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Semen Characteristics and Reaction Time of Yankasa Rams Experimentally Infected With *Trypanosoma congolense*

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Abstract: Nine mature rams aged 24-30 months old were used to determine the effect of *Trypanosoma congolense* (*T. congolense*) on semen characteristics and reaction time of Yankasa rams. They were divided into 2 groups of 6 infected and 3 uninfected control. The infected group of animals was inoculated with 1 x 10^6 *T. congolense* through the jugular vein while the control group remained uninfected. All infected rams developed signs characteristic of trypanosomosis with a pre-patent period of 9 ± 2 days. There was no substantial difference in the semen volume and concentration of the infected group and control group. However, there was an increase in the occurrence of sperm abnormalities as well as reaction time in the infected group compared to the control. The study shows that *T. congolense* is capable of rendering Yankasa rams infertile due to prolong reaction time and increase in the number of sperm abnormalities.

Key words: *Trypanosoma congolense* · Infertility · Ram · Reaction Time

INTRODUCTION

Trypanosomosis is caused by the blood parasites trypanosome [1] and transmitted cyclically or mechanically [2], although transmission through the placenta [3, 4] and oral [5] routes have been documented. Recent reports show that the organism is present in preputial materials [6], supporting earlier reports that coital transmission is possible [7]. In small ruminants, the disease was not accorded much attention [8]. However, infection in these animals has been reported [9-12]. Trypanosomosis causes both acute and chronic infection [13, 14] affecting the circulatory, nervous respiratory and reproductive systems [13, 15-17]. *Trypanosoma brucei*, *T. congolense* and *T. vivax* are the most pathogenic trypanosoma species affecting domestic animals with varying degree of pathogenicity [16].

In the female, irregular oestrus cycle, decreased conception rate, fetal death, low birth weight and death of the newborn are common features [18- 20] while in the male, there is deterioration of semen characteristics, abnormal spermatogenesis, penile protrusion, epididymitis, prepucial and scrotal inflammation [21-23]. Trypanosomosis associated lesions have also been seen in the anterior pituitary gland and hypothalamus [24, 25]. However, the pathological changes depend on the species and strain of trypanosome as well as the species of the infected host [14, 26].

T. congolense is pathogenic in dog, goat, sheep, pig, cattle and horse where it causes infection [27]. Adeyemo *et al*. [28] described changes in plasma testosterone levels of West African Dwarf rams infected with *T. congolense*. However, information on the effect of the parasite on semen characteristics and reaction time in Yankasa ram is

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lacking. This study was designed to investigate the effect of *T. congolense* on these parameters in Yankasa rams which are the most abundant breed of Sheep in Nigeria [29].

MATERIALS AND METHODS

Nine mature Yankasa rams aged 24-30 months old were purchased from a local market around Zaria. They were acclimatized for 4 months in fly and tick proof pens where they were fed legume hay (*harawa*), ground nut, maize offal, concentrate (100gm/head/day) multi-mineral nutrient block and fresh pasture with water *ad libitum*. The *Trypanosoma congolense* used for this study was obtained from the Nigerian Institute for Trypanosomiasis Research (NITR) Vom-Nigeria. This trypanosome was initially isolated from cattle but inoculated into mice and maintained by continuously passaging until use.

The rams were divided into 2 groups of six infected and three uninfected control. The infected group of six animals were inoculated with 1 x 10^6 *T.congolense* through the jugular vein. All the rams were closely monitored for clinical signs suggestive of trypanosomosis. The scrotum and scrotal content were palpated and semen was collected weekly for seven weeks using electro-ejaculator, this was evaluated according to the methods of Chemineau and Cagnie [30]. Semen characteristics measured include semen volume, sperm concentration and abnormalities. Reaction time, the time from onset of rectal massage to ejaculation was also determined. Data generated were analyzed and expressed in graphs.

RESULTS

All infected rams had pale mucous membrane from day 7 post infection (PI) with a pre-patent period of 9 ± 2 days. Other signs characteristic of trypanosomosis such as fluctuating temperature, ruffled hair coat and weight lost were observed.

There was no difference in the volume of semen between the infected and control group, as both fluctuated from time of infection to the termination of the experiment (Figure 1). The semen concentration dropped sharply in the infected group compared to the control group. However, it fluctuated in both groups till the end of the experiment (Figure 2). Incident of abnormalities progressively increased in the infected group from infection to termination of the experiment

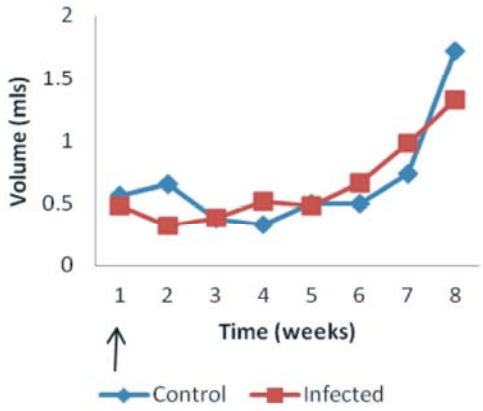

Fig. 1: Semen volume of Yankasa rams infected with *Trypanosoma congolense* (arrow indicates point of infection)

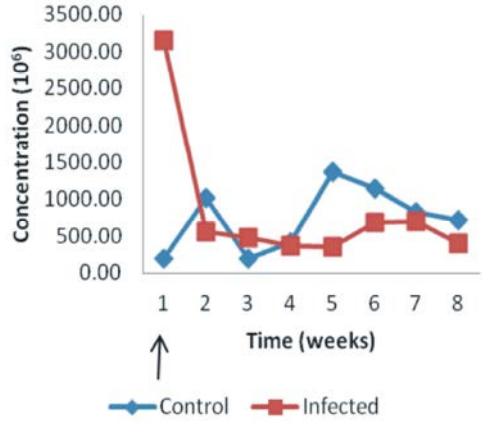

Fig. 2: Semen concentration of Yankasa rams infected with *Trypanosoma congolense* (arrow indicates point of infection)

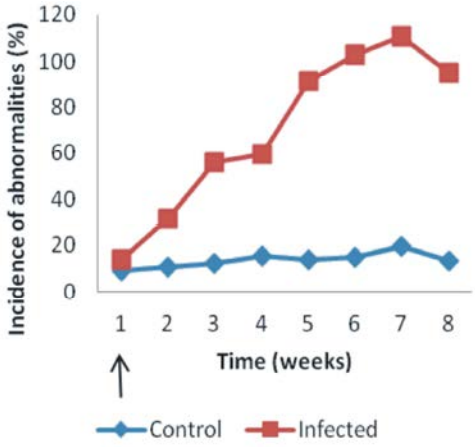

Fig. 3: Percentage sperm abnormalities of Yankasa rams infected with *Trypanosoma congolense* (arrow indicates point of infection)

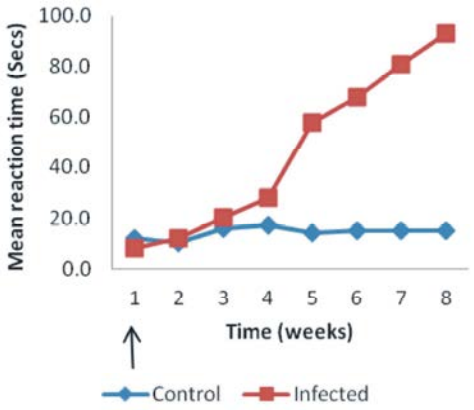

Fig. 4: Reaction time of Yankasa rams infected with *Trypanosoma congolense* (arrow indicates point of infection)

while, the control group remained within the same range till the end of the experiment (Figure 3). The reaction time in the infected group began to rise by the second week and increased to the end of the experiment but there was no significant change in the control group throughout the study (Figure 4).

DISCUSSION

The effect of *Trypanosoma congolense* on semen characteristics and reaction time of Yankasa rams has been demonstrated in this study. There was no significant change in semen volume and concentration of infected rams compared to the control. The semen volume in this study agrees with the report of Leigh and Fayemi [31] in *T. congolense* infected rabbits. However, it contradicts the report of Ikede [32] in *T. brucei* infected rams and Sekoni [33] in *T. vivax* infected rams who reported progressive decrease in semen volume and concentration. The difference may be as a result of species variation. It is well established that the pathological changes observed in trypanosomosis is dependent on the species and strain of Trypanosome [13, 14]. The more virulent a parasite is, the shorter its prepatent period [34]. *Trypanosoma congolense* has a longer pre-patent period than *T. brucei* and *T. vivax* [2] suggesting that it is not as virulent as these trypanosomes. It has also been suggested that there are differences in mechanism of tissue and organ damage by Trypanosoma species [35]. All this may account for the insignificant change in semen volume and concentration of *T. congolense* infected rams.

There was remarkable difference in the occurrence of sperm abnormalities between the infected and control rams. This is consistent with earlier reports of the infection in rams infected with *T. brucei* [32] and *T. vivax* [33]. It also agrees with the report of Leigh and Fayemi [31] in *T. congolense* infected rabbits. This further affirms earlier reports, suggesting that trypanosomosis localizes in the scrotal skin, provoking non-purulent inflammation that leads to degeneration of the seminiferous tubules [35] leading to spermatozoa abnormalities. It has also been suggested that the chronic intermittent fluctuations in pyrexia and the direct invasion of tissues by the parasite may be responsible for the reproductive disorder seen [7].

The reaction time increased following infection. This agrees with earlier reports in ram [33] and bull [36- 38] experimentally infected with trypanosomes parasite. The increase in reaction time began from the second week. This may be associated with testicular damage in trypanosomosis infection which is believed to begin two weeks post infection [22].

In conclusion, *Trypanosoma congolense* causes progressive increase in sperm abnormalities and reaction time in rams. Although semen volume and concentration were not affected, fertility of rams infected with the parasite is questionable.

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