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Histological Examination of Wild Animals Naturally Infected with Pathogenic African Trypanosomes

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Abstract

Mild encephalitis and myocarditis were associated with natural *T. brucei* infection in game animals. Extravascular trypanosomes were demonstrable in tissues of one animal. Structures were also found in the cerebral blood vessels of a lion infected with *T. congolense* which were probably intravascular aggregates of trypanosomes.

Introduction

Wild game in Africa is infected with species of trypanosomes which are pathogenic to man and domestic animals. Game animals are generally considered to act as the reservoir of infections without showing evidence of disease. However, it has been shown that some wild species can be killed by experimental trypanosomal infections (ASHCROFT et al. 1959), and occasionally natural infections have also been associated with disease (McCULLOCH 1967; SACHS et al. 1967).

Histological examination of wild animals was included as part of the sleeping sickness survey in Musoma District, Tanzania, which has been reported by GEIGY et al. (1971). The object was to determine whether lesions could be associated with trypanosomal infections, particularly with trypanosomes of the *brucei* subgroup which are known to cause extensive lesions in various organs and tissues by their extravascular localization and multiplication (PERUZZI 1928; LOSOS & IKEDE 1970).

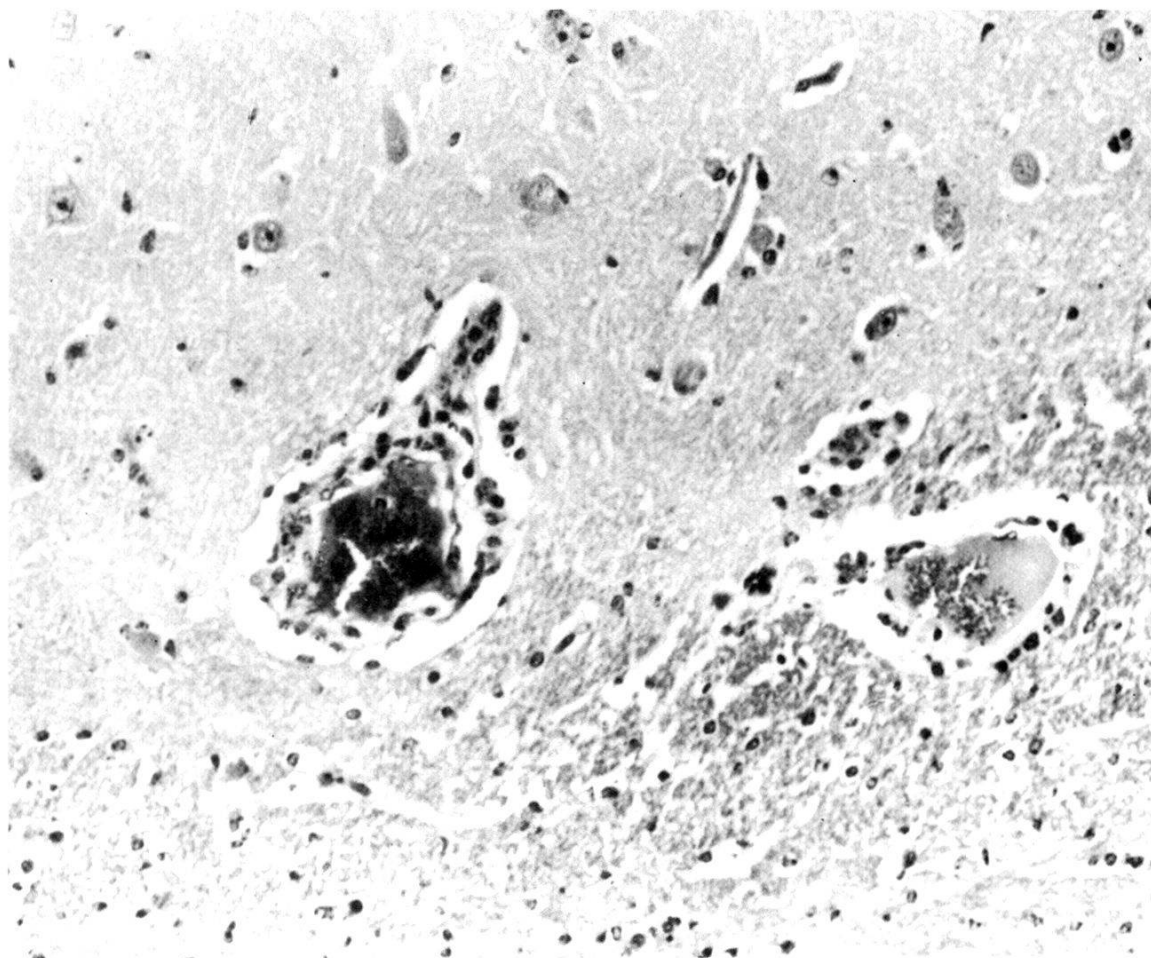
Materials and Methods

The number of animals which were necropsied and the results of haematological examination for trypanosomes are presented in Table 1. This group of animals consisted principally of those examined in the haematological survey reported by GEIGY et al. (1971), but some additional animals which were killed in the same area were also included.

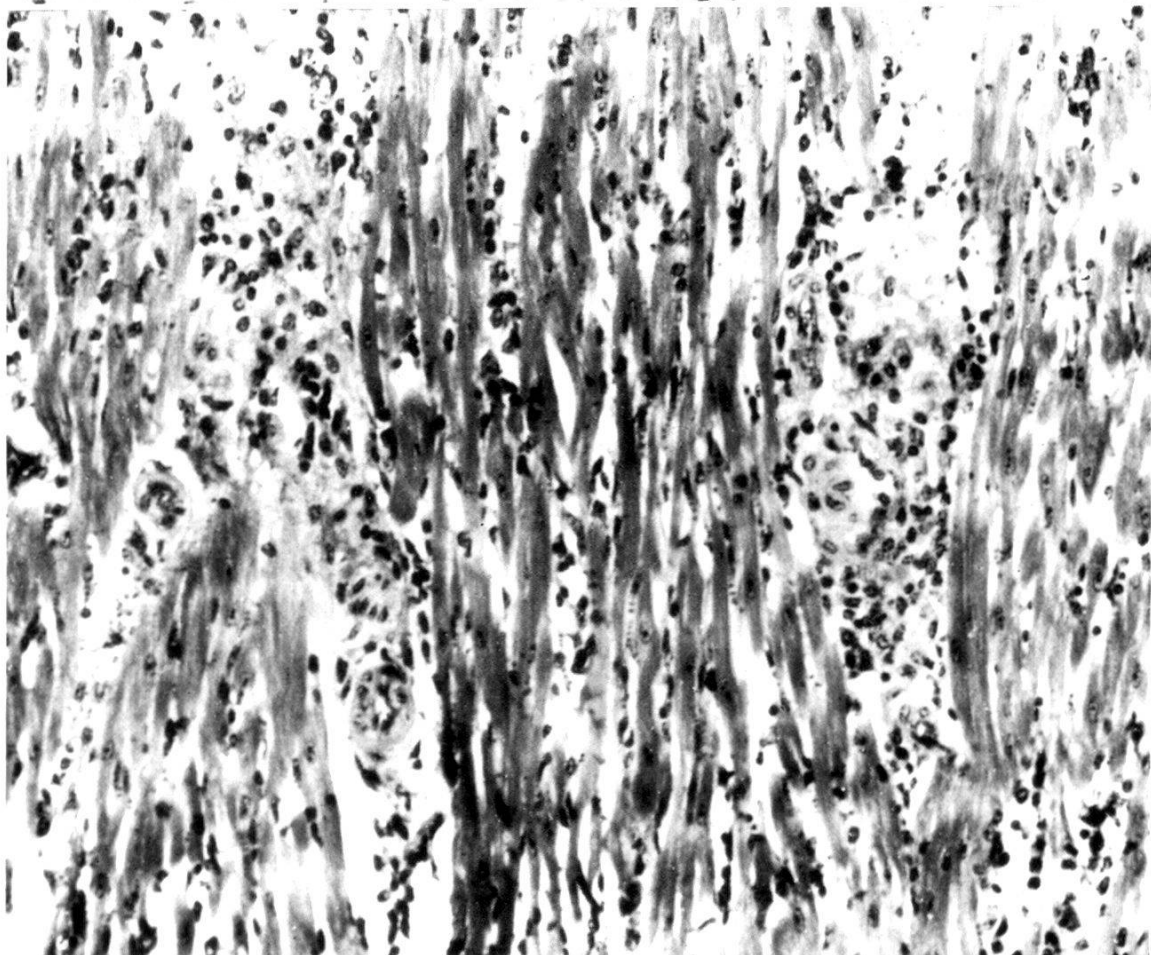
Postmortem examinations were usually carried out within one hour after death. The only exception was in the case of the lions which were done after five to eight hours.

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The following tissues were fixed in 10% formalin; lip, eyelid, pre-capular lymph node, brain, pituitary, atrial and ventricular walls, skeletal muscle, lung, liver, kidney, adrenal gland, bone marrow, and spleen. Routine paraffin sections were cut at five microns and stained with Harris's haematoxylin and eosin (H & E).

Thomson's gazelle: In the Thomson's gazelle which was infected with *T. congolense* as determined by haematological examination, there was a focal encephalitis affecting the hypothalamus and *pars nervosa* of the pituitary. The lesions consisted of perivascular mononuclear cell infiltrations made up of large lymphocytes and plasma cells. Trypanosomes were not found either inside or outside the blood vessels.

Coke's hartebeest: Two of the four animals found to be infected with *T. brucei* had a mild meningoencephalitis with occasional perivascular infiltrations of lymphocytes. One other infected animal had a slight myocarditis with an infiltration of the atrial walls by large lymphocytes. The fourth animal in this group had no evidence of lesions. One noninfected animal also had slight meningitis with a mononuclear cell infiltration. Trypanosomes were not detected in tissues of any of these animals.

Lion: A fairly extensive infiltration by lymphocytes and macrophages of the connective tissue stroma of the atrial walls was observed in the one animal infected with *T. brucei*.

Trypanosomes were not found in tissues. However, in this particular case their absence could possibly be due to the five to eight hour delay in performing the postmortem. It is known that trypanosomes in tissues quickly degenerate and lyse after death of the host (PERUZZI 1928).

In the lion infected with *T. congolense* there were accumulations of basophilic dots in a number of small blood vessels of the brain (Fig. 5). These were interpreted to be trypanosomal nuclei in intravascular aggregations of trypanosomes. This interpretation was based on comparable observations made in cattle infected by *T. congolense* (Fig. 6) (Losos et al., in preparation).

Results

Significant histological lesions were found in two impalas, one Thomson's gazelle, three Coke's hartebeest, and in two lions.

Impala: Two of the 19 impalas examined had a meningoencephalitis characterized by perivascular lymphocytic infiltrations in the brain and meninges (Fig. 1). One of these animals also had an accompanying fairly extensive interstitial myocarditis with lymphocytes, macrophages, and plasma cells, infiltrating the connective tissues of the atrial walls

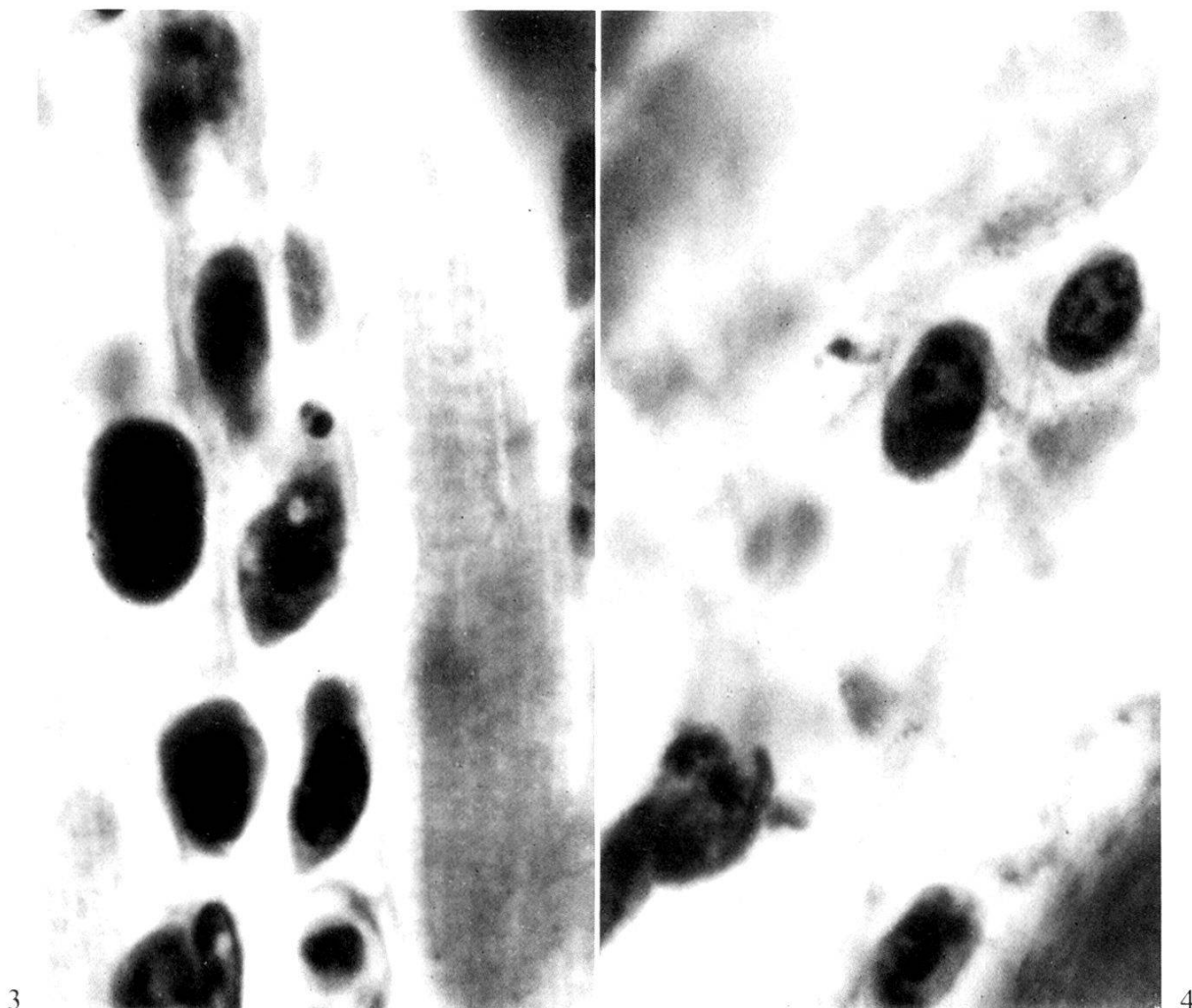


Fig. 3. Extravascular rounded form of a trypanosome with a prominent nucleus and kinetoplast. H & E.

Fig. 4. Extravascular flagellate form of the trypanosome. H & E.

(Fig. 2). Associated with the inflammatory reaction in the myocardium were structures which resembled single trypanosomes. These appeared as either single flagellate or rounded forms with a nucleus and kinetoplast (Fig. 3, 4). In neither of these animals were trypanosomes detected on haematological examination.

Discussion

Encephalitis and myocarditis are the common lesions caused by intercellular invasion of tissues of domestic and laboratory animals by the trypanosomes of the *brucei* subgroup. Of the 77 game animals examined haematologically as well as histologically (Table 1) five were found to be infected with *T. brucei*, and four of these had evidence of myocarditis and/or meningoencephalitis. Brain and heart lesions were also present in three of the other remaining 72 animals not found

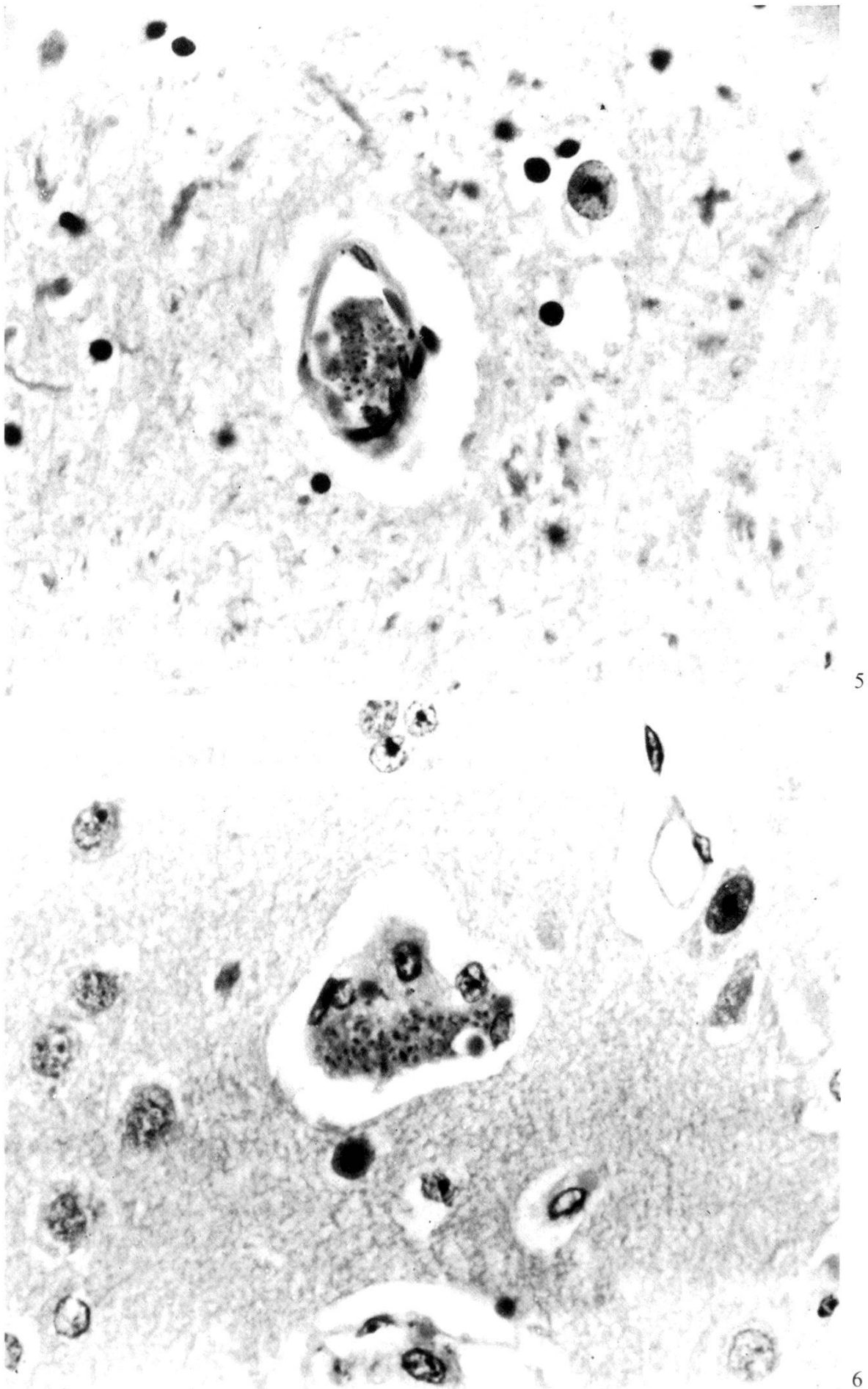


Fig. 5. Intravascular aggregate of basophilic dots, thought to be trypanosomal nuclei, in the brain of a lion infected with *T. congolense*. H & E.

Table 1. The infection rates with trypanosomes on haematological examination in the game animals examined histologically

| Species | No. examined | No. infected | <i>T. brucei</i> group | <i>T. congolense</i> group | Mixed <i>T. congolense</i> <i>T. brucei</i> | <i>T. vivax</i> group | Unidentified trypanosomes |
|-------------------|--------------|--------------|------------------------|----------------------------|---|-----------------------|---------------------------|
| Warthog | 9 | 3 | 0 | 0 | 0 | 0 | 3 |
| Impala | 19 | 2 | 0 | 0 | 0 | 0 | 2 |
| Thomson's gazelle | 10 | 3 | 0 | 2 | 0 | 1 | 0 |
| Coke's hartebeest | 16 | 12 | 4 | 2 | 2 | 3 | 5 |
| Topi | 10 | 1 | 0 | 0 | 0 | 0 | 1 |
| Zebra | 10 | 1 | 0 | 0 | 0 | 1 | 0 |
| Lion | 3 | 2 | 1 | 1 | 0 | 0 | 0 |
| Species 7 | 77 | 24 | 5 | 5 | 2 | 5 | 11 |

to be infected with *T. brucei* on haematological examination. There appears to be an association between the infections by *T. brucei* and the occurrence of these lesions. The changes which were found were mild. Trypanosomes were observed only in the myocardium of one impala. It should be pointed out that the demonstration of intra- and extravascular trypanosomes in routine histologic preparations of tissues is difficult unless they occur in relatively large numbers. The finding of cellular infiltrations in both the brain and heart in the infected animals suggests that as in domestic and laboratory animals *T. brucei* invades solid tissue and causes lesions. However, the mild nature of these lesions suggests that probably the infections were asymptomatic. Attention should also be drawn to the fact that since *T. brucei* appears to be a tissue parasite in the game animals, therefore, the diagnosis of infection by examination of blood for trypanosomes alone may not be an efficient method.

The accumulation of trypanosomes in the brain of one of the five animals infected with *T. congolense* is of interest in that similar aggregates have been observed in terminal stages of disease in cattle infected with *T. congolense*. This particular localization in cattle was associated with focal polioencephalomalacia which was postulated to be due to a pressure necrosis resulting from ischemia in the brain. Similar lesions were not observed in the lion, but these aggregates of *T. congolense* in venules indicated that as in cattle this species of trypanosomes may also localize in the microcirculation of game animals. The basophilic dots in the vessels, which were thought to be

trypanosomal nuclei, were irregular in size probably indicating nuclear degeneration as a result of the five to eight hour delay before post-mortem examination was performed.

Acknowledgements

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Zusammenfassung

Freilebende, mit *T. brucei* natürlich infizierte Wildtiere zeigten als Autopsiebefund eine leichte Encephalitis und Myocarditis. In den Geweben eines der Tiere konnten extravaskuläre Trypanosomen nachgewiesen werden. In den Hirngefäßen eines weiteren mit *T. congolense* infizierten Tieres (Löwe) fanden sich gewisse Strukturen, bei denen es sich um intravaskuläre Ansammlungen von Trypanosomen handeln dürfte.

Résumé

Des encéphalites et des myocarditis bénignes ont été constatées chez des animaux sauvages naturellement infectés par *T. brucei*. Des trypanosomes extravasculaires ont été mis en évidence dans les tissus d'un de ces animaux. Des structures correspondant probablement à des aggrégats intra-vasculaires de trypanosomes ont également été trouvées dans les vaisseaux du cerveau d'un lion infecté par *T. congolense*.