

Seroprevalence of *Rickettsia typhi* and *Rickettsia felis* in dogs from north-eastern Spain

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INTRODUCTION

Rickettsia typhi is the aetiological agent of murine typhus (MT). This disease is often acute and mild, although some fatal cases have been observed [1]. In Spain, clinical cases and serological evidence of exposure to *R. typhi* in humans have been described [2,3].

In the past, MT has been associated with rodents and rat fleas. Later, a peridomestic animal cycle involving cats, dogs, opossums and their fleas [1] was described. In Spain, *R. typhi* seropositivity has been shown in dogs [4] from the central region.

Rickettsia felis, transmitted by fleas, produces flea-borne spotted fever, a clinical syndrome indistinguishable from MT. Serological evidence of *R. felis* infection in humans has been observed in Spain [2,3]. *R. felis* has been detected in fleas commonly found on domestic cats and dogs in Spain [5].

Prevention of these infections depends on recognition of routes of transmission, risk factors for infection, and reservoirs. The aim of this study was to determine the prevalence of both rickettsiae in dog populations from the north-east of Spain.

MATERIALS AND METHODS

Geographical area

This was Catalonia, north-eastern Spain.

Samples

These comprised 93 dog sera from nine shelters corresponding to seven regions. Dogs were treated for ectoparasites monthly.

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The collection of samples took place from June 2006 to June 2007. Samples were frozen at -80°C until use.

Age, sex, date of collection, municipality, race, healthy/sick status and presence of ectoparasites were recorded.

Serological technique

IgG was determined by an indirect immunofluorescence antibody test. *R. felis* antigen was kindly provided by the Unité de Rickettsies, France. MRL Diagnostics (Cypress, CA, USA) antigen was used to determine antibodies to *R. typhi*. Titers $\geq 1/64$ were considered to be positive.

Statistical analysis

Statistical analysis was performed using the chi-square test and Fisher's exact test. A p-value < 0.05 was considered to be significant.

RESULTS

Overall, 39 dogs (41.9%) were male, and 33 (35.4%) were female; in 21 cases, sex was not provided. Most of the dogs were mixed breeds. Fifteen (16.1%) were puppies (≤ 18 months) and 78 (83.9%) were adults. No dogs were infected with ectoparasites at the time of inclusion. Health state was reported in 34 cases. Of these, nine were sick (digestive disorders, respiratory disorders, degenerative processes). Twenty-seven (29%) samples were collected in summer, 22 (23.7%) in autumn, 12 (12.9%) in winter, and 32 (34.4%) in spring.

Nine (9.7%) samples were *R. typhi*-seropositive. Five (5.4%) of them had an IgG titre of 1/64, three (3.2%) a titre of 1/128, and one (1.1%) a titre of 1/512. Forty-six (51.1%) sera were found with antibodies reactive with *R. felis*. Eighteen (19.4%) of them had an IgG titre of 1/64, 23 (24.7%) a titre of 1/128, four (4.3%) a titre of 1/256 and one (1.1%) a titre of 1/512.

The relationships between the antibody-positive rate and the surveyed variables are shown in Table 1. There were no significant differences in

Table 1. Demographic information from dogs tested for antibodies to *Rickettsia typhi* and *Rickettsia felis*

Variable surveyed	No. of (%) subjects	No. of (%) of positive sera against	
		<i>R. typhi</i>	<i>R. felis</i>
Total			
Age	93 (100)	9 (9.7)	46 (51.1)
Adult	78 (83.9)	6 (66.7)	37 (80.4)
Puppy	15 (16.1)	3 (33.3)	9 (19.6)
Sex			
Male	39 (41.9)	3 (33.3)	21 (45.7)
Female	33 (35.5)	4 (44.4)	20 (43.5)
No information	21 (22.6)	2 (22.3)	5 (10.8)
Season			
Summer	27 (29)	3 (33.3)	18 (39.1)
Autumn	22 (23.7)	2 (22.3)	6 (13)
Winter	12 (12.9)	0	3 (6.5)
Spring	32 (34.4)	4 (44.4)	19 (41.4)
Region			
Alt Penedes	8 (8.6)	3 (33.3)	6 (13)
Barcelones	10 (10.8)	1 (11.1)	6 (13)
Berguedá	12 (12.9)	0	3 (6.5)
Garraf	7 (7.5)	0	3 (6.5)
Maresme	13 (14)	2 (22.3)	8 (17.5)
Osona	11 (11.8)	1 (11.1)	2 (4.3)
Valles Occidental	32 (34.4)	2 (22.3)	18 (39.1)

the rates of antibodies to each of the *Rickettsia* species related to any of the items.

When the present results were compared with the *Rickettsia conorii* and Bar29 serological study carried out with the same sera, 15 (16%) dogs had antibodies against *R. felis* only.

CONCLUSIONS

R. typhi and *R. felis* are present in human population of Spain [2,3]. The seroprevalence of individuals who reported contact with domestic animals tended to be higher [2], pointing to the possible presence of a peridomestic animal cycle. The present data constitute the first evidence, by immunofluorescence assay, of *R. typhi* and *R. felis* infection in dogs in Catalonia.

Our *R. typhi* results are similar to those obtained in dogs from central Spain (9.7% vs. 12.3%). However, these results differ from those obtained in dogs from the neighbouring country Portugal (26.9%) [4].

Although the presence of *R. felis* in fleas collected from cats and dogs in Spain has been detected [5], to our knowledge, *R. felis* prevalence rates in the dogs have not been described. Thus, this is the first evidence of dog reactivity in Spain. *R. conorii* and Bar29 are present in our zone. The

latter and *R. felis* are classified in the spotted fever group, so some cross-reaction could be possible among them. However, 16% of dogs studied reacted only against *R. felis*. Therefore, even though this study represents a preliminary approach, the presence of antibodies to *R. felis* in dogs might be considered.

There were no significant associations between seropositivity rates and any of the items surveyed. In a central Spain study [4], the only statistically significant association observed was that between seropositivity and flea infestation. Although this item was considered in our study design, it could not be analysed, because all dogs had been treated for ectoparasites monthly. In the same way, other interesting variables, such as contact with other animals, could not be analysed because of the characteristics of the dog population studied.

In conclusion, dogs might play a role in *R. typhi* and *R. felis* transmission.

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