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Short Communication

The prevalence of concurrent trypanosome and gastrointestinal nematode infections in West African Dwarf sheep and goats in Nsukka area of eastern Nigeria

B.B. Fakae*, S.N. Chiejina

Department of Veterinary Parasitology and Entomology, University of Nigeria, Nsukka, Nigeria

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Abstract

The prevalence of concurrent nematode–trypanosome infections in traditionally reared West African Dwarf sheep and goats in eastern Nigeria was monitored over a 12-month period during 1987–1988. The most prevalent nematodes were *Haemonchus contortus* and *Trichostrongylus colubriformis*, which usually occurred together in all nematode infected animals. Their combined prevalence rates ranged from 90 to 100% throughout the year and they accounted for 66 to 98% of the total monthly worm burdens. Of the 107 animals examined 13.6% were infected with trypanosome species comprising *Trypanosoma brucei* (50%), *Trypanosoma conglense* (43%) and *Trypanosoma vivax* (36%). No clear seasonal pattern was observed in the prevalence of concurrent nematode–trypanosome infection but owing to the widespread prevalence of gastrointestinal nematode infections, all trypanosome infected animals were invariably infected with *H. contortus* and *Trichostrongylus colubriformis*.

Introduction

West African Dwarf (WAD) sheep and goats are the indigenous and predominant breeds of small ruminants in the subhumid and humid zones of Nigeria where they constitute a major under exploited food and economic resource. Parasitic infections, notably those caused by haemoprotozoa and gastrointestinal nematodes, have been identified as a major constraint on the productivity of these animals, especially under intensive and semi-intensive systems of husbandry (ILCA, 1979; Chiejina, 1987). However, much of our knowledge of the epidemiology and production effects of these infections is based on studies of problems caused by individual or closely related species of parasites. Very little is known about the prevalence and economic impor-

*Corresponding author.

tance of multiple, heterologous, especially helminth–protozoal interactions. This ignores the fact that: (1) naturally occurring parasitic diseases in farm animals are frequently caused by concurrent infections with two or more immunobiologically unrelated or remotely related species of parasites; (2) there is increasing experimental and field evidence which indicate that heterologous parasite–parasite (e.g. helminth–protozoal) interactions in domestic animals may give rise to the prolonged survival and enhanced pathogenicity of one of the concomitant infections and sometimes interfere with the development of acquired resistance to homologous challenge infection (Christensen et al., 1987). This paper describes preliminary observations on the prevalence of naturally occurring gastrointestinal nematode–trypanosome infections in WAD goats and sheep in the Nsukka area of eastern Nigeria.

Materials and methods

Animals and study area

The survey was conducted on traditionally reared WAD sheep and goats slaughtered at various rural slaughter slabs in the Nsukka area, which is located in the trypanosome-infested derived savanna vegetation belt of the subhumid zone of eastern Nigeria. This area is characterised by clearly defined rainy and hot dry seasons which last from April to October and from November to March respectively. The ages and history of the animals sampled were unknown but the estimated ages, based on information supplied by their owners, ranged between 2 and 5 years.

Parasitological techniques

Blood and the complete gastrointestinal tract were obtained monthly from a total of 89 and 18 slaughter goats and sheep respectively, between August 1987 and July 1988. Trypanosome infection was assessed from the presence of trypanosomes in 20 microscope fields of wet blood films and smears prepared from the buffy coats, at $\times 400$ magnification. The species of trypanosomes were identified from Giemsa-stained thin blood films and similarly stained smears made from the buffy coat following microhaematocrit centrifugation for the determination of the packed cell volume (PCV).

The abomasum, small and large intestines were processed for total and differential worm counts as previously described (Fakae, 1990a).

Statistics

Statistical analyses were performed using MSTAT-C version 1.3 software (Michigan State University, USA). Associations were tested by Spearman's

Rank Correlation while differences between groups were determined by the Mann–Whitney U test. Probability (P) levels <0.05 were considered significant.

Results

The animals were infected with predominantly *Haemonchus contortus* and *Trichostrongylus colubriformis*. Except in September 1987 and May 1988 when both nematodes infected 90% of the animals examined, their prevalence was 100% and they accounted for 66 to 98% of the total monthly worm burden throughout the year. The highest infection rates and worm burdens were recorded from June to November (Table 1). *Cooperia curticei* and *Oesophagostomum columbianum* were present in relatively very small numbers. The prevalence and intensity of infections of the small number of sheep examined with the dominant nematode species were similar to those in the goats. Data from the two animal species have therefore been combined.

Three species of trypanosome were detected in 11 out of 89 (12.4%) and 3 out of 18 (16.7%) goats and sheep respectively. *Trypanosoma brucei*, *Trypanosoma congolense* and *Trypanosoma vivax* respectively accounted for 50%, 43% and 36% of these infections. Ten of the 14 infected animals were infected with one trypanosome species and four harboured dual infections, the com-

TABLE 1

Trypanosome and gastrointestinal nematode infections in West African Dwarf sheep and goats in eastern Nigeria between August 1987 and July 1988

Month	No. of animals	Mean worm burden		No. of animals infected with trypanosomes[2]
		H. contortus and *Trichostrongylus colubriformis*	Others[1]	
August	9	358	1	0
September	10	1065	46	0
October	10	1230	218	3 (*Tv*; *Tb*; *Tc*)
November	9	1800	166	3 (*Tc*+*Tb*; *Tv*+*Tb*; *Tc*+*Tb*)
December	8	310	138	0
January	9	211	21	0
February	10	339	67	0
March	8	133	3	3 (*Tb*; *Tc*; *Tv*)
April	7	167	86	0
May	10	526	9	0
June	10	402	17	2 (*Tv*; *Tc*)
July	7	746	19	3 (*Tv*; *Tb*; *Tc*+*Tb*)

[1]Other nematodes included *Cooperia curticei* and *Oesophagostomum columbianum*.
[2]*Tv, Trypanosoma vivax*; *Tb, trypanosoma brucei*; *Tc, Trypanosoma congolense*.

monest combination being concurrent *Trypanosoma brucei* and *Trypanosoma conglense* infections. There was no clear seasonal influence on prevalence of concurrent infection but most infections were observed during June/July and October/November. These months also coincided with the periods of relatively high worm burdens (Table 1).

All trypanosome infected animals were concurrently infected with at least one helminth parasite. A modest positive correlation, although not statistically significant ($r_s = 0.4196$; $P > 0.05$), existed between the size of nematode infection and trypanosome prevalence. The commonest combinations of concurrent infections were *Haemonchus* and *Trypanosoma brucei* (42.9%), *Haemonchus* and *Trypanosoma conglense* (35.7%). On the whole, 91 animals were infected with nematodes alone, 14 with both nematodes and trypanosomes and only two were uninfected.

The mean PCVs ($\pm$standard error) for all animals infected with nematodes alone and those infected with both parasites were 28.4 ± 0.9 and 14.3 ± 0.8 respectively, while that of the non-infected animals was 41.0 ± 0.5. The PCVs of animals infected with only nematodes and those with dual infections were significantly different ($P < 0.01$) and the difference between each of these groups and the uninfected group was also statistically significant ($P < 0.05$).

Discussion

This survey confirms the widespread occurrence of low to moderate levels of gastrointestinal nematode infections (Fakae, 1990b) and provides data on naturally occurring concurrent gastrointestinal nematode–trypanosome infections in traditionally reared small ruminants in the derived savannah zone of eastern Nigeria. The overall trypanosome infection rate (13.6%) is very similar to that recorded by Kramer (1966) who studied a limited number of WAD sheep and goats in the same area.

Other workers (Smith et al., 1986; Chiejina, 1987) have made brief mention of trypanosome infections in WAD goats naturally infected with a variety of helminth and other parasites. However, these infections were always reported as separate health problems in their own right and no consideration was given to the implications of concurrent infections. The present observation is therefore the first to specifically address the problem of naturally occurring trypanosome–gastrointestinal nematode interaction in WAD small ruminants in Nigeria. Of particular interest are the observations that: (1) all animals infected with trypanosomes were also invariably concomitantly infected with at least *H. contortus* and *Trichostrongylus colubriformis*, due largely to the widespread occurrence of infections with these nematodes; (2) the occurrence of trypanosome infections usually coincided with periods of rela-

tively high worm burdens; (3) the lowest PCVs were recorded in concurrently infected animals.

It is not possible to draw any firm conclusions from these findings in view of the relatively small number of animals examined and the fact that there were no animals infected with only trypanosomes during the period studied. However, the observations are consistent with abundant evidence from laboratory animal models (reviewed by Christensen et al., 1987) and farm animals (Griffin et al., 1981a,b; Kaufmann et al., 1992) which clearly show that protozoal, especially trypanosome, infections can enhance the establishment, survival and pathogenicity of concomitant helminth infections. There is also some evidence that trypanosome infections can impair the capacity of some domestic animals to respond optimally to vaccination against important bacterial organisms such as *Vibrio foetus* (MacKenzie et al., 1975) and *Brucella abortus* (Anene et al., 1989). Since there was no clear seasonal pattern in the occurrence of concurrent infections in the present study, it is likely that the apparent association between the two classes of parasites was due to an interaction between them and not necessarily due to common seasonal factors affecting the transmission dynamics of both nematodes and trypanosomes. Besides, in Nsukka area, the activities of *Glossina* spp, the common vectors of trypanosomes, are more in the dry season than in the rainy season when conditions are favourable for helminth infections (Madubunyi, 1986).

There is a clear need for greater recognition and study of concurrent helminth–protozoal infections in general and gastrointestinal nematode–trypanosome infections in particular.

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