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Sleeping Sickness Survey in Musoma District, Tanzania

V. The Endemicity of Rhodesian Sleeping Sickness in Ikoma-Serengeti Area – Final Discussion

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Since 1922 when Rhodesian sleeping sickness was first introduced into the Ikoma area the disease must have been maintained as a zoonotic infection, the parasite being continuously transmitted between fly and game. People living in the area have been infected whenever they encroached onto the tsetse bush and encountered infected flies. The incidence of the disease in man has thus depended on the degree of man-fly contact which might have been brought about by the various human activities such as hunting, poaching, game watching, etc. The reduction in the number of human infections and eventual disappearance of the disease in man in the early 1950's might have been due to the decrease in human activity in the fly belts and thus the reduction of man-fly contact. The recrudescence of human trypanosomiasis in 1964 in the Ikoma-Serengeti area could be attributed to the increase in human population and their activities which enhanced man-fly contact. Population movements in the area in the form of (I) tourism, which is estimated to bring about 40,000 visitors into the park; (II) game protection carried out by game rangers and scouts who travel around within the park to prevent poaching; (III) road construction work within the park; (IV) game poaching by local people; (V) travels by employees and their families to and from the many scattered establishments within the park, etc. promotes a certain amount of man-fly contact during which an infection with *T. rhodesiense* may be contracted by susceptible persons. It is possible that the increase of the disease transmission from 4 in the first half to 37 in the second half of the ten year period, 1961 to 1970 inclusive, was due to the increase in the frequency of man-fly contact in the area.

ONYANGO & WOO (cf. part I) have found no evidence of infection in about 3,000 people who were living in the Ikoma-Serengeti area. Yet during the 4 months previous to the survey 4 patients were diagnosed all of whom were employees within the Park. In December 1970, a month following the survey, one patient living in the Ikoma area outside the park was also found infected. These isolated cases are

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an example of the complicated nature of the epidemiology of the Rhodesian sleeping sickness that baffles many investigators and has been the subject of a number of reviews (FAIRBAIRN 1948, ASHCROFT 1959, NASH 1960, FORD 1965 and ONYANGO 1966). Such sporadic cases confirm the belief that infection in this area occurs by chance.

The results of the entomological investigation (cf. part II in this issue) are indeed intriguing. Low infection rates in tsetse with mature *T. brucei* in the order of 0.1 % to 0.6 % is a known fact; despite these low rates intense transmission may still occur in endemic areas. The total absence of salivary gland infection in flies in an endemic area is an unexpected finding. Yet this finding in the area does not necessarily imply that transmission of *T. brucei* subgroup organisms will not be effected by flies which have no salivary gland infection. Recently it has been experimentally shown that "when flies from cages with known infected flies were individually fed on normal mice, the transmission rate was approximately 5 times higher than revealed by salivary gland infections" (WARD & BELL 1971). It may be that the proventricular forms of *T. brucei* and *T. rhodesiense* are as infective as the metacyclic forms in the salivary glands.

In all the 862 blood meals analysed only two were derived from primates, one from man and one from baboons. This finding together with the fact that no *brucei* subgroup trypanosomes were isolated from tsetse flies suggest that transmission of human trypanosomiasis is likely to be restricted.

The finding during the survey that *G. swynnertoni* readily attacks man when the opportunity arises shows that this tsetse species may be an efficient vector of *T. rhodesiense* if man-fly contact is established. Judging from the activities of the population in and around the Serengeti National Park and those of the visitors, particularly tourists, the circumstances that can bring about "personal" man-fly contact seem to come about rarely.

MWAMBU & MAYENDE (cf. part II) found a few *T. brucei* subgroup infections in cattle. Out of 28 strains isolated 10 were tested by BIIT and of these 4 behaved suspiciously like T. rhodesiense. Cattle have been proved to harbour *T. rhodesiense* in another part of East Africa (ONYANGO et al. 1966), hence the probability that cattle in Ikoma may be acting as reservoirs is not surprising. Since these cattle come in contact with tsetse in the Game Reserve only and these tsetse populations have little contact with the human population, chances of transmission of *T. rhodesiense* between cattle, tsetse and man appear remote.

GEIGY et al. (cf. part IV) in a survey of a limited number of game species isolated 12 strains of *T. brucei* subgroup, 5 of which behaved like *T. rhodesiense* by the BIIT. These suspicious strains were isolated from lions, hyaena, waterbuck and hartebeest. Their presence in these

mammalian species and their scarcity in the tsetse vector possibly indicate that the mammalian host must have been fed on only occasionally. These suspicious isolates will be tested in volunteers for their pathogenicity to man. Suffice to say, the role of game reservoirs of *T. rhodesiense* has been established. The species usually associated with the disease is bushbuck. Other ungulates have also been shown to harbour the parasite without ill effects on their health (ASHCROFT 1959). *T. brucei* has been isolated in the past from lions (SACHS et al. 1967) but not from hyaena. Isolation from hyaena is therefore interesting.

Conclusion

The reappearance of cases of Rhodesian sleeping sickness in the Ikoma-Serengeti area since 1964 confirms the endemicity of the disease in the area. From the results of the investigations described above it is difficult to pinpoint any focus responsible for the disease in man. It would appear that game-fly transmission occurs in a haphazard manner. The transmission to man is a chance occurrence which depends on many factors, the major one being man-fly contact, which in this locality appears restricted. To offer maximum protection to employees and resident population, adequate clearing of vegetation round the settlements and villages is advisable. This should be coupled with systematic case finding. For the individuals who may come in contact with the fly while sightseeing or during the course of duty, it is essential that they report to competent medical authorities any febrile episodes occurring a few days to a few weeks after a visit to the area. If this is done, the few infections that will be contracted will be quickly treated; hence these visits to the area could be made with impunity.

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Zusammenfassung

Im Oktober und November 1970 sind im Serengeti-Ikoma-Gebiet epidemiologische Erhebungen über das Vorkommen von *T. rhodesiense*-Infektionen durchgeführt worden. Diese vom Gesundheitsministerium von Tanzania veranlaßten Untersuchungen sind ausgelöst worden durch das periodische Wiederaufflackern von Herden östlicher Schlafkrankheit in jenen Gegenden vom Jahre 1964 an nach 10jährigem Stillstand. Die mit diesem Unternehmen beauftragte Forschergruppe setzte sich zusammen aus Medizinern, Veterinären, Entomologen und Protistologen, die von der E.A.T.R.O., Tororo (Uganda), und vom Schweizerischen Tropeninstitut in Basel gestellt wurden.

Es ergaben sich folgende Resultate: Von 3000 untersuchten Personen wies keine eine Trypanosomen-Infektion auf. Bei 8000 sezierten Tsetsefliegen sind wohl eine Anzahl Organinfektionen mit Trypanosomen festgestellt worden, jedoch keine für den Brucei-Typus charakteristischen Speicheldrüseninfektionen. Untersuchungen an 798 Rindern im Ikoma-Gebiet ergaben 3,5 % Infektionen vom Brucei-Typ, während an 115 Wildtieren 12 Brucei-Stämme von Hyäne, Löwe, Warzenschwein, Wasserbock und Kuhantilope isoliert werden konnten. Der in diesen Fällen durchgeführte Blut-Inkubationstest nach RICKMAN & ROBSON ergab zum Teil inkonstante Resultate, wies aber in einigen Fällen deutlich auf *T. rhodesiense* hin. Diese Frage wird weiter verfolgt. Zusammenfassend läßt sich auf Grund der negativen Resultate bei Mensch und Tsetsefliege, und der relativ niedrigen Infektionsraten bei Rind und Wildtieren heute feststellen, daß im Serengeti-Ikoma-Gebiet die Übertragungsmöglichkeiten offenbar sehr gering und dem Zufall überlassen sind und daß daher das Risiko für Schlafkrankheitsbefall gering ist.

Résumé

Au cours des mois d'octobre et de novembre 1970, une enquête épidémiologique sur l'incidence des infections à *T. rhodesiense* dans la région de Serengeti-Ikoma a été réalisée par un groupe de chercheurs comprenant des équipes de médecins, vétérinaires, entomologistes et protozoologistes de l'E.A.T.R.O., Tororo (Uganda), et de l'Institut Tropical Suisse à Bâle. Cette enquête, réclamée par le Ministère de la Santé de la République de la Tanzanie, a été déclanchée par la réapparition dans cette région de foyers de maladie du sommeil du type est-africain en 1964, après dix années d'absence. Les résultats peuvent se résumer ainsi: Sur 3.000 personnes examinées aucune infection n'a pu être mise en évidence. L'analyse de près de 8.000 mouches Tsé-Tsé a bien permis de constater dans un nombre de cas la présence de trypanosomes dans les organes, mais aucune infection de glandes salivaires, caractéristique du type Brucei, n'a pu être démontrée. L'examen de 798 têtes de bétail de la région d'Ikoma a révélé un taux d'infection à type

Brucei de 3,5 %, alors que sur 115 animaux sauvages 12 souches de Brucei ont pu être isolées de hyène, lion, phacochère, le cobe Defassa et la bubale. Le « Blood Inoculation Infectivity Test » d'après Rickman et Robson pratiqué sur ces souches a donné des résultat inconstants, mais cependant dans quelques cas nettement en faveur de *T. rhodesiense*. L'étude de ce problème sera poursuivi ultérieurement.

Etant donné d'une part la négativité des investigations menées chez l'homme et chez la mouche Tsé-Tsé et d'autre part vu le taux d'infection relativement bas du bétail et des animaux sauvages, les auteurs arrivent à la conclusion, que dans la région Serengeti-Ikoma la transmission est basse, épisodique et le fait du hazard et que la probabilité d'y contracter une infection à *T. rhodesiense* est faible.