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# Seasonal Occurrence of Tick-Borne Haemoparasite of Catlle in Makurdi Metropolis, Benue State, Nigeria

**Atsuwe T. S.*[1], Amuta E. U.[1], Imandeh G. N.[1] and Azua E. T.**

*Department of Zoology, Federal University of Agriculture Makurdi, Benue State*

***Corresponding Author:** Atsuwe Terese S., Department of Zoology, Federal University of Agriculture Makurdi, Benue State. Nigeria.*

## ABSTRACT

*A study on seasonal occurrence of tick-borne haemoparasite of cattle in Makurdi Metropolis, Benue state was carried out, A total of 432 cattle comprising of 216 of cattle slaughtered at abattoir at Wurukum, Wadata, Modern market and Cattle Market in both dry and wet season were examined. Age of cattle was determined by examination of the teeth of the cattle based on the time of eruption and the amount of wearing of the teeth. Blood sample were collected at designated areas for the period of six (6) months (December 2018 to February 2019 and May to July 2019) respectively to cover both the dry and wet season. A thin blood film technique was used to detect tick borne haemoparasites. Data obtained were analyzed using t-test and P values less than 0.05 ($p \leq 0.05$) were considered significantly different. The result of prevalence of cattle infected with tick-borne haemoparasite based on location revealed that Wurukum Abattoir (22(61.11%)) and Wadata Abattoir (22(61.11%)) recorded the highest prevalence of infection followed by UAM farm (19(52.70%)) and lowest prevalence (14(38.8%)) of infection was recorded in Cattle Market Abattoir while Modern Market abattoir and Cattle Market recorded a moderate percentage of prevalence range of 18(50%) and 15(41.66%) respectively in dry season. And during wet season, the highest prevalence was observed in UAM farm 28(77.77%) while the lowest (14(38.88 %)) infection prevalence was recorded in Wurukum Abattoir. Although the highest prevalence of thick borne haemoparasite in cattle was recorded in Wet season, but the difference was not statistically significant ($p < 0.05$) when compared with the dry season. Results of Seasonal occurrence of tick-borne haemoparasite revealed the present of Bebesia, Anaplasma spp and Theileria sp, with Anaplasma spp recorded the highest (103(80.47 %)) occurrence in wet season and concurrently recorded highest in dry season though the difference was not statistically significant ($p < 0.05$). The least occurrence species of tick borne haemoparasite was Theileria sp and this was recorded across the two seasons. Thus, this seriously indicate the presence of tick vectors and their continuous transmission of tick-borne haemoparasites. There should be a periodic quarantine of animals, good animal husbandry and monitoring of various abattoirs against unqualified veterinary practitioners to minimize the prevalence of the infection.*

**Key words:** *Tick-borne; Haemoparasite; Bebesia; Anaplasma spp ; Theileria sp; Makurdi.*

## INTRODUCTION

Ticks are parasites that are costly to their hosts as they divert resources for their growth, reproduction, and survival with no reward for the hosts. Development and transmission of haemoparasites by tick vectors are phenomena closely synchronized with the tick feeding cycle (Sonenshine, 2014). Ticks are among the most important vectors of animal diseases caused by protozoa,rickettsiae, bacteria, viruses and some helminths. They rank second only to mosquitoes as vectors of life threatening or debilitating human and animal diseases. Moreover, ticks have been reported to transmit a greater variety of infectious agents than any other arthropod group (Estrada-Peña, 2015). Apart from the discomfort they cause, these blood-sucking ectoparasites cause considerable production losses especially to improved cattle breeds in the Afrotropical region (Horak*et al.*, 2011).Almost all ticks belong to one of two major families, the Ixodidae or hard ticks, and the Argasidae or soft ticks. Adults have ovoid or pear-shaped bodies which become engorged with blood when they feed, and have eight legs. In addition to having a hard shield on their dorsal surfaces, hard ticks have a beak-like structure at the front containing the mouthparts whereas soft ticks have their mouthparts on the underside of the body. Both families locate a potential host by odour or from changes in the environment ((Horak*et al.*, 2011). Makurdi, capital of Benue state is challenged with tick-borne haemoparasites of cattle that are responsible for severe losses caused either by tick worry, blood loss, blood related infections, damage to hides, udders and the transmission of toxins, or through morbidity or mortality caused by the diseases they transmit. Thus this study was carried out to assess the seasonal occurrence of tick-borne haemoparasite of cattle in Makurdi Metropolis, Benue State.

## MATERIALS AND METHODS

### Study Area

Makurdi is located on latitude $7^0$ .$74^0$N and longitude $08^0$ $51^0$E. It has a tropical sub-humid climate, with two distinct season, namely a wet season and a dry season. Makurdi has many abattoirs, this study was carried out from the abattoir at Wurukum, Wadata, Modern market and Cattle Market Abatoir. Distribution of the abattoir in Makurdi is presented in Figure 1.

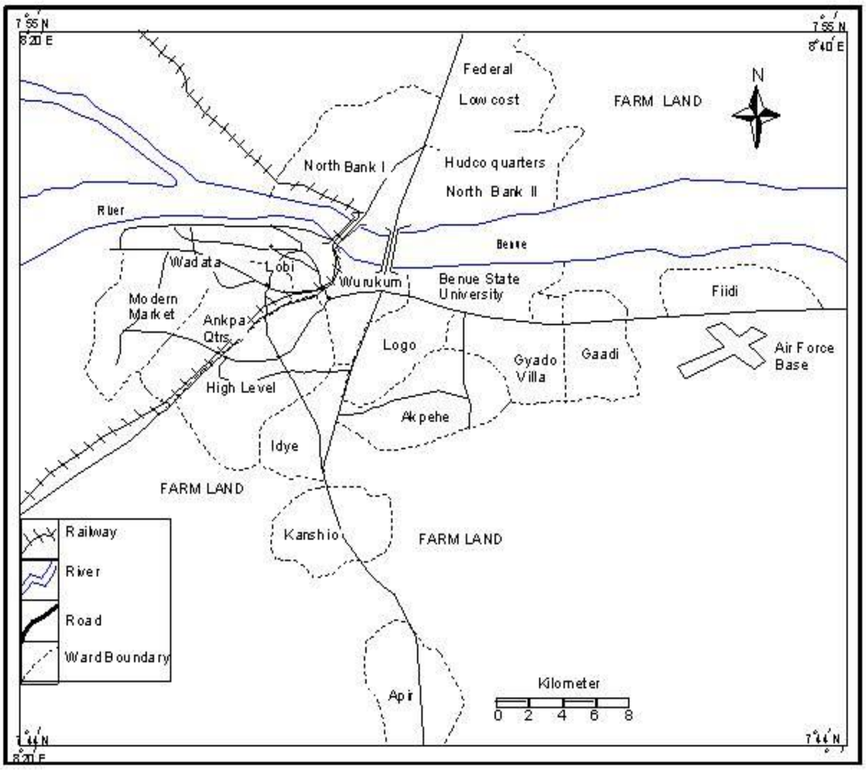



**Figure1:** *Map of Makurdi Local Government showing sampling sites (Ministry of Lands and Survey, Benue State).*

### Determination of Cattle Age

The age ofcattle was determined by examination of the teeth of the cattle as described by John (2008), Jane and Brandi (2013) and FSIS (2013). Briefly, time of eruption and the amount of wearing of the teeth were the major factors adopted to estimate the age of the examined cattle.

For age 0-1, the entire set of eight temporary incisors appears in the calf.

For two (2) years of age,the first two central incisors are replaced with permanent teeth.

For age 3, the first intermediates (one of each side of the pincers) are fully developed.

For age four (4) years, the second set of intermediates are present.

For age 5, the cattle usually have a fully set of incisors with the corners fully developed.

For age 6, the development is quite complete, at that time the borler of the incisors has been worm away a little below the level of the grinders.

For age 7,the first grinders begin to wear, and are on a level with the incisors.

For age 8, the wearing of the first grinders is very apparent.

At ten or eleven years, used surfaces of the teeth begin to bear a square mark surrounded by a white line, and this is pronounced on all the teeth by the twelfth year, between the twelfth and the fourteenth year this mark takes a round form (John, 2008; Jane and Brandi, 2013; FSIS, 2013).

### Sample Size Determination and Sample Selection

A total of 432 cattle comprising of 216 of cattle slaughtered at abattoir in the dry and wet season were randomly sampled during the period of study. This size was arrived at using Taro-Yamane's formular;

$S = N/1 + N\ (e)^2$

N = Population studied.

e = Error margin (0.05)

### Sample Collection

Blood sample was collected at designated areas for the period of six (6) months (December 2018 to February 2019 and May to July 2019) respectively to cover both the dry and wet season. Blood samples were collected from the cattle by jugular vein puncture into EDTA bottles.

The sample was labeled properly, placed in a cooler and transported immediately to University of Agriculture Veterinary Teaching Hospital laboratory, Makurdifor examination usingMicroscopic method by thin blood film method as described by (Gerald *et al*., 2010).

### Thin Blood Film Method

A thin blood film technique was employed to detect tick borne haemoparasitesas described by(Gerald *et al*., 2010).The blood was mixed gently with the aid of an applicator stick, few drops of blood was placed at the end of the slide at about 2cm to the edge of the slide. A separator was placed in front of the drops of blood and push backward to allow the separator to touch the blood and allowed to spray all to the sprayer. A firm push was made forward to make the blood dragged behind the separator slide to form a film. The procedure was completed as quickly as possible. The smear was allowed to dry and was labeled for proper identification. The smear was fixed in absolute methanol for five minutes and allowed to dry and was covered with Giamsa stain (Romanowslay stain) and allowed for 35 to 40 minutes and was washed with water and allowed to dry. The sample was viewed using a Microscope at X 100 objectives oil immersion for identification of tick borne haemoparasite (Gerald *et al*., 2010).

### Analysis of Data

Data obtained were analyzed using t-test and significant differenceswere considered at P values ≤ 0.05 (p ≤ 0.05).

## RESULT

### Prevalence of Cattle Infected with Tick-Borne Haemoparasite based on Location.

The result of prevalence of cattle infected with tick borne haemoparasite based on location is presented in Table I. During dry season, Wurukum Abattoir (22(61.11%)) and Wadata Abattoir (22(61.11%)) recorded the highest prevalence of infection followed by UAM farm (19(52.70%)). The lowest prevalence (14(38.8%)) of infection was recorded in Cattle Market Abattoir while Modern Market abattoir and Cattle Market recorded a moderate percentage of prevalence range of 18(50%) and 15(41.66%) respectively.

During wet season, the highest prevalence was observed in UAM farm 28(77.77%) while the lowest (14(38.88 %)) infection prevalence was recorded in Wurukum Abattoir. Although the highest prevalence of thick borne haemoparasite in cattle was recorded in Wet season, but the difference was not statistically significant (p < 0.05) when compared with the dry season. Accross all the locations in the two seasons, low prevalence range of infection was seen in both seasons.

**Table 1:** *Prevalence of cattle infected with tick borne haemoparasite based on location.*

| Location | Dry season No. of Cattle examined (%) | No. of Cattle infected | Wet season No. of Cattle examined (%) | No. of Cattle infected |
|---|---|---|---|---|
| Wurukum abattoir | *36(16.67)* | *22(61.11)* | 36*(16.67)* | 14(38.88) |
| Wadata abattoir | *36(16.67)* | *22(61.11)* | 36*(16.67)* | 17(47.22) |
| Modern market abattoir | *36(16.67)* | *18(50.00)* | 36*(16.67)* | 21(58.33) |
| Cattle market | *36(16.67)* | *15(41.66)* | 36*(16.67)* | 20(55.55) |
| UAM farm | *36(16.67)* | *19(52.77)* | 36*(16.67)* | 28(77.77) |
| Cattle market abattoir | *36(16.67)* | *14(38.88)* | 36*(16.67)* | 20(55.55) |
| Total | *216(100.00)* | *110(50.92)* | 216*(100.00)* | 120(55.55) |

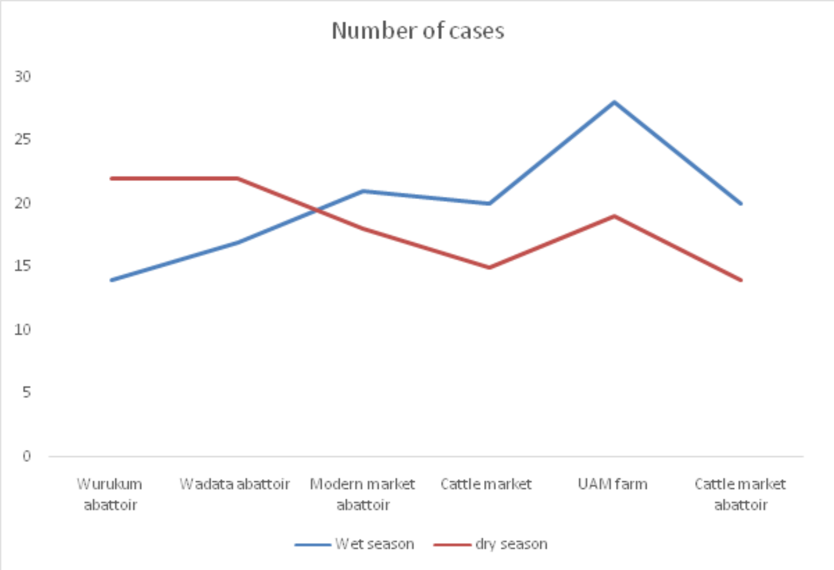



**Fig2:** *Graph showing Prevalence of cattle infected with tick borne haemoparasite based on location.*

## Seasonal Occurrence of Tick Borne Haemoparasite on Studied Cattle

Seasonal occurrence of tick borne haemoparasite on cattle is presented in Table 2. *Anaplasmaspp* recorded highest (103(80.47)) occurrence in wet season and concurrently recorded highest in dry season though the difference was not statistically significant ($p < 0.05$). The least occurrence species of tick borne haemoparasite was *Theileria sp* and this was recorded across the two seasons.

However, the occurrence of *Theileriaspp* was higher in dry season than the wet season but the difference was not statistically significant ($p < 0.005$). *Babesiaspp* recorded percentage occurrences ranging from 12(36.36 %) to 25(45.09 %) in dry season and 9 (20.45 %) to 6 (14.29 %) in Wet season.

**Table 2:** *Seasonal occurrence of tick borne haemoparasite on studied cattle.*

| Haemoparasite encounter | December | Dry Season January | February | Prevalence Rate (%) | June | Wet Season July | August | Prevalence Rate (%) |
|---|---|---|---|---|---|---|---|---|
| Anaplama SPP | *25(49.01)* | *25(60.98)* | *21(63.64)* | *71(56.80)* | 36(85.71) | 34(79.07) | 33(75.00) | 103(80.47) |
| Babesia SPP | *23(45.09)* | *15(36.59)* | *12(36.36)* | *50(40.00)* | 6(14.29) | 8(18.60) | 9(20.45) | 23(17.97) |
| Theileria SPP | *3(5.88)* | *1(2.44)* | - | *4(3.20)* | - | 1(2.33) | 1(2.27) | 2(1.56) |
| Total | *51(100.0)* | *41(100.0)* | *33(100.0)* | *125(100.0)* | 42(100.0) | 43(100.0) | 44(100.0) | 128(100.0) |

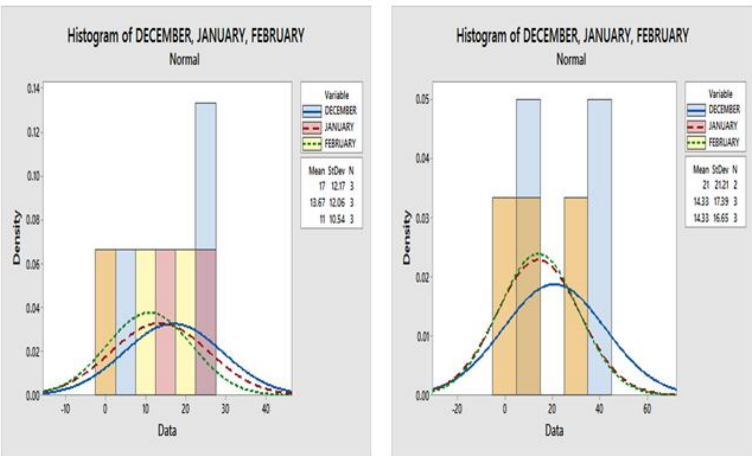



**Fig3:** *Histogram showing Seasonal occurrence of tick borne haemoparasite on studied cattle.*

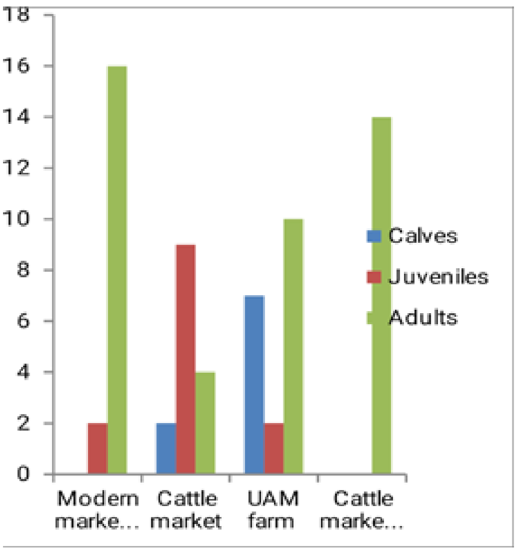
### Cattle Screened and Found Infected Withtick-Borne Disease Using Microscope in the Study Area

The result of cattle screened and found infected fortick-borne disease using microscope in the study area is presented in Table 3. Calves in all the study area except in Cattle market and UAM farm did not record any tick-borne disease in juvenile in cattle market in both seasons but only in juvenile in UAM farm.

However, there was a corresponding prevalence of tick-borne disease across the cattle inWurukum Abattoir which showed the highest (63.9%) in wet season while UAM farm recorded the highest occurrence of tick-borne diseases in wet season.

**Table 3:** *Cattle screened and found infected for tick-disease using microscope in the study area.*

| | Animals infected Dry Season | | | | | Animals infected Wet Season | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | Total Cattle Population | Calves | Juveniles | Adults | Total | Total Cattle Population | Calves | Juveniles | Adults | Total |
| Wurukum abattoir | *36(16.67)* | - | 6(16.67) | 17(47.22) | 23(63.9) | *36(16.67)* | - | 3(8.3) | 12(33.3) | 15(41.7) |
| Wadata abattoir | *36(16.67)* | - | 3(8.33) | 18(50.00) | 20(55.6) | *36(16.67)* | - | 3(8.3) | 14(38.9) | 17(47.2) |
| Modern market abattoir | *36(16.67)* | - | 2(5.56) | 16(44.44) | 18(50.0) | *36(16.67)* | - | 6(16.7) | 15(41.7) | 21(58.3) |
| Cattle market | *36(16.67)* | *2(5.56)* | 9(25.0) | 4(11.11) | 15(41.7) | *36(16.67)* | 1(2.8) | 14(38.9) | 6(16.7) | 21(58.3) |
| UAM farm | *36(16.67)* | *7(19.44)* | 2(8.33) | 10(27.78) | 19(52.8) | *36(16.67)* | 9(25.0) | - | 18(50.0) | 27(75.0) |
| Cattle market abattoir | *36(16.67)* | - | - | 14(38.89) | 14(38.9) | *36(16.67)* | - | 5(13.9) | 14(38.9) | 19(52.8) |
| Total | *216(100.0)* | *9(4.17)* | 22(10.19) | 79(36.57) | 110(50.9) | 216(100.0) | 10(27.8) | 31(14.4) | 79(36.6) | 120(55.6) |



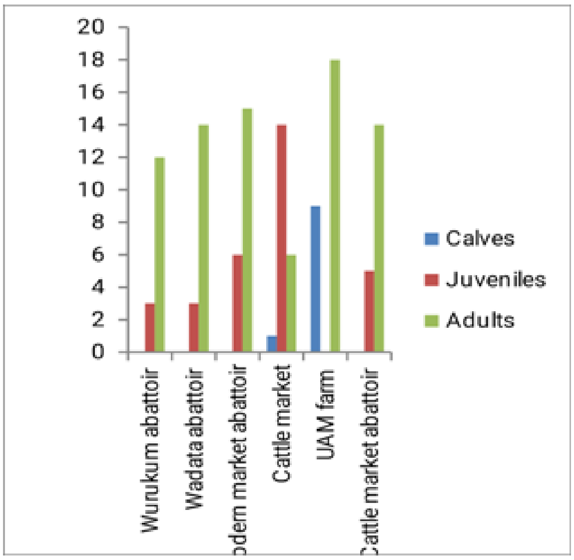




**Fig4:** *Histogram Showing Cattle screened and found infected for tick-borne diseases using microscope in the study area.*

## DISCUSSION

The result revealed low prevalence of infection in dry season and high prevalence of infection in wet season though the difference was not statistically significant at p≤ 0.05.

The high prevalence of tick borne infection in wet season could probably be attributed to life cycle of the ticks as the newly developed ticks as seen abundant in the wet season while they are buried in the soil during dry season and the abundant of grasses making the ticks guest upon the grazing animals. This result is similar to the study conducted by Mattioli*et al*. (1997) who reported high prevalence of N'dama cattle in wet season in Gambia compared with the dry season in their study on seasonal prevalence of ticks and tick-transmitted haemoparasite in traditionally managed N'dama cattle with reference to strategic tick control in Gambia (Mattioli*et al*., 1997). Apurba*et al*. (2018) also reported high prevalence of tick borne haermoparasites in wet season in their study on prevalence of tick borne haemoparasitic diseases in cattle of west Bengali India (Apurba*et al*., 2018).

The result of seasonal occurrence of ticks borne haemoparasite on cattle reveals highest occurrence of *Anaplama sp* in both wet and dry seasons. This is attributed to the presence of the tick vector. Anaplasma has reported to be transmitted by at least 20 ticks of various species including *Hyacommaspp*, *Rhipicephahisspp*, *Boophilusspp*, *Ixodesspp*, *Demacentorspp* among others (Taruun*et al*., 2015). However, *Boophilusmicrophus* has been found to be the major transmitting agent and reports of its abundant availability in the area have been expressively reported (Taruun et al 2015). Mechanical transmission by bitting flies of Diptera Order e.gTabanidae and stomoxyscould also be a related factor as these flies are seen in abundant. However, when red blood cells infected with *Anaplasmaspp* is inoculated into cattle, it has been reported that mechanical transmission through this medium is possible since veterinary services in the study area are generally poor.

This high prevalence could be further explained by the easy transmission routes since species of the genus Anaplasma can be transmitted by ticks through mechanical transmission by bitting flies and vertical transmission through this medium has been reported to play a role (De-waal 2000).

Biological transmission has been reported to involve more than 20 species of ticks (Kocan*et al*., 2004) with at least five competent vector ticks – namely *ArgasPersicus*, *Rhipicephallus evertsi*, *R. Sanguineus*, R. Simus and *R. (Boophilus) decoloratus* have also been reported (Bell-Sakyi*et al*., 2004).

This result is in line with the report of Kubelova*et al*. (2012) who also reported high prevalence of *Anaplasma spp* in ruminant in Angolar (Kubelova*et al*., 2012).

Bell-Sakyi*et al*. (2004) also reported high prevalence of Anaplasma species among other species (Bell-Sakin et al 2004).

Theilleriosis, a disease caused by Apicomplexan parasites of the genus Theilerie has been reported to be among the most important infections in ruminant including cattle in tropics and sub tropics (Yusumia et al., 2010). Infection by different species of *T. parva* cause the most severe theileriosis of cattle in Africa called East coast Fever (ECF) and *Rhipicephalus appendicalatus* and the vector of the disease is distributed in Eastern Africa. This findings also agree with the previous report in Nigeria by Adama and Balarebe (2012) and Musa *et al*. (2014).

There was occurrence of tick-borne disease in cattle examined for tickbornehaemoparasite. This is however expected as many literatures have documented tick-borne disease infection in ruminants (Simunnza*et al*., 2011; Kocan*et al*.,; 2012), However, this may be associated with the cattle immunity and early exposure to certain tick vectors.

The tick-borne disease may also be influenced by certain environmental factors which predispose the animal to infection.

This work agrees with the report of Bilgic*et al*. (2017) and Simunnza*et al*. (2011) (Bilgic*et al*., 2017; Simunnza*et al*., 2011).

## Conclusion

The result of the study revealed low prevalence of infection in dry season and high prevalence of infection in wet season though the difference was not statistically significant($p \leq 0.05$) and the result of seasonal occurrence of ticks-borne haemoparasite on cattle reveals highest occurrence of *Anaplama sp* in both wet and dry seasons. Thus,this seriously indicate the presenceof tick vectors and their continuous transmission of tick-borne haemoparasites. There should be a periodic quarantine of animals, good animal husbandry and monitoring of various abattoirs against unqualified veterinary practitioners to minimize the prevalence of the infection.

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