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Prevalence of Haemoparasites Infecting the Exotic Breeds of Dairy Cattle in Sebore Farm, Mayo-Belwa, Adamawa State. Nigeria

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Abstract
This thesis aimed at studying ticks/haemoparasites of exotic dairy cattle of Sebore Farm, was carried out to provide baseline information on ticks and TBDS and help in proffering solution to their damaging effects on the dairy cattle. 320 dairy cattle were sampled for ticks and tick-borne haemoparasites, (1277) ticks were collected from (120) breeds (Simmental, Jersey, Holstein Friesians, Brown Swiss, Brahman and their crosses), blood samples were collected from (100) breeds (Brown Swiss, Holstein Friesian, Jersey and Simmental). Ticks were collected using entomological forceps, stored in 70% alcohol taken to the Entomology laboratory; blood samples were collected from the jugular vein, 5mls each, stored in EDTA containers, transferred on icebergs to the Protozoology laboratory, of the Parasitology department of NVRI Vom. Ticks placed in petri-dishes with 70% alcohol were identified under low-power, confirmed with the high-power objective lens of the dissecting microscope. Blood samples were processed using HCT for motile parasites/PCV levels, stained thick/thin films in Giemsa were observed under x100 lens of the microscope for haemoparasites. Haemoparasite rate was significantly high (27%), *Babesia bigemmina* (20%) and *Babesia bovis* (7%); the Simmental were the most infested (35%), Brown Swiss (11%) and no infection in the Holstein and Jersey. Nigerian dairy farmers should pay attention to the calves and juveniles when controlling ticks, check attachment sites where ticks are protected from acaricide treatment and explore the use of vaccination which could help eradicate the tick *Rhicephalus*.
Keywords: *haemoparasites, dairy, cattle, prevalence*

Introduction
Ticks are said to be notorious vectors of human and other animal disease agents. They transmit a greater variety of infectious organisms than any other group of blood-sucking arthropods. Worldwide, they are the most important vectors in the veterinary field and second only to mosquitoes in terms of their public health importance [1]. Tick-borne diseases such as babesiosis, anaplasmosis, theileriosis, heart-water and many others have made it difficult or impossible to raise livestock in many tropical and sub-tropical regions of the world [2]. According to Horak *et al.* [3], ticks belong to the sub-order ixodida, of the acarine order parasitiformes. The ixodida

consists of three families, the ixodidae, Argasidae and Nuttalliellidae. The ixodidae are subdivided into the prostriata, represented by the single genus *Ixodes* with 241 species and the metastriata with 442 species, comprising the remaining 11 genera. Horak *et al.* [3], reported that there are 683 species in this family, representing about 80% of all tick species. The Argasidae contain four genera and about 183 species, while the Nuttalliellidae is a monospecific family, represented by only one species [1].

Ticks are of public health significance, mainly because of the zoonotic disease agents transmitted by them, which includes an array of bacterial, viral and protozoan disease agents [4-6]. They are also important, because their attachments can cause various kinds of dermatoses or skin disorders, such as inflammations, pain and swelling. Rarely, they invade the auditory canal causing a condition known as otoacariasis. Certain species of ticks may cause a flaccid, extending and sometimes fatal paralysis. Individuals bitten repeatedly by some ticks may develop allergic or even anaphylactic reactions [7].

Materials and Methods

Study Area

The study was done in Adamawa State is in the North-eastern part of Nigeria.

Experimental Design

One hundred and twenty cattle were randomly selected for the study on tick species. These included Brahman (Males - 0 & Females - 1), Brahman Crosses (Males - 10 & Females - 32), Brown Swiss (Males - 1 & Females - 20), Holstein Friesians (Males - 2 & Females - 2), Jersey (Males - 0 & Females - 1) and Simmentals (Males - 3 & Females - 48). While one hundred dairy Cattle which included Brown Swiss (27), Holstein Friesians (4), Jersey (2) and Simmental (67); were randomly sampled for the haemoparasitic study. The ages and sexes of the animals were obtained from the herders and the predilection sites of the ticks were carefully noted [8].

Ethical Consideration and Consent of the Management

The purpose and benefits of the studies were explained to the management Staff of Sebore Farm; a letter seeking for approval for the study was obtained from the Head of Department Zoology to get the consent and approval of the management. The veterinary doctor in charge of the livestock, the herdsmen and other workers also gave their consent.

Methodology

Collection of Ticks

The dairy cattle were arranged in line within the crusher, examined physically from head to tail including legs for the presence of ticks, which were then carefully collected with entomological forceps avoiding damage to the mouth parts as described by Mohammed (1974). Ticks collected (noting the attachment sites) were preserved in universal containers containing 70% ethanol and transported to the Entomology laboratory, Department of parasitology, National Veterinary Research Institute Vom for identification.

Method for collection of Blood Samples

One hundred exotic dairy cattle were randomly sampled after properly restraining them in the crusher; 5ml of blood was collected from the jugular veins after disinfecting the area with 70% alcohol. This was stored in sterile EDTA containers kept in the fridge at 4^{o}C and subsequently transported on icepacks to the Protozoology laboratory, Department of Parasitology, NVRI Vom for haemoparasite identification.

Identification of Ticks

Ticks were placed in Petri dishes containing 70% alcohol and examined using low power objective of a dissecting microscope and identification was done using the taxonomic keys of morphological characters described by Walker *et al.* [9], at the Entomology Laboratory.

Identification of Heamoparasites

Blood samples were examined using thick and thin smear which were air-dried, fixed for 2 minutes in methyl alcohol and stained by Giemsa diluted 1:10 in buffered saline [10]. Stained blood smears were examined under the X100 objective (oil immersion lens) of the microscope and parasites were identified according to their morphological features [11].

Micro-haematocrit method for packed cell volume (PCV), as described by Ochei & Kolhatkar [12] was followed by briefly filling two capillary tubes with whole blood, hereafter sealing one end with plasticine and spinning in the haematocrit centrifuge at 3000 rpm for 15 minutes. Results were read and recorded appropriately.

Statistical Analysis

Data obtained were analyzed using R Console software (Version 3.2.2, by the R foundation for computing platform, 2015). One-way analysis of variance (ANOVA) was used to compare the mean tick load in relation to cattle breeds, as well as in relation to predilection sites. Proportions of infestation rate of tick load in relation to species of ticks, gender and age groups were compared using Pearson's Chi-square test; which was also used to compare haemoparasites infection rate across cattle breeds and as well as infection rate between the parasites. P-values < 0.05 were considered statistically significant.

Results

Of the 100 cattle examined for tick-borne parasites, 27% (27) were infected, out of which *B. bovis* infected 7% (7) while *B. bigemmina* 20% (20). There was a significant difference (χ^2 =6.2593, df = 1, P = 0.01235) in haemoparasites' infection rate of the cattle breeds. Infection was higher by *B.bigemmina* 20% (20), than by *B. bovis* 7% (7). The Simmental cattle breeds were the most infected with tick-borne parasites, having a prevalence rate of 35% (24), followed by Brown Swiss, 11% (3) while Jersey and Holstein Friesians were not infected (Table 8). Therefore, there was as high significant difference (χ^2 = 59.667, df = 3, P < 0.000001) in the infection rate of tick-borne parasites in relation to cattle breeds.

Table 1: Prevalence of haemoparasites infecting the exotic breeds of dairy cattle

Cattle Breed	No. Exam.	Number Infected		Not Infected	Total Infected (%)
		B. bovis	*B. bigemmina*		
Brown Swiss	27	1	2	24	3 (11.11)
Holstein Friesians	4	0	0	4	0 (0)
Jersey	2	0	0	2	0 (0)
Simmental	67	6	18	43	24 (35.82)
Total (%)	100	7 (7)	20 (20)	73 ( )	27 (27)

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Discussion

From the one hundred exotic breeds of cattle randomly sampled for haemoparsites, there was a significant difference in infection by *Babesia bigemmina* (20%) than by *Babesia bovis* (7%). Abdullah *et al*. [13], identified three genera of haemoparasites, *Anaplasma marginale* (42%), *Thieleria mutans* (40%) and *Babesia bigemmina* (8%), they reported an overall infection rate of 42%. Their report is similar to that recorded by Pakuman *et al.* [14] who reported an overall prevalence rate of 41.8%, identified three species of tick-borne parasites (*Babesia bigemmina, Theileria parva* and *Anaplasma marginale*) and a non-tick-borne parasite, *Trypanosoma vivax*. They encountered mixed infections, identified similar pathogens and reported a very high overall infection rate which is not in agreement with this study. The report of this study agrees with the records of Kamani *et al*. [15] who had an overall prevalence rate of 25.7% in North-central Nigeria; Okorafor & Nzeako [16] reported an overall parasitaemia of 6.67% in Ibadan metropolis; Sitotaw *et al.* [16], reported an overall prevalence of haemoparasites to be 6.3% in and around Debre-zeit, Ethiopia; Hamsho *et al.* [8] observed an overall prevalence of 16.9% of bovine Babesiosis in Teltele district, Borena zone, Southern Ethiopia. The low prevalence and infection rates recorded in the latter studies and in this result may be attributed to the regular treatment of cattle with acaricides and de-warming. Lorusso *et al.* [18] provided an updated molecular-based study on cattle tick-borne pathogens of zoonotic importance in Nigeria cattle, they recorded lower prevalence for organisms as *Babesia bigemmina* (7.9%) and *Babesia bovis* (2.0%) which highlights a less stable epidemiological scenario but they suggested further investigation.

Conclusion

Tick-borne haemoparasitic prevalence was 27%, this raised a point of concern and calls for more research in the evaluation of tick-control measures so as to proffer solutions that will curb the endemic rate of ticks and tick-borne haemoparasites in both local and exotic dairy cattle breeds in the country.

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