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Environmental and multi-host infestation of the brown dog tick, *Rhipicephalus sanguineus* in Owerri, South-east Nigeria - a case report

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ABSTRACT

The common brown dog tick, *Rhipicephalus sanguineus* is the most predominant tick of dogs in Nigeria. It does not readily attack humans but usually prefers non-human hosts for completion of its development. We report a case of multi-host and environmental infestation of *Rhipicephalus sanguineus* involving five humans, two canines and three ovine hosts at a peri-urban site in south-eastern Nigeria. Eleven cases of human infestation were recorded, ten of which involved children between the ages of 4 and 8 years, while a single case was recorded in an adult female. Among the domestic animals ticks were found attached to a 2-year-old male Alsatian, an 8-year-old mongrel and three West African dwarf (WAD) sheep comprising a ewe and her two lambs. This case of multi-host parasitism may have resulted from extensive bush clearing in the area resulting in non-availability of other alternative hosts.

Key words: parasitism, *Rhipicephalus sanguineus*, human, ovine, canine, babesiosis, Nigeria

Introduction

Ticks are obligate but temporary parasites of animals and birds and usually feed only once at any stage of development. Ixodid ticks are important vectors of major protozoa and rickettsia of livestock. The importance of ticks has also extended to human beings because they have been shown to be vectors of some emerging and re-emerging infections. Argasid ticks in the genus Ornithodoros transmit many of the human relapsing fevers, while Lyme disease and Babesia microti are transmitted by those of genus Ixodid (NYINDO, 1992).

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The brown dog tick, *Rhipicephalus sanguineus* is one of the most prevalent ixodid species in Africa (HOOGSTRAAL, 1956). Throughout its development, this tick prefers dogs as a host but it can also feed on other animals (DIPEOLU, 1975; SADIQ et al., 2001). Earlier studies on ticks of veterinary importance in Nigeria show that *R. sanguineus* is the predominant tick of dogs (DIPEOLU, 1975; UGOCHUKWU and NNADOZIE, 1985; JAMES-RUNGU and IWUALA, 1996). While reports from some parts of the world have documented cases of *R. sanguineus* infestation of man (HOOGSTRAAL, 1981; GODDARD, 1989; MANFREDI et al., 1999), only one report of a similar case has been published for Nigeria (SADIQ et al., 2001).

The increasing number of reports on the incidence of human rickettsioses caused by rickettsial agents, and transmitted by *Rhipicephalus* ticks (FISHBIEN et al., 1987; MANFREDI et al., 1999; PRETORIUS and BIRTLES, 2002), emphasize the epidemiological importance of reports of *Rhipicephalus* infestation of man and other non-definitive hosts in a given environment. We report a case of human, ovine, canine and environmental infestation of *R. sanguineus*, the dog brown tick, at a peri-urban site in south-eastern Nigeria.

Case report

Owerri, the capital of Imo State in the south-eastern geopolitical zone of Nigeria, is an urban centre situated in a rainforest vegetational belt. Its rural extensions are fast developing into peri-urban sites with increasing human populations. One of these peri-urban sites, Irete in Owerri West Local Government Area, was surrounded by large expanse of bush fallows used mainly for crop farming before extensive bush clearance was carried out for the construction of residential structures.

Table 1. Tick infestation among family members at a peri-urban site in Owerri, Imo state Nigeria

Host	Age	Sex	N^{o} of infestations	Site of tick attachment	Stage of development
H1	4	Male	1	Groin	Nymph
H2	6	Female	4	Neck	Larvae
H3	7	Male	4	Groin (2)	Nymph
				Neck (2)	
H4	8	Male	1	Groin	Nymph
H5	24	Male	NI	NI	NI
H6	36	Female	1	Neck	Larvae
H7	43	Male	NI	NI	NI

NI = No Infestation

On May 4, 2001, a report of several cases of human and animal tick infestation were received by a private veterinary clinic from a man who had recently moved into a newly constructed house in this area, together with his family. This family comprises six persons, two dogs (2 year-old male Alsatian and an 8-year-old female mongrel) and three West Africa Dwarf (WAD) sheep (a ewe and her two lambs). On initial investigation and oral interview, it was found that the first case of human infestation occurred the previous week (27/4/01) and was on a boy of four years of age. Subsequent cases of human infestation, as shown in Table 1., occurred during our period of visits and investigation, which lasted 14 days. Altogether, 11 cases of human infestation were recorded. Ten of these involved children between the ages of 4 and 8 years, while a single case was recorded on an adult female. Three cases each attached on the neck and groin regions. All cases of larval attachment were on the neck and on females, whiles nymphs were found attaching on both the neck and groin areas, especially among the boys. The human hosts did not allow the ticks to feed to engorgement stage but removed them immediately they were noticed. The points of tick attachment remained raised and reddish, and continued to itch for about 48 hours.

Table 2. Tick infestation among domestic animals at a peri-urban site in Owerri, Imo state Nigeria

Host	Age	Sex	N^{o} of ticks	Sites and distribution of tick attachment				
				Ear	Face	Withers	Perineum	Digital space
Dogs								
Alsatian	> 2 yrs.	Male	> 500	> 250	5	> 150	2	> 50
Mongrel	8 yrs.+	Female	> 150	35	15	>70	NI	30
Wad sheep								
Ewe	3 yrs.	Female	46	NI	7	NI	39	NI
Lamb1	4 mths.	Female	73	11	NI		22	NI
Lamb2	4 mths.	Female	85	10	NI	40	20	NI

NI = No Infestation

Among the domestic animals (Table 2.), over 500 ticks were found attaching on the 2 year- old male Alsatian, while the 8 year-old mongrel harboured about 180 ticks. Sites of attachment were mostly on the ears, withers, especially under the heavy fur of the mane and in the inter-digital spaces. The Alsatian weighed 20 kg, had a history of progressive emaciation, dullness and anorexia. On examination the dog was found to be severely emaciated, had prominently swollen sub-mandibullar lymph nodes, pale mucous

membrane and slightly enlarged spleen. Rectal temperature was 39.9 °C. The mongrel did not present any of the above clinical signs; it had a history of normal appetite and a rectal temperature of 37.8 °C.

Infestation was much lower among the three WAD sheep, with the lambs harbouring 73 and 85 ticks each (Table 2.) The ewe had 39 ticks attaching on the perineal region, while 40-55 ticks were attached on the withers of the lambs. None of the sheep presented clinical sign of illness. Ticks found on both the dogs and sheep were at different stages of development, with some being fully engorged.

Samples of ticks collected from the different hosts, the grounds, the dog kennels, sheep pen and inside the family dwelling were submitted to the Department of Biological Sciences, Imo State University, Owerri, for identification. Thereafter, each animal was given an acaricide bath using a commercial diazinon preparation (Diazantol®, Animal Care Ltd) according to manufacturers' instructions. This was repeated thrice at two-weekly intervals. Result of tick identification implicated different developmental stages of the common brown dog tick, *R. sanguineus* as the only species involved in the infestation.

Cephalic venous blood of the dogs or jugular venous blood of the sheep was collected into ethylene diamine tetra acetic acid- (EDTA) treated bottles for haemogram and parasitology by standard procedure (JAIN, 1986). The Alsatian had high parasitaemia with Babesia canis. Packed cell volume (PCV), erythrocyte count, leukocyte count and haemoglobin concentration values were 19%, $21.14x10^6$/µl, $9.60x10^3$/µl and 4.9 mg/dL, respectively. Values of similar parameters were within normal ranges in the mongrel and the sheep, with the former having a mild parasitaemia due to the same *B. canis* as in the Alsatian.

A lower than recommended dosage, i.e. 0.044 mg/kg body mass of Diminazene aceturate (Diminaze®, Pantex Inc.), was given twice (after 48 hours of the initial) to the Alsatian, and once to the mongrel, by intramuscular injection. The Alsatian was also put on selective supportive treatment consisting of daily analgin, oxytetracycline, vitamin B complex and iron dextran given for five days according to manufacturers' instructions. Post-treatment evaluation of the haematological and parasitological status of the dogs on the 5th day after treatment revealed appreciable improvement of haemogram and absence of *B. canis* in circulation. Rectal temperature of the Alsatian had also returned to 37.6 °C. The humans, the mongrel and the sheep remained clinically healthy throughout the study period.

A simple candle and white paper technique, (OKOLI, pers. Com., 1999) was used to estimate the level of environmental infestation in the compound. This involved the positioning of a lighted candle in the middle of a white foolscap sheet and placing both, either on the ground or on the floor of the area being assessed for upwards of 30 minutes

during the night. Thereafter, the number of ticks attracted to the light was counted. The area was then scored as being mildly, moderately or heavily infested when 1-5, 6-10 or >11 ticks, respectively, were counted. Using this method, we found that the grounds of the dwelling, the sheep pens and dog kennels were heavily infested with developmental stages of the R.. sanguineus tick (15-35 ticks), while the dwelling itself was moderately infested (5-9 ticks).

The infested environments were treated by spraying with a commercial diazinon (Diazantol®) preparation according to the manufacturers' instructions. A commercial household detergent was, however, included in the preparation at 35g per 20 l of reconstituted acaricide solution, to improve wetting of materials and the soil. Environmental treatment was repeated thrice at fortnightly intervals. The level of infestation was re-evaluated before each re-treatment. Both the animals and the environment were tick-free two weeks after the final treatment.

Discussion

Our results represent an interesting case of multi-host and environmental infestation of the common brown dog tick, *R. sanguineus* in a humid tropical environment, involving humans, dogs and sheep. While all the life stages of this tick are known to be mainly associated with dogs, few alternative hosts have been reported in the USA, Italy and Nigeria, among others (ANON., 1987; MANFREDI et al., 1999; SADIQ et al., 2001). The present case occurred during the early rainy season months of April and May, known to represent a period of increased reproductive activity by the *R. sanguineus* (ODUYE and DIPEOLU, 1976). It is probable that extensive bush clearing around the study area, occasioned by farming activity at this period of the year, may have depopulated wild rodents which may have acted as alternative hosts for the developmental and adult stages of the ticks, thus forcing the ticks to parasitise humans and sheep. NELSON (1969) reported that *R. sanguineus* did not readily attack humans, but apparently prefers non-human hosts for completion of its development. The infected humans in this study did not allow the ticks to feed to engorgement stage.

The present case of human infestation by R. sanguineus may also suggest that the species is becoming more anthropophilic in its feeding habits. This may portend serious epidemiological implications since ticks are implicated as vectors of several pathologic organisms of humans and animals (MAEDA et al., 1987; AZAD and BEARD, 1998; PRETORIUS and BIRTLES, 2002). Furthermore, the fact that Mediterranean Spotted Fever (MSF) or "boutonneuse" caused by *R. conorri* and transmitted by *R. sanguineus* has recently become endemic in several warm climate countries (BENINATI et al., 2002), highlights the epidemiological importance of the present report. Although none of the hosts manifested clinical signs of any tick-borne rickettsiosis, this does not preclude the

presence of any of these organisms in any of the mammalian hosts, or even the ticks. The attachment sites of the ticks on the humans remained raised, reddened, and continued to itch for upwards of 48 hours, probably because of acute inflammatory processes at the sites involving the liberation of various inflammation mediators. Specifically, the itching may be due to the hyperalgesic activities of prostaglandins besides other mediators (NYINDO, 1992).

The body and clinical condition of the Alsatian dog improved greatly within 3 days of treatment, indicating that babesiosis is probably the only canine infection transmitted by the ticks. Both the curative and selectively supportive treatment, especially the use of lower than the manufacturers' recommended dose rate of Diminaze^{R} (0.044 mg/kg), proved very effective. The choice of the use of this dosage regime of diminazene aceturate has been reported by ODUYE et al., (2001) in the treatment of trypanosomosis in expensive exotic dogs and is usually made to avoid possible toxic effects of the full normal dose of the drug on an already dehydrated and weak animal.

The present report has also shown that the expensive exotic Alsatian dog breed is more susceptible to *R. sanguineus* infestation and babesiosis given the fact that other domestic animals, such as the local mongrel and the WAD sheep, inhabiting the same environment had lower tick counts on their body and did not manifest clinical signs of babesiosis. This is probably due to possession of inherent resistance (innate resistance) by the mongrel and sheep. Since the Alsatian dog is used by many homes in Nigeria both as a pet and as guard/security dogs, we suggest that routine screening of clinically ill exotic dogs for *B. canis* be carried out upon presentation in veterinary clinics, as well as regular ticks control on the dogs and their living environment. Finally, such regular control of the common brown dog tick on dogs should include other domestic animals that freely roam residential areas, since they can also harbour and perpetuate this tick in the environment.

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SAŽETAK

Smeđi pasji krpelj, *Rhipicephalus sanguineus*, je najčešći krpelj u pasa u Nigeriji. Obično ne parazitira u ljudi nego češće izabire životinje kao nosioce kako bi završio razvoj. Prikazan je slučaj invazije različitih nosilaca i okoliša krpeljom *Rhipicephalus sanguineus*, uključujući pet ljudi, dva psa i tri ovce u prigradskom mjestu u jugoistočnoj Nigeriji. Zabilježeno je jedanaest slučajeva invazije ljudi i to desetero djece u dobi između 4 i 8 godina i jedne odrasle žene. Od domaćih životinja krpelji su pronađeni na 2 godine starom mužjaku njemačkog ovčara i 8 godina starom mješancu, kao i kod tri zapadnoafričke patuljaste ovce i dva njena janjeta. Ovaj slučaj parazitizma u različitih nosilaca vjerojatno je posljedica opsežnog uklanjanja grmlja u tom području i odsutnosti odgovarajućih nosilaca.

Ključne riječi: parazitizam, *Rhipicephalus sanguineus*, čovjek, ovca, pas, babezioza, Nigerija