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Survey of haemoparasitic infections in dairy cattle (Friesian breeds) at Nagari integrated dairy farms, Gauta-Nike village, Keffi local government area, Nasarawa state, North Central State of Nigeria

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ABSTRACT

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The study was conducted in October, 2012 where 50 dairy cattle (male and females) are kept on semi-intensive system of management were randomly selected. Blood samples were collected in an anticoagulant sample bottle and processed at 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), no significant difference ($P < 0.05$) between any of the mixed infections observed (Table 2). Hemoparasites are endemic in the cattle under study which may result in serious disease

conditions when the animals are stressed.

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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. Theilerias 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 .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. 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 and Bell-sakyi et al., 2004).

Babesiosis is a worldwide tick-borne hemoprotozosis 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). *Babesia* are the second most common blood-borne parasites of mammals after the trypanosomes. More than 100 species of *Babesia* 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 rickettsial haemoparasite, *A.marginale* (Kocan et al., 2003). *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 dairy 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 7°52'N and 8°56'N and longitudes 7°25'E and 9°37'E respectively. Annual rainfall figures range from 1100 to 2000 mm. The mean monthly temperatures in the state ranges between 20°C and 34°C (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 (LGA) where the research was carried out is one of the thirteen LGA's 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 Dairy 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 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 minutes, 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 $\times 1000$ 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 \times 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 haemoparasites, the overall prevalence was found to be 90% (82% female and 8% males). 3 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 dairy 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 3 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 (%)
<i>A. marginale</i> with <i>B. bigemina</i>	50		
<i>A. marginale</i> with <i>T. mutans</i>	50		
<i>B. bigemina</i> with <i>T. mutans</i>	50		

($P < 0.05$).

Table 3

Prevalence of haemoparasites in both sexes of Dairy Cattle.

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

($P > 0.05$).

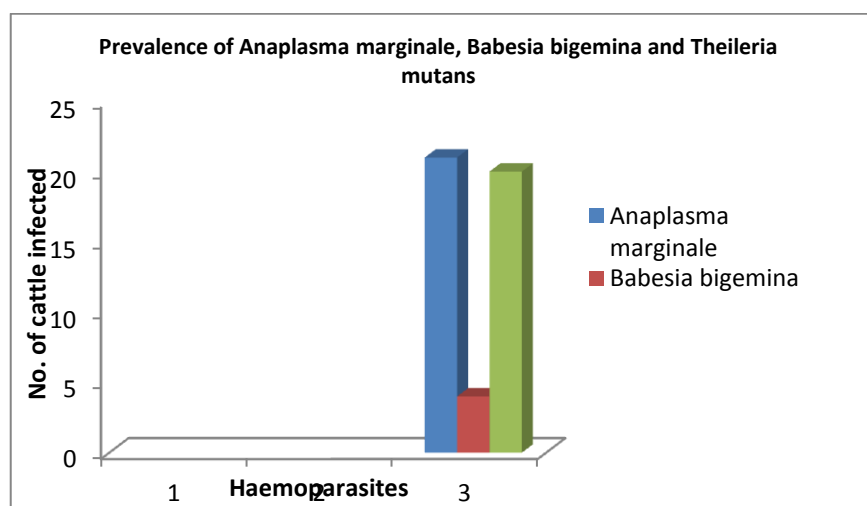


Fig. 1. Barchart showing the prevalences of each heamoparasite identified.

4. Discussion

The study was the first at the Nagari Intergrated Dairy Farm and revealed a high prevalence of haemoparasites in the dairy cattle examined. The above data shows an overall prevalence of 90% and this confirms the reports of previous workers on the range of haemoparasites found in cattle in Nigeria (Leeflang and Ileomabade, 1977; Ajayi et al., 1983; Enwezor et al., 2009). The infection rate of 90% 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 Ajayi et al. (1983). *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 (Kamani et al., 2010). 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 trypanosomiasis, 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).

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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 and other effective control strategies.

References

- Ajayi, S.A., Fabiyi, J.P., Umo, I., 1983. Clinical Anaplasmosis and Babesiosis in Friesian cattle. *World Anim. Rev.*, 36, 68-69.
- Bell-sayki, L., Koney, E.B.M., Dogbey, O., Walker, A.R., 2004. Incidence and prevalence of tick-borne haemoparasites in domestic ruminants in Ghana. *Veter. Parasitol.*, 124, 25-42.
- European Food Safety Authority (EFSA), 2010. Scientific Opinion on Geographic distribution of Tick-borne Infections and their Vectors in Europe and the other Regions of the Mediterranean Basin., 1, J 8(9), 1723.
- Enwezor, F.N.C., Umoh, I., Esievo, K.A.N., Halid, I., Zaria, L.T., Anere, J.I., 2009. Survey of bovine trypanosomiasis in the Kachia Grazing Reserve, Kaduna State, Nigeria. *Veter. Parasitol.*, 159 :121–125.
- Holmes, P.H., Katunguka-Rwakishaya, E., Benninson, J.J., Wassink, G.J., Parkins, J.J., 2000. Impact of nutrition on the pathophysiology of bovine trypanosomiasis. *Parasitol.*, 120, 73-85.
- Hunfeld, K.P., Hildebrandt, U., Gray, J.S., 2008. Babesiosis: Recent insights into an ancient disease. *Int. J. Para.*, 38(11), 1219-1237.
- Kamani, J., Sannusi, A., Egwu, O.K., Dogo, G.I., Tanko, T.J., Kemza, S., Tafarki, A.E., Gbise, D.S., 2010. Prevalence and Significance of Haemoparasitic Infections of Cattle in North- Central, Nigeria. *Veter. World.*, 3 (10), 445-448.

- Kocan, K.M., DelaFuente, J., Guglielmo, A.A., Mendeleiev, R.D., 2003. Antigens and alternatives for control of *Anaplasma marginale* infection in cattle. *Clin. Microbiol. Rev.*, 16, 698-712.
- Leeflang, P., Ilemobade, A.A., 1977. Tick-borne diseases of domestic animals in Northern Nigeria II. Research summary, 1966–1976. *Trop. Anim. Hlth Prod.*, 9, 211–218.
- Lyam, A., 2000. Nasarawa State. In: (Mamman A.B., Oyebanji J.O. & Peters S.W. (eds)), *Nigeria: A people united, a future assured. Survey of States, Vol. 2, 2*, Federal Ministry of Information. Abuja., Pp. 28.
- Marchette, N., Stiller, D., 1982. The Anaplasmataceae, Bartonellaceae and Rochalimaea Quintana, In: Marchette, N.J. (Ed.), *Ecological Relationships and Evolution in the Rickettsiae*, CRC Press, Boca Raton, Florida, USA., Pp. 98-106.
- Melendez, R.D., 2000. Future perspective on veterinary hemoparasite research in the tropic at the start of this century. *Ann. N.Y. Acad. Sci.*, 916, 253–258.
- Minjauw, B., McLeod, A., 2003. Tick-borne diseases and poverty, the impact of ticks and tick-borne diseases on the livelihood of small-scale and marginal livestock owners in India and eastern and southern Africa Research report, DFID Animal Health Programme, Centre for Tropical Veterinary Medicine, University of Edinburgh, UK., 16-19.
- National Population Commission (NPC)., 2006. Census data of 2006, 67-68.
- Norval, R.A.I., Obi, T.U., Anosa, V.O., 1980. Haematological studies on domestic animals in Nigeria IV. Clinico haematological features of bovine trypanosomiasis, theileriosis, anaplasmosis, eperythrozoonosis and helminthiasis. *Zblblatt Vet. Med.*, B27,789–797.
- Palmer, G.H., Brown, W.C., Rurangirwa, F.R., 2000. Antigenic variation in the persistence and transmission of the Ehrlichia spp., *Anaplasma marginale*. *Microbes Infect.*, 2, 167-17.
- Purnell, R.E., 1981. Babesiosis in various hosts In: M. Ristic and J.P. Kreier, Editors, *Babesiosis*, Academic Press. New York., pp. 25 – 63.
- Stuen, S., Nevland, S., Moum, T., 2003. Fatal cases of tick-borne fever (TBF) in sheep caused by several 16S rRNA gene variants of *Anaplasma phagocytophilum*. *Ann. N.Y. Acad. Sci.*, 990, 433 - 434.
- Uilenberg, G., 1982. Disease problems associated with the importation of European cattle in the tropics. In proceedings 12th world congress on diseases of cattle. Amsterdam., 11. pp.1025.
- Uilenberg, G., 2006. Babesia – A Historical Review. *Vet. Para.*, 138, 3–10.
- Walker, A.R., Bouattour, A., Camicas, J. L., EstradaPeña, A., Horak, I.G., Latif, A.A., Pegram, R.G., Preston, P.M., 2003. Ticks of domestic animals in Africa. A guide to identification of species. The University of Edinburgh. UK., pp.23 – 26.