

Prevalence of Besnoitiosis and Associated Histopathological Changes Amongst Apparently Healthy Cattle and Goats at Slaughter in Maiduguri Central Abattoir, Borno State, North Eastern Nigeria

*M. K. Zango¹, S. A. Malgwi¹, F. Kyari¹, A. W. Mbaya¹, A. A. Biu¹ and S. J. Badau²

¹Department of Veterinary Microbiology and Parasitology, Faculty of Veterinary Medicine, University of Maiduguri, Maiduguri, Nigeria

²Department of Veterinary Pathology, Faculty of Veterinary Medicine, University of Maiduguri, Maiduguri, Nigeria

Abstract: This study was conducted to investigate the prevalence of besnoitiosis and associated histopathological changes amongst apparently healthy cattle and goats at slaughter in Maiduguri central abattoir Borno state, Nigeria. A total of 100 skin sections each, from the neck region were randomly collected, preserved in 10% formalin and later taken to the laboratory and subjected to histopathology to detect *Besnoitia* cysts and associated histopathological changes. This study revealed an overall prevalence of 2% in cattle. Out of the 100 skin sections examined from cattle, 38 were from bulls and 62 were from cows. Of the 38 skin sections from bulls examined, 2(5.3%) were positive for *Besnoitia* cyst and none (0%) was positive for the cow's ($P>0.05$). Similarly, of the 100 skin sections examined, 80 were from Wadara breed and 20 from Red bororo. Out of the 80 skin sections examined from Wadara breed, 2(2.5%) were positive for *Besnoitia* cyst and none (0%) was positive for Red bororo ($P>0.05$). However, out of 100 skin sections from goats examined, none was positive for *Besnoitia* cysts revealing 0% prevalence. All the skin sections sampled and examined were from adult cattle and goats. Out of the 100 skin sections examined from the adult cattle, 2(2.0%) were positive for *Besnoitia* cysts. A skin section examined from Wadara breed showed localized area of suppurative dermatitis in the dermis of the skin characterized by massive neutrophilic infiltrations. This is the first report showing the prevalence of besnoitiosis in apparently healthy cattle and goats in Borno state, north eastern Nigeria.

Keywords: Besnoitiosis, Borno State, Cattle and goats, Nigeria, Prevalence

I. Introduction

Besnoitiosis also referred to as bovine elephantiasis and bovine anasarque, is an acute or chronic disease caused by a coccidian protozoan of the genus *Besnoitia*. It affects a wide range of domestic and wildlife [1], [2], and [3]. The lifecycle involves a definitive host and an intermediate host and there are seven classified species of which three occur in domestic livestock. The species are *Besnoitiabesnoiti* in cattle, *B. caprae* in goats, and *B. benneti* in horses, donkeys and mules. The other four *Besnoitia* species infect wildlife species [4]. *Besnoitia* are host specific and *B. caprae* does not infect sheep [4]. Cats are the definitive host for some *Besnoitia* infecting wildlife but the definitive host(s) for the three domestic livestock species are not known [5], [6], [7] and [4].

Besnoitiosis in livestock occurs as outbreaks in some tropical and subtropical regions and sporadically in other areas and in endemic areas, the disease can affect large proportion of the herd and cause significant economic losses [4]. Bovine besnoitiosis has been described in sub-saharan Africa (South Africa, Swaziland, Botswana, Namibia, Zimbabwe, Angola, Congo, Kenya, Uganda, Tanzania, Cameroon, Sudan, Nigeria), Asia (Israel, Russia, South Korea) western and central Europe [8], [9], [10], [11], [12], [13], [14] and [15].

The natural means of transmission is not known, but is presumed to be by ingestion of oocysts from the definitive host(s). Infection with *B. besnoiti* and *B. caprae* can be transmitted experimentally with endozoites and bradyzoites, and mechanically by infections or by biting flies [4]. The role of a carnivorous definitive host in the epidemiology of bovine besnoitiosis remains to be elucidated. Wild ruminants and probably rodents should not be disregarded as reservoirs of the parasites [13] and [16]. However, as at present, bovine besnoitiosis has not been reported to infect man [17].

Clinical cases appear in two distinct stages; the acute anasarca stage and chronic scleroderma stages, with cysts developing in many predominantly superficial tissues [18]. Thickening of the skin (Elephant skin disease) over the lower limbs, around the eyes, nose, face and scrotum, alopecia in all of these areas and white granular cysts in the sclero-conjunctiva can be seen [19]. Infection can also occur in a sub-clinical form, with its

only overt sign being the occurrence of parasitic cysts in the sclera, skin and conjunctiva [18] Recent epidemiological data confirm an increased number of cases and geographical expansion of besnoitiosis in the European Union Member States (EU MS), therefore bovine besnoitiosis should be considered an emerging disease in the EU [17]. However, there is paucity of information on the prevalence of besnoitiosis in Nigeria in general. Thus, this study was undertaken to determine the prevalence of besnoitiosis and associated histopathological changes amongst apparently healthy cattle and goats at slaughter in Maiduguri Central Abattoir, Borno state, North eastern Nigeria.

II. Materials And Methods

Study area

The study was conducted was in Maiduguri the capital of Borno State, Nigeria located between latitude 11° 5' and 12°N and longitude 13° 5' and 14°E at about 354m above sea level with an ambient temperature of 40-45° [20]. The range of 30-50% is the mean relative humidity of Maiduguri with the minimum been experienced in February and March when it drops to as low as 10% and reaches maximum in August when it rises to as high as 90% [21]. The abattoir was established in 1957 for the purpose of providing wholesome meat for human consumption. It is located around kasuwanshanu area in Maiduguri [22].

Sample Size Estimation

The sample size was determined using the formula of [23] using a previous prevalence of 6.7% [24], and the calculated sample size was 96 samples, for more precision 100 skin sections samples each were collected from cattle and goats.

Sample Collection

A total of 100 skin sections each were obtained from apparently healthy cattle and goats at slaughter, around the neck region, measuring about 1 by 1cm each without any clinical manifestation of infection. A simple random sampling technique was employed; samples obtained were preserved in 10% formalin and transported to the Parasitology Laboratory of the Department of Veterinary Microbiology and Parasitology, University of Maiduguri for processing.

Histopathology

The samples were sectioned at 5µm thickness using a rotary microtome, the sectioned skins were dehydrated in ascending grades of alcohol (70%,80%,90% and 100%), and later stained with haematoxylin and eosin stain [25]. The stained skin sections were examined microscopically for the presence of *Besnoitia* cysts containing basophilic granuled bradyzoites [26] and associated histopathological lesions.

Statistical analysis

Data obtained was presented in simple percentages using chi-square [27].

III. Results

The prevalence of besnoitiosis in cattle according to sex in Maiduguri central abattoir, Borno state, northeastern Nigeria is presented in Table 1. Out of the total of 100 skin sections examined, only 2(2.0%) were positive. However, out of the 100 skin sections sampled, 38 were from bulls and 62 from cows. Of the 38 skin sections from bulls examined, 2(5.3%) were positive for *Besnoitia* cyst and none (0%) was positive for the cows. There was no statistical variation in the prevalence rate between sexes ($p>0.05$). Table 2 shows the prevalence of besnoitiosis in cattle according to age in Maiduguri central abattoir, Borno state, northeastern Nigeria. All the 100 skin sections sampled were from adult cattle none was from young. Out of the 100 skin sections examined from the adults, 2 (2.0%) were positive for *Besnoitia* cysts.

Table 3 shows the prevalence of besnoitiosis in cattle according to some breeds in Maiduguri central abattoir, Borno state, northeastern Nigeria. Out of the 100 skin sections sampled, 80 were from Wadara breed and 20 from Red bororo. Out of the 80 skin sections examined from Wadara breed, 2(2.5%) were positive for *Besnoitia* cyst and none (0%) was positive for Red bororo. Similarly, There was no statistical variation in the prevalence rate between breeds ($p>0.05$).

Tables 4, 5 and 6 show the prevalence of besnoitiosis in goats according to sex, age and some breeds respectively. None (0%) of the skin sections of the goats examined were positive for *Besnoitia* cysts.

Figure one (Fig.1) shows photomicrograph of a *Besnoitia* cyst encountered in the dermis of the skin section of wadara cattle. Figure two (Fig.2) shows photomicrograph showing localized area of suppurative dermatitis in the dermis of the skin of wadara cattle characterized by massive neutrophil infiltration

IV. Discussion

This study on the prevalence of besnoitiosis and associated histopathological changes amongst apparently healthy cattle and goats at slaughter in Maiduguri Central Abattoir, Borno state north eastern Nigeria revealed a prevalence of 2.0% in cattle, following the occurrence of *Besnoitia* cysts from various skin sections examined. This is in agreement with the work of [24] in the same study area, who reported a higher prevalence of 6.7% following the occurrence of *Besnoitia* cysts in pachydermatous skin lesions of two cattle (wadara), which showed symptoms of clinical cutaneous besnoitiosis in the study area. The variation between the study conducted by [24] and this present study is that the former, worked on clinically infected cattle, while in this present study apparently healthy cattle and goats were examined which might have accounted for the lower prevalence rate recorded.

Similarly an in-apparent form of besnoitiosis was reported in Nigerian cattle, which had neither clinical signs nor gross lesions suggestive of the disease, but *Besnoitia* cysts were found in skin sections [28]. However, this is in consonance with the present study carried out amongst apparently healthy animals, no clinical signs or skin lesions were observed prior to laboratory examination of skin sections but revealed the presence of *Besnoitia* cysts.

In this study, only bulls (5.3%) revealed the presence of *Besnoitia* cysts which is contrary to the findings of [24], who recorded 13.6% and 2.7% prevalence in bulls and cows respectively. [29], also reported the first incidence of caprine besnoitiosis in female goats (does) in a study conducted in Anchau area of Kaduna state. Similarly, in this study, only skin sections from the Wadara breed of cattle were positive for *Besnoitia* cysts and this is in consonance with the work of [24] who also reported only positive cases from Wadara breed of cattle. This could possibly be due to the susceptibility of the Wadara breed to bovine besnoitiosis as suggested by [24]. In this study only skin sections from adult cattle and goats were sampled and examined which revealed 2% prevalence in adult cattle only. This is due to the fact that animals slaughtered in the abattoir during the period of this investigation were adults; young ones are only slaughtered as a result of serious trauma or ailment with poor prognosis. However, [8] reported that there is a relationship between the age of the animal and the epidemiology of the disease. He further stated that in a study conducted on a farm where the disease was present, the highest incidence of infection was detected in adult animals but was rarely encountered in calves less than 6 months of age. Histopathologically, a skin section examined from wadara breed showed localized area of suppurative dermatitis in the dermis of the skin characterized by massive neutrophil infiltration which is suggestive of secondary bacterial infection [30].

V. Conclusion

In conclusion, *Besnoitia* cysts were identified in an apparent or sub-clinical form exclusively in the Wadara bulls. This study therefore provided base line information on the prevalence of the infection amongst sex, age and some breeds of cattle and goats in the study area.

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Table 1: prevalence of besnoitiosis in cattle according to sex in Maiduguri Central Abattoir, Borno state, northeastern Nigeria

Sex	No. Examined	No. Positive (%)
Male (Bulls)	38	2(5.3) ^a
Female (Cows)	62	0(0.0) ^a
Total	100	2(2.0)

Numbers with same superscripts in 3rd column did not differ significantly (P>0.05): chi-square

Table 2: Prevalence of besnoitiosis in cattle according to age in Maiduguri Central Abattoir, Borno state, northeastern Nigeria

Age	No. Examined	No. Positive (%)
Adult	100	2(2.0) ^a
Young	0	0(0.0) ^a
Total	100	2(2.0)

Numbers with same superscripts in 3rd column did not differ significantly (P>0.05): chi-square

Table 3: Prevalence of besnoitiosis in cattle according to some breeds in Maiduguri Central Abattoir, Borno state, northeastern Nigeria

Breed	No. Examined	No. Positive (%)
Wadara	80	2(2.5) ^a
Red bororo	20	0(0.0) ^a
Total	100	2(2.0)

Numbers with same superscripts in 3rd column did not differ significantly (P>0.05): chi-square

Table 4: prevalence of besnoitiosis in goats according to sex in Maiduguri Central Abattoir, Borno state, northeastern Nigeria

Sex	No. Examined	No. Positive (%)
Male (Buck)	32	0(0.0) ^a
Female (Doe)	68	0(0.0) ^a
Total	100	0(0.0)

Numbers with same superscripts in 3rd column did not differ significantly (P>0.05): chi-square

Table 5: Prevalence of besnoitiosis in goats according to age in Maiduguri Central Abattoir, Borno state, northeastern Nigeria

Age	No. Examined	No. Positive (%)
Adult	100	0(0.0) ^a
Young	0	0(0.0) ^a
Total	100	0(0.0)

Numbers with same superscripts in 3rd column did not differ significantly ($P>0.05$): chi-square

Table 6: Prevalence of besnoitiosis in goats according to some breeds in Maiduguri Central Abattoir, Borno state, northeastern Nigeria

Breed	No. Examined	No. Positive (%)
Sokoto red	70	0(0.0) ^a
Borno white	30	0(0.0) ^a
Total	100	0(0.0)

Numbers with same superscripts in 3rd column did not differ significantly ($P>0.05$): chi-square

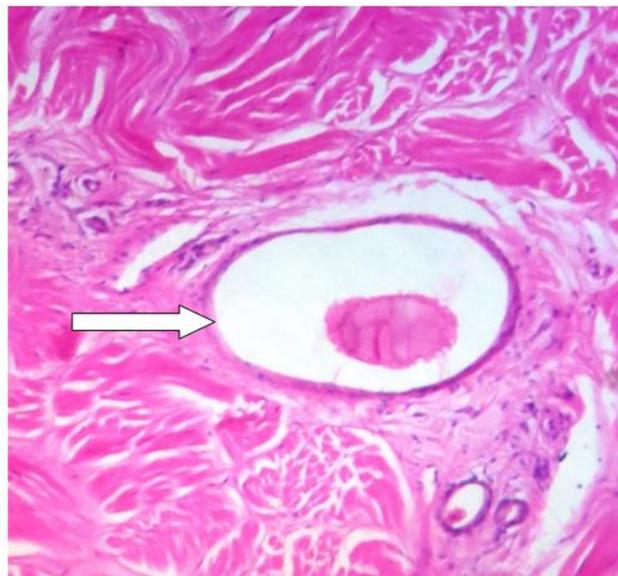


Fig. 1: Photomicrograph of a *Besnoitia* cyst encountered in the dermis of the skin section of wadara cattle (arrow), H & E, X100.

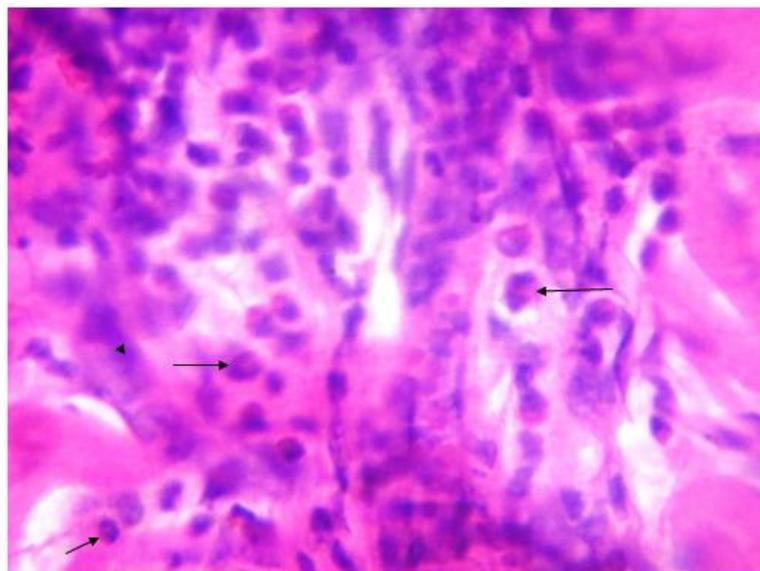


Fig. 2: Photomicrograph showing localized area of suppurative dermatitis in the dermis of the skin of wadara cattle characterized by massive neutrophil infiltration (arrows). H & E, X400.