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EPIDEMIOLOGICAL SURVEY OF CANINE BABESIOSIS IN MAKURDI, NIGERIA

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ABSTRACT

The prevalence of Babesia canis and their tick vectors was investigated in Makurdi. 108 dogs were screened for Babesia canis and 208 dogs were examined for tick ectoparasites. 10.2 % of the dogs were positive for Babesia canis infection. Chi square analysis showed no significant difference in infection rates in male and female dogs (X^2 = 2.579, df = 1, P > 0.05). 75.9 % of dogs examined for ticks were infested with either Rhipicephalus, Boophilus and Amblyomma species or combination of the three. The paws were the most preferred site of attachment for the ticks. 126 (79.6 %) of the 158 infested dogs had ticks on the paw (X^2 = 10.388, df = 4, P > 0.05). The public health implications of these findings especially as relates to the increasing incidence and prevalence of dog borne zoonotic infections are discussed.

Keywords: *Babesia canis,* Ticks, Public health risk

INTRODUCTION

Dogs are important household pets and most of the times kept for security purposes. In Makurdi, dogs are kept mainly as household guards and are generally free range with some being restricted in the daytime. Hence, most dogs are prone to ectoparasites infestation. The clinical and pathological consequences of this infestation and the resultant diseases transmitted by these ectoparasites have been widely documented in Nigeria and elsewhere (James-Rugu and Iwuala, 1988; Etim *et al*., 1996; Ripberger, 1999; Bryson et al., 2000; Wilson and Bram, 2003).

Canine babesiosis is one of the most important tick borne diseases in Nigeria (James-Rugu and Iwuala, 1988; Bodade *et al*., 1989; Abdullahi *et al*., 1990; Mamman and Abdullahi, 1998). Ticks from dogs also occasionally bite humans with the potential of transmitting tick borne diseases. Cases of human babesiosis have been reported (WHO, 1981; Wentworth, 1988; Carter, 2001). These findings have serious public health implications for Nigeria considering the deteriorating domestic environment and the rising trend of dog keeping within residential premises.

There has been an unprecedented increase in the number of stray dogs roaming the streets of Makurdi resulting to an intense man-dog contact, especially with children. This study investigated the prevalence of *Babesia canis* and also collected and identified ticks from infested dogs, potentials for human infestation with dog ticks was studied.

MATERIALS AND METHODS

Study Areas: Makurdi, the capital of Benue State, Nigeria, is fast becoming a metropolitan centre with attendant health, social, housing and environmental problems. The town lies between latitude $7^0$15' – $7^0$45'N and longitude $8^0$15 - $8^0$40'E. The town lies in the guinea savanna vegetative belt and on the bank of the second largest river in Nigeria, River Benue. The river divides the town into North and South banks and the town covers an area of 16km^2 (Figure 1). The river constitutes the main source of water supply for the inhabitants of the town. The sudden influx of commercial and developmental activities that resulted from rapid urbanization has side-lined many indigenous people and urban migrants, consequently, the populations of poorer residential areas such as Wadata, Wurukum and North bank are beginning to swell. These three high-density residential areas (i.e. Wadata, Wurukum and North Bank) were selected for sample collection.

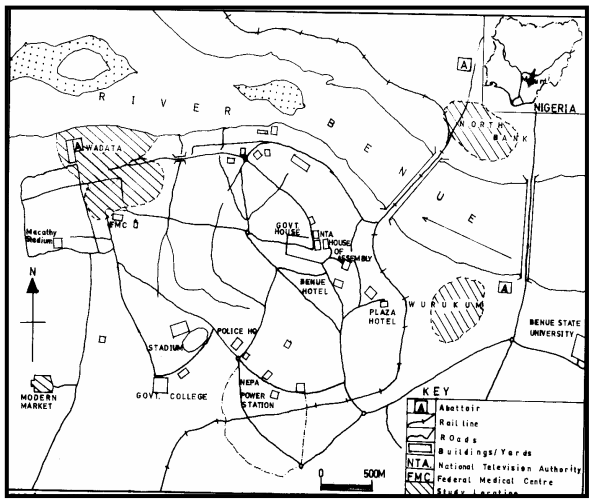

Figure 1: Map of Makurdi showing the sampled sites

Wadata: Wadata constitutes a reasonable population of the town, located along the bank of the river towards the western end of the town. The area is densely populated with inadequate water supply, sanitary and waste management. Drainages are open and blocked by piles of rubbish. In addition to

residential houses, there is a market, a prison yard, abattoir, a rice mill, and thriving burnt-brick production along the bank of the river (Figure 1). The inhabitants of this area are largely Hausas and Jukuns who are active fishermen. The majority of the Hausa residents combine livestock keeping and other forms of petty trade. It is therefore very common for many households to keep goats, sheep and cattle in residential premises and to practice free- range systems of husbandry.

Wurukum: This is another residential settlement within the metropolis; the actual study was conducted in a portion called Angwan-Jukun. It is known for its unhygienic conditions, overcrowding, and poor state of housing and lack of clean water. Heaps of refuse block access to the road while municipal waste disposal facilities are non-existent. The Jukun ethnic group used to be the predominant residents but this is rapidly changing due to the influx of other ethnic groups as a result of lower rents. Landmark facilities include a rice-mill, an abattoir and vegetable farms along the river bank. The predominant animals kept by the residents of this area are goats and pigs which are reared under a free-range system. Their faeces are usually used as manure for the vegetable farms.

North Bank: The north bank area is located across the river towards the north; the actual study site is the area called Angwan-Sariki (Figure 1). The area is densely populated and there are prominent gully erosion sites and these gullies serve as refuse dumps. The residents of this area are also engaged in free-range rearing of cattle, sheep and goats, trading and other small- scale businesses. The majority of the residents lack clean water and depend on the river for water. Sanitary conditions are poor and most drainages are blocked with piles of rubbish.

Parasitological Screening for *Babesia canis*: For each participating dog, information on age, breed and sex were obtained from dog owners. Peripheral blood samples were collected from dog's earflap; the animals were first restrained and muzzled to prevent dog bites during blood collection. Two drops of blood were taken from each dog by the ear pricking method using disposable lancets. Thin blood films were made for each dog and stained using Giemsa's stain (Wentworth, 1988; Ripberger, 1999); two slides were prepared for each dog. Microscopy was done using light microscope to search for *Babesia canis* in blood film.

Sampling Methods for Ectoparasites: Ectoparasites were collected from dogs with the assistance of members of the household, using the hand picking and hair brushing methods (James Rugu, 2000). The entire animal's body was inspected and brushed with special attention paid to the ears, the area around the eyes, the maxillae and the groin as recommended by Shah-Fischer and Ralph Say (1989).

Preservation and Identification: Ectoparasites collected were counted and transferred to the laboratory in clearly labeled specimen bottles containing 70 % alcohol. The sex and breed of dog from which the parasites were collected was recorded on each specimen bottle. Ticks were identified using the keys and illustrations in Wentworth (1988), Shah-Fischer and Ralph Say (1989).

Data Analysis: simple percentages and Chi-Square were employed to test significance and compare prevalence at the various sampling sites and sexes. The survey was carried out during the months of February and May 2006.

RESULTS AND DISCUSSION

Blood samples were collected from a total of 108 dogs of which 10.2 % were positive for *Babesia canis* infection (Table 1). Chi - square analysis showed no significant difference in the rates in male and female dogs ($X^2 = 2.57$, df = 1, $P > 0.05$). Two main breeds of dogs were encountered in this study; Mongrel (87.9 %) and Alsatian (12.1 %). While 9.5 % of the Mongrels were infected with *Babesia canis*, 15.4 % of the Alsatians had the infection. This difference in infection rate is however not significant ($P > 0.05$).

Two hundred and eight (208) dogs were examined for tick infestation, 75.9 % were infested with either *Rhipicephalus, Boophilus* and *Amblyomma* species or combination of the three (Figure 2). Though dogs in High Level had the highest percentage of tick infestation (81.2 %), this was however not significant (Figure 2). Infestation among male and female dogs was also not significant ($P > 0.05$) (Table 2). The paws were the most preferred sites for attachment for the ticks, 126 (79.6 %) of the 158 infested dogs had ticks on the paw. This was statistically significant when compared to the neck, head, and other sites for attachment ($X^2 = 10.38$, df = 4, $P < 0.05$). While 57.9 % of the Alsatian dogs examined had tick infestation 73.3 % of the Mongrel breed had tick infestation, this difference was not statistically significant ($P > 0.05$).

The prevalence of canine babesiosis in this study was low, despite the heavy infestation of dogs with the principal vector (*Rhipicephalus* species) and potential vectors (*Amblyomma and Boophilus* species). Bobade *et al.*, (1989), Abdullahi *et al.*, (1990), Mamman and Abdullahi (1998) and carter (2001) reported similar findings and reasoned that pre-immunity against the disease in dogs found in endemic areas was the factor for the low prevalence. The clinical and epidemiological implications of babesiosis in infected dogs and those at risk cannot be overemphasized as this could influence their nutritional, physiological and behavioural well-being (Mamman and Abdullahi, 1998; Jacobson *et al.*, 2000; Carter, 2001).

The heavy infestation of dogs by tick species encountered in this study suggests a wide distribution of Babesia vectors in Nigeria.

Table 1: Prevalence and distribution of *Babesia canis* in Makurdi

District	Breed	Female		Male		Total	
		Number examined	Number infected (%)	Number examined	Number infected (%)	Number examined	Number infected (%)
High level	**Mongrel**	16	-	19	2 (10.5)	35	2 (5.7)
	Alsatian	1	-	3	1 (33.3)	4	1 (25.0)
Wadata	**Mongrel**	12	-	12	1 (8.3)	24	1 (4.6)
	Alsatian	-	-	1	-	1	-
Wurukum	**Mongrel**	12	2 (16.6)	13	2 (15.4)	25	4 (16.0)
	Alsatian	3	-	4	1 (25.0)	7	1 (14.2)
North Bank	**Mongrel**	6	1 (16.6)	5	1 (20.0)	11	2 (18.1)
	Alsatian	-	-	1	-	1	-
Total		**50**	**3 (6.0)**	**58**	**8 (13.8)**	**108**	**11 (10.2)**

Table 2: Tick infestation and preferred site for attachment on dogs in Makurdi

District	Breed	Female		Male		Total		Attachment sites				
		Number examined	Number infested (%)	Number examined	Number infested (%)	Number examined	Number infested (%)	Head	Neck	Back/ Trunk	Paw	others
High level	**Mongrel**	21	16 (76.1)	27	23 (85.1)	48	39 (81.2)	10	12	34	41	18
	Alsatian	1	1 (100.0)	5	3 (60.0)	6	4 (66.6)					
Wadata	**Mongrel**	18	13 (72.2)	29	23 (79.3)	47	36 (76.6)	19	24	27	29	17
	Alsatian	-	-	4	2 (50.0)	4	2 (50.0)					
Wurukum	**Mongrel**	23	18 (78.2)	35	29 (82.8)	58	47 (81.0)	27	29	42	37	11
	Alsatian	2	2 (100.0)	4	2 (50.0)	6	4 (66.6)					
North Bank	**Mongrel**	11	7 (63.6)	25	19 (76.0)	36	26 (72.2)	14	8	21	19	10
	Alsatian	1	-	2	1 (50.0)	3	1 (33.3)					
Total		**77**	**57 (74.0)**	**131**	**101 (77.1)**	**208**	**158 (75.9)**	**70 (44.3)**	**73 (46.3)**	**124 (78.5)**	**126 (79.7)**	**56 (35.4)**

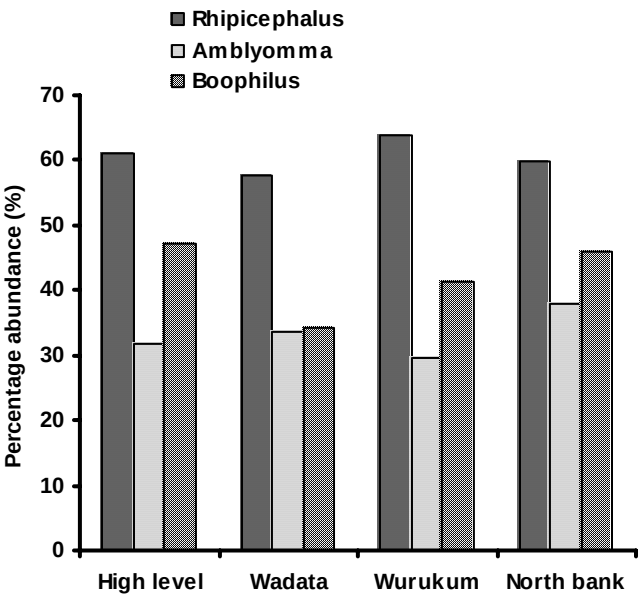

Figure 2: Species composition and abundance of ticks infesting dogs in Makurdi

Our findings corroborated with other findings reported in some parts of Nigeria (James-Rugu and Iwuala, 1988; Umeche and Chianama, 1995; Etim *et al.*, 1996; James-Rugu, 2000) and elsewhere (Bryson *et al.*, 2000; Wilson and Bram, 2003). Ticks from dogs and other livestock have been reported to occasionally bite humans and transmit Lyme disease, tick paralysis, human babesiosis and relapsing fever in parts of North America, Africa and Australia (WHO, 1981; Wentworth, 1988; Carter, 2001).

The large population of roaming dogs as well as those restricted within residential homes reduces hygienic standards and increase the risk of acquiring arthropod borne zoonotic infections. Human infestation with ticks and other ectoparasites have not been empirically documented in Nigeria, however this occasionally occur in children with close association with dogs. Nwoke (2004) and Ikpeze (2005) observed that dismantling of hitherto biological barrier between livestock and man has resulted in the mixing of human and animal population with resultant emergence and re-emergence of new zoonotic infections. Carter (2001) reported mild dermatitis sometimes progressing to papular eruption in humans infested with scabies mites. Dog and cat fleas on the other hand have been reported to transmit *Dipylidium caninum* in children who accidentally swallow infected fleas while playing with pets (Wentworth, 1988; Torrance, 2005). Ade-Serrano and Ejezie (1981) reported that 41.5 % of school children in Badagry near Lagos were infested with *Tunga penetrans*, a flea that can cause serious inflammation of the feet, leading to ulceration and fibrosis. They explained the high prevalence of infestation to close association of children with large numbers of pigs (another host) that roam about in the area.

The regulation of dog ownership and collaboration of veterinary and public health experts in ensuring more responsible dog ownership is being suggested. The enforcement of already existing prohibition of stray/roaming animals in urban areas will go a long way in reducing man-dog contacts and resulting zoonotic transmission.

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