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West African Diseases

By Professor Oskar Klotz, M.D.*

President George H. Sedgewick: When Dr. George Vincent of the Rockefeller Foundation was in Toronto recently I heard him say that when people came to this continent wanting to know where to go to see what was being done in the way of research and in education, particularly along medical lines, he always sent them to Toronto because he said there was a very happy combination and co-operation between all the organizations that have to do with health and medicine. The city Board of Health, the Provincial department, the hospitals and the University, he said, worked together and Toronto was outstanding too, in the fact that it had remarkable men carrying out research purely from the point of view of getting more knowledge at the disposal of the people, differing in that respect from the business research which is carried out by organizations with an end to more profitable working of their own businesses.

We down town ought, in slang phrase, to hand it to the men of the University who have the ability and capacity to earn a great deal more than they earn in their present positions, but who devote themselves to the good of the community without any real expectation of possible monetary reward.

We are glad to know that we don't have to import all the distinguished men who come to the University and become professors. Our guest is a graduate of the University of Toronto and a native of Ontario. His father was a president of the Canadian Club in Ottawa. He has grown

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up with our country and I am told that his position in the world that has to do with pathology is such that he is counted among the first half-dozen of the world. Therefore it was not by chance that the Rockefeller Foundation selected him to make this investigation into Yellow Fever in Africa, on which he has been engaged in the last six months.

Prof. Klotz: Mr. President and gentlemen, it seems a far cry from the wintry season of Canada to the sweltering heat of Africa and it seems as if there was nothing in common that could link us to that country and give us something to discuss here today. Nevertheless it is only a month ago since His Excellency, the Governor, appeared before us here to urge us into a better understanding of the distant colonies in this empire, so that with a better understanding there should be closer co-operation with them. And so I feel that a few words about a distant colony, its difficulties and its resources may not be amiss here today.

When one speaks about tropical Africa one hardly realizes the large segment of the earth occupied by it. Tropical Africa occupies the greater part of that continent and a large part was for many years unexplored, though many attempts were made. Sir Frederick Lugard, a man of wide experience in tropical countries, who has spent more than twenty years in tropical Africa, looks forward to the day when the tropics shall be sought after much more than the temperature zone and when the twentieth century will see great advance in the tropics. Whether that be the case or not the nineteenth century has given us the opportunity for carrying out such a program. Among other things it has provided us with steam and steam has been the means whereby pathways have been opened to distant lands, shortening courses and making more accessible for commerce many of the resources. But even with all this the tropics today are only scratched on the surface, as far as making available for us in distant parts those resources which are natural to them is concerned.

There are very few countries today self-supporting in the matter of foodstuffs; and the condition is getting worse when we view the increasing populations. The United

States is a good example. It is not so many years ago that they were a self-contained nation. They could produce what they required for industry and the needs of the people. That day has passed. She is seeking new lands from which to get foodstuffs and raw materials to keep the wheels of her industries grinding. She is seeking the south and particularly South America and she is also looking towards the east in Africa.

Africa has gone with an evil reputation for many years, a reputation that has been brought back to civilized countries by adventurers. Attempts have been made through the centuries to snatch from her resources and wealth. The Romans knew the way to tropical Africa and sent expeditions across the Mediterranean up the Gulf, across the Sahara and advanced towards the central portion. The resources that were mainly sought then were gold, ivory and slaves, and it is remarkable that for centuries gold, ivory and slaves were the most valuable products from that country. But during all the centuries the country was only scratched. Only within the last hundred years were the ports of West Africa opened up to new development. And even during the last few years when attempts were made to open up the country they failed, and failed miserably.

In the reports of the difficulties encountered we find stress laid on climatic conditions and upon the turbulent tribes that offered resistance, and most of all, on disease. Climatic conditions are not felt as much now. There are ways of alleviating the sweltering heat. One can acclimatize oneself to it and provide oneself with various essentials. One changes one's mode of life, working early in the morning or late in the evening. There are difficulties, as there is no twilight and no dawn. Morning breaks at 7 o'clock, suddenly, and it is full day. In the evening it is sundown at seven and it is pitch dark. You cannot extend the day easily. But nevertheless much can be accomplished.

With respect to turbulent tribes no great difficulty has been encountered when they have come to realize that the invasion is not a warlike one, but rather to gain their confidence and to have them appreciate that the white man's approach is not for the purpose of disturbing tribal customs but to get co-operation.

For the present it may be interesting to know something of British possessions in tropical Africa. On the west, to the north, is the small province of Gambia. It is not of great extent and naturally the products from it are not large. Then there are Sierra Leone and Nigeria—provinces very rich in natural resources. We have rubber, cotton, sugar and most important of all, palm oil, of which we hear so little in everyday life and yet it is before us in everyday use, in soaps, largely made from palm oil, and in countries where it is allowed to be sold, in oleo-margarine. There is a good quantity of tin now being worked. There is hardwood and mahogany that is hardly touched. There is a small export of it taking place to England and the continent of Europe, but the quantity is still small, lacking facilities of transportation.

It means the invasion, not war-like, (because the policy of Great Britain has been to develop the regions by the people who inhabit them), but the invasion of commerce. The tribes are to be left undisturbed with supreme authority in the tribal districts which they have to administer. Even the law courts are administered through the chiefs, save for capital punishment which is not allowed to be inflicted save after the evidence has been reviewed by the white man's court. In this way it is hoped to stimulate the backward races and to interest them more in agriculture until the day when they will become a productive people and enter into the general social organism. At the present time through backwardness and lack of information of the world's doings and through their inability to participate in world courts the white man has undertaken the trust for them. The British Government has instituted large schools of agriculture and is trying to teach them to advance by their own endeavors rather than trying merely to teach them the manners and customs of the white man.

That is one of the misfortunes. The native likes to mimic the white man's ways and that has led to some tragic results. One of these is the assumption of the dress of the white man. I will deal with that later.

Nigeria, which is about three times the size of Great Britain has a native population of 20,000,000. The natives

go about naked and they are very cleanly in person and they have certain customs and rites that we might well adopt. But when, in mimicking the white man he assumes the white man's garb he does not appreciate the need for cleaning his clothing. The result is that they acquire various types of vermin, more particularly lice, and lice in the tropics are a menace inasmuch as they are carriers of a particular disease. Relapsing fever, carried by lice, is broadening its boundaries year by year and is now many, many miles from the orginal focus where it existed.

These native people, with tribal customs, speaking different languages in the different parts of the country, very often not understanding one another, give difficulty to the foreigner inasmuch as one interpreter does not suffice and in passing from mouth to mouth the information gets rather mixed up. That is particularly difficult in attempting to get information respecting disease. You may ask a question and get an answer that is rather ridiculous, passing through the various interpreters. One of the men deserted for some days and I asked where he had been and he said "Next week."

Then we have many difficulties to contend with in the ordinary fashion. I mentioned a moment ago that the greatest difficulty was the opposition offered by disease. There are particular diseases unknown to us here, diseases endemic amongst them and occasionally spread to other parts of the world through commerce. Those which the traders have found difficulty with are sleeping sickness, relapsing fever, yellow fever and malaria. You are familiar with malaria. Some of you have been in districts where it exists. You have learned that in malaria the transmission of the disease is only through a particular type of mosquito. But it is not only one variety, the anopheles, that carry malaria, but several varieties. But malaria can be brought under control and has been in certain districts. In organized communities it is not so difficulty, but in unorganized districts with dense population, as in Southern Nigeria, in swampy country, one finds great difficulty in carrying out the same procedure which has brought malaria under control in other countries. With continuous treatment very

few of the whites die from it. On the other hand for yellow fever no cure is known and relapsing fever, because of deficient knowledge of sanitation and adoption of the white man's methods of life, has advanced its borders, so that the greatest effort and investment of money and organization of research is required.

Sleeping sickness at one time, not so long ago, when brought to the attention of the white man, was found in the centre of Africa and was thought to be confined there. Livingstone described the disease and furthermore noted that the same type occurred in animals and he even described the fly which he believed had something to do with sleeping sickness. At that time Livingstone did not see the importance of his observations, but several decades later another Scotchman, David Bruce, going to Central Africa found the tsetse fly was carrying infection. And in 1900 J. E. Dutton, in Gambia, working for the Liverpool School of Tropical Medicine, endowed mainly by institutions of commerce—the Elder Dempster Line and its associates—saw this organism causing sleeping sickness in the blood. He has written a letter about it to Dr. James Elliott here, which is on file in the archives of the Academy of Medicine. It shows the enthusiasm of Dutton at having first seen the organism of sleeping sickness. However, opportunity for further study did not come for several years and in the meantime Castalini was able to determine that this organism was the causative factor or agent of sleeping sickness.

Dutton then with another associate from Canada, Dr. John L. Todd, of Montreal, made a further study and described thoroughly sleeping sickness and what were the conditions produced by it. Dutton worked day and night on the problem and while doing so encountered another disease which interested him greatly. This was the relapsing fever of Africa. In the midst of his work Dutton was stricken with the disease which never before had been reported. The nature of the infection had been unknown. Dutton found it, Dutton acquired it and Dutton died in Central Africa. Todd was working with him and carried out the work to completion. It was published subsequently, not in the name of Todd. Todd granted all the credit to Dutton, who really was the first discoverer.

Another Canadian participated in the study of tropical disease at the same time that Dutton and Todd went to Central Africa. This was Dr. Thomas of McGill, who also was associated with the Liverpool School of Tropical medicine. Thomas had his attention drawn to the cure of sleeping sickness. Previously it had been shown that compounds could be made in the laboratory between arsenic and some of the aniline compounds. This drug had no particular application but Thomas, in studying the material in the laboratory found it had a marked effect on animals inoculated with sleeping sickness. This material was almost a specific. Subsequently Koch enlarged the work, producing another compound of a somewhat similar nature and in later years still another substance, 205, has been put on the market and found efficacious in the treatment of sleeping sickness.

It was thought that sleeping sickness was confined to a particular area in Central Africa and that was true at a certain time. However, conditions resulted which allowed the breeding of the fly elsewhere and we find it in the Cameroons and Northern Nigeria and extending southwards. Britain has recognised the menace of sleeping sickness in Nigeria and the Colonial Office has sent out several workers. I may mention two particularly, Lloyd and Johnson, who are staying in Nigeria at an isolated base, several hundreds of miles from any place where white men are living, in a bush house and with no facilities about them. They are living in a stricken country where sleeping sickness has devastated the entire area and where the natives have fled in fear of the disease.

Lloyd and Johnson were sent into this country to investigate sleeping sickness and the means of checking further invasion. They are living alone studying the breeding habits of the fly. The breeding places are found in shady nooks, near moist soil and loose loam, usually in the vicinity of small rivers. In these districts, shaded by the jungle, the fly breeds in large numbers, ever ready to attack people, because it is a blood-sucking insect. Lloyd and Johnson found that when sunlight was permitted to shine on the breeding places the fly would no longer breed there. The

earth became dry, the shady nooks were removed and they cut a wide swath through the jungle, a mile to two miles, and in some cases three miles broad, so that the flies would not traverse that particular stretch. It is very much like cutting a fire lane through a city during a conflagration. These men are doing remarkable work. They are living alone and most of their food is got by their own rifles, although they have a certain stock of tinned goods. They are not only doing this practical work, but they are carrying out scientific investigations with limited facilities. There is a type of work that the individual must do when working in the tropics and he has not the facilities of large laboratories. It is his own initiative which spurs him on and his own resourcefulness which enables him to succeed with problems that seem insurmountable.

These various diseases that I have referred to as opposing the advance of the white man's invasion of tropical Africa are all borne by insects, being transmitted from one individual to another. There are other diseases, of course, common diseases that we see here, but the important ones with which it is necessary to cope by a thorough organization before satisfactory commerce can be carried out in those distant ports, are yellow fever (the old Yellow Jack of commerce known fifty years ago), malaria, relapsing fever and sleeping sickness. Yellow fever, known as a heavy pestilence fifty years ago in the West Indies and the Gulf of Mexico, was found also in Central and South America and eventually decimated certain districts to such a degree that it was thought uncontrollable. For years it manifested itself on the shores of the United States. New Orleans repeatedly had epidemics and it was found in Charleston, Baltimore, Philadelphia, New York and even in Halifax, and it is also reported as having occurred in Quebec in 1710. At one time this disease eluded entirely the investigation into the manner in which it was spread. It was a dreadful disease, bringing about death in a few days.

Africa was another home of yellow fever, which was probably transported from there in the old slaving days. No doubt the slave traders had difficulty with it. They

would be a few days at sea and find they had lost half their cargo. Then they would turn back to a new port and raid more towns.

Yellow fever is interesting as an insect-borne disease inasmuch as in 1880 one Charles Finley was the first to suggest that this disease was borne by the mosquito. He was in Cuba and was present at the epidemics in Havana. Nothing, however, was thought of the suggestion until after the Spanish-American war in 1900, when the Army Department of the United States sent a small commission to Havana to study yellow fever. After six months they were able to prove that this particular mosquito was the transmitting agent. There were tragic results in the experiments. Dr. Lazear had one mosquito bite on his own arm. He became very ill and died of the disease. He was one of the martyrs of medicine, but through him proof has been brought that this particular mosquito was the one that conveys the disease. Because of yellow fever De Lesseps failed with the Panama Canal. After the founding of the commission Gorgas undertook to put it to the test whether the mosquito alone was the transmitting agent and if any control could reduce the disease in that area. The proof was complete within a year. Havana was cleared of yellow fever and then it was found possible to consider the construction of the canal by tackling the disease problem rather than the engineering problem. Gorgas was again put in charge and you know the result. Subsequently the fight was carried to South America. In Ecuador, San Salvador and Peru they were not only able to reduce the number of cases of yellow fever but to absolutely eradicate it. That work was one that stimulated the Rockefeller foundation and International Board of Health to further the work in other countries. They have carried out the same work in Mexico, Honduras, Brazil, Columbia and Venezuela. All of these countries have been rid of infection save Brazil, and until it comes to rest and leaves aside the revolutionary spirit it is difficult to deal with the problem. At present there are many migrating bands carrying the disease, but soon we hope yellow fever will disappear from Brazil and then we shall have it no longer in the Western Hemisphere.

On the other hand yellow fever in Africa has gone along more or less undisturbed. The condition of the people is such that it is very difficult to handle the problems of sanitation and hygiene. We have people living there in large communities without any sanitary control and without any knowledge even of the rudiments of sanitation. So it is very difficult to institute any measures of control. In such large centres in Nigeria as Ibadan, with half a million people huddled together in small groups and compounds of twenty to thirty houses, with access to the compounds refused, it is very difficult to cope with the matter. They have no water supply and the British Government is acting on the problem of sanitation by putting in water supply as far as possible.

The transmitting agent of yellow fever is such that the mode of approach is along one line. The stegomyia is the transmitting agent, and not every stegomyia, but a particular variety, and furthermore not all the mosquitoes of that variety transmit the disease. It is only the female of the species and the female requiries human blood before she will lay eggs. These mosquitoes like others lay eggs in large numbers on the surface of water, but before the eggs are laid she must have at least one feeding upon human blood and so it happens that these mosquitoes are more or less domestic and live around the houses, at a distance generally of not more than one hundred and fifty to two hundred feet. Another thing about these stegomyia is that they prefer to breed in clean water, not in muddy water or stinking pools. They use the tin cans around the huts and the earthenware jars that are used as receptacles for water. In our investigations by going from house to house we found that the percentage of habitations where they were breeding varied from fourteen to sixty and seventy per cent. So that we have in Nigeria a fairly big problem.

It is interesting, however, to note that these natives having lived for many centuries under particular conditions have acquired a gradual immunity to the diseases common to them. The native is much more immune to yellow fever than the white man recently arrived among them and thus we found, in the coast towns, that it is the whites who suffer most during an epidemic. We have not been able to find

out from what source he acquires the disease; no doubt from the natives, who take the disease mildly, and particularly the children, the same as they take measles or chicken-pox or scarlet fever in a mild form. And so in these cases the white man gets the disease in a virulent form and the mortality is high, running from thirty to one hundred per cent in certain epidemics. This is one of the reasons why the International Board of Health is anxious to do something to bring about control. The disease is not carrying off such large numbers as it did a century or two ago. It is not very extensive, even in Africa, but there is always the lurking danger and when it bursts into flame among a large regiment of men the chances are that a large proportion would be wiped out. It is impossible to bring a large aggregation of men together without getting them in contact with the endemic disease which is so mild with the natives and it is very difficult therefore to seek and find the cause of yellow fever in West Africa, a much more difficult problem than it was in South America. The study of the Rockefeller Foundation is carried on in co-operation with the British Government. The British Government has instituted research stations along the west coast and also on the east coast and is well aware of the importance of medical research in tropical countries and realizes that new advances must go hand in hand with medical progress. The construction of railroads, the building of highways, the development of ports, all must be done with a knowledge of the sanitation in the district.

The development of the port of Lagos, was undertaken a few years ago, and it is the only port today on the west coast that deserves the name, trade generally being carried on by means of surf boats. At Lagos, however, a large docking system has been laid down, and with that attention was for a time drawn aside from the possibility of bringing in new disease to the natives, that had not been endemic. Last year black plague invaded the port of Lagos and is causing havoc there. Plague is one of the most serious of diseases and introduced into a community of that kind, with no sanitation and where vermin of a certain kind is not looked down upon, it is more serious still. The natives

of Nigeria do not look seriously upon the presence of rats in their house. At times they constitute part of their food; and so with bats. And these rats are carriers of the type of insect which conveys plague from one individual to another or from one rat to another and to humans. Plague once introduced is very difficult to get rid of. Plague introduced among an untrained and uncivilized people makes the problem still greater. When the plague will be eradicated is hard to say—a hundred years, two hundred years it may be; certainly not less. That is one great misfortune that has happened to the West Coast and will require a very great amount of money to bring under control. Africa offers tremendous opportunity for the sending of natual resources to countries abroad, and we are looking forward to the time when Africa will not be regarded as the plague spot of the world, but, possibly, as Sir Frederick Lugard put it, the Playground of the world.