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Prevalence of haemoparasitic infections in dairy cattle (Friesian breeds) at nagari integrated dairy farms, Gauta-Nike village, Keffi local government area, Nasarawa state, north central of Nigeria

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ABSTRACT

The of prevalence of haemoparasites of cattle located in Nagari Integrated Farms, Gauta-Nike Village, Keffi Local Government Area, Nasarawa State, Nigeria was conducted in October 2012 where 50 Friesian cattle (male and females) are kept on intensive system of management were randomly selected. Blood samples were collected in an anticoagulant sample bottle and submitted to the Parasitology Laboratory of Faculty of Veterinary Medicine, Ahmadu Bello University Zaria, Kaduna state of Nigeria for parasitological examination. Giemsa stained thin blood smears were examined for hemoparasites and Hematocrit Centrifuge Technique (HCT) was used to determine the presence of motile parasites. An overall prevalence of 90% (82% female and 8% male) was recorded for all samples examined, 21 (42%) were infected with Anaplasma marginale, Theileria mutans shows 20 (40%) prevalence and 4 (8%) were infected by Babesia bigemina. Mixed infection between Anaplasma marginale and Babesia bigemina revealed 2 (4%) while Anaplasma marginale and Theileria mutans was 7 (14%). There was a significant difference ($P > 0.05$) in infections caused by Anaplasma marginale, Babesia bigemina and Theileria mutans (Table 1) and also between

sexes(Table 3), but there was no significant difference ($P<0.05$) between any of the mixed infections observed (Table 2). The result of this study shows these hemoparasites are endemic in the cattle under study which may result in serious disease conditions when such animals are subjected to stressful condition.

1. Introduction

Tick-Borne Diseases (TBDs) are a constraint to livestock production in many developing countries of the world, They are responsible for high morbidity and mortality resulting in decreased production of meat, milk and other livestock products and the loss of draught power, They are also a significant impediment to the improvement of indigenous breeds of cattle, sheep and goats, since they prevent the introduction of more productive exotic breeds (EFSA, 2010). Ticks transmit a greater variety of pathogenic microorganisms, than any other arthropod vector group, and are among the most important vectors of diseases affecting livestock. In general, tick-borne protozoan diseases (e.g. Theileriases and Babesiosis) and rickettsial diseases (e.g. Anaplasmosis and Heartwater or Cowdriosis) are preeminent health and management problems of cattle, small ruminants and buffaloes, affecting the livelihood of farming communities in Africa, Asia and Latin America (Minjauw and Mcleod, 2003).

Cattle in Nigeria may be infected with a widevariety of vector-borne hemoparasites (Callow, 1978; Swallow, 2000). The most economically important genera are the trypanosomes (Trypanosoma vivax, T. congolense and T. brucei), Babesia (Babesia bigemina, B.bovis) Anaplasma and Ehrlichia (Cowdria), and to a less extent Theileria (Theileria parva and T.veilifera) (Leeflang and Ileomabade, 1977). Some haemoparasites species are only evident when the host is undergoing a clinical response to infection, while other members of the same genera may be easily seen in blood smears from apparently healthy animals (Luckins, 1992). African animal trypanosomosis, Babesiosis and Cowdriosis are considered as the most important constraints to the health and improved productivity of cattle in sub-Saharan Africa (Ajayi et al., 1983; FAO, 1984; Young et al., 1988, Bell-sakyi et al., 2004).

Babesiosis is a worldwide tick-borne hemoprotozoosis affecting many mammalian species and caused by intraerythrocytic multiplication of Apicomplexans in the Babesia genus. The evolutionary success of this parasite is attested by the large number of species described more than 100, with numerous species probably remaining to be discovered and/or described (Hunfeld et al., 2008). Babesiae are the second most common blood-borne parasites of mammals after the trypanosomes. More than 100 species of Babesiae have been identified which are traditionally divided on the basis of their morphology into the small and large groups. To date, only ixodid ticks have been identified as vectors for Babesia spp. The specific tick vector must feed on a vertebrate reservoir that is competent in maintaining the Babesia organisms in an infectious state (Uilenberg, 2006).

Anaplasmosis is an arthropod borne, haemolytic disease of ruminants caused by the rickettisial haemoparasite, A.marginale (Kocan et al., 2000). A. marginale is the most prevalent tick borne pathogen of animals worldwide and is responsible for severe morbidity and mortality in temperate, subtropical, and tropical regions (Palmer et al., 2000). Anaplasmosis reduces the animal's body weight, reduces milk production, causes abortions and frequently leads to death (Melendez, 2000 and Stuen et al., 2003). Anaplasma spp transmitted by atleast 20 ticks species, including Argas persicus, Ornithodoros lahorensis, Boophilus annulatus, B. decoloratus, B. microplus, Dermacentor albipictus, D. andersoni, D. occidentalis, D. variabilis, Hyalomma excavatum, Ixodes ricinus, Rhipicephalus bursa, R. sanguineus and R. simus (Marchette and Stiller, 1982).

This research was aimed at determining the prevalence of haemoparasites in exotic breeds of cattle in Nagari Integrated Dairy Farm, Gauta-Nike Village, Keffi Local Government Area, Nasarawa State, Nigeria.

2. Materials and methods

2.1. Study area

Nasarawa State falls within the guinea savannah agro-ecological zone and is found between latitudes 7052'N and 8056'N and longitudes 7025'E and 9037'E respectively. Annual rainfall figures range from 1100 to 2000 mm. The mean monthly temperatures in the State ranges between 200 C and 340C (Lyam, 2000).The State is bounded on the north by Kaduna State, on the east by Plateau State, on the south by Benue State and on the west by Kogi State and the Abuja, FCT. The state has a total human population of about 1,207, 876 (NPC, 2006) and the vegetation is Guinea Savannah which is conducive for farming and rearing of livestock. The state consists of 13 local government areas within three senatorial districts. Keffi Local Government Area where the research was carried out is one of the thirteen LGAs in Nasarawa State, Nigeria. The headquarters is in the town of Keffi with an area of 138 km² and a population of 92,664 (NPC, 2006). Nagari Integrated Diary Farms is located in Gauta-Nike Village, Keffi Local Government Area Nasarawa State, Nigeria.

2.2. Sample collection

5ml blood samples were collected using 18 - gauge sterilised hypodermic needle and syringe from the jugular vein of the cattle which were randomly selected. The hypodermic needle was removed and the plunger of the syringe was gently pushed allowing the blood to flow in to a labelled blood sample bottle containing anticoagulant. The samples collected were preserved in a refrigerator and later submitted to the Parasitology Laboratory of Faculty of Veterinary Medicine, Ahmadu Bello University Zaria, Kaduna state of Nigeria for parasitological examination.

2.3. Sample processing

A thin blood smear was prepared from each blood sample, air-dried, fixed in methanol for 2–3 min, stained in 5% Giemsa stain with added Azur II (2 g/l of undiluted stain) and rinsed in buffered water. The smears were examined at ×1000 magnification (oil immersion) on a Light microscope; at least 50 fields were searched per slide. Presence of hemoparasites was recorded; identification was carried out to genus and where possible, species level. Blood from each sample was introduced into a plain glass microhaematocrit tube, one end of the tube was sealed using molten candle wax or plasticin, and the tubes were spun for 5 min at 13000×g in a Microhaematocrit centrifuge (Hawksley, England). The buffy coat was used to examine the motile blood parasites.

The following results were obtained after repeating the same procedure for each sample.

3. Results

3.1. Prevalence of haemoparasites

A total of 45 samples of the 50 blood samples of cattle (43 females and 7 males) examined parasitologically were positive for different heamoparasites, the overall prevalence was found to be 90% (82% female and 8% males). Three genera of haemoparasites were observed in this study; Anaplasma, Babesia and Theileria. Based on morphological characteristics and epidemiological considerations, the Babesia in bovine blood smears were identified as B. bigemina (large, pleomorphic piroplasms) (Purnel, 1981) and the Theileria species were identified as T.mutans (large, pleomorphic, mainly oval piroplasms) (Norval et al., 1992). Anaplasma specie was identified as A. marginale (Uilenberg, 1982).

21 (42%) of the samples were infected with Anaplasma marginale, 20 (40%) of Theileria mutans and 4 (8%) of Babesia bigemina respectively (Table 1). High infections of the parasites (++) was observed in the Diary cattle with Anaplasma marginale, Babesia bigemina and Theileria mutans having the prevalence of 22%, 2%, and 16% respectively. Mixed infections between A. marginale and B. bigemina revealed 2 (4%), A. marginale and T. mutans was 7(14%), while between B. bigemina and T. mutans was 1 (2%) (Table 2). There is a significant difference ($P > 0.05$) between the three infections observed in Table 1 and also in between sexes in Table 3 below, but no significant difference ($P<0.05$) exist between any of the mixed infections observed in Table 2.

Table1

Prevalence of A. marginale, B. bigemina and T. mutans.

Haemoparasite	Number examined	Number infected	Percentage infected (%)
Anaplasma marginale	50	21	42
Babesia bigemina	50	4	8
Theileria mutans	50	20	40

(P>0.05).

Table2

Mixed infections of A. marginale, B. bigemina and T. mutans.

Haemoparasite	Number examined	Number infected	Prevalence (%)
A. marginale with B. bigemina	50	2	4
A. marginale with T. mutans	50	7	14
B. bigemina with T.mutans	50	1	2

(P<0.05).

Table 3

Prevalence of haemoparasites in both sexes of diary cattle.

Sex	No. Sampled	No. Infected	Prevalence (%)
Male	7	4	8
Female	43	41	82
Total	50	45	90

(P>0.05).

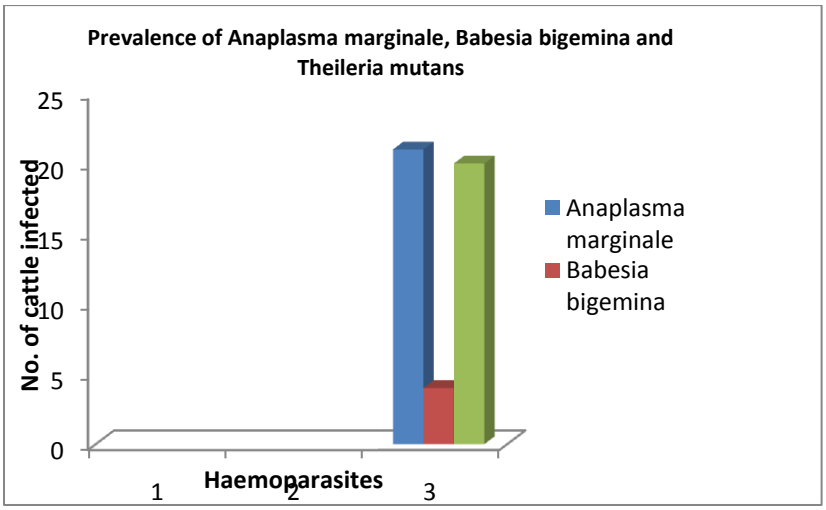

Fig. 1. Barchart showing the prevalences of each heamoparasite identified.

4. Discussion

The study was the first in the Diary Farm and revealed a high prevalence of haemoparasites in the Diary cattle examined. The above data shows an overall prevalence of 42% and this confirms the reports of previous workers on the range of haemoparasites found in cattle in Nigeria (Obi and Anosa, 1980; Leeflang and Ilemobade, 1977; Ajayi et al., 1983; Enwezor et al.,2009). The infection rate of 42% by hemoparasites reported in this study suggests a continuous challenge by parasites and the existence of carrier state in most animals. Anaplasma marginale alone or in combination with other parasites accounts for most of the parasites seen followed by

Theileria mutans. This is in contrast to the work of Kamani et al. (2010) who observed a reverse trend in a survey conducted on Haemoparasitic infections of cattle in North-Central Nigeria, West Africa and also the work of Bell-Sakyi et al. (2004) in a survey conducted in livestock at Ghana, West Africa. Anaplasma marginale was present in 42% which is also in contrast to the earlier report of Obi and Anosa (1980).Theileria mutans is usually of low pathogenicity, however, fatal infections have been reported. It appears to be relatively common in cattle examined and can be attributed to relative abundance of the tick vector, Amblyomma variegatum in the study area (Walker et al, 2003).

There was a significant difference (P>0.05) in the prevalence of hemoparasitism in female and male animals, in which the result shows it is higher in females than males possibly due to the fact that females are kept much longer for breeding and milk production purposes. The lower prevalence in young animals compared to adults can be attributed to restricted grazing of young animals which tends to reduce their chance of contact with the vectors of these diseases (Enwezor et al., 2009). As such effort should be made to improve the management of both young and adult animals in question. Most haemoparasites reported in this work are known to replicate in the erythrocytes leading to hemolysis and anaemia.

The significant difference (P > 0.05) observed between infections caused by the three different genera namely; Babesia bigemina, Anaplasma marginale and Theileria mutans may be due to their differences in virulency and pathogenicity and also host specificity. The high prevalence of Anaplasma marginale recorded by this work compared with other findings in the area can be attributed to the sensitivity of the processing technique employed (Buffy coat smear) and the endemicity of the disease in the area.

There was a persistent mortality of cattle on the farm during one of the dry seasons and also commenced at the end of the previous rainy season. The highest prevalence of vector borne diseases such as trypanasomiasis, babesiosis and helminthosis occurs during the dry seasons. This is also the period when the plane of nutrition is very low due to the reduced pasture. Poor nutrition, especially low protein intake is known to exacerbate parasitic diseases in livestock (Holmes et al., 2000).

The present report confirms the presence of carrier populations of hemoparasite-infected cattle which both serve as a reservoir of infection for tick-vectors and susceptible livestock, and has the potential for clinical relapse under stressful conditions. The pastoral management system of livestock where animals are under continuous challenge of vectors, high cost of acaricides and scarcity of feeds are compounding factors to efforts at controlling the vector-borne diseases. We recommend routine screening of animals or effective control strategies.

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