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Pathogenicity of *Trypanosoma brucei* *brucei* in experimentally infected pigs

OTESILE (E.B.), AKPAVIE (S.O.), FAGBEMI (B.O.), OGUNREMI (A.O.). Pathogénicité de *Trypanosoma brucei brucei* chez des porcs infectés expérimentalement. *Revue Élev. Méd. vét. Pays trop.*, 1991, 44 (3) : 279-282

Une infection expérimentale de porcs âgés de 4 à 5 mois avec une souche de *Trypanosoma brucei brucei* a entraîné une parasitémie élevée, de l'anorexie, de la fièvre et une diminution d'un tiers de l'hématocrite (PCV). Des manifestations nerveuses de tournis et de tremblement des antérieurs sont apparues chez l'un des animaux dont l'autopsie a révélé une méningo-encéphalite sévère et la présence de trypanosomes dans le cerveau. Ces résultats confirment que *T.b. brucei* est susceptible de causer une affection grave chez les porcs. *Mots clés* : Porc - Infection expérimentale - Trypanosomose - *Trypanosoma brucei brucei* - Nigeria.

INTRODUCTION

By preventing the utilisation of vast areas of grass-land, tsetse-transmitted animal African trypanosomosis is the most important constraint to livestock production in Sub-Saharan tropical Africa (8). At present, tsetse flies infest approximately ten million km² of Africa affecting 38 countries. It is considered that seven million km² of this area would otherwise be suitable for livestock (9). The most important trypanosome infection of pigs is *Trypanosoma simiae* which usually causes a fulminating and fatal infection (11). *Trypanosoma brucei* and *T. congolense* run a mild course in pigs (7, 11).

During a survey on blood parasites of pigs in Ibadan, Nigeria, a case of *T. b. brucei* infection with an unusually high parasitaemia was observed in a local pig. This paper gives the results of investigations on the pathogenicity of this *T.b. brucei* stock in the pig.

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Reçu le 12.2.1991, accepté le 11.6.1991.

MATERIALS AND METHODS

Experimental animals

Six female Large White pigs, 4 to 5 months of age, were obtained from a farm near Ibadan. They were dewormed with piperazine citrate at a dosage of 400 mg per kg live-weight, screened for blood parasites and confirmed to be free of trypanosomosis. The pigs were housed in a fly-proof accommodation and fed a commercial growers ration (Pfizer Livestock Feeds, Ibadan, Nigeria) throughout the study period. Male Albino mice were obtained from the experimental Animal Unit of the College of Medicine, University of Ibadan.

Trypanosoma brucei stock

The stock was obtained from an anaemic local pig at slaughter at the Ibadan Municipal Government abattoir, with a parasitaemia of 10^{7.2} trypanosomes per ml blood.

After staining with Giemsa, the parasites were identified as a *T. brucei* species. The organisms were infective for mice. When subjected to the blood incubation infectivity test (10), infectivity of the parasites for mice was abolished by the action of human serum, but not bovine or porcine serum. The parasites were thus identified as *Trypanosoma b. brucei*.

Experimental protocol

Four of the 6 experimental pigs were inoculated intravenously with mouse blood containing approximately 5 x 10⁶ motile *T. brucei* parasites. The remaining two pigs served as non-infected controls.

Every other morning, between 9 and 10 a.m., the body temperature was measured with a rectal thermometer and blood was collected from an ear vein into two heparinized haematocrit centrifuge tubes for determination of packed cell volume and parasitaemia, as described by HERBERT and LUMSDEN (2).

All pigs were euthanised at the end of observation, 50 days post infection (dpi). Tissues for histopathology were fixed in 10 % buffered formalin, processed routinely for histopathology and stained with haematoxylin and eosin. Selected sections were stained with Giemsa or Martin

Scarlet blue. Wet mounts were made from the cerebrospinal fluid (CSF) and examined for trypanosomes. Smears made from CSF were also stained with Giemsa and examined for trypanosomes.

RESULTS

Clinical findings and haematology

The mean prepatent period of parasitaemia was 4.5 ± 0.6 (SD) days. Subsequently, there was undulating parasitaemia in infected pigs with peaks occurring at intervals of 5-8 days in each animal. Peak parasitaemia in individual infected pigs varied from $10^{7.8}$ to $10^{8.4}$ trypanosomes per ml blood (fig. 1).

A rise in the mean rectal temperature of infected pigs became apparent at 4 dpi (fig. 2). Thereafter, the mean rectal temperature of infected pigs remained higher than

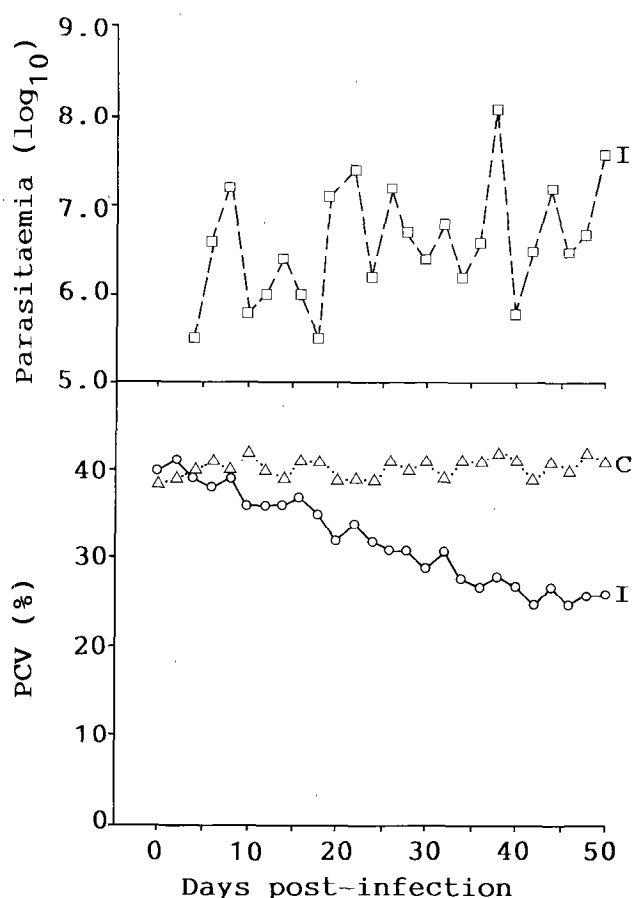


Fig. 1 : Mean packed cell volume and parasitaemia of infected and control pigs.

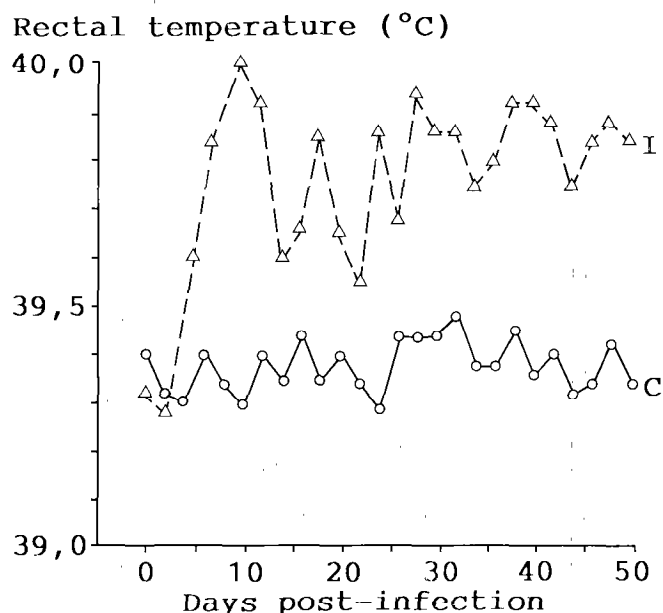


Fig. 2 : Mean rectal temperature of infected and control pigs. (I : infected pigs ; C : controls).

that of the controls even though the values fell to normal levels at intervals in individual pigs. The peak of rectal temperature in individual pigs varied from 41.1 to 41.8 °C.

By 50 dpi, the mean packed cell volume had fallen by 34 % i.e. from 40 to 26 % (fig. 1). Infected pigs were anorexic, weak, recumbent and very lean. A pig started showing intermittent circling and wobbling of the hindlegs as from 46 dpi.

Pathology

At necropsy, the carcasses of infected pigs lacked subcutaneous or abdominal fat and were lean. The lymph nodes especially the prescapular, subcutaneous and those of the lumbar region, were markedly enlarged. The brain of the pig that showed nervous signs was grossly congested and focal grey areas of necrosis were present on the cerebral cortex.

Microscopical examination of tissues of all infected pigs revealed moderate haemosiderosis, erythrophagocytosis, neutrophilic and eosinophilic infiltration of the white pulp as well as a mild macrophage and plasma cell hyperplasia in the spleen. The ovarian lesion was characterized by mild eosinophilic, lymphocytic and macrophage infiltrates into the connective tissue. In addition, there was sludging of lymphocytes and neutrophils in

many blood vessels. In all infected pigs a marked congestion and oedema was observed in the lymph nodes, with medular and subcapsular spaces containing moderate neutrophilic infiltrates. A moderate macrophage hyperplasia was also seen in the medular area of the lymph nodes. In the pig that exhibited ner-

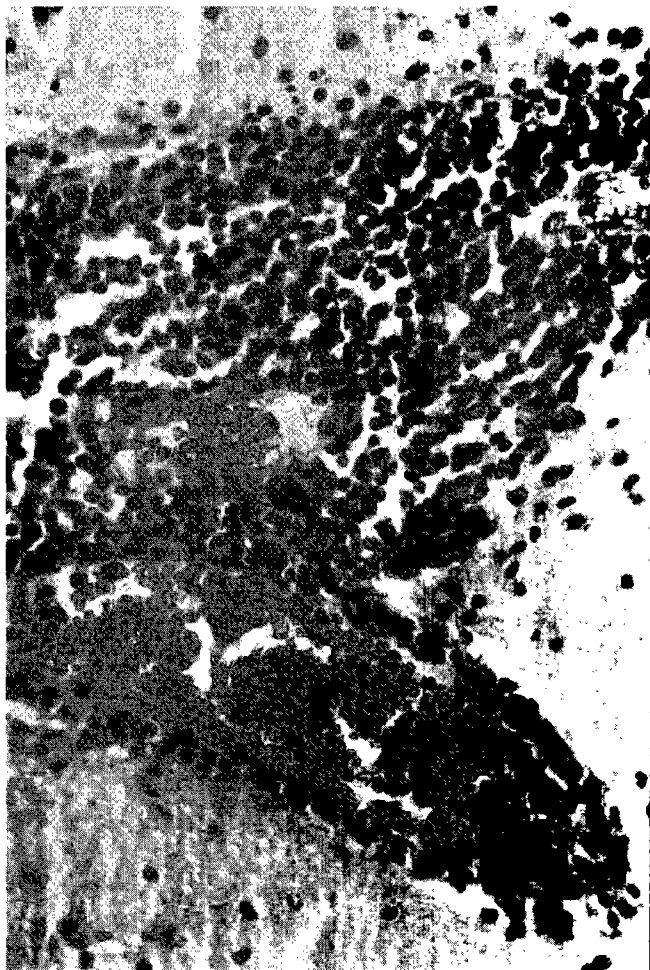


Photo 1 : Histological section of the cerebrum of a pig showing meningitis with vasculitis and perivascular lymphocytic cuffs. (H & E x 1400.)

OTESILE (E.B.), AKPAVIE (S.O.), FAGBEMI (B.O.), OGUNREMI (A.O.). Pathogenicity of *Trypanosoma brucei brucei* in experimentally infected pigs. *Revue Elev. Méd. vét. Pays trop.*, 1991, 44 (3) : 279-282

An experimental infection of 4-to 5-month old pigs with a stock of *Trypanosoma brucei brucei* resulted in a high parasitaemia, anorexia, pyrexia and a decline in the packed cell volume by one third. Nervous sign of circling and wobbling of the hind legs occurred in one of the pigs which at necropsy revealed a very severe meningo-encephalitis and the presence of trypanosomes in the brain. These results confirm that *T. b. brucei* might cause a severe disease in pigs. **Key words** : Pig - Experimental infection - Trypanosomosis - *Trypanosoma brucei brucei* - Nigeria.

vous signs, the brain lesion was a very severe meningo-encephalitis which was characterized by a very severe lymphocytic infiltrates into the meninges, vasculitis, perivascular cuffs (photo 1) and glia nodules in the brain tissue. The presence of trypanosome nuclei both in the brain tissue and in the blood vessels was confirmed in Giemsa stained sections. Motile trypanosomes were seen in the wet mounts made from CSF while the Giemsa stained smears also contained trypanosomes. Similar lesions were not seen in the brain of the remaining three infected pigs and no lesions were observed in the control pigs.

DISCUSSION

The observations on parasitaemia, rectal temperature and packed cell volume in this study are consistent with those reported for virulent species of African trypanosomes (11). The results also indicate that the stock of *T. brucei* used in this study could cause economic losses through anaemia and invasion of the central nervous system which invariably terminates fatally (3, 4, 5).

The meningoencephalitis observed at histopathology and the presence of trypanosomes in the CSF and brain tissue explains the signs of central nervous system disturbance observed in one of the pigs. This observation has not been previously shown in pigs infected with *T. brucei* although meningoencephalitis has been observed in the dog and horse naturally infected with *T. brucei* (3, 4, 5). VOHRADSKY (13) and ISOUN and ANOSA (6) reported the presence of endometritis and cystic ovaries in cattle and sheep infected with *T. vivax*. The lesions were not observed in pigs infected with *T. brucei* in the present study although eosinophilic and macrophage infiltrates were observed in the ovarian connective tissue of infected pigs.

The present results thus support a previous finding in Northern Nigeria that *T. brucei* may cause a severe rather than a mild syndrome in infected pigs (1).

OTESILE (E.B.), AKPAVIE (S.O.), FAGBEMI (B.O.), OGUNREMI (A.O.). Patogenicidad de *Trypanosoma brucei brucei* en cerdos infectados experimentalmente. *Revue Elev. Méd. vét. Pays trop.*, 1991, 44 (3) : 279-282

Una infección experimental de cerdos de 4 a 5 meses de edad con una cepa de *Trypanosoma brucei brucei* provocó una parasitemia elevada, anorexia, fiebre y una disminución de una tercera parte del hematocrito. Síntomas nerviosos de modorra y temblores de los miembros anteriores ocurrieron en uno de los animales ; la autopsia demostró una meningo-encefalitis grave y la presencia de tripanosomas en el cerebro. Dichos resultados confirman que *T. b. brucei* puede causar una enfermedad grave en los cerdos. **Palabras claves** : Cerdo - Infección experimental - Tripanosomosis - *Trypanosoma brucei brucei* - Nigeria.

REFERENCES

1. AGU (W.E.), BAJEH (Z.T.). An outbreak of fatal *Trypanosoma brucei brucei* infection of pigs in Benue State of Nigeria. *Trop. Vet.*, 1986, **4** : 25-28.
2. HERBERT (W.J.), LUMSDEN (W.H.R.). *Trypanosoma brucei*. A rapid "matching" method for delete estimating the host's parasitaemia. *Expl. Parasit.*, 1976, **40** : 427-431.
3. IKEDE (B.O.), HILL (D.H.), AKPOKODJE (J.U.). Clinicopathological changes in horse naturally infected with *Trypanosoma brucei*. *Nig. Vet. J.*, 1973, **2** : 13-17.
4. IKEDE (B.O.), LOSOS (G.J.). Trypanosomal meningoencephalomyelitis with localization of *T. brucei* in the brain of a dog. *Trans. R. Soc. trop. Med. Hyg.*, 1972, **66** : 357.
5. IKEDE (B.O.), LOSOS (G.J.). Spontaneous canine trypanosomiasis caused by *T. brucei*. Meningoencephalitis with extravascular localization of trypanosomes in the brain. *Bull. epiz. Dis. Afr.*, 1972, **20** : 221-228.
6. ISOUN (T.T.), ANOSA (V.O.). Lesions in the reproductive organs of sheep and goats infected with *T. vivax*. *Tropenmed. parasit.*, 1974, **24** : 469-476.
7. McLENNAN (K.J.R.). The epizootiology of trypanosomiasis in livestock in West Africa. In : MULLIGAN (H.W.) ed., The African trypanosomiasis. London, George Allen and Unwin, 1970. Pp. 751-773.
8. MURRAY (M.), MORRISON (W.L.), WHITELOW (D.D.). Host susceptibility to African trypanosomiasis. In : BAKER (J.R.), MULLER (R.) ed., Advances in parasitology. London, New York, Academic Press, 1982, **21** : 16-86.
9. MURRAY (M.), TRAIL (J.C.M.), GROOTENHUIS (J.G.). Trypanotolerant livestock : potential and future exploitation. *Outlook on Agriculture*, 1984, **13** : 43-51.
10. RICKMAN (L.R.), ROBSON (J.). The testing of proven *Trypanosoma brucei* and *rhodesiense* strains by the blood incubation infectivity test. *Bull. WHO*, 1970, **42** : 911-916.
11. STEPHEN (L.E.). Pig trypanosomiasis in Africa. Commonwealth agricultural bureaux, Farnham Royal, 1966. P. 65.
12. STEPHEN (L.E.). Clinical manifestation of trypanosomiasis in livestock and other domestic animals. In : MULLIGAN (H.W.) ed., The African trypanosomiasis. London, George Allen and Unwin, 1970. Pp. 774-794.
13. VOHRADSKY (F.). Clinical signs, daily rate of infection, physical changes of the blood and pathomorphological changes in cattle artificially infected by *Trypanosoma vivax*. *Revue Élev. Méd. vét. Pays trop.*, 1971, **24** : 251-263.