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Veterinary Parasitology 120 (2004) 123–129
veterinary parasitology
www.elsevier.com/locate/vetpar

Ectoparasitic species from *Canis familiaris* (Linné) in Buenos Aires province, Argentina

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Received 25 March 2003; received in revised form 28 November 2003; accepted 2 December 2003

Abstract

Several arthropods that live as ectoparasites on domestic dogs can cause severe dermatitis or act as vectors of pathogenic agents, resulting in serious diseases not only in dogs, but also in humans. We studied ectoparasites found on *Canis familiaris* sampled in five areas in Buenos Aires province, Argentina. The prevalence of fleas, ticks and lice was analyzed, as well as their seasonal variations through the different sites studied. The kind of infestation found in each host was determined and the intensity of natural infestation was estimated. The study was carried out from October 2001 to July 2002, with 116 dogs that lived in rural areas and did not receive control treatments. In order to remove the ectoparasites, the dogs' skin was rubbed with a piece of cotton soaked in ether. All dogs had at least one species of ectoparasites. A total number of 5193 ectoparasites were found corresponding to four species, 15.7% *Ctenocephalides canis*, 73% *Rhipicephalus sanguineus*, 1.8 *Linognathus setosus* and 9.4% *Heterodoxus spiniger*. *R. sanguineus* was the most abundant species, and *C. canis* was the only flea species found. This may be due to the dogs being exclusively rural animals. Within the zones sampled, Magdalena showed the greatest prevalence, maybe as a consequence of having the highest relative humidity in relation to the other areas. Triple infestation (ticks–fleas–lice) was observed in 56.9% of the dogs; 39.6% presented double infestation, most being ticks–fleas, and only 3.4% showed simple infestation (lice). Female hosts were the most affected. Even though there were records of ectoparasites throughout all the year, a higher intensity was observed during the spring months, most likely as a result of the increase in temperature after the winter months.

Keywords: Ectoparasites; Ticks; Fleas; Lice; Argentina

1. Introduction

Several arthropods live as ectoparasites on the domestic dog. These parasitoses, generally associated to dermatitis, affect animals to different degrees depending on their nutrition,

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doi:10.1016/j.vetpar.2003.12.001

immunological condition and parasite intensity, and in extreme cases can lead to death. On the other hand, ectoparasites that affect the domestic dog (fleas, ticks and lice) can also act as vectors of pathogenic agents, such as borreliasis, rickettsiasis and piroplasmosis, and/or intermediate hosts of filarids and cestodes, which cause serious diseases not only in dogs, but also in humans. Fleas, particularly species of *Ctenocephalides*, can cause considerable irritation to animals and humans, and are responsible for cases of severe allergic dermatitis.

Even though the species of dog ectoparasites have been known for a long time (Torres et al., 1974; Alcaíno and Gorman, 1999; Autino and Lareschi, 1998; Castro and Cicchino, 1998; Cicchino and Castrodel, 1998), few studies have focused on prevalence and infestation analyses, and they are practically non-existent for Argentina. Most literature is oriented to the study of fleas. Koutinas et al., (1995) reported differences in frequency and geographical location of several flea species in Greece. Horak (1982), who studied the seasonal prevalence of ticks and fleas on domestic dogs in Pretoria, South Africa, stated that ectoparasite prevalence on these animals was well documented for the northern hemisphere, but not for the southern hemisphere. Alcaíno et al., (1990) discussed the ecology of the brown dog-tick, *Rhipicephalus sanguineus*; their work referred to its importance and its life cycle, and estimated the natural intensity of infestation for the metropolitan area of Chile. Alcaíno et al., (2002) established the infestation pattern of fleas in domestic dogs for three sites in Chile.

The present work was conducted in order to determine and compare prevalence and intensity of infestation on *Canis familiaris* (Linné) among regions. We examined the ectoparasites found on *C. familiaris* sampled in different areas of Buenos Aires province, Argentina. The prevalence of fleas, ticks and lice was analyzed and their seasonal variations were registered, considering the different sampling sites. Different kinds of infestation found on each host were determined, and the natural infestation intensity was estimated.

2. Materials and methods

The ectoparasites were extracted from domestic dogs from five areas of Buenos Aires province, Argentina: Magdalena, Las Quintas, Los Hornos, Melchor Romero and Mar del Plata. All the hosts were healthy animals that lived in rural areas, around farms but outdoors. Although they were fed daily, they did not belong to specific owners, and therefore did not receive control treatments.

The observations were carried out on 116 dogs (70 females and 46 males) at different times of the year, from October 2001 to July 2002. All of the hosts' skins was rubbed with a piece of cotton soaked in ether, in order to facilitate the extraction of ectoparasites by making them drowsy. Each host was thoroughly examined, going through all areas of the body for 10 min, four times a day on each sampling date. The ectoparasites, collected by examining the animal directly and by using a fine comb, were afterwards kept in 70% ethanol. All the collected specimens were identified under compound microscope and scanning electronic microscope.

The mean, range, standard deviation and variability coefficient were calculated in order to estimate different kinds of infestation (Sokal and Rohlf, 1980). The ectoparasite analysis was expressed in terms of prevalence, with a confidence interval (CI) for a significance level

Table 1
Number (*N*), frequency (*F*) and prevalence (*P*) of ectoparasites found on dogs in five towns from Buenos Aires province, Argentina

Species	Magdalena			Las Quintas			Los Hornos			Melchor Romero			Mar del Plata			Total		
	N	*F*	*P*	*N*	*F*	*P*	*N*	*F*	*P*	*N*	*F*	*P*	*N*	*F*	*P*	*N*	*F*	*P*
C. canis (Siphonaptera)	456	0.15	100	84	0.16	100	88	0.25	100	39	0.17	75	152	0.14	90	819	0.16	90
R. sanguineus (Acarina)	2219	0.75	100	449	0.83	100	249	0.69	100	129	0.57	100	745	0.67	80	3791	0.73	93.3
L. setosus (Anoplura)	52	0.02	62.5	0	0	0	11	0.03	25	22	0.1	75	8	0.01	20	93	0.02	36.6
H. spiniger (Mallophaga)	233	0.08	87.5	7	0.01	25	11	0.03	25	36	0.16	75	203	0.18	70	490	0.09	63.3
Total	2960			540			359			226			1108			5193		

of 5%; the frequency of each ectoparasite was calculated as the percentage of each species in relation to the total amount of ectoparasites collected on the examined hosts (Morales and Pino, 1987). The infestation intensity was estimated according to the criterion established by Alcaíno et al., (1990).

3. Results

All dogs were infested with at least one ectoparasite. A total of 5193 ectoparasites of four species were recovered: 15.7% were *Ctenocephalides canis* (Siphonaptera), 73.0% were *Rhipicephalus sanguineus* (Acarina: Ixodidae), 1.8% were *Linognathus setosus* (Anoplura) and 9.4% were *Heterodoxus spiniger* (Amblycera). The number, frequency and prevalence of these ectoparasites varied throughout the study sites (Table 1). *R. sanguineus* was the most abundant species in all five study sites; *C. canis* was the second most abundant species, though at significantly lower frequencies. The other two taxa were represented by a relatively low number. All four ectoparasite species were found on the dogs from the five sampling sites, though those dogs sampled in Magdalena exhibited the highest infestation intensity.

The prevalence of different ectoparasites on dogs, either with simple or multiple infestation indicates that *R. sanguineus* and *C. canis* parasitized almost all hosts, with a prevalence of 99.1% (CI = 1.71) and 98.2% (CI = 2.35), respectively, whereas the prevalence of *H. spiniger* (62.9%, CI = 8.62) and of *L. setosus* (37.0%, CI = 8.62) was much lower.

Triple infestation occurred in 56.9% of the dogs (ticks–fleas–lice); 39.6% exhibited double infestation (73.9% of these with ticks–fleas, 17.4% with ticks–lice and 8.7 with fleas–lice). Only 3.4% presented single infestations with lice. Types of infestation were correlated to host sex (Table 2). The analysis of different infestation types suggested that most of the hosts have triple infestations, followed by double infestations by ticks–fleas. The remaining infestation combinations were scarcely represented. We noted that both triple and double (ticks–fleas) infestations were more frequent in female than in male hosts.

Table 3 shows the seasonal estimation of intensity of infestations by the ectoparasites considered. Higher intensities occurred during spring months, with lower though constant values the rest of the year.

Table 2
Infestation by host (*C. familiaris*) according to sex in Buenos Aires province, Argentina

	Triple infestation		Double infestation				Simple infestation (females)
	Females	Males	Ticks–fleas		Ticks–lice (females)	Fleas–lice (males)	
			Females	Males			
X	80.4	49.2	67.0	49.8	25.0	8	22
R	22–111	9–100	38–125	13–74	13–37	–	–
S.D.	25.3	26.5	32.8	22.0	12.0	–	–
CV	31.4	53.8	48.9	44.1	48.0		

X: average number of ectoparasites, *R*: range, S.D.: standard deviation, CV: variability coefficient.

Table 3
Seasonal estimation of the intensity of natural infestation by different ectoparasites on dogs from Buenos Aires province, Argentina

Species	Autumn	Winter	Spring	Summer
C. canis	++	++	+++	++
R. sanguineus	+++	+++	++++	+++
L. setosus	+	+	+	+
H. spiniger	+	++	++	+

++++, very abundant (25 or more); +++, abundant (10–24); ++, regular amount (4–9); +, scarce (1–3).

4. Discussion and conclusions

All the dogs had at least one ectoparasite. Many authors have stated high prevalence values for this host, such as Acha (1952), who found 91% out of 100 dogs infested; Liberato (1998), who detected a prevalence of 85.5% out of 400 dogs; Bustamante (1998), who determined that 94.4% of 390 dogs were infested; and Estares et al., (1999), who discovered that 98.8% of 400 dogs were infested. The four ectoparasite species were present in hosts at all sampling sites, though at different rates.

According to our study, ticks were the most abundant ectoparasites in triple as well as double infestations, followed by fleas, in all sampled areas. This data is coherent with Horak's findings (1982) in Pretoria, South Africa, where the average number of adult *R. sanguineus* was much higher than that of *Ctenocephalides* spp. However, Estares et al., (1999) found in Lima, Peru, that the greatest prevalence corresponded to fleas (89%), followed by ticks (30.0%).

C. canis was the only flea species found on the examined dogs from all five areas, a result which agrees with those reported by Ressl (1963) in Austria, Baker and Hatch (1972) in Ireland, Guzman (1984) in New Zealand and Koutinas et al., (1995) in Greece. Nevertheless, some authors have found *C. felis felis* to be the most abundant species, with prevalence values up to 92% (Harman et al., (1987) in Florida, USA, Painter and Echerlin (1985) in Virginia, USA, Amin (1976) in Wisconsin, USA, Amin (1966) in Egypt and Estares et al., (1999) in Lima, Peru).

Regarding the prevalence of lice, *H. spiniger* was more abundant (62.9%) than *L. setosus* (37.0%). This data agrees with that presented by Estares et al., (1999) for the metropolitan area of Lima, Peru, though with significantly lower values (9.3%).

From the analysis of different kinds of infestation, a greater abundance can be observed in female compared to male hosts (60.35 and 39.65%, respectively). These results could be related to those reported by Edwards (1969), Kristensen et al., (1978) and Alcaíno et al. (2002), who observed higher infestation intensities in females compared to males, though only in flea infestations, and at a much higher rate (5:1 females/males in Alcaíno et al.).

Considering the characteristics of the different areas studied, it could be observed that Magdalena was the zone of higher prevalence, maybe due to the fact that it is the most humid area. Alcaíno et al., (2002) considered that the differences in frequency among diverse areas are not easy to explain, and that microclimatic factors, as well as social and cultural aspects related to the urban or rural ways of life might play a role. They suggested that Osorno

(Chile), being a rural area, was an area of higher prevalence when compared to Santiago (Chile), which is the capital city. Edwards (1969), Kristensen et al., (1978), Beresford-Jones (1981), Dryden and Rust (1994, USA) and Alcaíno et al., (2002, Chile) noted that within flea species, *C. canis* is the most predominant species on dogs in rural areas, whereas *C. felis* is the most common in urban areas. Since our studies were carried out in rural areas, this could explain the presence and high prevalence values of only one flea species, *C. canis*.

The ectoparasite species we found in our study prefer the mild, humid spring months. According to the criterion used to estimate the infestation intensity, we determined intensity for spring: *R. sanguineus* very abundant; *C. canis* abundant; *H. spiniger* in regular amounts, and *L. setosus* scarce. Horak (1982) stated that for Pretoria, *R. sanguineus* preferred the mild months from October to April, but this species exhibited an increase in early spring. In Egypt, Amin and Madbouly (1973) also found adults during spring and summer, and they considered that there were few in autumn and winter. Dipeolu (1975) reported that the highest number of parasites occurred in summer in Nigeria, whereas Alcaíno et al., (1990) established that in Chile they are predominant in spring, showing a distinct decrease since the beginning of summer, until completely disappearing in autumn.

For *C. canis*, Horak (1982) considered that the most favorable months for adults are November to May (summer–autumn), maybe due to the higher temperature and humidity, whereas the most unfavorable period is that from July to October (winter–spring), due to low temperature and humidity. Amin (1966) described two peaks of abundance for El Cairo, one in spring, as a result of the increase in temperature after winter, and another in autumn, as a result of the increase in humidity after summer.

Our observations show that all four ectoparasitic species found on domestic dogs are present all year in the five study areas, and although the highest number was recorded from September to December, months in which the temperature rises suddenly after the low winter temperatures, these four species showed low, though constant values during the rest of the year.

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