Haemoparasites are considered as the most important constraints to the health and improved productivity of cattle in sub-Saharan Africa. This study was aimed at determining their prevalence among cattle slaughtered at Jos South abattoir, Plateau state, Nigeria. A total of 200 blood samples were collected between April and May, 2018. Thin and thick blood films were made from the samples and stained with Giemsa and examined microscopically using X100 magnification. A total of 128 (64%) cattle were positive for *Babesia* species. No other haemoparasite were detected. Blood sample of 190 (95%) were collected from cattle that were 3 years and above and 10 (5%) were from cattle below 3 years. Female and white Fulani cattle were 2 times (POR = 2.29; *P* < 0.01) and 3 times (POR = 3.19; *P* < 0.0001) respectively at the risk of a positive result of *Babesia* species infection, when compared to male cattle and Red Bororo by bivariate analysis. There was no significant difference in the prevalence of *Babesia* species with respect to age (*p* = 0.27) and source of cattle (*p* = 1.00, *p* = 0.96 and *p* = 0.56) for animals from Plateau, Bauchi and Maiduguri respectively. This study showed a high prevalence of *Babesia* species infection amongst slaughtered cattle at Jos South abattoir. It confirms the presence of carrier populations of *Babesia*-infected cattle which both serve as a reservoir of infection for tick-vectors, susceptible livestock and humans. Routine screening and treatment of animals to effectively reduce to the barest minimum the prevalence of *Babesia* species in the study areas is highly recommended.

**Key words:** Haemoparasites, *Babesia*, Cattle, Slaughtered, Abattoir, Jos
Introduction

Haemo parasites are parasites that are found in blood. They are considered as the most important constraints to the health and improved productivity of cattle in sub-Saharan Africa. Animals such as cattle, sheep and goats may be infected with a wide variety, most importantly vector-borne prokaryotes and eukaryotic haemo parasites such as the Rickettsiae: Anaplasma and Ehrlichia (Cowdria), and the protozoan parasites Theileria, Babesia and Trypanosoma (Bell-Sakyi et al., 2004; Okaiyeto et al., 2008).

African animal trypanosomiasis, Babesiosis and Cowdriosis are considered as the most challenging disease affecting cattle production in Africa (FAO, 1984; Young et al., 1988, Bell-sakyi et al., 2004). They are generally shown to cause destruction of red blood cells resulting in anaemia, jaundice, anorexia, weight loss and infertility (Mtshali et al., 2004; Kaufman et al., 2006, Jonsson, 2006; Justin, 2008).

These parasites are cosmopolitan due to the fact that their vectors; ticks and flies, also have a global distribution. The high incidence of haemo parasites in the tropics could be as a result of the favourable environmental conditions that promote the survival and proliferation of the arthropod vectors responsible for their transmission (Adejinmi et al., 2004 and Payne, 1990).

Livestock sub-sector is an important and strategic agricultural component that generates income for human livelihood in Africa, especially Nigeria (Ahmed, 2002). Livestock provides major sources of protein (meat and milk), hide and skin, bone and bone meal for livestock feeds, raw material for other agro based industries as well as providing employment for both rural and urban dwellers engaging in production and marketing of livestock and its by-product (Maisamari, 2002).

Parasitological analysis

Haemo parasites were detected using the techniques of stained thin and thick blood smear and was examined using X100 objective lens as prescribed by (Cheesbrough, 1998).

Giemsa Stain Preparation

Giemsa powder (3.8g) was dissolved in 250mls of methanol and then 250mls of glycerol was added. The flask was then closed with a cotton wool and placed in a water bath at 70 degree centigrade for 1hour, and was slightly agitated occasionally. The preparation was then removed from the water bath and kept at room
temperature for 2-3 weeks to ripen, labeled and stored in the dark at room temperature.

**Thin and Thick Blood Smear Preparation Staining Procedure**

The dried thin film was fixed in methanol for 2 minutes. The slide was placed on a staining rack and was flooded with 10% dilution of Giemsa stain for 45 minutes. Excess stain was washed with buffer distilled water (pH 7.2) and the back of the slide was cleaned with dry cotton wool. It was allowed to air dry at room temperature and was examined microscopically using oil immersion objective lens (100x).

**Data Analysis**

The prevalence odds ratio was determined using bivariate analysis to determine whether age, sex, breed or source of the cattle were risk factors.

**Results**

A total of 200 cattle blood samples were examined. Babesia (64%) was the only haemoparasite that was detected. Most of the cattle, 190 (95%) were greater than 3 years of age, 130 (65%) were females. Majority, 119 (59.5%) were of the white *Fulani* breed and 92 (46%) were from Plateau State of Nigeria. 123 (64.7%) of the cattle ≥ 3 years of age and 5 (50%) of the cattle < 3 years of age were positive for Babesia. 92 (70.8%) of the female cattle and 36 (54.1%) of the male cattle were infected. 89 (74.8%) of the white *fulani* cattle and 39 (48.2%) of the red *bororo* cattle were positive. 53 (57.6%), 45 (59.2%) and 21 (65.6%) of the cattle were from Plateau state, Bauchi state, and Maiduguri (Borno state) were positive for Babesia respectively.

The bivariate analysis to determine whether age, sex, breed or source of the cattle where risk factors indicated that female cattle and white *Fulani* cattle were 2 times (POR = 2.29; p < 0.01) and 3 times (POR = 3.19; p < 0.0001) respectively at the risk of a positive result to Babesia using Giemsa test when compared to male cattle and red *bororo* by bivariate analysis. There was no significant difference in the prevalence of Babesia with respect to age (years) and source of cattle (Table 1).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency (%)</th>
<th>No. Positive (%)</th>
<th>*POR</th>
<th>**P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>&lt; 3 years</td>
<td>10 (5.0)</td>
<td>5 (50.0)</td>
<td>0.54</td>
<td>0.27</td>
</tr>
<tr>
<td>≥ 3 years</td>
<td>190 (95.0)</td>
<td>123 (64.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>70 (35)</td>
<td>36 (51.4)</td>
<td>2.29</td>
<td>0.01</td>
</tr>
<tr>
<td>Females</td>
<td>130 (65)</td>
<td>92 (70.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Breed</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>White Fulani</td>
<td>119 (59.5)</td>
<td>89 (74.8)</td>
<td>3.19</td>
<td>0.0001</td>
</tr>
<tr>
<td>Red Bororo</td>
<td>81 (40.5)</td>
<td>39 (48.2)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Source of cattle</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Plateau</td>
<td>92 (46)</td>
<td>53 (57.6)</td>
<td>Referent</td>
<td>1.00</td>
</tr>
<tr>
<td>Bauchi</td>
<td>76 (38)</td>
<td>45 (59.2)</td>
<td>1.07</td>
<td>0.96</td>
</tr>
<tr>
<td>Maiduguri</td>
<td>32 (16)</td>
<td>21 (65.6)</td>
<td>1.40</td>
<td>0.56</td>
</tr>
</tbody>
</table>

(*POR: Prevalence Odds Ratio, **P: Level of significant was set at P<0.05, N=200)

**Discussion**

This study showed a high prevalence of *Babesia species* infection amongst sampled cattle. It confirms the presence of carrier populations of *Babesia*-infected cattle which both serve as a reservoir of infection for tick-vectors, susceptible livestock and humans. The results obtained from this study showed a higher prevalence (64%) compared to reports from previous studies from Nigeria. In several studies
conducted on haemo parasites of cattle, Agu and Amadi, reported a prevalence of 3.9% in Ebonyi State in 2001. Enwezor and his colleagues in Kaduna State reported a prevalence of 13.5% in 2009, and Agu and his colleagues in a study also in Kaduna State reported a rate of 9.4% in 1990. In a study among 637 cattle by Kamani et al. (2010) for haemo parasitic infections in North-Central, Nigeria, 25.7% prevalence was recorded.

Studies in Jos Plateau by Olabode et al. (2010), have also shown the presence of *Trypanosoma, Babesia* and *Theileria* species in cattle slaughtered in Jos abattoir. The prevalence of 64% reported in this study suggests that the cattle are subject to a continuous challenge by the parasites and that there seems that there is a carrier state in most animals. In contrast, the works by Bell – Sakyi et al. (2004), Enwezor et al. (2009) and Kamani et al. (2010) recorded lower prevalence of 3.18%, 8.4% and 8.0 respectively.

Differences in prevalence may be attributed to the period of sampling and the availability of tick vectors that transmit the parasites. The prevalence obtained in relation to age, sex, breed and source of cattle, shows that the cattle of age three year and above had a higher prevalence than those below three years. Female cattle have higher prevalence than males. The white *fulani* had higher prevalence than red *bororo*. The higher parasitemia observed in females may be attributed to accumulation of parasites by the females due to the extended breeding for economic reason such as calving and milk production. This confirms previous report of sex dimorphism in the incident of haemo parasitism in Nigeria (Agu et al., 1990, Agu and Amadi, 2001; Enwezor et al., 2009, Kamani et al., 2010). The variability in breed specific parasitemia was in line with observations made by Agu and Amadi (2001) that attributed this variability to host specific factors peculiar to individual breeds.

**Conclusion**

Costs due to babesiosis are incurred not only from mortality, ill-thrift, abortions, loss of milk/meat production and draft power and from control measures (such as acaricide treatments, purchase of vaccines and therapeutics), but also through its impact on international cattle trade. The present study confirms the presence of carrier populations of *Babesia*-infected cattle which both serve as a reservoir of infection for tick-vectors, susceptible livestock and humans. Routine screening and treatment of animals to effectively reduce the barest minimum the prevalence of *Babesia species* infection in the study areas is highly recommended.

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