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# RESEARCH COMMUNICATION

# *THEILERIA*? *TAUROTRAGI*: A PROBABLE AGENT OF BOVINE CEREBRAL THEILERIOSIS

A. J. DE VOS(1), R. BESSENGER(1) and L. F. BANTING(2)

ABSTRACT

DE VOS, A. J., BESSENGER, R. & BANTING, L. F., 1981. *Theileria*? *taurotragi:* a probable agent of bovine cerebral theileriosis. *Onderstepoort Journal of Veterinary Research*, 48, 177–178 (1981).

A case of bovine cerebral theileriosis was confirmed at autopsy on a farm where 4 animals out of 70 died. All were less than 2 years old and all showed nervous signs.

Serologically, no evidence was found of *Theileria mutans* or the *Theileria parva* group in young animals born on the farm. Six out of 13 calves 6–9 months of age were, however, serologically positive for *Theileria*? *taurotragi* and it was concluded this species was the probable cause of death of the 4 animals.

*Résumé*

THEILERIA? TAUROTRAGI: *UN AGENT PROBABLE DE THEILERIOSE CÉRÉBRALE*

*Un cas de theileriose cérébrale bovine a été confirmé à l'autopsie sur une ferme où quatre animaux sur 70 périrent. Tous étaient de moins de deux ans d'âge et tous montraient des signes nerveux.*

*Sérologiquement aucune évidence de* Theileria mutans *ni de* Theileria parva *ne fut trouvée chez les jeunes animaux nés sur la ferme. Six sur treize veaux de 6–9 mois étaient cependant sérologiquement positifs pour* Theileria? taurotragi *et il en a été déduit que cette espèce était la cause probable de la mort des quatre animaux.*

## INTRODUCTION

Bovine cerebral theileriosis (BCT), or "turning sickness", was first described in East Africa by Mettam (1934) and Mettam & Carmichael (1936). The disease was fatal and was characterized by circling or turning movements, blindness, and the absence of fever. In the course of the disease either death ensued within as little as 2 days or the animals survived for as long as 6 months.

Mettam & Carmichael (1936) found theilerial schizonts, often in large numbers, in stained smears of cerebral haemorrhages of affected animals. The schizonts were most frequent in animals that died within a few days of the appearance of clinical symptoms and tended to become less and less numerous as the period of illness lengthened. No schizonts were found in some old chronic cases. A remarkable phenomenon of this disease was the infrequency of schizonts in the spleen and lymph nodes; in most cases they could not be demonstrated at all.

In their comprehensive study of BCT, Mettam & Carmichael (1936) described the case histories of 24 animals. These had all been raised in enzootic East Coast fever regions and 15 out of the 24 were known recently to have had East Coast fever, most of them within the previous 9 months.

Lewis & Fotheringham (1941) observed several cases of "turning sickness" in cattle 6–8 weeks after they were admitted to a quarantine station from an enzootic East Coast fever region. These authors failed to reproduce BCT experimentally, but they were inclined to look upon the disease as a cerebral infection of *Theileria parva* which probably occurs in an animal partly resistant to East Coast fever and suffering from a second attack while exposed to massive infestation with infected ticks.

The first 2 cases of BCT reported in South Africa were described by Flanagan & Le Roux (1957). The aetiological agent was identified as *Theileria mutans* because of the prevalence of this species in the districts of Pretoria and Rustenburg where the 2 cases were diagnosed. *T. parva* had last been diagnosed in these districts more than 30 years before and was therefore discounted as a possible cause.

Later, Van Rensburg (1976) described the case histories of a further 5 cases of BCT in South Africa. In these cases *T. mutans* was also incriminated as the aetiological agent.

More recently, Giles, Davies, Duffus & Heinonen (1978) reported on an outbreak of disease in a heard of 400 cattle in Kenya where the post-mortem findings were fairly typical of East Coast fever. Approximately 20% of the animals were ill and about half of these showed nervous symptoms. Sera of dying and recovering animals were examined for antibodies to *T. parva* and *T. mutans*. The results showed high titres of antibodies to *T. parva* and low titres to *T. mutans*. The authors concluded that the schizonts seen in brain impression smears were probably those of *T. parva*, and not *T. mutans*.

What all the authors mentioned above were unaware of at the time, or failed to consider, was the possibility that *Theileria* spp. other than *T. parva* and *T. mutans* might have been involved.

De Vos & Roos (1981 a) confirmed in South Africa what had been known in East Africa for several years, namely, that *Rhipicephalus appendiculatus* is not a vector of *T. mutans*. They did show that *Amblyomma hebraeum* is a very efficient vector of this species in South Africa. According to the literature reviewed by De Vos & Roos (1981 a), however, the existence in South Africa of a benign *Theileria* transmitted by *R. appendiculatus* has been recognized for a long time and until recently this species was taken to be *T. mutans*. Uilenberg, Perié, Lawrence, De Vos, Paling & Spanjer (1981) and De Vos & Roos (1981 b) confirmed the existence in southern Africa of *Theileria*? *taurotragi*, a benign *Theileria* sp. transmitted by *R. appendiculatus*.

(1) Veterinary Research Institute, Onderstepoort 0110
(2) State Veterinarian, Private Bag X927, Potchefstroom 2520
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The distribution of *R. appendiculatus* in South Africa follows closely that of *A. hebraeum* (Howell, Walker & Nevill, 1978). Recently, however, an opportunity presented itself of making some observations on the possible cause of BCT. A case was confirmed on a farm near Potchefstroom where *R. appendiculatus* occurred abundantly but *A. hebraeum* and heartwater, which is caused by *Cowdria ruminantium* and transmitted by this tick, were unknown.

## Case History

Four Friesian cross animals under 2 years of age out of a herd of 70 died on a property near Potchefstroom in the Transvaal. The deaths, which occurred during January 1981, were associated with heavy burdens of adult *R. appendiculatus*. Neurological signs, particularly circling movements and blindness as well as enlarged regional lymph nodes were the principal symptoms seen by the farmer in all the affected animals before death. Only one of the animals, which was destroyed *in extremis* 4 days after the onset of symptoms, was submitted for post-mortem examination. A large thrombus in a superficial blood vessel on the surface of a cerebral hemisphere, cerebral congestion, tumor splenis and lymphadenopathy were evident at autopsy.

Numerous schizonts were seen in a stained smear prepared from the thrombus. No schizonts, however, were seen in smears prepared from the spleen and a prescapular lymph node. Small numbers of theilerial piroplasms were present in the red blood cells.

TABLE 1 Reciprocal titres of sera of animals against theilerial antigens using the indirect fluorescent antibody test

| Sera | Antigens | | |
|---|---|---|---|
| Farm animals | *T.* ? *taurotragi* | *T. parva parva* | *T. mutans* |
| 1 | 320 | 40 | <40 |
| 2 | 160 | <40 | <40 |
| 3 | 80 | 40 | 40 |
| 4 | 80 | <40 | <40 |
| 5 | 80 | 40 | 40 |
| 6 | 80 | <40 | <40 |
| 7 | 40 | <40 | 40 |
| 8 | 40 | <40 | <40 |
| 9 | <40 | <40 | <40 |
| 10 | <40 | <40 | <40 |
| 11 | <40 | <40 | <40 |
| 12 | <40 | <40 | <40 |
| 13 | <40 | <40 | <40 |
| Controls | | | |
| *T.*? *taurotragi* (weak positive) | 80 | 40 | <40 |
| *T.*? *taurotragi* | 320 | 40 | <40 |
| *T. parva bovis* (weak positive) | 40 | 80 | <40 |
| *T. parva bovis* | 320 | 320 | <40 |
| *T. parva parva* | 160 | 320 | <40 |
| *T. mutans* | <40 | <40 | 5120 |

## Serology

Serum samples were collected 1 month after the last death from 13 6–9-month-old calves born on the property. The sera were tested against piroplasm antigens of *T.*? *taurotragi* (Vaalwater), *T. parva parva* (Onderstepoort) and *T. mutans* (MSD), using the technique of Gray & De Vos (1981) (Table 1). Positive sera of *T.*? *taurotragi, T. parva bovis, T. p. parva* and *T. mutans* were used as controls.

Titres against *T.*? *taurotragi* in 6 out of the 13 calves were comparable with those of the positive controls of this species (Table 1). Titres against *T. p. parva* and *T. mutans* antigens, however, were very low. The reactions of the control sera of *T. p. parva* and *T. p. bovis* against *T.*? *taurotragi* antigen are in accordance with the one-way cross reactivity observed by De Vos & Roos (1981 b) between *T.* ? *taurotragi* and the *T. parva* group.

## Conclusion

It appears that *T.*? *taurotragi* was the only *Theileria* sp. present on the farm at the time and it was therefore the probable cause of BCT. With *T. parva,* this is the second *Theileria* sp. implicated serologically in outbreaks of BCT in eastern and southern Africa. To our knowledge this is the first definite evidence of a potentially lethal effect of *T.*? *taurotragi* in cattle.

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