Paper ISSN 0189-0514
Online ISSN 1427-4410
J. Anim. Prod. Res. (2023) 35 (2): 48-57

National Animal Production Research Institute
Ahmadu Bello University
P.M.B 1096, Shika-Zaria,
Kaduna State, Nigeria.
Email:japr@napri.gov.ngUrl:journals.napri.gov.ng

BOVINE HEARTWATER (COWDRIOSIS) IN ZARIA: A RETROSPECTIVE OBSERVATION

Bashir, A.U., Abubakar, Y.U., Muhammad, S.A., Bawa, A.Z., Aliyu, J.H., Umar, A.
National Animal Production Research Institute, Ahmadu Bello University, Zaria, Kaduna State.
Email: ammarbasheer28@gmail.com Phone number: +2348067251366

ABSTRACT

A retrospective study on the occurrence of Bovine Cowdriosis in a livestock production research institute was conducted between 2000 and 2017. A total of 278 cases were diagnosed by the Animal Health Unit of the Institute. Of the 278 cases recorded 13.67% were in Bunaji (White Fulani), 6.12% in Sokoto Gudali, 7.55% were in Friesian, 0.72% in N'dama, 14.03% in Bunaji-Friesian crosses, 52.16% in Friesian-Bunaji Crosses, 1.08% in Charolaise, 0.72% in N'dama crosses, 1.08% in Sokoto Gudali crosses and 2.88% in Charolaise crosses. Bovine heartwater showed remarkable predisposition in sex with 68.35% of cases occurring in Cows and 31.65% in Bulls. The disease equally showed higher occurrence in Adult 53.96% than in Calve 46.04%, also the highest occurrence is in Friesian-Bunaji cross 52.16% and lowest occurrence in N'dama cross 0.72%. The percentage recovery and mortality from the disease were 54.32% and 45.68% respectively. According to this study there is high occurrence in Cow, Adult and Friesian-Bunaji cross, though 54.32% recovered, 45.68% died posing a great economic threat. Statistical significance was not observed in any of the group (P>0.05).

Key words: Bovine Heartwater (Cowdriosis), Breed, Sex, Age

INTRODUCTION

Heartwater is an infectious, noncontagious, tick-borne rickettsial disease of ruminants. The causative organism is an obligate intracellular parasite, previously known as *Cowdria ruminantium* (Merck Manual, 2015). Molecular evidence led to reclassification of several organisms in the order Rickettsiales, and it is now classified as *Ehrlichia ruminantium (*Marcelino *et al*., 2016). Under natural conditions, *Ehrlichia ruminantium* is transmitted by *Amblyomma* ticks (Merck Manual, 2015). The 1974 outbreak of Heartwater in Shika farm coincided with the non-adherence of the strategic tick control measures after 5 successive years in which only 2 cases of the disease were diagnosed and during which time tick control was uniformly good (Ilemobade, 1977). Since transovarial transmission does not occur, there must have been a reservoir of infection other than ticks on the farm to precipitate this outbreak.

Heartwater in Nigeria is usually associated *Amblyomma variegatum* tick (Ilemobade *et al* 1977) which has been established as the incriminating vector. Although no tick was seen on the carcass but it is possible due to the life cycle of the tick being a three-host-tick and also very plentiful in the region (Allsopp *et al*. 2005). As described by Van de Pypekamp and Prozesky, (1987) in cattle acute Heartwater is the most common form of the disease in endemic areas and characterized by high fever (over 40° C) which drops shortly before death. The patients become inappetant, congested conjunctiva mucous membranes. Nervous signs are common and occasionally, the patients remain standing, holding their head low, persistent Bruxism, and showed high stepping gait, laterally fall down with opisthotonous and pedelling of legs. Death follows soon after convulsion. Diarrhoea is frequently seen particularly in cattle (Vera and Irina, 2011).

Cowdriosis was thought to be a specific disease of sheep and goats, which were "the only ruminants known to naturally contract heartwater" (Lounsbury 1902). But however, cattle along with sheep and goats came down with the disease (Logan, 1987; Mutwakil *et al.* 2013). Heartwater has also been reported in wild ruminants like Sitatunga in Nigeria (Okoh *et al*., 1987), eland (*Taurotragus onyx*) (Young and Besson, 1973) and in springbok (*Antidorcas marsupialis*) (Neitz, 1944).

Clinical and laboratory diagnosis of *Ehrlichia ruminantium* is difficult by conventional methods (Mahan *et al.*, 1998). Serological tests are based on detection of antibodies by immunofluorescence or by enzyme-linked immunosorbent assay (ELISA). However, cross-reactivity between *Ehrlichia ruminantium* antigens and antibodies to several Ehrlichia spp. has been observed (Jongejan, 1991; Mahan *et al.*, 1998; OIE, 2002). Molecular diagnosis is presently the most reliable approach for detection of *E. ruminantium* carrier animals and ticks (Waghela *et al*., 1991; Mahan *et al*., 1992; Mutwakil *et al*., 2013).

The disease is endemic in Nigeria and pose a great economic problems to farmers, limited research was conducted with regards to it. . It is on this basis that this retrospective study was conducted to evaluate the economic importance of this condition as it affects animals of all age and gender and overall performance of Nigerian cattle and encourage further investigation on the condition in the country.

MATERIALS AND METHOD

Aim

To determine the factors that influence occurrence of Bovine Heartwater

Objectives

I. To determine the effect of Age on Bovine Heartwater

II. To determine the effect of Breed on Bovine Heartwater

III. To determine the effect of Sex on Bovine Heartwater

Study Location

This study was conducted at National Animal Production Research Institute, Ahmadu Bello University, Shika, Zaria, Nigeria. Shika, is located in the Northern Guinea Savannah between Latitude 11˚N and 12˚N, and between Longitudes 7˚E and 8˚E at the elevation of 650m above sea level. The climate is characterized by average annual maximum and minimum temperatures of 31.0 ± 3.2˚C and 18.0 ± 3.7˚C, respectively. It has a monthly average rainfall of 148.1 ± 68.4 (69.2-231.9) mm during the raining season (May-October).

An Eighteen (18) year (2000-2017) data from the Animal Health records of the institute was used for a case control study. It was analyzed using simple descriptive statistical analysis, T-test and analysis of variance (ANOVA).

RESULTS

A total of 278 clinical cases of Bovine Heartwater were diagnosed at the Institute. Of the 278 cases, 38 (13.67%) were in Bunaji (White Fulani), 17 (6.12%) in Sokoto Gudali, 21 (7.55%) were in Friesian, 2 (0.72%) in N'dama, 39 (14.03%) in Bunaji-Friesian crosses, 145 (52.16%) in Friesian-Bunaji Crosses, 3 (1.08%) in Charolaise, 2 (0.72%) in N'dama crosses, 3 (1.08%) in Sokoto Gudali crosses and 8 (2.88%) in Charolaise crosses. The disease showed higher occurrence rate in Cow 190 (68.35%) than in Bulls 88 (31.65%).

The disease equally showed higher occurence in Adult 150 (53.96%) than in Calve 128 (46.04%), also the highest occurrence is in Friesian-Bunaji cross 145 (52.16%) and lowest occurrence in N'dama cross 2 (0.72%). 151 (54.32%) recovered and 127 (45.68%) died from the disease. (Table 1, Figures 1, 2, 3 and 4).

Table 1: Influence of Age, Breed and Sex on Frequency and Percentage of Occurrence and Fatality of Bovine Heartwater

S/N	CATEGORY		FREQUENCY	PERCENTAGE
	Type	**Group**		**(%)**
1	AGE	a) Adult	150	53.96
		b) Calve	128	46.04
2	BREED	a) White Fulani	38	13.67
		b) Sokoto Gudali	17	6.12
		c) Friesian	21	7.55
		d) Ndama	2	0.72
		e) White Fulani cross	39	14.03
		f) Friesian cross	145	52.16
		g) Charolais	3	1.08
		h) Ndama cross	2	0.72
		i) Sokoto Gudali cross	3	1.08
		j) Charolais cross	8	2.88
3	SEX	a) Male	88	31.65
		b) Female	190	68.35
4	MORTALITY	a) Recovered	151	54.32
		b) Dead	127	45.68

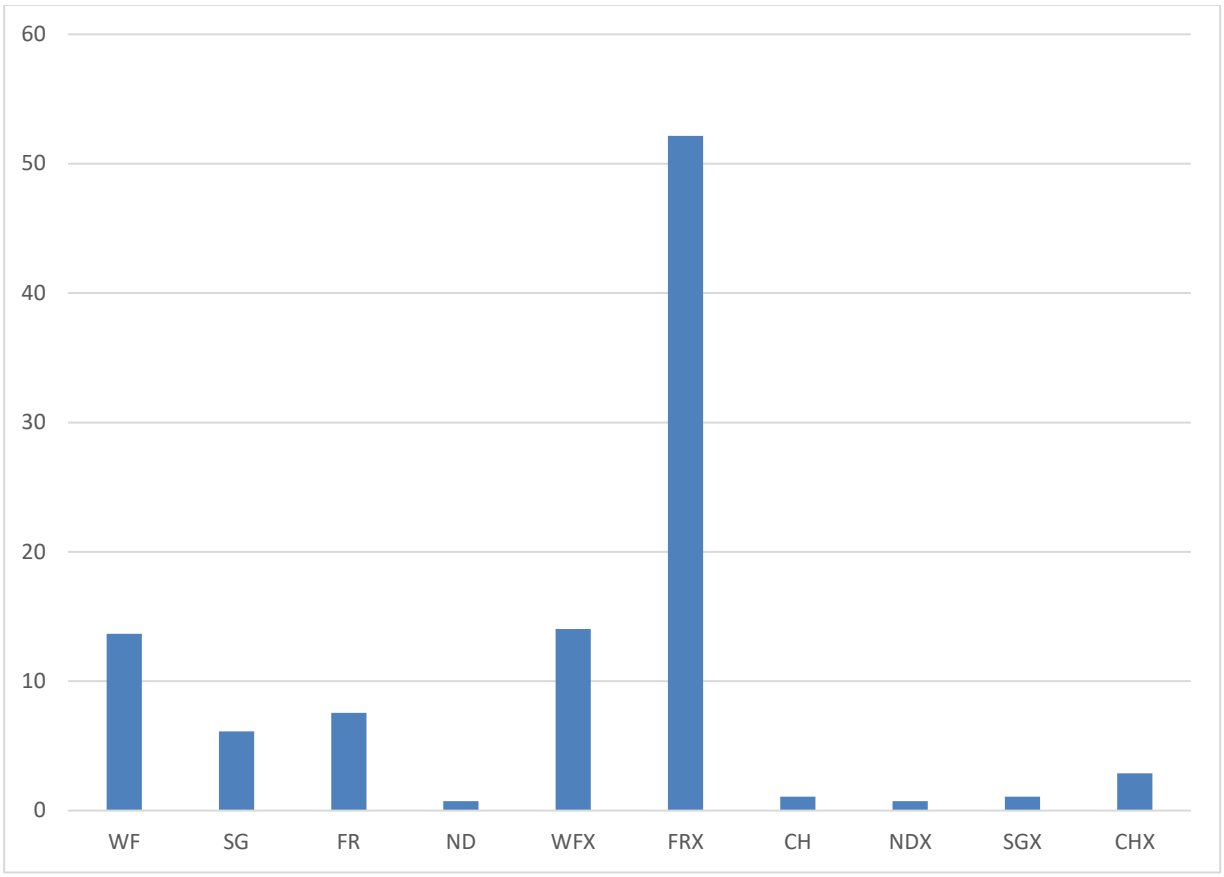


Figure 1: Effect of breed on Frequency of Bovine Heartwater

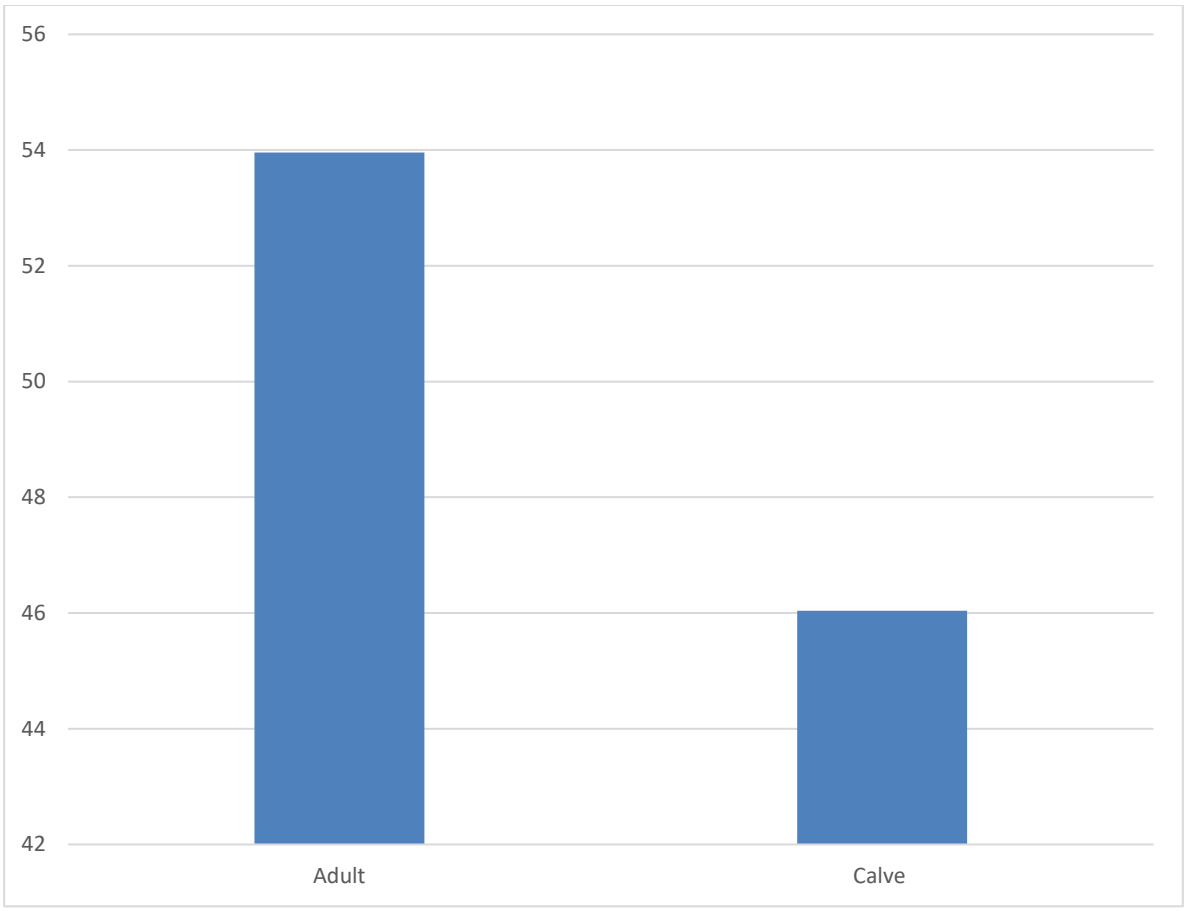


Figure 2: Effect of age on Frequency of Bovine Heartwater

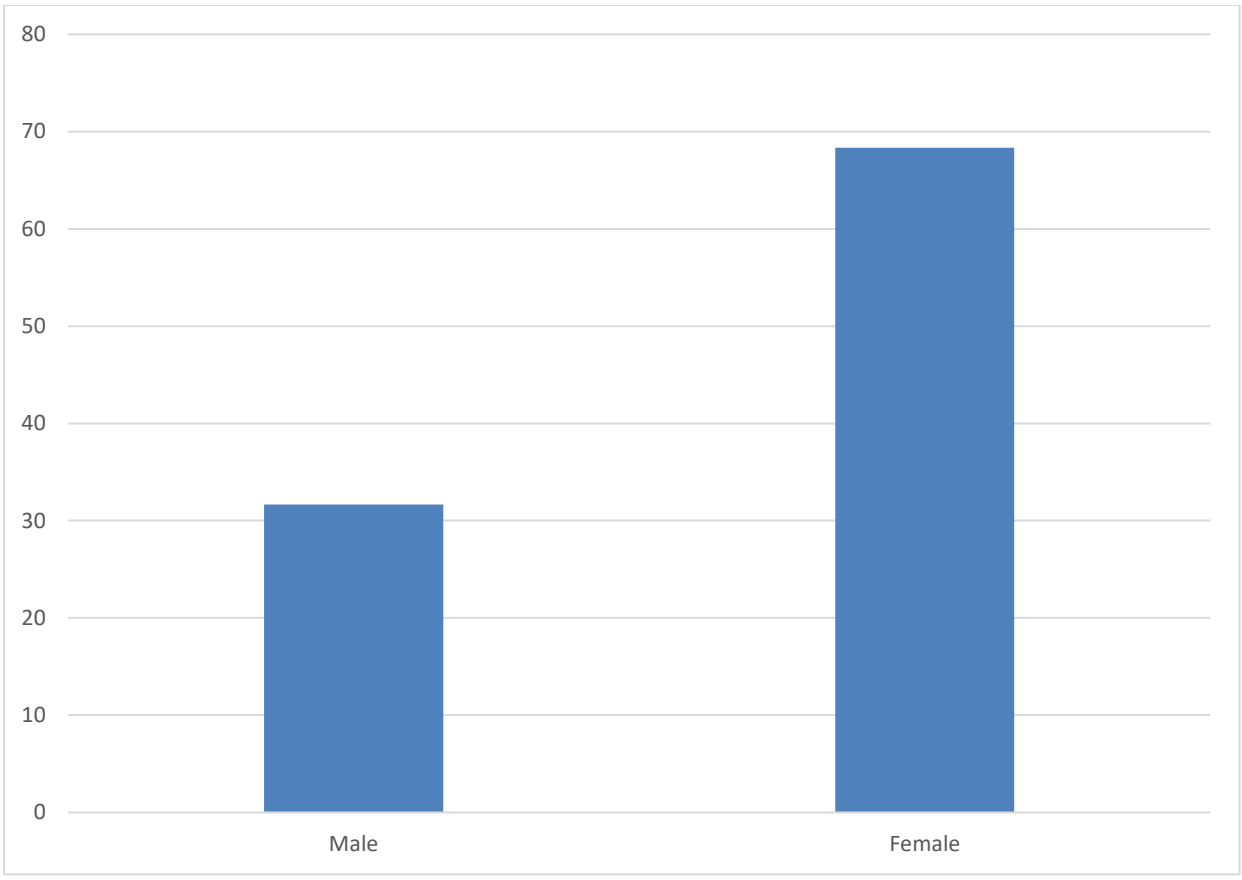


Figure 3: Effect of Sex on Frequency of Bovine Heartwater

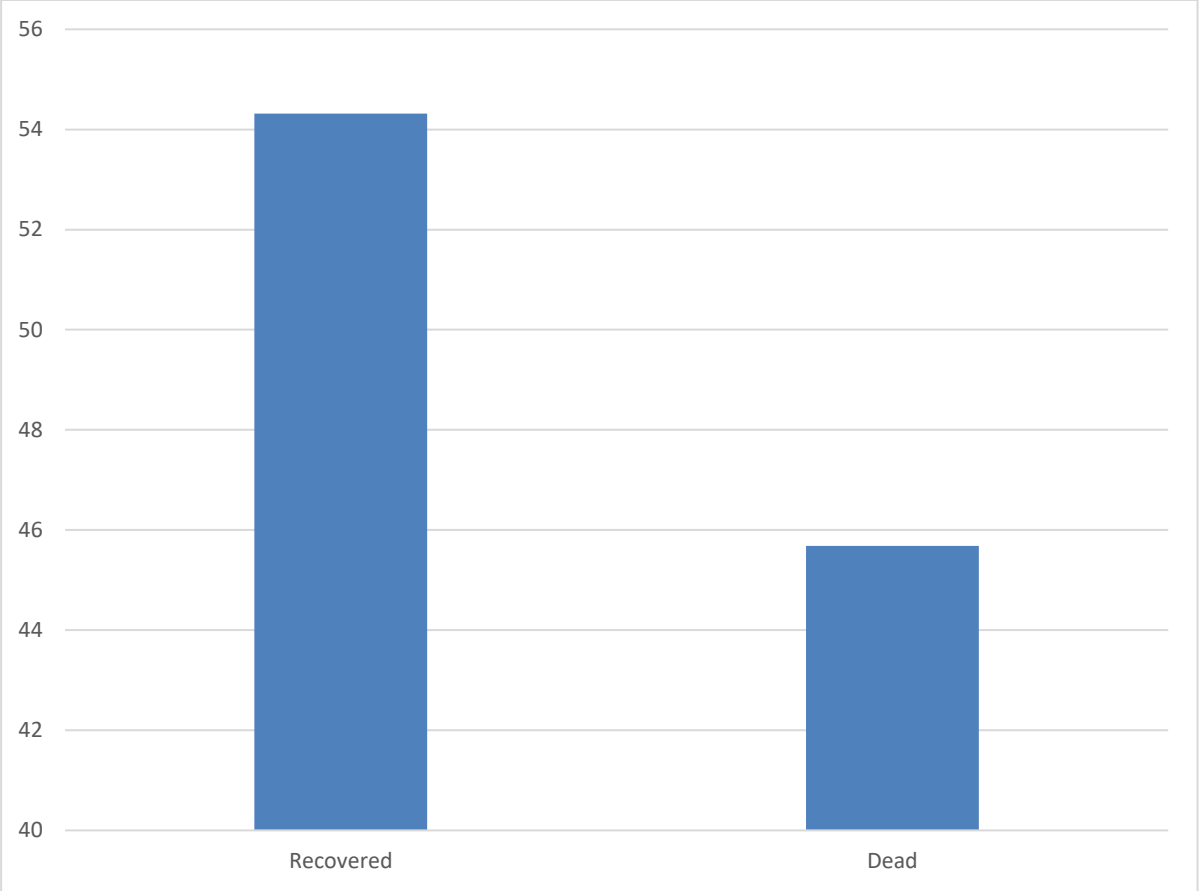


Figure 4: Fatality of Bovine Heartwater

DISCUSSION

High occurrence in female 190 (68.35%) than in male 88 (31.65%) is in line with Achenef *et al*., 2014 who reported that of the 37 cases, 26 (70.27%) were female and 11 (29.73%) were male. The economic losses due to the disease are associated with deaths, the cost of acaricides and antibiotics and loss of milk yield (Achenef *et al*., 2014), which is evident in our research as 127 (45.68%) of the animals died. In a similar study conducted in Arsi, Ethiopia the mortality rate was 15.71% (Obsa and Zerihun, 1993). Heartwater accounted for 51% of all mortalities on farms in Zimbabwe (Meltzer *et al*., 1996) similar to our research where we have 45.68% death. The increased incidence in females 68.35% reflects the relatively low number of male animals in the institute.

Colostrum-derived antibodies to *Cowdria* have been detected in sera from calves up to four weeks old (ILRAD, 1991) which indicate the reason of having less calves 46.04% infected. The less susceptibility of young calves may also indicate reduced exposure to ticks of indoor calves. . It has also been reported that in calves, sero prevalence rose steadily with age up to a maximum of 73% in endemic areas (Koney *et al*., 2004). Esemu *et al*., 2018 reported that there was no statistical significance among cattle of different age, Calves between 0 and 9 months have been shown to have a dominant immune response (acquired and innate) to *Anaplasma* and *Ehrlichia* infections and this may be the reason why all the calves in this study were apparently healthy.

European breeds are generally more susceptible than indigenous African breeds (OIE, 2011), which concurs with our findings whereby 145 (52.16%) in Friesian-Bunaji Crosses has the highest occurrence rate followed by other exotic crosses, with 2 (0.72%) in N'dama with lowest occurrence. The majority (96.7%) of the cattle studied were Gudali which is probably due to the popularity of this breed in the region (Esemu *et al*., 2018). According to U.S. Department of Agriculture, Bos indicus (Zebu) cattle breeds are generally more resistant to heartwater than Bos taurus (European) breeds, which is also in line with our study.

CONCLUSION AND RECOMMENDATION

In conclusion Bovine heart water is prevalent in the institute and can be detected in all stages of cattle, it shows in this study that Bovine Heartwater is of economic importance in Livestock (Cattle) production in Nigeria. High occurrence in female have effect in dairy farms, affects animals that attain puberty and above and good amount of the cattle died although the recovery rate is higher. Various tick control strategies need to be implemented and any evidence of clinical disease needs to be reported without delay, so that treatment can be commenced. To determine the prevalence of the disease, other diagnostic techniques, including serology should be implemented, and care should be taken when introducing new stock, especially if it is from susceptible breeds.

Less is known yet in this condition in Nigeria, therefore there is need for further research to confirm possible causes, modality of transmission, Vaccination production, control measures and economic significance of the disease in Nigeria.

REFERENCES

Achenef, M., Basaznew, B., Mersha, C., Wassie, M., Gizat, A. (2014). A three year follow-up study on the occurrence of bovine ehrlichiosis (cowdriosis) at Gondar University dairy farm. Journal of Veterinary Medicine and Animal Health. Vol. 6(3), pp. 83-90.

Allsopp, B.A., Bezuidenhout, J.D., Prozesky, L. (2005). Heartwater, in: Infectious diseases of livestock, edited by Coetzer, J.A.W. & Tustin, and R.C. Cape Town: Oxford University Press Southern Africa.

Esemu, S. N., Ndip, R. N. and Ndip, L. M. (2018). *Detection of Ehrlichia ruminantium infection in cattle in Cameroon. BMC Research Notes, 11(1).* Doi: 10.1186/s13104-018-3479-2

Ilemobade, A.A., Leeflang, P. (1977). Epidemiology of heartwater in Nigeria Rev. Elev. Med. Vet. Pays trop., 1977, 30(2):149-155

ILRAD (1991). Annual Scientific Report, International Laboratory for Research on Animal Diseases. P.O. Box 30709. Nairobi, Kenya.

Jongejan, F. (1991). "Serodiagnosis of Cowdria ruminantium: Current status. Recent development in the control of anaplasmosis, babesiosis and cowdriosis". Proceeding of a workshop held at ILRAD, 13-15 May 1991, Nairobi, Kenya. p. 68-77.

Koney, E.B., Dogbey, O., Walker, A.R., Bell-Sakyi, L. (2004). Ehrlichia ruminantium seroprevalence in domestic ruminants in Ghana. II. Point prevalence survey. Vet. Microbio. 103:183-193.

Logan, L.L., Whyard, T.C., Quintero, J.C., Mebus, C.A. (1987). The development of Cowdria ruminantium in neutrophils. Onderstepoort Journal of Veterinary Research, 54(2):197-204.

Lounsbury, C.P. (1902). Heartwater in calves. Agricultural Journal of the Cape of Good Hope, 21:165-169.

Mahan, S.M., Semu, S.M., Peter, T.F., Jongejan, F. (1998). Evaluation of the MAP-1B for cowdriosis with field sera from livestock in Zimbabwe. Annal. N. Y. Acad. Sci. 849: 259-261

Meltzer, M.I., Perry, B.D., Donachie, P.L. (1996). Mortality percentages related to heartwater and economic impact of heartwater disease on large-scale commercial farms in Zimbabwe. Prev. Vet. Med. 26:187- 199.

Mutwakil, B.I., Elhassan, M.A.S., Shawgi, M.H., Ahmed, A.G., Khalid, M.S., Ahmed, Z.S.A. (2013). Diagnosis of Ehrlichia ruminantium in Ruminants in Central Sudan Using Polymerase Chain Reaction. Journal of Agricultural and Veterinary Sciences Qassim University. 6(2):59-68

Neitz, W.O. (1944). The susceptibility of the springbuck (Antidorcas marsupialis) to heartwater. Onderstepoort Journal of Veterinary Science 20(1): 25-27.

Obsa, T. and Zerihun, A. (1993). Incidence of Bovine Cowdriosis at Asela Livestock Research Farm. Proceedings of the Fourth National Livestock Improvement Conference, Institute of Agricultural Research, Addis Ababa (Ethiopia). Addis Ababa (Ethiopia): IAR, p. 293-297.

OIE. (2002). "The Office International des Epizootic. "Manual of Standards for Diagnostic Tests and Vaccines, 4th.ed.

Okoh, A.E.J., Oyetunde, I.L., Ibu, J.O. (1987). Heartwater Infection (Cowdriosis) in a Sitatunga (Tragelaphus Spekei) in Nigeria. Journal of Wildlife Diseases. 23(2), 1987, pp. 211-214

The Merck Veterinary Manual, (2015). Overview of Heartwater (Cowdriosis). Last full review/revision May 2024 by Valerie Rodrigues MSc, OMSA expert for Heartwater, CIRAD, UMR ASTRE.

Van de Pype, K. and H.E, Prozesky, L. (1987). Heartwater, an overview of the clinical signs, susceptibility and differential diagnosis in domestic ruminants. Onderstepoort, J. Vet. Res. 54: 263-266.

Waghela, S.D., Rurangirwa, F.R., Mahan, S.M., Yunker, C.E., Crawford, T.B., Barbet, A.F., Burridge, M.J., McGuire, T.C. (1991). A cloned DNA probe identifies Cowdria ruminantium in Amblyomma variegatumticks. J. Clin. Microbiol. 29. 2571-2577.

Young, E., Besson, P.A. (1973). Heartwater in the eland. Journal of the South African Veterinary Association 44: 185-186.

Marcelino, I., Holzmuller, P., Stachurski, F. (2016). Ehrlichia ruminantium, the causal agent of heartwater. In: Thomas S, ed. Rickettsiales: Biology, Molecular Biology, Epidemiology, and Vaccine Development. Springer; 241-280.

Ilemobade, A. A. (1977). Heartwater in Nigeria. I. The susceptibility of different local breeds and species of domestic ruminants to heartwater. Tropical animal health and production, 9(3), 177–180. https://doi.org/10.1007/BF02240335

Vera, R., Irina, G. (2011). Anaplasma, Ehrlichia, and "Candidatus Neoehrlichia" bacteria: Pathogenicity, biodiversity, and molecular genetic characteristics, a review, Infection,

Genetics and Evolution, Volume 11, Issue 8, Pages 1842-1861, ISSN 1567-1348, https://doi.org/10.1016/j.meegid.2011.09.019.