

HUMAN TRYPANOSOMIASIS AND SPIROCHAETOSIS IN
PORTUGUESE SOUTH-WEST AFRICA, WITH SUGGES-
TIONS FOR PREVENTING THEIR SPREAD IN THE
COLONY.

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Introduction.

THE origin and object of the following paper can be explained in a few words. In April, 1904⁽¹⁾, the writer published a series of 280 blood examinations (to which were added about 150 more) of natives of southern Angola (Portuguese West Africa) without recording a single instance of the presence either of trypanosomes or of spirochaetes in the circulation. Quite recently in the course of an investigation¹ of the endemic malaria of the same district, 513 examinations made among the same people and with the same technique revealed 3 individuals harbouring trypanosomes and 4 showing spirochaetes in their blood. These observations, together with the fact that a year or so ago the natives reported no cases of Tick Fever⁽²⁾, while recently statements are made by them that the Tick Fever of the upper Zambezi has reached Angola, and also the fact that Sleeping Sickness is reported to be advancing southward through the province, have led me strongly to suspect that these diseases have lately begun to spread markedly in my part of the colony, and that one or both of them may not inconceivably assume in the near future epidemic proportions.

Method and Terminology.

As a matter of convenience, I am, for the purposes of this paper, considering together the two diseases mentioned in the title. I am the more encouraged to do this in view of recent suggestions regarding

¹ This will soon be published by the American Society of Tropical Medicine.

their aetiology. Schaudinn's experiments with the blood parasites of birds⁽³⁾, and a remark made by Novy and MacNeal⁽⁴⁾ will serve as illustrations of the close relationship which is suspected to exist between the parasites causing the two affections. There are two views as to the nature of this relationship. (1) That the two parasites are but different stages in the development of the same protozoon. This occurs to one when studying involution forms of trypanosomes consisting of practically nothing but the flagellum⁽⁵⁾. (2) That they are analogous but distinct organisms. This is probably the case. The facts of different hosts and different symptoms unite with the morphological considerations to establish this view. It is moreover probable, as Nuttall⁽⁶⁾ and others have pointed out, that further inoculation experiments with different animals will show the spirochaeta of Tick Fever to be a species distinct from *S. obermeieri*. By the natives of Angola fever caused by both trypanosomes and spirochaetes is not differentiated from manifestations of malaria and is generally known by the term "ombambi" (fever). Sleeping Sickness is called "uveyi wokusuñila" (drowsy disease). In this paper the terms Trypanosomiasis and Spirochaetosis are employed as general designations of the respective infections.

Definition and History.

The diseases under consideration, connected with the presence in the blood of *Trypanosoma* (? *gambiense* Dutton) and *Spirochaeta sp. incert.*, seem recently to have become more widespread than formerly among the Umbundu-speaking Bantus of southern Angola and are doubtless transmitted from one individual to another through the medium of Tsetse flies and ticks. One case of Spirochaetosis has been observed in a white man⁽⁷⁾. There are reasons for fearing that one or both diseases may spread more rapidly in the future. I believe that the first mention of the occurrence of both affections in this district is to be found in my initial papers on Tick Fever⁽²⁾ and Human Trypanosomiasis⁽⁸⁾ hereinafter mentioned. Dr A. Y. Massey published, subsequent to my first communication⁽²⁾, a paper on Spirochaetosis⁽⁷⁾ and I have since discussed both Spirochaetosis⁽⁹⁾, Trypanosomiasis⁽¹⁰⁾, and their respective transmitters, *Ornithodoros moubata* Murray⁽¹¹⁾ and *Glossina palpalis wellmani* Austen⁽¹²⁾. So far as I know these are the only communications from this district on these subjects.

Recognition of the Diseases.—The Parasites.

Both parasites are readily recognized in fresh blood at a magnification of $\times 950$. Dried films containing trypanosomes are best stained for diagnostic purposes with some form of Romanowsky method. For spirochaetes some strong basic stain is necessary; I have usually employed a weak solution of carbol-fuchsin. In examining series of cases for both parasites, a good plan is to make one fresh and two dry films from each individual. One of the dry films may then be treated with Romanowsky and the other with fuchsin. The human trypanosome seen in this district seems to be morphologically identical with *Tr. gambiense* Dutton⁽¹³⁾. The shape of the posterior end, the arrangement of the centrosome, nucleus and flagellum, as well as the "set" of the organism on the slide, correspond with the same points in *Tr. gambiense*. I have already published a description of the trypanosome⁽¹⁰⁾ and can mention but a few details here. The protoplasm stains somewhat irregularly with Romanowsky, taking on a slightly basophilic reaction. The centrosome stains a dark purple, and the flagellum, which stains pink, seems to rise from or near it. The nucleus lies near the middle of the body, and often occupies more than two-thirds the width of the parasite. It is oval in shape and stains red like other chromatin material. Following are measurements of a stained specimen of the parasite:—

Length.....	(about) 24 μ ,
Greatest width.....	3.5 μ ,
Distance of centrosome from posterior end	3 μ ,
Length of free flagellum	(about) 9 μ ,
Largest diameter of nucleus	4 μ .

The spirochaete of Tick Fever is a thin, motile thread, slightly tapering at the ends, and which in the blood cannot be distinguished, either when alive or in stained preparations, from *S. obermeieri*. I have, in former communications^(2, 9), recorded some notes on this parasite. One point which is worth mentioning is that the typical spiral forms so often figured are very seldom seen. The creature as a rule dies in rather large curves. The average measurements of some stained specimens examined by me were:

Length.....	30 μ ,
Greatest breadth	0.1 μ .

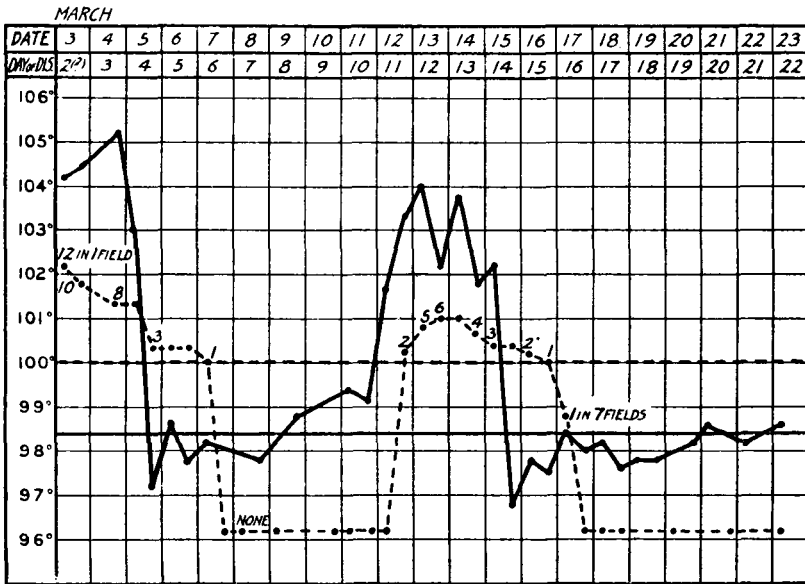
Recognition of the Disease.—Symptoms.

In regard to the three cases of Trypanosomiasis studied⁽¹⁰⁾, it cannot be said that the symptoms are a certain guide to the detection of the disease. The first case encountered gave no history of illness except occasional slight fevers, and there were no symptoms whatever that would lead one to suspect trypanosomal infection. The temperature was normal. Blood examinations showed about 5,000,000 red cells, and 7000 leucocytes. A differential leucocyte count showed the following results.

Polymorphonuclears.....	30 per cent.
Lymphocytes	25 " "
Large mononuclears.....	24 " "
Transitionals.....	7 " "
Eosinophiles.....	13 " "

I have frequently seen as great a proportion of large mononuclears and eosinophile leucocytes as this count shows, in West African Bantus apparently in the best of health. My second case had suffered for several months with irregular fevers, which were milder and rarer at the time I saw him than they had been formerly. The patient was thin, and there was marked oedema of the eyelids. The skin was harsh and dry. A papular eruption somewhat resembling recently acquired scabies was present on the back, arms and thighs. The cervical glands of the right side were very slightly enlarged. The third case which has been seen in the district gave the history of having had fever and pains in the bones of the legs, lasting for several weeks, about a year before he was examined. His health had been good during the interval. The spleen was enlarged and the face showed a slightly puffy appearance. In other respects the man was in good health and condition.

The first in the series of cases of Tick Fever⁽²⁾, had, when I first saw him, a temperature of 104.4° F. The pulse was 92, respiration 29. The spleen was slightly enlarged. The temperature remained fairly stationary for two days, but fell on the third morning to subnormal. This was a typical case of Relapsing Fever, and after about a week the temperature rose again finally to fall permanently after four or five days more. There was a very definite relation between the rise and fall of the temperature and the presence of parasites in the blood which is shown in the following chart.



DESCRIPTION OF CHART.—The temperature is represented in the usual manner by an unbroken line. The dotted line represents the comparative abundance of the parasites in the blood during different stages of the attacks, taking the line marked 100° as representing the average of one parasite in each field. Thus 101° would mean six parasites in each field, 102° eleven parasites, &c.

The second case in my series was that of a man who had suffered from irregular fevers, and at the time I saw him had a temperature of 104° F. Nothing in the history or appearance of the patient would lead one to suspect anything more than malarial attacks. He was seen while on the march, and the case was not followed up. Spirochaetes were not very plentiful in his blood. The third and fourth cases were detected by blood examinations made in a series of apparently healthy natives, one of whom had very slight enlargement of the spleen. The case recorded by Dr Massey⁽⁷⁾ was that of a white man. The temperature was 103.4° F. The patient gradually sank into a semi-comatose state, passing urine and faeces involuntarily, and died in three days from the time he was first observed. I could wish that these notes showed enough regularity of symptoms to justify some hope of medical officers being able to recognize the diseases by their clinical signs, but I fear that they only emphasize the general principle that microscopical examination of the blood is the only reliable method of detecting such

infections as we are considering. It is to be desired that the Government of this colony awake to the necessity of supplying its medical officers with microscopes and other needful clinical apparatus—an epidemic leading to this consummation would, perhaps, not be too dear a price to pay.

Transmitters of the Diseases.

In view of the recent researches of Gray and Tulloch⁽⁶⁾, and of Todd and the late Dr Dutton⁽¹⁴⁾, it is probably safe to say that the carriers of human Trypanosomiasis and Spirochaetosis in this region are respectively the only Tsetse fly of the district, *Glossina palpalis wellmani* Austen (1905) and the common West African tick, *Ornithodoros moubata* Murray (1877)¹. All three cases of Trypanosomiasis above mentioned had been frequently in the fly belt infested by *Gl. palpalis wellmani*, and two of the cases of Spirochaetosis gave the history of having been recently bitten by *O. moubata*.

Perhaps a few notes on these two arthropods may be of help to local medical officers and others in determining specimens:—

Gl. palpalis wellmani (called by the blacks “ochisumangala”) the disseminator of Trypanosomiasis^{(15), (12)} is distinguished from the type *Gl. palpalis* Rob.-Desv.⁽¹⁶⁾ by its having the frontal stripe pale ochraceous and the thoracic markings much reduced, so that the thorax appears spotted, the antero-lateral markings taking the form of spots or blotches; the spot immediately behind the inner extremity of the humeral callus on each side being small, ovoid or nearly circular, and especially conspicuous when the insect is viewed from above and slightly from behind. The femora also are pale, the dark blotches being much reduced. The fly belt of my district is at a point called Esupua on the lower reaches of the Katumbela River. The road from the interior to the seaport towns of Benguella and Lobito runs through the long axis of this belt. Porters and traders are thus constantly passing through the “fly,” and at Esupua one may see half-a-dozen large caravans of half-naked porters camping in one place.

Ornithodoros moubata (which is locally known as the “ocihopio”), the carrier of the spirochaete, is very common throughout the whole district. The ticks infest the huts and camps of the natives in great

¹ Several species of *Stomoxys* and a number of *Tabanidae* (*Chrysops*, *Haematopota* and *Tabanus*) are also common in the region, as is the troublesome haemophagous larva of *Auchmeromyia luteola* Fabr. and ticks other than *O. moubata*, chief among which are *Amblyomma variegatum* and *Rhipicephalus decoloratus*.

numbers. I have found as many as a hundred in an hour in an old native hut. In some places they become an intolerable plague, and the blacks are not seldom compelled to burn their old kraals and build new ones in order to escape their bites. *O. moubata* ⁽¹⁾ is a brownish tick, oval in shape, flattened and with the dorsal surface more rounded than the ventral. There is a ventrally curved hood hollowed out to form a camerostome with thick edge. The tegument is finely mammillated, giving it a leathery appearance. There are depressions on the dorsal surface, and coxal and supercoxal folds on the ventral, as well as transverse pre-anal and post-anal furrows and a longitudinal anal groove. The tick can be distinguished from *O. savignyi*. And (the only one with which it is liable to be confused), by the fact that the former has no eyes which are present in the super-coxal fold of the first pair of legs in *O. savignyi*.

Suggested Preventive Measures.

The task of inhibiting the threatened spread of the diseases above discussed from their endemic lowland areas into the comparatively healthy highlands, cannot claim a bright outlook. It is not feasible to change the course of the Benguella road because of the limited water supply near the coast. The plan of the town of Catumbella on the lower river too, depending as it does on the narrowness of the valley in which it lies, is unfavourable to needed changes. Against the spread of Trypanosomiasis I would suggest the following immediate feasible and economical measures.

(1) The native camps at Esupua should be moved farther away from the river. Of course this would meet with a little native opposition, but half-a-dozen native soldiers (police) stationed there would be sufficient to enforce such a regulation. That this can be done is proved by the situation at Lomalo, the next halting place to the east of Esupua, where the water is nearly a mile from the camps. At Esupua the vegetation away from the river rapidly becomes reduced to small clumps of *Acacia reficiens* and other thorny shrubs affording little shade, so that even a few hundred yards distance from the water would afford some advantage. *G. palpalis wellmani* does not seem to share the dislike for human ordure which has been ascribed to its congeners, and feeds actively on the scantily clothed blacks as they sit about the camps. The course of the road from Mt Noi to Esupua, too, might be carried a few hundred yards to the north. While the natives claim that the

“ochisumangala” bites also at night, yet one observation which I had the opportunity of making suggests that this is not the case, and it might be worth while to pass squads of soldiers, etc., through the “fly” at night.

(2) Native quarters in Catumbella should also be moved as fast as is possible away from the river towards the hills to the north of the town.

(3) The Government should not permit Sleeping Sickness cases and suspected cases of trypanosome fever to be brought from the endemic areas in Malange, Cazengo, Ambaca, Dondo, and other districts north of the Coanza River to be landed at Lobito or Benguella.

(4) Care should be taken not to allow such recognizable cases as are already in the district to be transported through the fly belt, either from Benguella, Lobito and Catumbella to the interior or from the interior to the coast.

As regards the prophylaxis of Tick Fever, I would suggest the following:

(1) The tick in question should be regularly destroyed in crowded centres by disinfecting native houses, barracks and other permanent quarters, and by burning old camps, huts, etc.

(2) Soldiers, labourers on plantations, etc., should be made to keep their houses clean, and to sleep in hammocks, or on beds well raised from the floor, and away from the wall. Natives should never be allowed to sleep in or near the quarters of Europeans.

(3) Soldiers, porters, servants, plantation labourers, and other controllable bodies of natives, should be compelled to observe regulations regarding regular bathing and washing of clothes.

(4) Natural enemies of *O. moubata* might possibly be found, and introduced or encouraged. I have observed *Reduviidae* (resembling *Opsicætus personatus* L.) feeding on this tick⁽¹¹⁾. I also noted on one occasion the presence of a mould^(2,9), which in some instances destroyed them. One can hardly see how the bugs could be utilized in this connection, but experiments might be made with the fungus.

REFERENCES.

Note. Some of the references to several reports and papers of the writer recently communicated to the American Society of Tropical Medicine do not give the date of publication, and to wait for receipt of reprints would delay the appearance of this article several months. Copies of any of these papers however, may be obtained from Professor Joseph McFarland, Secy. Am. Soc. Trop. Med., Office of the Secretary, Philadelphia, U.S.A.

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