Ticks on Dogs and Its Role As Vectors/ Intermediate Hosts in the Center-West of Portugal

F. Rosa[1], M. Crespo[2], D. Ferreirinha[2], M. Morgado[2], M. Madeira[2], M. Santos-Silva[3], A. Santos[3] and R. Sousa[3]

[1]Instituto de Investigação Científica Tropical, Rua da Junqueira, 14, 1300-343 Lisboa, Portugal
[2]Escola Superior Agrária/Instituto Politécnico de Santarém, Apartado 310-2004 Santarém Codex, Portugal
[3]Centro de Estudos de Vectores e Doenças Infecciosas. Instituto Nacional de Saúde Ricardo Jorge, Águas de Moura, Portugal

Summary

Dogs are one of the most important hosts in the maintenance of tick population. In order to identify the species and their role on the transmission of hemoparasites and rickettsiae, ticks were collected on 466 dogs of Center-West region of Portugal. Taxonomical studies were done and appositional hemolymph smears were also performed in order to search for rickettsia infections. Some ticks were processed for DNA extraction and screened by PCR for detection of rickettsiae DNA.

Specimens of *Rhipicephalus sanguineus*, *R. pusillus*, *Ixodes* spp. and *Hyalomma marginatum* were identified. Only the first two species were found infected with a rickettsial strain Bar29 and with *R. massiliae*.

These results reinforce the important role of dogs and its ticks on epidemiology of tick-borne rickettsiae agents in Portugal.

Introduction

Ticks are commonly involved in several tick-diseases affecting different hosts, assuming an important role in public health. Dogs are one of the most important hosts in the maintenance of tick population, mainly because of their proximity to human populations as pets, which can easily favour human infection.

In Portugal, dogs can be infected at least by 12 ixodid species (Dias, 1994; Caeiro, 1999), including genera *Rhipicephalus, Ixodes, Hyalomma, Boophilus, Dermacentor, Haemaphysalis* and *Ornithodorus*, some of which have been reported to infect man, like *I. ricinus, R. bursa, R. sanguineus, B. annulatus,* and *Dermacentor marginatus*. In addition, *Rhipicephalus sanguineus, Ixodes ricinus, I. ventalloi*, which can be found in dogs, are responsible for *Rickettsia conorii* and *Ehrlichia phagocitica* transmission in Portugal (Sousa *et al*., 2002; Santos *et al*., 2004).

Therefore, the aim of this study was in first place to identify dog ticks and investigate their abundance in dogs from the regions of the Ribatejo-Oeste (RO) and Vale do Tejo (VT), and secondly to evaluate its role in the transmission of hemoparasites and rickettsiae.

Materials and Methods

This study was based on a tick survey on 10% of rural and urban dog population (446 animals) of RO and VT, during the official anti-rage vaccination Campaign. Between April and August 2005, in the first region (RO), sampling was performed based on 279 dogs, while 187 dogs from the second region were use on this study, between April and July.

Taxonomical studies were done in all specimens. Appositional hemolymph smears stained by Giemsa and Gimenèz were also performed to search for hemoparasites and rickettsia infections. Only a small amount of suspicious ticks on smears were processed for DNA extraction and screened by PCR for detection of rickettsiae DNA.

Results

Out of 466 dogs observed, 335 (71,89%) were infected with ticks, with an average of 7,13 ticks per animal (Ix/an). One of the interesting results was the difference on prevalence and Ix/an in both studied regions, meaning the higher prevalence was observed in the VT region (73,8%), although superiority on Ix/an was in the RO (8,78 Ix/an) (Table 1).

A total of 2387 ticks were collected, from which the great majority were from dogs in the RO region (1729 ticks, 72,43%). Although among adults, females were always predominant, independently of the studied region, immature stages (nymphs and larvae) were only evidenced in the VT region (Table 1).

Seasonal fluctuations were observed, the abundance of ticks and the average of Ix/an reached their highest values on May (48,09%; 9,03 ix/an) and lowest on August (9,30%; 4,80 ix/an) (Fig. 1).

As previously mentioned immature stages (nymphs and larvae) have only been noticed on VT region, between June and August.

According to data, differences on the attachment site pattern were demonstrated by χ^2 test ($p<0,05$). The attachment site more frequent occurred outside ears (65,65%), followed by dog back (14,08%) and neck (6,41%).

Excluding *Ixodes hexagonus, I. ventalloi* and *Hyalomma marginatum,* which

Table 1- Prevalence and abundance of Ixodids in dogs of Ribatejo-Oeste and Vale do Tejo (Portugal).

	RO	VT	TOTAL
Dogs			
Observed	279	187	466
Infected	197	138	335
%	70,60	73,80	71,89
Ticks			
Males	821	133	954
%	47,48	20,21	39,97
Females	908	216	1124
%	52,52	32,83	47,09
Nymph	0	306	306
%		46,5	12,82
Larvae	0	3	3
%		0,46	0,13
Total	1729	658	2387
	72,43	27,57	
Ix/ani.	8,78	4,77	7,13

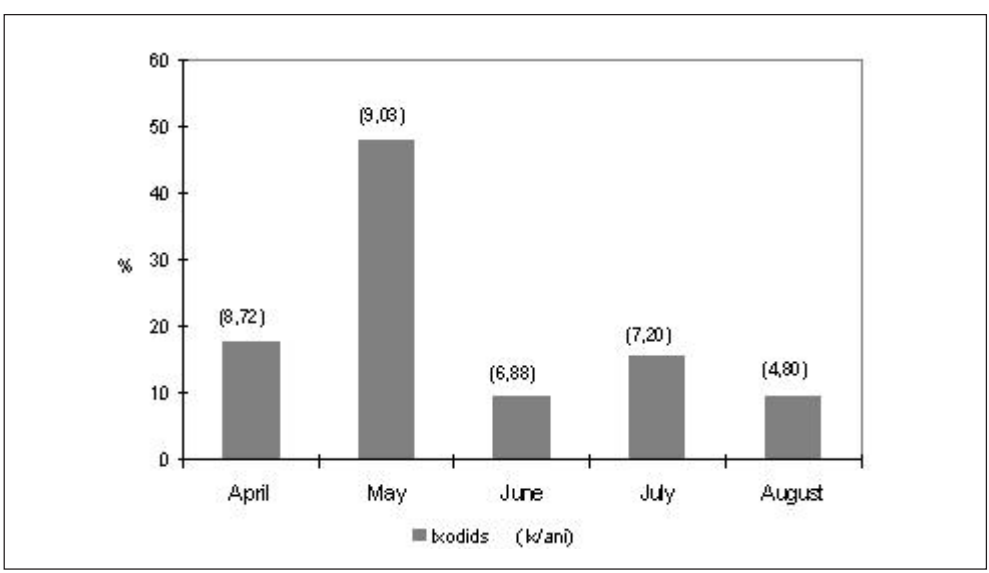

Figure 1- Seasonal distribution of Ixodids.

have only been registered in RO region, *Rhipicephalus sanguineus, R. turanicus and R. pusillus* were identified in the studied regions. Some specimens of the *Rhipicephalus sanguineus* group were also evidenced, but its status complexity did not allow completing specific identification.

Out of 1070 haemolymph smears, 195 (18,22%) were suspicious for Rickettsiae, from these a total of 30 ticks of the *R. sanguineus* group were processed for DNA extraction and screened by PCR for detection of rickettsiae DNA. *R. sanguineus* (2 specimens) and *R. turanicus* (1 specimen) were found infected with a rickettsial strain Bar29 and *R. turanicus* (1 specimen) with *R. massiliae*, whose competence to infect man is uncertain.

Conclusions

All species found in these areas have already been identified in this host in Portugal (Caeiro, 1999).

The density variability in the adult ticks and immature stages between the collecting months and regions could be explained mainly by the differences on ecological characteristics of each region. This has not been studied yet and should also be investigated in these two regions.

These preliminary results highlight the important role of dogs in ticks' life cycle and their potential influence on epidemiology of tick-borne rickettsiae agents in Portugal. Other studies should be performed to provide more data on ticks' seasonality, ecological constraints and tick and host relationship, in order to implement control and preventive measures against tick infections and tick-borne diseases in animal and man.

References

Caeiro, V. - General review of tick species present in Portugal. *Parassitologia*, 1999, 41 (Suppl. 1), 11-15.

Dias, J. T. - As carraças (Acarina-Ixodoidea) da Península Ibérica. Algumas considerações sobre a sua biogeografia e relacionamento com a ixodofauna afropaleártica e afrotropical. *Estudos, Ensaios e Documentos*, 1994, 158, 1-163.

Santos, A.S.; Santos-Silva, M.; Almeida, V.; Bacellar, F.; Dumler, J. - etection of *Anaplasma phagocytophilum* DNA in *Ixodes ticks* (Acari: Ixodidae) from Madeira Island and Setúbal district, mainland in Portugal. *Emerging Infectious Diseases*, 2004, 10 (9), 1643-1648.

Sousa, R.; Nóbrega, S.; Bacellar, F.; Torgal, J. - Sobre a realidade da febre escaro-nodular em Portugal. *Acta Médica Portuguesa*, 2002, 16, 429-436.