THE PREVENTION OF SLEEPING SICKNESS.

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At the end of 1905 and during 1906, the Liverpool School of Tropical Medicine issued a series of studies^(1 2 3 4 5) on sleeping sickness in the Congo Free State, which lead to the following conclusions for that territory:

1. Trypanosomes can most easily be found in cases of human trypanosomiasis by the examination of the juice obtained by gland puncture.
2. Glandular enlargement is a very constant phenomenon in cases of human trypanosomiasis.
3. (a) In infected areas, every person possessing much enlarged glands, without obvious cause, is probably a case of trypanosomiasis; and (b) an individual with general glandular enlargement is not often seen amongst populations from which sleeping sickness is absent.
4. As a rough rule, then, every native who has large glands—the posterior cervical group being taken as an indication of the whole lymphatic system—should be considered as a case of trypanosomiasis until the contrary is proved.
5. A system of quarantine based upon these facts was proposed by which infected natives would be prevented from entering districts from which the disease was as yet absent. It had previously been impossible to attempt the prevention of the mingling of infected with healthy persons, since no such perfect and easily applicable means had existed of determining the presence of the parasites in a person suffering from trypanosomiasis.

It has never been pretended that gland palpation is a perfect method of diagnosis. The evidence^(3 12 13) proving that the examination of gland juice, first used by Greig and Gray, is the most constantly efficacious of all methods of demonstrating the presence of trypanosomes in infected persons is incontrovertible; neither can the frequent occurrence of general glandular enlargement in trypanosomiasis be questioned.

The only points in our conclusions which admit of discussion are: How perfect a method of examination is gland palpation supplemented by gland puncture—that is, what proportion of persons infected remain undetected by this method; and, for each locality considered, what proportion of persons with enlarged glands are not cases of trypanosomiasis.

It is maintained that gland palpation forms an extremely valuable test in human trypanosomiasis. One of its chief values lies in the fact that it may be applied by any one, and suspicious cases may therefore be retained for further examination and puncture by medical men. The glands in cases of trypanosomiasis of long standing are frequently small; the diagnosis from other clinical signs is here, however, unmistakable. It is in the detection of early cases where the glands are not yet enlarged that the method fails. There is, unfortunately, no means of ascertaining what proportion of cases will be missed because of this fact. It is certain that the majority of the apparently healthy persons found by blood examination, in the Congo Free State and in Gambia, to be infected with trypanosomes would also have been suspected cases because of their enlarged glands. Dr. Kinghorn's report⁹ constitutes another evidence of the value of gland palpation. Dr. Kinghorn palpated 9,005 natives in Northern Rhodesia between July and December, 1907; of them 1,878 had palpable neck glands.*

As appears in the table given below, 5 of them had glands which placed them in our + class; that is, patients who are almost certainly infected; 36 of them were in our + - class, and 1,837 in the - - - class. Of the 5 with enlarged glands, 3 (all imported cases) were found to be infected with trypanosomes when gland puncture was done.

	+	+ -	- - -
Natives with palpable posterior cervical glands	5	36	1,837
Glands punctured	5	36	297
Patients infected with trypanosomes	3	0	0

Classified according to the size of the cervical glands (2) + = in each posterior cervical triangle, (a) one gland measuring 1.5 by 0.75 cm., or (b) several glands, the largest measuring 1 by 0.5 cm. Groups showing less enlargement than this but more than + - - were classed as + - -. - - - = in each posterior cervical triangle, (a) one or two glands measuring 0.5 by 0.25 cm.; (b) many tiny, hard, just palpable glands.

* Dr. Kinghorn states that filth seems to have been the only cause of glandular enlargement in those cases uninfected by trypanosomes.

That is, the only 3 cases found to be infected by a highly trained medical man amongst 9,000 patients might equally well have been detected by an intelligent native sergeant! Such a method, however imperfect, certainly has a certain value in the practical prevention of the spread of the disease. Had a system of quarantine based on gland palpation been in force, the + - as well as the + cases (41 natives in all) would have been detained for some little period to await examination by a medical officer; the + - - cases would not have been detained. In my opinion, the inconvenience to which these 41 persons would have been put would be slight compared to the benefit accruing to their fellows by the segregation and treatment of the 3 natives found to be infected.

The completely elaborated scheme for preventing the spread of sleeping sickness in the Congo Free State comprised, besides other important but less essential measures,¹⁸ the establishment of stations of examination, under the charge of medical officers, at important points on the main routes in the Congo Free State, and also the institution of villages, as free as possible from tsetse flies, and situated in areas where sleeping sickness was already endemic, in which persons definitely found to be infected should be detained and treated.

In these and other publications,⁶ the opinion was expressed that the rapid spread of sleeping sickness in Africa could not be accounted for by the mechanical transmission of trypanosomes from patient to patient by *Glossina palpalis* alone, but that other means of infection probably existed, and that, until the contrary was proved, all *Glossinae*, and even all biting flies, might be suspected as possible transmitters of trypanosomes; it was shown for the Congo Free State that no area could definitely be stated to be free from *Glossina palpalis*, since an examination continued for several months was successful in finding it in several places from which it had been supposed to be absent.⁷ Consequently, for both these reasons, the extension of sleeping sickness must be considered to be possible in every part of the Congo Free State, should *Trypanosoma gambiense* be introduced by an infected person. It was suggested that the same conditions might obtain in other areas in the neighbourhood of the Congo Free State, and, in particular, that the immediate spread of the disease towards the south was to be feared. Of late various articles have appeared which seem to be at variance with the principles and conclusions reached in our papers.

The object of the present communication is to reiterate the importance of the conclusions already presented by the Liverpool School, while bringing new facts to support them, and especially to insist upon the enormous importance of preventing the spread of the parasite causing sleeping sickness, since the insects which transmit it cannot be controlled.

Reports received from various parts of the Congo,⁸ as well as from Northern Rhodesia,^{9 16 17 24} make it only too apparent that sleeping sickness is continuing to spread, slowly it is true, towards the south. It is superfluous to quote any of the numerous instances of the present constant extension of the disease in parts of Africa, other¹⁴ than the Free State, where it is spreading with greater or less rapidity beyond its former endemic areas.

A few reports have been received from Europeans, officials and missionaries, residing in various parts of the Congo, which make it evident that sleeping sickness is still spreading there, although in one or two places the intensity and the expansion of the epidemics seem to be lessening. The conditions in Uganda seem to be somewhat similar.¹⁹ In several localities in the Lower Congo there are said to be fewer cases now in proportion to the number of persons living than there were in 1904; but just above Stanley Pool deaths from sleeping sickness are still very frequent. The following dreadful observation made in that area will serve as still another instance of the frightful destructiveness of the disease. During 1907 234 persons—men, women, and children—died in one native village. In December, 1907, there were still in that village 32 men, 36 women, and 39 children—a total of 107 persons, of whom 8 were dying.

Conditions in the neighbourhood of Lukolela* and Coquilhatville remain about the same. The epidemic, however, is spreading rapidly to the east along the Ruki

* For map see (3).

River towards the centre of the Congo Free State. In the neighbourhood of Bumba the riverine population is rather worse affected than it was in 1904, and a few cases have occurred amongst villages on the high land behind Upoto, where none previously existed. As in 1904, the natives about Basoko still seem to be free from the disease. Between Basoko and Stanleyville there are at least two villages near Yanonghe which are badly infected, and on the north bank it is believed that cases are commencing to appear amongst some of the inland villages. Imported cases, time-expired and home-returned soldiers or labourers, have been found in many of the villages in this locality, as well as in the riverine villages on either side of Stanley Falls, although none have occurred to the immediate north of that post. Some of the villages along the river between Stanleyville and Ponthierville are infected, but here, as along the whole stretch of the river to Kasongo, it is the villages of Arabized natives which suffer most. It is this type of native which makes long voyages in canoes and which engages in traffic; they go, or send others, into infected districts; these persons become infected, and thus carry infection to their, formerly, uninfected villages. The disease seems to have made very little advance amongst the villages of purely local natives in this part of the Congo. It has spread more rapidly in the south, and it is instructive to compare the southern limit of the endemic area of sleeping sickness given by Hearsey¹¹ with the limit some distance further north indicated in our map showing the distribution of sleeping sickness in the Congo in 1905.³

Bishop Roelens¹⁶ was the first to indicate that it had spread beyond the boundaries we show by reporting that the disease had become endemic at Mbuli on the western shore of Lake Tanganyika, and that there were a fair number of cases some distance inland in that region at Lusaka and again further to the south on the lake shore. Dr. Massey¹⁷ made it very evident that the disease was rapidly spreading to the south, and Dr. Kinghorn⁹ and others⁸ have reported additional cases, for the most part imported ones, in the posts furthest south in the Congo Free State, as well as three imported cases in British territory. Although at first sight the small number of the imported cases may seem to make their presence of slight importance, the history of the probable origin of the epidemic of sleeping sickness in Uganda and of its spread in the Congo Free State, indicates only too clearly that the spread of sleeping sickness into the British territory in the Northern Rhodesias which was dreaded in 1905 is already commencing. If its further extension is to be prevented action must be immediate and thorough. Let us review the methods by which its advance may be combated.

From our experience in the Congo Free State we adopted the following postulates:

1. That the rapid spread of sleeping sickness could not be explained by the mechanical transmission of the trypanosome by *Glossina palpalis* alone; and it was suggested on various grounds "that other biting insects might also transmit it."
2. As a result of continued observations we concluded that *Glossina palpalis* was present or might become present in practically every part of the Congo Free State.
3. Sleeping sickness was found to be extremely rife in villages near which *Glossina palpalis* could not be found at the time of our examination.

For all these reasons it was determined that measures designed to prevent the spread of the disease by controlling the contact between natives and *Glossina palpalis* would be inefficacious. Many of the conditions present in the Congo seem to be present in Rhodesia, and it is our opinion that preventive measures in Rhodesia, as in the Congo, must be directed against the parasite; that is, that every effort must be made to prevent infected persons from entering into British territory and mixing with the population there. *Glossina palpalis* has been found in many new localities in the Rhodesias, and it seems as though it might be found by competent observation over long periods to be almost ubiquitous there, as it is in the Congo. At all events, some species or other of *Glossina* has been found almost everywhere amongst the important water courses in the Southern Congo and in the Northern Rhodesias (¹⁰, ¹⁷, etc.). While the exact determination of the distribution of "fly areas" for any ven date is

important, it cannot be too clearly understood that a single observation, or even a lengthy observation over a week's time, is simply an observation of bionomic value, useful in determining the movement of fly areas, and has no permanent value as an indication of the impossibility of the existence of sleeping sickness in that locality. The disease may conceivably appear in it in one of three ways. *Glossina palpalis* may later appear there; the trypanosome may be transmitted by other biting insects*; or the natives resident in that locality may acquire the disease while absent in infective districts.

Hence the disease must be mainly combated by preventing infected persons from coming into contact with persons free from the disease. In districts where no cases of sleeping sickness have as yet appeared this will be done by instituting a strict quarantine against infected areas. Natives from uninfected areas must not be allowed to seek work or carry loads in infected areas, and vice versa. So far as possible all communication must be interrupted. The caravan routes should be strictly watched, and all natives controlled by some special authority, as soldiers, labourers, servants of officials, etc., must be carefully examined for the presence of individuals with enlarged glands. These and, of course, persons presenting any other clinical sign of sleeping sickness must be detained for examination and disposition by the medical officer. In districts where cases have already appeared quarantine must still be maintained, and the cases must be segregated in villages of detention and treatment placed in fly-free localities. As examples of legislation and preventive measures directed against the spread of the disease, one may well study the rules adopted in the Congo Free State¹⁸ and in Uganda.¹⁹ The measures in Uganda seem to be particularly well carried out, and the determined effort which has been made there to obtain active native co-operation in the execution of the measures adopted cannot be too highly commended.

Other measures of great importance, but still of secondary consideration, which must be especially enforced in areas as yet uninfected, are the removal inland of all native villages from the neighbourhood of water courses to high clear ground free from flies. The areas surrounding native villages should not be occupied by jungle or by tall, shade-giving crops, such as millet, bananas, or manioc; low-lying plants, such as ground-nuts or sweet potatoes, alone should be permitted there. From our observations in the Congo it is, unfortunately, certain that such measures as these, although in themselves admirable, would be quite useless in preventing the infection of a population whose occupation normally takes them to localities where the fly exists. We have, for example, observed communities of paddlers or rubber-collectors to be seriously infected although tsetse flies were never seen within their villages. Again, although as a general rule the clearing of underbrush from about a ford, or particularly a collection of buildings, will render the locality comparatively free from flies, it will never, from our own experience in the Congo⁷ and from reports received from Dr. Kinghorn, completely do so. Dr. Kinghorn, for example, reports the repeated presence of *Glossina palpalis* in European houses surrounded on all sides by absolutely bare ground and placed at 275 yards from the river and 75 yards from the nearest trees.

In a recent number of the *Annals of Tropical Medicine and Parasitology*²⁰ a complete review of the present position of the treatment of sleeping sickness appears. Nothing, therefore, is said on that subject here, save to insist once more that every attempt at treatment must be energetic and persistent. In considering the measures which may be directed against sleeping sickness as a whole, one feels certain that the disease can be arrested, but it is equally certain that the means of prevention adopted must be energetically and continuously applied by a group of competent medical men, well-assisted and numerous enough to thoroughly cover the district to be protected. A local medical service could never attempt to carry out adequate measures in addition to performing their

* Even mosquitos,²³ if they pass directly from feeding upon an infected animal to a healthy one, have been definitely shown to be capable, by means of their infected proboscis, of mechanically transmitting the trypanosomes from the one animal to the other. *Glossina fusca*, long suspected of being able to transmit *Trypanosoma gambiense*, has been shown to do so in one experiment.¹⁵

ordinary duties. The administration and execution of measures directed against sleeping sickness should be the duty of a well-manned service appointed specially for that purpose. While every support must be given to the immediate institution of thoroughly practical preventive measures, the study of those unknown factors determining the epidemicity of sleeping sickness must be energetically prosecuted; in particular, knowledge is much needed concerning the habits of *Glossina*. In this connexion the results obtained by Bagshawe²¹ and Zupitza²² are most interesting.

ADDENDUM.

Since this paper was written, a proof of an able and valuable report²⁴ from the Principal Medical Officer of North-Eastern Rhodesia has been received. Additional evidence appears in it to show that sleeping sickness is spreading into British territory to the south of the Congo Free State. Quarantine and segregation measures have been adopted and advised, although they have involved much interference with transport routes, and consequent dislocation of various enterprises.

Irkesome though such drawbacks to the opening up of the country may be, the policy of keeping infected natives out of uninfected districts must be persevered in most rigidly. To quote the report, "the prevention of the spread of sleeping sickness requires prompt, bold, and decisive measures."

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AMONG the bequests made by the Hon. Louisa Charlotte Canning, who died on August 18th, were £2,500 to the London Bible Women's and Nurses' Association, £500 to the Convalescent Home of the same undertaking, and an equal sum to Tunbridge Wells Hospital.

THE Pereira Medal, the blue ribbon of the Pharmaceutical Society's School in Bloomsbury Square, has been awarded this year to a lady, Miss Gertrude Holland Wren, of Muswell Hill. At the examination she obtained 82 per cent. of the total possible marks, the next highest competitor having 75 per cent. The same lady has also received the Redwood Scholarship. Since last year the laboratories of this school have been refitted and considerably extended.

SEVENTY-SIXTH ANNUAL MEETING

OF THE

British Medical Association.

Held at Sheffield on July 24th, 25th, 27th, 28th, 29th, 30th, and 31st.

PROCEEDINGS OF SECTIONS.

SECTION OF MEDICINE.

W. DYSON, M.D.Durh., F.R.C.S.Eng., President.

DISCUSSION ON
THE ETIOLOGY OF THE DEGENERATIVE
CHANGES IN THE AORTA.

OPENING PAPER.

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I HOPE that by presenting a brief summary of our present views with regard to certain aspects of the etiology of the degenerative changes in the aorta, and by pointing out certain gaps in our knowledge, this paper may form a basis for discussion by the distinguished physicians who have indicated their intention of taking part; many of them have been interested in the question for many years past, and have both written and experimented much on the matter. We are particularly pleased to welcome here to-day Professor Bouchard from Paris, whose name has long been connected with the question.

It is very striking in the *post-mortem* room how often the most extensive disease going on even to calcification may be found in one portion of the aorta, while the remainder may be quite healthy and the change from diseased to healthy tissue is abrupt. Now if such degeneration were due to hyperpiesis or to senescence, the difference could not be so marked; in such case the localization has more probably been determined by a local infection or by some anatomical condition such as the area supplied by one of the vasa. Extreme atheroma in the aorta may be associated with healthy vessels in the periphery or with lesions which at first sight appear to be of a totally distinct character, such as arterio-sclerosis. Again, the peripheral vessels may present marked disease, and yet the aorta be healthy. The distinction between the etiology of the lesions of the various parts of the circulation is very apt to be overlooked, and yet it is of importance. It arises partly from the difference in the anatomical structure, partly from the different conditions to which they are subjected, and partly from the predilection of various poisons and organisms for particular sites; and in order adequately to clear up questions of etiology we must first be sure that we are agreed as to the use of our terms.

There is a general agreement that so far as the peripheral vessels are concerned atheroma and arterio-sclerosis are distinct processes.

Atheroma consists of a patchy thickening of the internal coat with degenerative changes in its deeper part, fatty, atheromatous, or calcareous, associated more or less with changes in the media and adventitia. The thickening affects the vessel wall irregularly, and the changes are scattered in patches through different vessels. The pathologist defines arterio-sclerosis as a more uniform and diffuse change affecting the intima all round, and not associated with patchy, local, fatty, and degenerative changes. Unfortunately the term is used clinically merely to describe a thickened artery. Not infrequently the thickening is due to quite a different process—namely, enlargement of the middle coat either from contraction or from myohypertrophy, to which attention has been particularly directed by Dr. W. Russell and Dr. Savill, associated with thickening of one or both of the other coats. Calcification of the media may also be confused with it.

If the difficulty is great with the peripheral vessels, it is far greater with regard to the aorta. The ordinary chronic endarteritis deformans, or atheroma of the aorta, commences in the deeper part of the intima with a marked increase in its tissue, an excess of cells, and a fatty