Tick infestation of dogs and Prevalence of canine babesiosis in the north-east of Algeria; area of El-Tarf

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ABSTRACT

During the year 2009, a study was conducted to identify ticks that infest dogs in two different regions of the wilaya of El-Tarf (Algeria). A total of 120 dogs were examined between March and August 2009. 856 ticks were collected, where three different species were observed: *Ixodes ricinus*, *Haemaphysalis punctata* and *Rhipicephalus sanguineus*. *Rhipicephalus sanguineus* is the most frequently found species, and the only one identified in Bouhadjar (100%), and representing 77.2% of all species identified in El-Kala. *Ixodes ricinus* and *Haemaphysalis punctata* were only present in El-Kala with 13.1 and 9.7% respectively. In the area of El-Kala, the load parasite on dogs infected with *Rhipicephalus sanguineus* were about 4.2, which represent a lower value compared with the area of Bouhadjar (8.7). The difference is highly significant (p<0.0001). *Rhipicephalus sanguineus* was found alone in 55% on dogs in the area of El-Kala, while the association of the three species of ticks was observed for 5% of the population. No correlation was noted with regard to sex or age of the animals and the amount of ticks collected. The ear was the preferred site for fixation of all ticks (58.53% and 68.12% for El-Kala and Bouhadjar respectively) (P-value = 0.007679).

*Babesia canis* was detected in erythrocytes of dogs in the two regions with varying proportions. A global prevalence of 30% was found for canine babesiosis in the region of El-Tarf.

Key words: ticks - dogs - *babesia canis* - prevalence - Algeria

Introduction

Ticks are the most important group of arthropod vectors of diseases transmissible to animals and humans. We found in the world over 800 species of ticks (Hoogstraal; Aeschlimann, 1982). They are responsible for the maintenance and transmission of many pathogens affecting domestic animals and humans, including several species of bacteria, helminths, protozoa, and viruses (Cupp, 1991; Scott et al., 2001).

In Algeria, very few studies have been conducted on the subject of ticks (Boulkaboul, 2003), especially for the dog and the vector-borne diseases.

Similarly a survey of species in natural environments reveals a large number of tick species (Meddour Boudou and Meddour, 2006).

Canine babesiosis is a parasitic disease caused by the multiplication and the pathogenic action of hemoprotozoan organism; genus is *Babesia* naturally transmitted by ticks *Ixodidae*. *Rhipicephalus sanguineus* and *Dermacentor reticulatus* are both essential vectors of this disease (Bourdeau, 1993).

In this work, we have found different species of ticks infesting dogs in two different bioclimatic regions in the north-eastern Algeria, and the diagnosis in the laboratory of canine babesiosis was made for dogs with presented the symptoms of the disease.

Material and Methods

Area of study:

The wilaya of El-Tarf is located at the north-eastern Algeria. The wilaya is open to all media (Figure 1):
The Mediterranean Sea to the north;
- The sub-coastal plains west of Annaba in continuity with the plains of Bounamoussa;
- The upstream of Boucheougouf and North-eastern province of Guelma;
- The rugged south (wilaya of Souk-ahras), a mountainous region;
- The Tunisian border to the east, land held for international trade;

The coastal region (El-Kala) climate is strongly influenced by the proximity of the sea, the high humidity and a mild winter temperature (January averages of > 10 °C). Average maximum temperatures are highest in July-August values exceeding 30 °C.

In the interior basins (Bouhadjar, Cheffia and Ain-Karma), the rainfall totals are significantly lower than those of neighboring regions, in fact look like little inland basins is stagnant and hot in summer. There are three relatively distinct units:
- Mountain area, at an average altitude of 500 m (Bouhadjar);
- Area plains;
- Dunes and lakes (El-Kala).

Collection of ticks:

We have chosen for this work the period of tick activity (Bourdeau, 1993).

The harvest period was extended from March 2009 until August 2009. Two different bioclimatic regions have chosen: El-Kala and Bouhadjar belonging to the wilaya of El-Tarf.

Our samples were collected on 120 randomly selected dogs, breed local (rural and urban), sex and age groups.

The tick is removed in the direction of implantation of the rostrum (essential to the diagnosis) avoiding any rotational movement; cotton soaked in ether is often used to facilitate the tearing of the tick.

Ticks collected are stored in numbered tubes containing 70 ° alcohol.

Dogs of the study:

120 dogs were chosen (60/60) for this subject in our study. For El-Kala, we were selected urban dogs (n = 20) (some dogs who lived with cats) and other animals rural (n = 40). while for Bouhadjar, dogs lived in rural areas with large and small ruminants (cattle, sheep and goats).

Among the dogs of the study, 42.5% were females and 57.5% males.
For El-Kala, females accounted for 40% and 60% males.
For Bouhadjar, the distribution was respectively 43% (n = 27) and 57% (n = 33).
The owners do not medicalisaient their dogs (rabies vaccination was only practiced by a few people).
Some dogs had various clinical signs of canine babesiosis when sampling.

An information sheet accompanying each sample of ticks, the latter includes in addition to number, date of collection, age and sex of the animal, the region of tick attachment on the body.

Observation and Identification of ticks:

The identification of ticks was performed in the laboratory of Parasitology at the Veterinary Institute (El-Tarf) using a dissecting microscope.

Manipulation of ticks was carried out with fine forceps in a box Petrie. Sometimes identification was hampered by the presence of cellular debris or blood level of the rostrum; why cleaning is needed. The determination of the genus and species was based on the observation of morphological characteristics established by Hillyard, 1996 and Estrada-Peña et al., 2004.

Identification of ticks is based mainly on the following characters:
- Rostrum: length and shape;
- Eyes: presence or absence;
- Furrow anal: position relative to the anus;
- Scallops: presence or absence;
- Coxa I: bifid or not.

Canine babesiosis:

When collecting ticks, a clinical examination of each dog was performed (presence or absence of apparent clinical signs of babesiosis).
Of all animals included in the study, 40 dogs (15 dogs in the area of El-Kala and 25 dogs for Bouhadjar) showed a combination of symptoms that led us to suspect the disease: fever, loss of appetite, depression, pale mucous membranes with the common sign of intense weight loss.

For each animal suspected, a venous blood sample was made and placed in EDTA tubes to look for babesies in erythrocytes of dogs using staining with coloration May-Grunwald-Giemsa.

Statistical Analysis:

The Mann Whitney test was used to compare the parasite loads in dog ticks Bouhadjar the region and the region of El-Kala.

The relationship between the number of ticks, sex and age of dogs were investigated.

Analyses were performed using SPSS software v19 statistics.

Results:

A/ Identification of ticks:

***All dogs were infested with ticks.:

a / The morphological study has led us to identify three tick species: *Rhipicephalus sanguineus*, *Ixodes ricinus* and *Haemaphysalis punctata* (Table I).

In the region of El-Kala, the three species of ticks have been found with a dominance of *Rhipicephalus sanguineus* (77.20%). The brown dog tick was collected only in the region Bouhadjar (Table II, Figure 2). This mite infested dogs with parasite load of 8.8 (number of ticks / host) in Bouhadjar while a lower intensity was observed in El-Kala (4.2).

*Ixodes ricinus* and *Haemaphysalis punctata* were found on dogs of El-Kala with a parasite load of 0.7 and 0.8 respectively (Table IV).

b / A change in the number of ticks collected on dogs was noticed during the six-month study with a maximum of 104 *Rhipicephalus sanguineus* in June for the region of Bouhadjar (Figure 3) and 55 ticks of the same species in the month of April to the region of El-Kala (Figure 3).

| Table I: Distribution of ticks collected in the two study areas. |
|---------------------------------|-----------------|-----------------|
| area of study, species of ticks  | El-Kala          | Bouhadjar       |
| *Rhipicephalus sanguineus*      | 223 female-31 male | 292 female-235 male |
| *Ixodes ricinus*                | 09 female-34 male | 00              |
| *Haemaphysalis punctata*        | 21 female-11 male | 00              |
| Total                           | 329              | 527             |

| Table II: Abundance of different tick species in the two study areas. |
|---------------------------------|-----------------|-----------------|
| area of study, species of ticks  | El-Kala relative abundance % | Bouhadjar relative abundance % |
| *Rhipicephalus sanguineus*      | 254 77.2         | 527 100         |
| *Ixodes ricinus*                | 43 13.1          | 00              |
| *Haemaphysalis punctata*        | 32 09.7          | 00              |
| Total                           | 329 100          | 527 100         |

| Table III: Location of infected ticks on dogs in the two study areas. |
|---------------------------------|-----------------|
| El-Kala                         | Bouhadjar       |
| parts of the body               | ear             | Inguinal region | Member |
| Number of ticks                 | 192             | 125             | 12     |
| Percentage (%)                  | 58.4            | 38.0            | 3.6    |

| Table IV: Parasite load in the infected dogs in the two study areas. |
|---------------------------------|-----------------|-----------------|
| area of study, species of ticks  | El-Kala Number of ticks / host | Bouhadjar Number of ticks / host |
| *Rhipicephalus sanguineus*      | 254 4.2         | 527 8.7         |
| *Ixodes ricinus*                | 43 0.7          | 00              |
| *Haemaphysalis punctata*        | 32 0.5          | 00              |
Fig. 1: Location of the study area.

Fig. 2: Abundances of species of ticks in the regions of El-Kala and Bouhadjar.

%: Percentage
Fig. 3: Variations in the total number of ticks *Rhipicephalus sanguineus* collected according to the months in the two regions.

Fig. 4: Variations in the total number of ticks collected according to the months in the region of El-Kala.

Fig. 5: Percentage of parasitism of dogs according to the association of species of ticks.
The number of ticks *Rhipicephalus sanguineus*-to-month Bouhadjar the region was higher than the region of El-Kala (Figure 3). The difference is highly significant between the two regions ($p = 0.002165 <0.001$).

In the region of El-Kala, the number of *Rhipicephalus sanguineus* collected each month was higher by contribution from other species.
Ixodes ricinus was observed throughout the study period with a peak in the month of June (13 ticks), while Haemaphysalis punctata was observed only in the first four months with a maximum of 15 ticks in April (Figure 4).

c / There were mostly female ticks on dogs in the area of El-Kala with 77%, while for Bouhadjar, the sex ratio was more balanced, with 55% females. No relationship was found between sex of the dogs and the number of ticks collected.

d / regarding the co-infection at the region of El-Kala, the association of three species of ticks was observed in 5% of dogs while the infection by two species was noted for 40% of dogs while Rhipicephalus sanguineus was collected only in 55% of dogs (Figure 5).

e / The distribution of ticks is not uniform in all age groups. A large number of ticks collected on dogs aged 1 to 24 months for the two study areas. For Bouhadjar, a number important of ticks was also observed for the range of 25 to 36 months (Figure 6 and Figure 7).

While in terms of parasite load, it was found that for Bouhadjar, the intensity was very high for the category of 50 to 63 months (12.5 / dog); and for El-Kala, it was important for dogs aged between 42 and 48 months (6.3 / dog).

No influence of age was observed in both regions.

f / The parasitism by ticks is mainly located at the ears with a high rate of 58.4% and 68.1% in the two regions (El-Kala and Bouhadjar respectively). A significant rate was observed at the inguinal region and a very low infestation was marked in the limbs (Table III). There are differences highly significant for the amount of ticks between different body regions (F-value = 0.007679).

B/ The study of canine babesiosis:

The common sign when sampling was intense weight loss in dogs. The abatement and pale mucous membranes exist with variable rates.

The selection of dogs for blood sampling (whole blood) was based on the association of different symptoms of suspected babesiosis.

Microscopic observation of blood smears revealed the presence of piroplasms (pear-shaped double quadrifora) in erythrocytes (photo 1).

Among the 40 blood samples (suspicion of piroplasmosis), we confirmed the presence of Babesia canis in 12 samples by microscopic examination of blood smears (Giemsa staining), an overall prevalence of 30%.

Discussion

The dogs of the region of Bouhadjar are infested with a single tick: Rhipicephalus sanguineus, while two other species of ticks were found in addition to dogs of the region of El-Kala: Ixodes ricinus and Haemaphysalis punctata. All these mites belonged to the family Ixodidae.

The domestic dog is the main host of Rhipicephalus sanguineus in urban and rural areas (Szabo et al., 2001), however other mammals such as cats and rats (Cummings, 1998) and birds (Okello -Onen et al., 1999) can also host this arthropod. This may also explain the presence of ticks for dogs living alone or cohabiting with some mammals (cats).

Our result is quite different from that reported by Zennr and Dreven (2003) in their studies on dogs of Ain and Haute-Savoie in the North East of Lyon who reported the presence of ticks following: Ixodes ricinus, Dermacentor reticulatus and Rhipicephalus sanguineus, with a very strong dominance of Ixodes ricinus.

A survey conducted in Belgium has been able to show that two species on domestic carnivores: I. ricinus and I. hexagonus (Losson, 2001).

The Mediterranean climate is a climate favorable for some species of ticks, including Rhipicephalus sanguineus (Bourdeau, 1993) and climatic differences between regions mentioned may largely explain the different distributions of species of ticks.

The absence of dog tick (Dermacentor reticulatus) in our study does not exclude its presence in Algeria (Meddour Bouderra and Meddour, 2006).

Tick-infested dogs of Bouhadjar with a parasite load average of 8.8 ticks per dog, greater density than that reported in the region of El-Kala (5.4), this difference may be explained by climatic differences between these two regions and the urban way of life for some dogs in the coastal region.

The dominance of the Rhipicephalus sanguineus was reported by Moubamba (2006) in his study in the area of Libreville in Gabon.

The same author found an average parasite load of 7.3 ticks per dog, which is a value close to what we found in Algeria.

Parasite load in our study is larger than that reported by Goldberg et al. (2002) in dogs infested by the same arthropod (3.8 ticks per dog) in Northwest Georgia.
It is likely that the lifestyle and the environment are the cause of the discrepancy between these values. Concerning the location of ticks, we found the majority of these parasites located at ear level; a significant amount was also taken from the inguinal region. However Zenner and Drevon (2003) reported a majority of ticks collected at the head and neck and secondarily in the back and flank. Also, in another study in Hungary, the most preferred sites of tick attachment in decreasing order were head, neck and legs (Gabor Foldvari and Robert Farkas, 2005).

We note that ticks collected during this period are all adults (no larval and pupal). Some authors have reported the presence of different parasite stages (Zenner and Drevon, 2003; Moubamba, 2006). Our study for canine babesiosis was based on the period risk and the presence of ticks and symptoms of dogs during harvest pests, including loss of appetite, anemia, and secondarily the presence of fever. The babesies were found in dogs in both study areas.

Calculating the average prevalence of canine babesiosis gave a rate of 30% which is higher than that reported by Cabannes and colleagues (2002) in France (14.1%) working on antibodies found in diseased dogs. This prevalence is higher than that reported by Ahmed et al. (2007) in Pakistan which reported a rate of 12.5% and 14.0% for two years.

The absence of Babesia canis on the smear does not exclude the presence of the disease (Smith and Kakoma, 1989) and the presence of ticks and the symptoms never confirms the disease.

Conclusion:

Based on our results, it was found that in the area of El-Tarf, the presence of ticks on dogs is important. Our results confirm the results obtained by Meddour Bouderda and Meddour, 2006 for the area north-east of Algeria. Depending on the region's climate and geography, we see that there is predominance of thermophilic species Rhipicephalus sanguineus, and the presence of ticks mesophilic (I ricinus and H.punctata) view that the urban lifestyle and especially the humid climate favoring the development of these parasites.

On canine babesiosis, the use of MGG staining of whole blood from dogs with clinical signs may give an interesting result for the specificity of this technique. However, this method takes time and application of habit. These results can guide us towards further study to better understand the population dynamics of Rhipicephalus sanguineus ticks in areas of different habitats and the associated vector-borne diseases by applying diagnostic methods adapted to the Algerian context. Using tools of molecular biology (PCR) will be essential in future studies to conduct.

References


