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Short communication

Epidemiology of canine distemper and canine parvovirus in domestic dogs in urban and rural areas of the Araucanía region in Chile

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ABSTRACT

To assess whether the seroprevalence of canine distemper virus (CDV) and canine parvovirus (CPV) in domestic dogs is higher in urban versus rural areas of the Araucanía region in Chile and risk factors for exposure, a serosurvey and questionnaire survey at three, urban-rural paired sites was conducted from 2009 to 2012. Overall, 1161 households were interviewed of which 71% were located in urban areas. A total of 501 blood samples were analysed. The overall CDV and CPV seroprevalences were 61% (CI 90%: 58–70%) and 47% (CI 90%: 40–49%), and 89% (CI 90%: 85–92%) and 72% (CI 90%: 68–76%) in urban and rural areas, respectively. The higher seroprevalence in domestic dogs in urban areas suggests that urban domestic dogs might be a maintenance host for both CDV and CPV in this region. Due to the presence of endangered wild canids populations in areas close to these domestic populations, surveillance and control of these pathogens in urban dog populations is needed a priority.

1. Introduction

Domestic dogs are particularly abundant in urban areas of some developing countries where they can act as efficient reservoirs for pathogens because they usually live in large populations, are not vaccinated and are regularly allowed to roam freely, facilitating contact between infected and susceptible hosts (Amaral et al., 2014). In rural areas where domestic dog densities and population size are often low, highly virulent pathogens such as rabies and canine distemper virus (CDV) cannot be maintained and it is expected that these infections fade out without the introduction of new infections from neighbouring areas (Funk et al., 2001; Lembo et al., 2008). Despite the risk of spillover of CDV and canine parvovirus (CPV) from urban domestic dogs populations to wild canids – including indirectly via contaminated environments (Gordon and Angrick, 1986) – few studies have been conducted to investigate this in the field (e.g. Acosta-Jamett et al., 2011; Frölich et al., 2005).

The Araucanía region of Chile is inhabited by three wild canids: the culpeo (*Lycalopex culpaeus*), the chilla (*Lycalopex griseus*) and one of the most endangered canid species on the world, Darwin's fox (*Pseudalopex fulvipes*), and inhabits the Nahuelbuta National Park (NNP) (37°47′S, 72°59′W; Jiménez et al., 2008). Recent studies have reported its presence in the locality of Lastarria (Gorbea district, 39°11 S, 72°6′W; D'elía et al., 2013) and other areas south to the NNP (Farias et al., 2014). Whether domestic dog populations from urban areas in the Araucanía region are the source of CDV or CPV infection in the region is unknown. In this study our goal was to determine the seroprevalence and risk factors for CDV and CPV infection in domestic dogs in urban and rural areas of the Araucanía region and to assess the risk to wild canids by targeted sampling in areas where spillover of infection might occur within this fragmented landscape.

2. Material and methods

2.1. Study area

The study was conducted in the Araucanía region in South Central Chile. To compare CDV and CPV seroprevalence in dogs at urban and rural sites the study included three urban areas – Angol (~50,000 inhabitants), Curacautín (~16,000 inhabitants) and Gorbea (~14,000 inhabitants) – and rural areas located close to these cities and three places where wild canids were known to

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occur. These sites included Nahuelbuta National Park (37°45′S; 73°00′W), Conguillío National Park, 15 km south-east of Curacautín (38°42′S; 71°37′W); and Arauco forestry company lands, located close to Lastarria locality, 20 km south-west of Gorbea (39°11′S; 72°46′W) (Fig. 1).

2.2. Sampling design

Previous studies carried out in urban areas of Chile have reported CDV and CPV seroprevalences of 75% (Acosta-Jamett et al., 2011) and 82% (Acosta-Jamett, 2009), respectively. To estimate the total population of dogs a human:dog ratio of 5.5:1 was assumed. Target sample size in cities was 50 dogs (assumed conservative seroprevalence 75%, desired absolute precision 10%, 90% confidence; EpiInfo 7). A sampling design similar to that of Acosta-Jamett et al. (2010) was used, randomly sampling households within cities and visiting all households within each rural area and sampling at least one dog in each household (Fig. 1).

2.3. Questionnaire survey and dog sampling

A questionnaire was conducted between 2009 and 2012 and was developed following similar studies (Acosta-Jamett et al., 2010; Kitala et al., 2001). All selected households were visited and re-visits were done if no household member was available at the first visit. Only adult members of the household were interviewed. The questionnaires were asked in Spanish by a team of veterinarians and veterinary undergraduate students, who were trained and supervised by the lead author.

Questions within the questionnaire can be divided into two levels: (1) household level, and (2) animal level. The data collected at the household level was '*number of people per household*', '*number of dogs per household*', '*methods of feeding*' (*commercial/household food*), '*waste disposal methods*' (*burning, burial, municipality disposal*), '*education of owners*' (*primary, secondary, superior*) and '*household condition*' (*owners, leasing, family home*). At the animal level questions included '*age*' (<12, 12–24, >24 month), '*sex*' (*male/female*), '*purebreed*' (*yes/no*), '*origin*' (*gift, born at home, found*), '*function*' (*pet, guarding, herding*), '*allowed to roam freely*' (*always, sometimes, never*), '*seen by veterinarian*' (*yes/no*), '*anthelminthic treatment in last three months*' (*yes/no*) and '*spayed/neutered*' (*yes/no*). Questions regarding the vaccination status of each animal were made in order to sample only unvaccinated animals. All data was transferred into a database using unique identifier numbers at the household and individual level. Data was kept as confidential.

The coordinates of each household were recorded with a GPS (Etrex, Garmin®) and then transferred to a GIS system (ArcGIS 10.1). Three additional spatial risk factors were included in the analyses: '*distance to city*', '*distance to nearest household*', and '*distance to road*' by using a proximity function which measures the Euclidian distance between the household of each sampled dog and the center of the nearest city, household or road, respectively.

2.4. Demography of domestic dogs

With the information obtained during the questionnaire survey we calculated the percentage of dog-owning households (DOHH). We also estimated the average number of dogs per household by summing the dogs reported in each study site and dividing by the interviewed households. In addition, the human:dog ratio was calculated by summing the total number of people reported in each urban or rural site and dividing by the total number of dogs reported for each site (Acosta-Jamett et al., 2010). Following

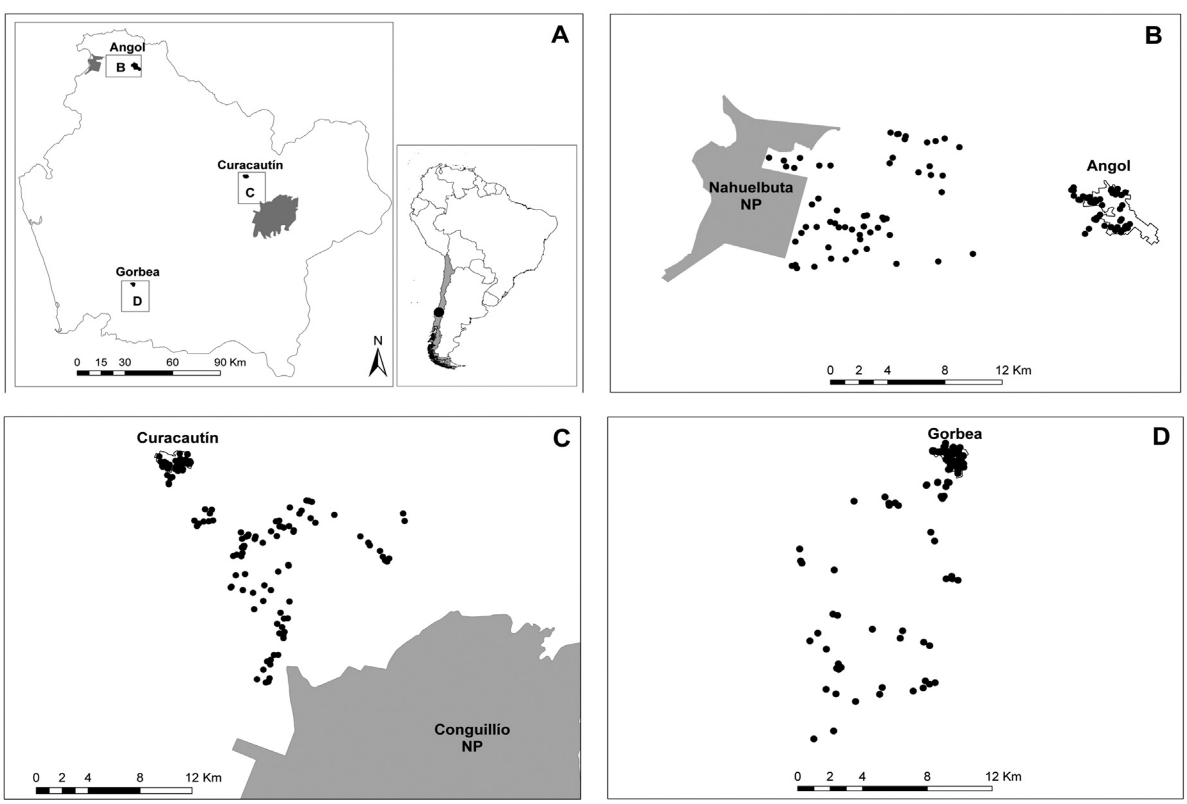

Fig. 1. (A) Study area in the Araucanía region in south-central Chile where a questionnaire survey of domestic dog-owners at three sites was conducted (in rectangle). In black are urban areas included in the study and in grey are protected areas. (B–D) Selected sites where sampling was carried out. Black dots represent households where blood samples were obtained from domestic dogs. In grey are shown Nahuelbuta National Park (B) and Conguillío National Park (C).