



Prevalence of Tick Borne Haemoparasites in Some Breeds of Cattle and Goats Slaughtered in Some Abattoirs within Makurdi, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Authors TSA, ETA and GNI designed the study and wrote the protocol and wrote the first draft of the manuscript. Authors VUO and TSA performed the statistical analysis and managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JALSI/2019/v21i430110

Editor(s):

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Complete Peer review History: <http://www.sdiarticle3.com/review-history/49552>

Original Research Article

Received 13 May 2019
Accepted 23 July 2019
Published 30 July 2019

ABSTRACT

This study was carried out to compare the prevalence of tick-borne hemiparasite in some variety of cattle and goat in Makurdi. The thin blood film technique was used in the study. Chi-square (X²) test was used to compare the prevalence rates. Breed of cattle examined was: White Fulani (45.2%), N'dama (35.5%) and Muturu (19.3%); While those of goats were: West African Dwarf (16.7%), Adamawa Red (37.3%) and Red Sokoto (46.1%). Haemoparasites of cattle and goats and their prevalence were: *Anaplasma centrale* (22.4%), *A. marginale* (21.1%), *Babesia bovis* (11.4%); *A. centrale* (16.7%), *A. marginale* (12.3%), *B. ovis* (11.4%) and *Theileria ovis* (7.8%) respectively. The prevailing tick-borne hemiparasites detected were *A. central*, *A. marginale* and *B. bovis*, in cattle and *A. central*, *A. marginale*, *B. ovis* and *T. ovis* in goats.

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Keywords: Haemoparasites; cattle breed; *anaplasma centrale*; *Babesia bovis*.

1. INTRODUCTION

Haemoparasites are parasites that live within their host's (animal) bloodstream. Hemiparasitic diseases have a global distribution because their vectors, ticks and blood-sucking flies also have a global distribution [1]. Tick-borne diseases (TBDs) are one of the most important constraints to livestock production in developing countries. Some of the most important TBDs of cattle and goats in Africa, especially Nigeria include theileriosis (East Coast fever), babesiosis (red water), Anaplasmosis (gall sickness) [2]. Ticks feed on animals that are either sick from any of these diseases or animals that are healthy but have the parasite in their blood (Carriers). Cattle and goat become infected with TBDs when the ticks feed on them. Through their saliva, a single infected tick can pass disease into an animal during the process of feeding [3].

The tick-borne disease may be triggered by infection with a variety of pathogens, including rickettsia and other types of bacteria, viruses and Protozoa. Because ticks can harbour more than one disease-causing agent, cattle and goats can be infected with more than one pathogen at the same time [4]. Ticks and the diseases they transmit are responsible for severe losses caused either by tick worry, blood loss, blood-related infections, damage to hides, udders and the transmission of toxins by the diseases they transmit. The problem is that cattle and goats which serve as food to man have their production diminishing. The most striking problem is whether haemoparasites are responsible for diminishing meat that serve as food for man. This calls for a comparative study on tick-borne haemoparasites of cattle and goats slaughtered in our abattoirs.

2. MATERIALS AND METHODS

2.1 Study Area

Makurdi is one of the Local Government Area that makes up Benue State of Nigeria, located in the North Central geopolitical zone. It is located in the Middle Belt area of Nigeria and shares boundary with Guma, Gwer, Gwer West and Tarka local government areas. Makurdi is situated along the coast of River Benue and comprising of major places like high level, Wurukum, Wadata, North bank and Modern market. Makurdi is located on latitude 07°74'N and longitude 08°51'E. It has a tropical sub-

humid climate, with two distinct seasons, namely a wet season and a dry season. The wet season lasts for seven months, starting from April to October. There is, however, usually one or more heavy rain out of the seasonal rains in January, February and March. Makurdi, the state capital, for example, records average maximum and minimum daily temperatures of 35°C and 21°C during the dry season and 37°C and 16°C during the wet season, respectively. Makurdi lies in the Guinea Savannah. Persistent clearance of the vegetation has led to the development of regrowth vegetation at various levels of serai development, but more importantly, parklands with grasses ideal for animal grazing during their early growth [5]. These succulent grasses can be cut with machinery, dried and baled for dry season livestock feeding.

The grasses, however, grow very tall, coarse and tough on maturity. The scattered trees are mainly those of economic value and include locust bean, shea butter, mango, silk cotton, African iron, Isoberlinia, cashew, oil palm, *Daniellia oliveri*, Gmelina [5].

The study area comprises of four abattoirs namely: Wurukum abattoir, Wadata abattoir, Modern Market abattoir, cattle Market in Makurdi, Benue State.

2.2 Sample Size Determination and Sample Selection

A total of 456 animals comprising of 228 each of cattle and goat slaughtered at the abattoir was randomly sampled during the period of study. This size was arrived at using Yaro – Yamane's formulae;

$$S = N/1 + N (e)^2$$

N = Population studied.

e = Error margin (0.05)

The blood sample was collected at designated areas for the period of three (3) months (July to October 2014) when the animals were slaughtered, 3–5 ml of blood was collected immediately from the jugular vein, into a bijon bottle containing ethylene-diamine-tertra-acetate (EDTA) used as anti-coagulant.

The sample was labelled properly, placed in a cooler and transported immediately to University

of Agriculture Veterinary Teaching Hospital laboratory, Makurdi where it was examined using a thin blood film method.

2.3 Thin Blood Film Method

A thin blood film technique as described by Cheesbrough [6] was employed to detect tick-borne haemoparasites of cattle and goats. The smear was fixed in absolute methanol for five minutes and allowed to dry; the smear was covered with Giemsa stain (Romanowsky stain) and allowed for 35 to 40 minutes. The smear was washed with water and allowed to dry. The smear was viewed using the Microscope (using X 100 objectives) oil immersion for identification of tick-borne haemoparasite.

2.4 Statistics

Data were analyzed using the Chi-square test to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories and to examine differences within categorical variables.

3. RESULTS

Breed of cattle and goats examined for haemoparasitic infection are presented in Table 1. White Fulani were the dominant cattle 103(45.2%) and Red Sokoto goats were the dominant goats 105(46.1%). Isolated haemoparasites for cattle and goats are also presents (Table 1).

The three haemoparasites isolated from cattle (*Anaplasma central*, *A. marginale* and *Babesia bovis*) were dominant in Muturu and the four parasites isolated from goats (*Anaplasma central*, *A. marginale* and *Babesia ovis* and *Theileria ovis*) had *T. ovis* dominating in Adamawa Red and all the other haemoparasites dominating in West African Dwarf. χ^2 -test, however, did not show any significant difference ($p>0.05$) in a variety of cattle and goats with haemoparasites isolated. Table 2 compared haemoparasitic infection load on the studied cattle and goats. *A. central* was the dominant haemoparasite in both cattle and goats. Single infection load comparison for cattle and goats showed no significant variations ($p>0.05$). Table 3 compared haemoparasitic mixed infection load on the studied cattle and goats. Findings, however, revealed no significant differences ($p>0.05$).

4. DISCUSSION

Results demonstrated the presence of *Anaplasma*, *Babesia* and *Theileria* species in cattle and goats in 54.8% and 48.2% respectively, with single and mixed infections. This study revealed a high parasitic infection rate similar to the report of Akande [7] in Abeokuta. The farmers may not recognize the effects these parasites have on their livestock mainly due to their subclinical nature of presentation [7] or their adverse effect on the affected animals. Most of this cattle is brought via road by the herders from far north. The high prevalence of parasitic infections recorded in White Fulani cattle and Red Sokoto goats is as per [7,8]. This may be attributed to free-range grazing on the pasture. The variability in breed-specific parasitemia is in line with observations made by Agu and Amadi [9] that attribute this variability to host-specific factors peculiar to individual breeds. Also, the environmental conditions of Makurdi and its environs such as the vegetations, the presence of the Benue River and its tributaries encourage the survival and abundance of the arthropod vectors responsible for the transmission of some of these parasites. The high parasitic infections observed in the white Fulani breed of cattle and Adamawa red breed of goat suggests that they are highly susceptible to parasitic infections. The high prevalence of *Anaplasma* spp reported in this work could have an effect on the pack cell volume (PCV) and total white blood count (TWBC). Olabode et al. [10] reported that *Anaplasma* spp to have caused a decrease in PCV and TWBC resulting in cases of anaemia in cattle and goat in Jos Plateau State. The detection of *Theileria* spp was generally low, [11] reported that *Theileria* spp infection is a mild pathogenic parasite and its ability to produce severe anaemia depends on the occurrence with other parasites.

The relatively high incidence of haemoparasite could be attributed to the favourable environmental conditions for the survival and proliferation of the arthropod vectors responsible for their transmission [5].

Single and multiple haemoparasitic infections recorded for the study are attributed to different tick-borne haemoparasites that the cattle and goats were exposed to. Findings revealed that three species of parasites were singly recorded for the cattle with breeds having not more than two mixed parasites per breed as compared to more complex mixed infections in goats which recorded four single infections.

Table 1. Comparison of a variety of cattle and goats examined for isolated tick-borne heamoparasites

Cattle N	A.c (%)	A.m (%)	B. b (%)	Goats N	A.c(%)	A.m (%)	B.b (%)	T. ovis
W. Fulani 103	22(21.4)	21(20.4)	12(11.6)	W.A.D 38	7(18.4)	5 (13.2)	5 (13.2)	3(7.9)
N'dama 81	14(17.3)	13(16.1)	7(8.6)	A. Red 85	14(16.5)	10 (11.8)	9 (10.6)	7(8.2)
Muturu 44	15 (34.1)	14(31.8)	7(15.9)	R. S 105	17 (16.2)	13 (12.4)	12 (11.4)	8(7.6)
Total 228	51(22.4)	48(21.1)	26(11.4)	Total 228	38 (16.7)	28 (12.3)	26 (11.4)	18(7.8)

$\chi^2=22.06$, $df=12$, $P>0.05$; Key: W.A D=West African dwarf, A. Red=Adamawa, R. S =Red Sokoto, W. Fulani=white Fulani; Central= n= number Examined, Anaplasma central, A. m= Anaplasma marginale, B. b= Babesia bovis, B. o, T. o= Theileria ovis; $\chi^2=22.06$, $df=12$, $P>0.05$

Table 2. Comparison of tick heamoparasitic single infection load on the studied cattle and goats

Cattle	ni (%)	A.c(%)	A.m(%)	B.b (%)	Goats	ni	A.c (%)	A.m (%)	B.b (%)	T.o (%)
W. Fulani	54(44)	22(40)	21(38.2)	11(20)	W.A.D	21 (19.1)	7(33.3)	5(23.8)	5(23.8)	3(14.3)
N'dama	33(27.2)	14(41.2)	13(38.2)	7(20.6)	A. Red	40 (36.4)	14(35)	10(25)	9(22.5)	7(17.5)
Muturu	36(28.8)	15(41.7)	14(38.6)	8(22.6)	R. S	49 (44.5)	17(34.7)	13(26.5)	8(16.3)	9(18.4)
Total	123	51(40.8)	48(38.4)	26(20.8)	Total	110	38(34.5)	28(25.5)	26(23.5)	18(16.4)

$\chi^2=22.06$, $df=12$, $P>0.05$ Key: W.A D=West African dwarf, A. Red=Adamawa, R. S =Red Sokoto, W. Fulani=white Fulani
Central= ni= number infected, Anaplasma central, A. marginale= Anaplasma marginale, B. bovis= Babesia bovis, B. ovis, T. ovis= Theileria ovis

Table 3. Comparison of tick haemoparasitic mixed infection load on the studied cattle and goats

Variety of cattle	ni	A. c + A.m	A.c+ B.b	A.m + B.b				
W.Fulani	55(44)	11 (20)	24 (43.6)	19 (34.5)				
N'dama	34 (27.2)	7 (20.6)	14 (41.2)	12 (35.3)				
Muturu	36 (28.8)	8 (22.2)	16 (44.4)	13 (36.1)				
Total	125	26 (20.8)	54 (43.2)	44 (35.2)				
Breed of Goat	No inf	A.m+A.c	A.m+B.o	A.c+B.o	A.m+T.o	B.o+T.o	A.c+A.m +B.o+T.o	A.m+B.o+T.o
W.AD	21(19.1)	3(14.3)	6(28.6)	4(19.1)	3(14.3)	2(9.5)	2(9.5)	1(4.8)
A.Red	40(36.4)	7(17.5)	11(27.5)	8(20)	6(15)	4(10)	3(7.5)	1(2.5)
R.Sok	49(44.9)	9(18.4)	13(26.5)	10(20.4)	7(14.3)	5(10.2)	4(8.2)	1(2.0)
Total	110	19(17.3)	30(27.3)	22(20)	16(14.5)	11(10)	9(8.2)	3(2.7)

$\chi^2=26.1804$, $df=20$, $P>0.0$; Key: AM=Anaplasma marginale, AC= Anaplasma central, BO=Babesia ovis, TO=Theileria ovis
W. A. D=West African dwarf, A. Red=Adamawa, R. S =Red Sokoto, W. Fulani=White Fulani

5. CONCLUSION

Environmental and climatic conditions of Makurdi appears to favour many tick species. This study reviewed the prevalence of both single and mixed infections of different tick-borne pathogens in different varieties of cattle and goat slaughtered in Makurdi abattoir. The prevailing tick-borne haemoparasites detected in were *A. central*, *A. marginale* and *B. bovis*, in cattle and *A. central*, *A. marginale*, *B. ovis* and *T. ovis* in goats.

ETHICAL APPROVAL

A letter of introduction was given by the Department of Biological Sciences of the University of Agriculture Makurdi. The letter was accepted by the inspection officers at the abattoirs, who in turn gave verbal approval.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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