arias [a], Juan Angel Basualdo [d]

[a] Cátedra de Microbiología y Parasitología, Escuela de Medicina, Universidad Nacional del Comahue, Buenos Aires 1400, J.B. Alberdi 136, (8300) Neuquén, Argentina
[b] Departamento de Zoonosis, Subsecretaria de Salud, Provincia de Neuquén, Fotheringham 121, (8300) Neuquén, Argentina
[c] Dirección de Zoonosis y Vectores, Municipalidad de Neuquén, Av. Argentina 307, (8300) Neuquén, Argentina
[d] Cátedra de Microbiología y Parasitología, Facultad de Ciencias Médicas, Universidad Nacional de La Plata, Calle 60 y 120, (1900) La Plata, Buenos Aires, Argentina

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ABSTRACT

The presence of parasites was investigated by the examination of 1944 dog faecal samples collected from urban ($n = 646$) and rural ($n = 1298$) areas of the province of Neuquén, Patagonia, Argentina. Parasitic agents (PA) were found in 37.86% of samples. A total of 15 different PA were detected, including *Toxocara canis* (16.35%), *Taenia* spp./*Echinococcus* spp. (12.65%), *Trichuris vulpis* (6.06%), *Giardia* spp. (1.29%), *Toxascaris leonina* (0.56%), *Ancylostoma caninum* (0.41%), *Dipylidium caninum* (0.31%), *Diphyllobothrium* spp. (0.10%), among others. Several of these PA are recognized as zoonotic agents. Therefore, the results of this investigation revealed that local population is exposed to a broad spectrum of zoonotic parasites by means of environmental contamination with dog faeces. Prevalence of PA was slightly higher in rural (40.06%) than in urban (33.44%) locations. Distribution of groups of PA (cestodes, nematodes, and protozoa) showed statistical differences between both habitats. Prevalence of cestodes (18.18%) and protozoa (11.86%) was significantly higher in the rural environment than in urban areas and nematodes (29.10%) were more frequent in urban locations. Infection of dogs with *Linguatula serrata* and *Cryptosporidium* sp. was demonstrated for the first time in Neuquén. Rural dogs of the study area are under hydatic disease control program, which includes treatment with praziquantel every 6 weeks; thus, the finding of high level of cestode infection in these areas is of great relevance. The epidemiology of zoonotic parasitic infections in urban and rural dogs showed different patterns and, in consequence, different control measurements should be applied in each location.

1. Introduction

Several studies performed throughout the world have demonstrated that dogs can play an important role in the transmission of zoonotic parasites. Dogs are definitive hosts for several helminths and protozoan with zoonotic potential like *Taenia* spp./*Echinococcus* spp., *Toxocara canis*, *Dipylidium caninum*, *Ancylostoma* spp., *Giardia* spp., or *Cryptosporidium* sp. Contamination of urban public areas (parks, squares, and streets) with dog faeces harbouring infective parasitic forms is frequent in many countries representing a high risk of infection for the people living in those areas and therefore constituting a serious public health problem. In rural areas, close contact between dogs

* Corresponding author. Tel.: +54 299 443 0820; fax: +54 299 443 0820.
E-mail address: vivianasoriano@jetband.com.ar (S.V. Soriano).

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and humans is part of natural living conditions especially in regions where livestock raising is of economic importance (Pierangeli et al., 2007). In consequence, rural populations are also at risk of acquiring zoonotic diseases transmitted by dogs.

Understanding the epidemiology of zoonotic parasitic infections is important to minimize the risks to humans (Dubná et al., 2007). Since there are no published data about the epidemiology of parasites present in canine faeces in the province of Neuquén, Argentine Patagonia, the aims of the present work were to determine the presence of PA in faeces of urban (owned and stray) and rural dogs; to compare the epidemiology of both populations and to assess potential risk for human infection with dog transmitted parasites.

2. Materials and methods

2.1. Study area and design

The province of Neuquén is located in the north of the Argentine Patagonia region, with an area of 94,078 km^2 (Fig. 1). The total population estimated in 2004 was 502,268 inhabitants, 201,202 of whom live in the city of Neuquén (capital district) and its periphery. The rest of the population is distributed in small cities and in rural areas. Rural population lives in small communities and raise goats or less frequently sheep for subsistence, mostly under a transhumant model of production. Different climatic and geographic conditions are present. The weather is continental semi-arid, with warm dry summers and cold winters that have a larger relative environmental humidity. Hydatic disease is endemic in Neuquén and the province carries out a control program that includes periodic administration of praziquantel (5 mg/kg) to rural dogs every 6 weeks. To achieve the objectives of the present work a prospective, observational and analytical study was carried out between June 2005 and October 2008.

2.2. Source of samples

During the study period a total of 1944 samples of fresh dog faeces were collected from streets, parks and squares in urban locations as well as from the peridomicile and interior of farms in rural areas. Of those samples, 646 were obtained from urban areas of Neuquén city and Chos Malal (a small city located in the north of the province) and 1298 from rural districts.

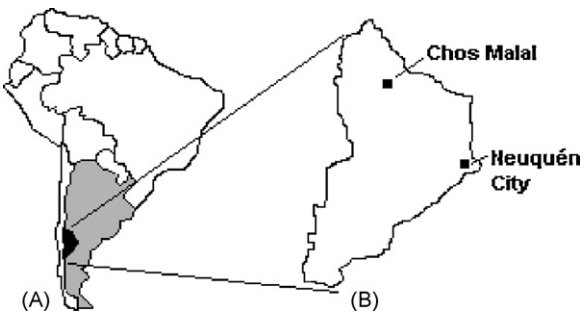

Fig. 1. Geographic location. (A) Argentina in South America and Neuquén in Argentina. (B) Location of Neuquén and Chos Malal cities.

2.3. Parasitological procedures

Faecal samples were collected in 5% formaldehyde and processed by flotation and sedimentation conventional methods. Each sample was microscopically examined at 100× and 400× amplifications. Identification of PA was performed by morphological characteristics. In addition, 100 samples from Neuquén city were screened for *Cryptosporidium* sp. by means of a modified Ziehl Neelsen method (standard technique without heating). A sample was recorded as positive if at least one parasitic form was observed by any method.

2.4. Data analysis

Data analysis was performed using EpiInfo2000 Software (Centers for Disease Control, Atlanta, USA). Differences between groups were compared by the Chi-square (χ^2) test and considered statistically significant when $p < 0.05$. For statistical analysis of the data, samples were grouped by location into rural or urban. The Fager index was calculated to measure the affinity between pairs of associated species (Fager, 1957). The degree of resemblance between the species present in rural and urban locations was evaluated by the Sorensen coefficient of similarity (Brower and Zar, 1977). Three indexes were calculated to compare the diversity of species present in each location: the Shannon–Weaver index of specific diversity, the absolute diversity index and the equitability index (Morales and Arelis Pino, 1987).

3. Results

The overall prevalence of PA was 37.86% among the 1944 faecal samples analyzed. The most frequently observed parasite was *T. canis* (16.35%) followed by *Taenia* spp./*Echinococcus* spp. (12.65%), *Trichuris vulpis* (6.06%) and others with minor percentages. The general and relative prevalences of each parasite are shown in Table 1. Multiple infections were remarkably less frequent (22.82%) than infections with a single parasite (77.18%).

General prevalence of parasites showed a slight significant difference between rural (40.06%) and urban (33.44%) dog populations. However, when the distribution of groups of parasites (nematodes, cestodes, and protozoa) in each habitat was analyzed, higher statistical differences in general and relative prevalences were observed (Table 2). Values of the Shannon–Weaver specific diversity index were 2.44 for rural and 1.95 for urban samples. The results for absolute diversity were 3.70 and 3.32 and for the equitability index 0.65 and 0.58 for rural and urban samples, respectively, in each case. The Sorensen coefficient of similarity between both locations was 0.78.

Results of the analysis performed at the genera-species level are also shown in Table 2. Single infection was predominant both in rural and urban dogs. The distribution of samples by number of associated parasite genera is shown in Table 3. When present, the most frequent associations