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Trypanosomes and helminths infections in Mayo Rey Division of Cameroon and impact of concurrent infections on cattle

Mamoudou Abdoulmoumini[1]*, Pierre Fongho Suh[2] and Ebene Njongui Jean[3]

[1]Department of Parasitology and Parasitological Diseases, School of Veterinary Medicine and Science, University of Ngaoundéré Po Box 455 Ngaoundéré Cameroon.
[2]Department of Animal Biology and Physiology, Faculty of Science, University of Yaoundé I, P.O.Box 812 Yaoundé Cameroon.
[3]Department of Parasitology and Entomology, Nnamdi Azikiwe University, P.M.B.5025.Awka, Anambra State.

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A survey was carried out to determine the prevalence of gastro-intestinal nematodes and trypanosome infections and their impact on two indicators of cattle health in the Sudano Sahelian Region of Cameroon in June, 2013. A total of 223 cattle were randomly selected from 24 herds and examined for blood parasite infections (parasitaemia) and for gastrointestinal nematode fecal egg counts. The prevalence of helminth infections was 33.62% (95%CI, 27.43 to 39.83%); three types of helminth eggs identified were Strongyles (96.30%), Toxocara (2.47%) and Eimeria (1.23%). The prevalence of trypanosome infection was 9.86% (95% CI, 5.95 to 13.78%); three species of trypanosomes were identified: *Trypanosoma congolense* (81.82%), *Trypanosoma vivax* (13.63%) and *Trypanosoma brucei* (4.54%). Seven animals were found with concurrent infections. Cattle with concurrent infections had a lower mean Body Condition Score than those with trypanosomes or helminths infections alone. The effect of concurrent infection was equally negative on the Packed Cell Volume of cattle but this effect seems to be caused by trypanosome alone following the practice of drenching by pastoralists.

Key words: Cattle production, helminths, trypanosomes, body condition score (BCS), packed cell volume (PCV), extensive management system, Sudano Sahelian Region, Cameroon.

INTRODUCTION

Most of the sub-Saharan African range lands are inhabited by pastoralists and agro-pastoralists and many of whom live on the edge of disaster and amidst poverty (Teer, 1986). They are at the mercy of vector borne diseases, predators, drought, floods and other natural disasters (Otim et al., 2004). In Cameroon, especially in areas where traditional farming is practiced, cattle play an important role in providing protein (meat, milk) and non-food commodities (manure, hides). They also serve as a form of saving for the rural population. Consequently, the number of animals owned appears to be more important than their individual productivity. One of the major

*Corresponding author. E-mail: mamoudou.abdoulmoumini@yahoo.fr. Tel: +237 690557705.

constraints for cattle breeding in tsetseinfested areas is trypanosomiasis, of which anaemia is a predominant sign (Kaufmann et al., 1992). High worm burdens, predominantly *Haemonchus contortus, Bunostomun phlebotomum* and *Oesophagostomum radiatum* have also been reported to induce severe anaemia, emaciation and hypoproteinemia (Kaufmann and Pfister, 1990). Although single parasitic infections in a host are common in nature, mixed infections with various species or with several different types of parasites is the rule (Sharma et al., 2000). In mixed infections, the interaction between two or more parasites may lead to significant physiological and biochemical changes in tissues and fluids, which cannot be attributed to either of these parasites individually (Sharma et al., 2000). Infections of trypanosomes cause immunosuppression resulting into flare up of other bacterial or viral infection and poor immune response to vaccines (Gupta et al., 2009; Singla et al., 2009).

Under experimental conditions, concurrent infections of *Trypanosoma congolense* and *H. contortus* resulted in more severe disease in Djallonke sheep (Goossens et al., 1997) and in N'dama calves (Kaufmann et al., 1992) than single infections. The prevalence of trypanosomiasis as well as that of helminthiasis in cattle has been described in Cameroon by many authors (Mpouam et al., 2011; Ntonifor et al., 2013); but little is known about the prevalence of concurrent infections in naturally grazing cattle whose occurrence was alluded in the south west by Ngole et al. (2003) who analyzed the blood and feces of cattle, originating from the savanna and sahel regions and, destined for slaughter. The present study was undertaken in a peri-domestic Sudano-Sahelian agro-eco-system in Cameroon to determine the prevalence of these infections among cattle and assess their impact on two indicators of cattle health.

MATERIALS AND METHODS

Study area

The survey was carried out in Yoko village in the Sudano Sahelian agro-ecological zone in Cameroon at the beginning of the rainy season (June, 2013). The study site is 124 km from Ngaoundéré, the regional capital of the high Guinea savannah zone which is the main access way from Yaoundé, the political capital of Cameroon. In the Sudano Sahelian zone, the wet and humid season lasts for 7 months from June to the end of September; the highest rainfall is concentrated around July and August. Many animals are reared in Yoko, the most important being cattle, sheep and goats; animal husbandry is practiced mostly by Mbororo and Fulbe tribes for centuries (Bronsvoort et al., 2002) and have remained subsistence oriented. During the rainy season in Yoko, an important portion of the land is used for agricultural activities thus limiting pasture for livestock; whereas during the dry season a large amount of pasture resulting from dry millet, maize and sorghum cobs is available and attracts many transhumant pastoralists in the zone. The study site comprised of 10 adjacent villages situated at about 1.5 km apart and is surrounded by fields in an area of open Savannah woodland and fresh water swamps and artificial water catches.

Animals and sampling

Pastoralists of Yoko and of the surrounding villages were convened in a meeting and sensitized on the purpose of the project.There were 20 pastoralists in total and all of them received a short questionnaire to sample the perception of the importance of both trypanosomiasis and helminthic infections in their herds as well as their responses to the issue. Five pastoralists, owners of a total of 24 herds, were selected randomly from group; their oral consent for participating in the study was subsequently obtained.The size of herds varied between 50 and 70 animals. Each animal was attributed a number marked on its skin; the list of cattle for each herd was then constituted and between 8 and 10 animals were randomly selected from each list. Characteristics of each animal notably sex, age (determined from dentition), breed, color of the skin and the body condition score (BCS) (determined according to Ezanno et al. (2003) were recorded.

The age of animals and the body condition score (BCS) were then categorized into three groups: calf (0 to 6 months), juvenile (6 to 24 months) and adult (older than 24 months) for age and poor (≤ 3), good (> 3 and 7 <) and very good (> 7). All animals had venous blood samples collected from the ear vein into microhaematocrit tubes. Faecal samples were collected perrectum from each animal using a plastic glove then put into clearly labeled plastic bags and transported in a cool box to the laboratory where they were stored in a refrigerator until examination the following day.

Diagnosis

Blood samples collected into microhaematocrit tubes were centrifuged at 8000 rpm for 5 min. The percentage packed cell volume (PCV) was then read with the help of a Hawskley microhaematocrit reader (Hawksley, Lancing, United Kingdom). Trypanosome infections were diagnosed using the buffy coat technique (BCT) (Murray et al., 1977) while the number of trypanosomes was calculated by the method of Herbert and Lumsden (1976). Trypanosomes species were identified by their movement, size and morphology and confirmed later with a stained blood smear stained with Giemsa. All animals infected by trypanosomes were immediately treated with a trypanocidal drug Veriben B12® (Ceva, France) at curative dose of 7 mg/kg body weight. Faecal samples were processed following the technique described by Behnke et al. (2006) to determine helminthic infections and egg counts.

Data analysis

The data were entered in microsoft office excel. Prevalence was calculated as a percentage of d/n where d is the number of animals infected and n the total number of animals examined. The mean fecal egg counts were calculated with respect to age category, and sex. The Chi-square test (× 2) and Z test were used to compare proportions; the t-test, were used to compare means. The XLSTAT 2014 was used to perform all the analysis. Level of precision was held at 95%, and P ≤ 0.05 set for significance.

RESULTS

Pastoralists' knowledge and practices

All interviewers (20) knew about trypanosomiasis and helminthiasis and they regularly use trypanocide and anti-helminthic medicines to treat sick animals. These medicine

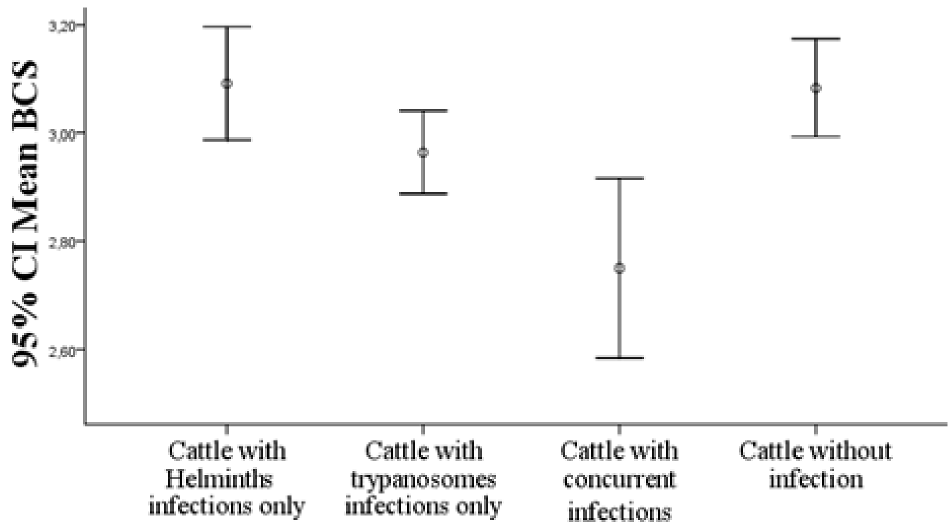

Figure 1. Effect of trypanosomes, helminths and concurrent infections on cattle's BCS.

medicines are equally administered as preventive measures.

Characteristic of cattle sampled

Two hundred and twenty three (223) cattle were sampled from the 24 herds selected for the survey. The Gudali (*Bostaurus taurus*) was the main breed; cattle were of three colors: Black, white and brown; the most represented color was brown 57.84% (X^2 = 148.735; P < 0.0001). There were more females (53.81%) thanmales (46.18%) (Z = 1.138; P = 0.255). Concerning age category, adult cattle were the most represented (72.64%), followed by juvenile (26.46%) and calves (0.9%). The mean body condition score was 3.067 (SD = 0.301). The majority of cattle (80.72%) (Z = 9.174; P < 0.0001) fell within the poor score of BCS (2.881; SD= 0.188); animals with a good BCS had a mean of 3.843 (SD = 0.227)

Trypanosomes and helminth infections

Of the 223 cattle sampled, 75 were infected with helminths, corresponding to a prevalence of 33.62% (95% CI, 27.43 to 39.83%) whereas 22 (9.86%; 95% CI, 5.95 to 13.78%) were infected with trypanosomes; seven animals had concurrent infections. Two types of helminth eggs strongyles, *toxocara* and eimerian coccidian oocysts were identified. Strongyles were the most prevalent of the helminths species identified (96.30%) (X^2 = 244.856; P < 0.0001); the two others toxocara and eimeria had 2.47 and 1.23% prevalence, respectively; the mean egg per gram was 155.147 (SD = 125.670 EPG) corresponding to light infection. Of the 75 helminthic infections, 70 (93.33%) were single infections while 5 (6.67%) were multiple infections. The mean egg count was 155.147 (SD = 215.126) and 278.571 (SD = 372.891), respectively in cattle infected with helminths only and concurrent infections; the difference between these means was not significant (t = -1.339; P = 0.185). Three species of trypanosome were identified in this study; *T. congolense*, *T. vivax* and *T. brucei.* Like helminths, trypanosomes infections are dominated by one species: *T. congolense* (81.82%; 95% CI, 65.70 to 97.94%); the two other species:*T. vivax* and *T. brucei* represented, respectively 13.63 and 4.54% of all infections. The prevalence of helminthic infections did not vary significantly between the sex (Z = -0.669; P = 0.503) and the age (Z = -0.472; P = 0.638) categories. As concerns trypanosome infections, a significant difference was observed only for age category and notably between adult animals (22/162) and those aged at most 2 years (0/61) (Z = 2.831; P = 0.004).

Impact of helminths and trypanosomes infections on cattle: BCS and PCV

The mean BCS among cattle infected with helminthic infections only (68) stood at 3.092 (SD = 0.432) and 80.88% of these animals had a poor BCS. The mean BCS among those infected exclusively by trypanosome (15) was 2.964 (0.134); 93.33% of the latter had a poor BCS. There was no significant difference between these two means of BCS (t = -1.091; P = 0.279). However, a significant difference was obtained when comparing the mean BCS between cattle with either trypanosomes (t = 3.118; P = 0.006) or helminths (t = 4.114; P = 0.001) infections and those with concurrent infections (Mean BCS: 2.750; SD = 0.158) (Figure1).

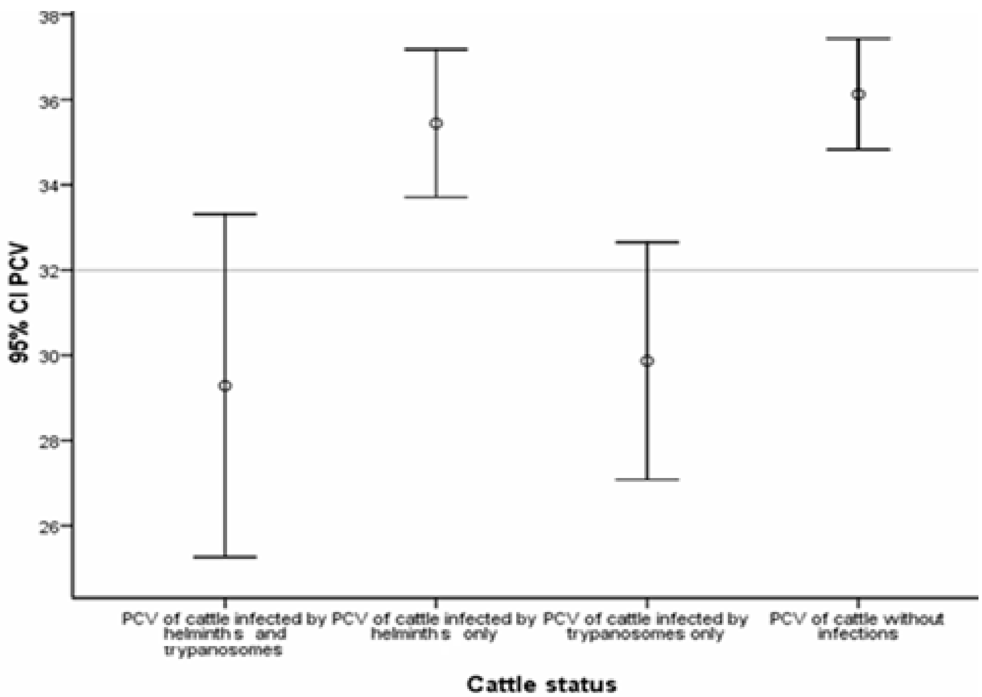

Figure 2. The effect of trypanosomes, helminthes and concurrent infections on cattle PCV.

The mean PCV among cattle infected by helminths only was 35.441 (SD = 7.154); the latter did not vary significantly with that of cattle free of infections (Mean 36.143; SD = 0.653) (t = -0.635; P = 0.526). In cattle infected with trypanosomes only, the mean PCV was 29.867 (SD = 5.027); this value was significantly lower than that observed among cattle free of infections (t = -3.143; P = 0.002) and that observed among cattle infected by helminths (t = -2.860; P = 0.005). The PCV of cattle with concurrent infections was 29.286 (SD = 3.469); this value was significantly lower than those observed for cattle free of infections (t = -2.382; P = 0.019) or for cattle infected by helminthes (t = -2.226; P = 0.029). No significant difference was found between the mean PCV of cattle infected by trypanosomes and those with concurrent infections (t = -0.263; 0.796) (Figure 2).

DISCUSSION

Helminth infections are ubiquitous and represent, with trypanosomes, a serious constraint to efficient livestock productivity in Africa (Ndamukong, 1985; Vlassoff and Leathwick, 2001; Nganga et al., 2004). In this study we have evaluated the prevalence of these parasitic diseases and compared their impact on two indicators of cattle health in the Mayo Rey Division. The overall prevalence of helminth infections among sampled cattle was 33.62% (95% CI, 27.43 to 39.83%). This frequency was lower than findings from (Moti et al., 2013) in Ethiopia and (Achi et al., 2003) in Ivory Coast. However, it was in line with that of Ntonifor et al. (2013) in the north west region. This low prevalence might be due to the frequent drenching behavior of herders. Strongyles were the predominant helminthes. Similar observations were made by other authors (Cheru et al., 2013; Moti et al., 2013). The prevalence of infections was not significantly different between age and sex categories. These results corroborate those of Moti et al. (2013) and Ntonifor et al. (2013), suggesting that cattle of all ages and sex are exposed to equal risk of infestation.

The prevalence of trypanosomiasis in the study zone was 9.86% (95% CI, 5.95 to 13.78%) and it was mainly caused by *T. congolense* (81.82%). The high abundance of *T. congolense* among infected cattle is in accordance with observations made by (Ndamkou and Nchare, 1995) in tsetse infested areas of the north region. Thus, it suggests that transmission of this disease is mainly achieved by the biological vectors, tsetse flies. The prevalence of bovine trypanosomiasis did not vary significantly between sexes. These results are in consonance with reports from (Sam-Wobo et al., 2010) and confirm the fact that neither the biological nor the mechanical vectors (like tabanids) discriminate host sex in their search for blood meal. The age-specific rates of bovine trypanosomiasis showed no significant difference as reported by (Delafosse et al., 2006; Yeshitila et al., 2006). However findings of other authors like (Sam-Wobo et al., 2010) are opposed to that. These authors found a significantly higher prevalence of trypanosomiasis among older cattle; they explained this situation with the grazing habit of older cattle being exposed to insect bites than the young calves which always remain in their byres (herd shed).

The mean BCS of sampled cattle was 3.067 (SD = 0.301) and the majority of them had a poor score; this poor condition of most sampled animals could be attributable to the climatic conditions. Deffo et al. (2010) have reported that the performance of animals in the north of Cameroon decreases in the dry season; animals of the study zone may have not considerably recovered from the stress of dry season (temperature, limited forage) by the time the study was undertaken. Cattle infected by either trypanosomes or helminths had a mean BCS significantly higher than that of those with concurrent infections. Both infections have a negative effect on the body condition of cattle but their effect on cattle BCS is significantly higher when present concomitantly; similar observations were made by Dwinger et al. (1994) in the Gambia.

Trypanosomes like gastro-intestinal parasites are known to cause anemia (Morrison et al., 1981), measured by the packed cell volume (PCV). In this study, the PCV was significantly lower among trypanosome infected animals than in non-infected animals. Our results indicate trypanosomiasis involvement in reducing the PCV values in infected animals. Anemia is a well-recognized and inevitable consequence of trypanosomiasis and gastrointestinal parasites (Morrison et al., 1981). Contrary to observations made by Agyemang et al. (1997) on N'Dama cattle in Gambia, the effect of helminth infections on PCV was not significant in this study. The significant effect of the concurrent infections on PCV seems to be caused by trypanosomes alone. To explain this situation, we suggest two reasons. The first reason is that cattle of the study sites may have developed tolerance to helminthes more than trypanosomes. The second reason highlights the impact of drenching practiced by pastoralists. This practice may have resulted in low EPG among infected animals, leading to lesser effect of these parasites on anemia.

Conclusion

Trypanosome and helminth infections are prevalent in cattle in Mayo Rey Division; helminth infections are more abundant. Both infections have a negative effect on cattle health indicators.

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Conflict of interest

Authors have none to declare.

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