TROPICAL MEDICINE*

INTRODUCTORY ADDRESS

BY

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In addressing you to-day on the subject of tropical medicine it may perhaps be well for me to survey very briefly some of the great discoveries which have been made in this field since the beginning of this century. These discoveries have led to vast improvements in the health of those residing in tropical countries, and incidentally to the recognition of tropical medicine as a special branch of medical science.

Diseases peculiar to the Tropics differ in many respects from those found in temperate zones, and it was this difference, combined with lack of knowledge on these subjects, which led Sir Patrick Manson to institute special schools for the study of what is now known as tropical medicine. Though this term has been applied to a particular branch of medicine, it must be remembered that those desirous of practising in the Tropics must have a sound foundation of general medical knowledge, in addition to special knowledge of tropical medicine, because many diseases are cosmopolitan in character and occur both in temperate and in tropical regions.

It has from time to time been said, and this even quite recently, that there is no such thing as tropical medicine, but this view is, in my opinion, quite incorrect. There are many diseases—such as trypanosomiasis, sprue, and yellow fever, to quote only a few—which are restricted to the hot parts of the globe, while there are others, although occurring in temperate climates, that are much more common in the Tropics—for example, malaria, dysentery, and cholera. Another feature of tropical diseases which differentiates them from those of temperate climates is that, in many cases, insects play a part in their transmission. Again, tropical diseases are more frequently associated with protozoal and helminthic parasites than are diseases of other parts of the world. For these reasons it is essential that the student wishing to understand tropical medicine should have a special training in protozoology, entomology, and helminthology. The general medical education of the average student cannot equip him for practice in the Tropics, where the whole outlook on disease differs from that in temperate climates.

Foundation of Tropical Medicine Schools

Those who would have tropical medicine once more lost in the maze of general medicine must have failed to realize the special features to which I have just referred, and that in every branch of life at the present day specialization alone will ensure the greatest efficiency and progress. There is, however, little danger of any such retrograde step being taken, for the opening up of tropical countries is such an important part of our policy of colonial and empire development that more and more is a sound knowledge of tropical medicine demanded of those taking up practice in such countries.

After the foundation of the tropical schools in England—in Liverpool and London—other nations, realizing the importance of this special branch of teaching, quickly followed our example. France, Germany, and Belgium have established similar institutions, and now every

country owning tropical dependencies affords facilities for special instruction in tropical medicine. America has schools, our own Navy, Army, and Air Force have special courses, and, more recently, the Empire has carried on the good work by the founding of institutes in Calcutta and Sydney for a similar purpose.

The history of the last thirty-five years well illustrates the value of this special concentration on one branch of medicine. When I began the study of tropical medicine in 1899 all patients suffering from trypanosomiasis and kala-azar coming home to England invariably died, while those with bilharziasis were doomed to a miserable existence for the rest of their lives without any hope of relief. Now all this is changed, and in the past thirty-five years advances have taken place which rival or even excel those of any other similar period in the history of medicine.

Filariasis

The riddle of malaria transmission had just then been solved. The explanation of the spread of filariasis by the mosquito as intermediary host was carried a stage further by the finding of the mature worm in the proboscis of the insect, a discovery which indicated that the infection was spread directly by the bite of the mosquitos and not through water as was previously supposed. The name of filariasis will always be associated with Australia, because of the discovery by Dr. Joseph Bancroft of the adult forms of the parasite in a lymphatic abscess of the arm in Brisbane in 1876. Cobbold, to whom the worms were sent for identification, named the parasite *Filaria bancrofti* as a compliment to the discoverer. Later, Dr. Joseph Bancroft's son, Dr. T. L. Bancroft, also did excellent work on this subject.

Yellow Fever and Trypanosomiasis

In this period it was proved, by the American commission in Havana in 1901, that yellow fever was spread by mosquitos; the commission also proved that the causative agent was a filterable virus. As a result of this work Havana was freed from yellow fever, and for the first time an effective control of this terrible malady was reached. A direct result of this was that Gorgas was able to proceed with the sanitation of the canal zone, rendering possible the construction of the Panama Canal. Further endemic areas in the canal zone and in South America were also freed, and the disease has been very largely extinguished from the New World.

In recent years, however, yellow fever has been shown to be prevalent on the west coast of Africa. The discovery by the Rockefeller Commission of an experimental animal, the rhesus monkey (*Macaca mulatta*), susceptible to the disease, has made possible great advances in our knowledge of the infection, while what are called serological protection tests have revealed the existence of endemic foci scattered widely among the natives of West Africa. Protective inoculations, based on work done by Theiler with the virus fixed for the brain of mice, are now available for those proceeding to yellow fever areas.

In 1901 Ford on the Gambia discovered an organism in human blood which Dutton identified as a trypanosome. He described the resulting disease as trypanosomiasis fever. In 1933 Castellani found similar parasites in the cerebro-spinal fluid of persons suffering from sleeping sickness in Uganda, and this led to the important discovery that this malady was only a late stage of trypanosomiasis of man.

Kala-azar

Kala-azar, which is a native name meaning black fever, was another tropical problem that for many years defied solution. The disease, which has a wide distribution,

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was at that time supposed to be limited to Assam, where it yearly killed off hundreds of victims, and often spread in epidemic waves of great severity. Many commissions had studied it, but had failed to discover its cause. In 1900, however, Leishman found certain parasites in the spleen juice of a soldier who had died from dum-dum fever, and in a paper published in 1903 he suggested that they were the cause of kala-azar. This was proved to be the case, the organism being given the name of *Leishmania donovani* in honour of Leishman and of Donovan, who had also found similar bodies in cases of splenomegaly from Madras.

Helminthic Diseases

During these years notable advances were also made in combating helminthic diseases. A peculiar form of anaemia present in Porto Rico was shown to be due to ankylostomiasis, and, following upon this discovery, this disease was found to be prevalent in the southern United States. In 1904 Katsurada identified, in the portal veins of two cats, schistosomes with eggs similar to those found in human beings suffering from an endemic disease characterized by cachexia, enlargement of the spleen and liver, ascites, and anaemia, and he was able to demonstrate that this condition was one of schistosomiasis caused by the presence of *Schistosoma japonicum*, a bilharzial parasite similar to those responsible for the well-known Egyptian bilharziasis. The year 1904 was also important for the discovery that goats suffered from undulant fever, and that the chief source of infection in man was their milk. This led to the eradication of this debilitating disease from among members of the Navy and Army in Malta.

Intravenous Antimony Treatment

Perhaps one of the most brilliant discoveries in tropical medicine, however, was that of the method of giving antimony (tartar emetic) directly into the veins. It is extraordinary that a drug which when given by the stomach causes vomiting, and when injected intramuscularly or subcutaneously causes extensive sloughing, can yet be safely introduced directly into the blood stream without doing any harm. To Broden and Rodhain, two Belgian doctors working in the Congo on sleeping sickness, is due the credit of this method of administering antimony preparations. In my presidential address to the Royal Society of Tropical Medicine and Hygiene, entitled "A Retrospect of Tropical Medicine from 1894 to 1914," I said:

"Broden and Rodhain, working on the Congo with cases of sleeping sickness, found the same difficulties in administering antimony, and as an experimental trial gave some natives who were *in extremis* a little of the solution of the drug into the veins. The result was extraordinary; the drug, instead of sloughing the walls of the veins, disappeared into the circulation without producing any ill effects, and ameliorated the condition of the patient in a most remarkable manner. Larger doses were then tried, and the intravenous route was established. I think I may say without exaggeration that this discovery of the intravenous administration of antimony is one of the greatest that medicine has ever seen. It has enabled us to control trypanosomiasis (partly), kala-azar, ulcerating granuloma, and bilharziasis, and to rob these terrible diseases of their terrors. The saving of suffering and life it has brought about is inestimable. Before its introduction, for example, 95 per cent. of kala-azar patients died; now the conditions are entirely reversed, 90 per cent. or so recovering. Yet if one were to ask the man in the street, medical or otherwise, if he had ever heard of Broden and Rodhain and their work, he would probably invariably reply in the negative.

"The first records of the use of tartar emetic injections in leishmaniasis were made at the Brazilian Society of Dermato-

logy in 1913, when Machado and Vianna showed cases of cutaneous leishmaniasis successfully treated in this manner. In the same year (1913) Arãgao and Vianna treated cases of ulcerating granuloma by the same method with excellent results. Rapid healing of the lesions took place in both their cases, the results being permanent. Terra and Rabello confirmed this work, and the treatment then became generally adopted for this loathsome disease. During 1914, further papers on the treatment of cutaneous leishmaniasis by intravenous injections of tartar emetic were published by Da Silva and Carini in Brazil."

Subsequently Caronia in Italy treated the leishmaniasis (kala-azar) of the Mediterranean with success with this drug, while Rogers introduced the method into India. More potent organic preparations of antimony have been used in recent years, and now kala-azar, which was at one time regarded as hopeless, can be easily cured.

In 1917 Christopherson tried antimony injections in the treatment of vesical and rectal bilharziasis at the Khartum Civil Hospital with a success that passed all expectations. It was found that a course of intravenous tartar emetic injections resulted in a cure, and the disease was thus for the first time brought within the effective range of therapeutics. Patients who had suffered from the disease since the South African War, on treatment by the new method, were quickly and definitely cured. Results such as these speak for themselves.

Plague and Beri-beri

In 1907 a second Plague Commission, by a series of careful experiments, showed that the rat and its fleas played an important part in the spread of plague, the disease being transmitted from rat to man by the bites of rat fleas.

The conquest of beri-beri, a disease causing an enormous mortality among the inhabitants of the Federated Malay States and other parts of the East, has been another triumph for tropical medicine. It was considered in some way or other to be connected with diet, but it was not until Fraser and Stanton, who began their investigations in 1907, established the present-day view that it was a deficiency disease that any progress in control was made. They first studied the occurrence of the disease in groups of labourers living under controlled conditions as to diet and other factors, and then, by analysis and experiment in the laboratory, showed that the basic factor in the causation of the disease was an absence from the diet of a substance minute in amount but of high value in nutrition, one of a group of substances to which Funk later gave the now familiar name of "vitamins." Fraser and Stanton's brilliant piece of work not only initiated the idea of vitamins and deficiency diseases, but also enabled the Governments of the countries concerned to control beri-beri and to reduce its incidence practically to *nil*, thus saving many lives and much money.

Another important discovery which I must mention is the use of emetine, one of the alkaloids of ipecacuanha, in amoebic dysentery. On February 6th, 1911, Captain Edward B. Vedder, of the Medical Corps, United States Army, read a paper before the Manila Medical Society entitled "A Preliminary Account of some Experiments Undertaken to Test the Efficacy of the Ipecacuanha Treatment of Dysentery." He found in this experimental work that emetine was very toxic to amoebae *in vitro*. Following this up in Calcutta, Sir Leonard Rogers put the matter to a clinical test, and devised a method of giving the alkaloid hypodermically. This discovery led to a revolution in the treatment of amoebic dysentery, and to the disappearance, to a large extent, of its most serious consequence—liver abscess.

During the war Professor Leiper with his colleagues discovered the life-history of *Schistosoma haematobium* and *S. mansoni*. Previously nothing was known of the life-cycle of these particular species of schistosomes, though the Japanese had worked out the complete life-history of *Schistosoma japonicum*, to which I have already referred.

Future of Tropical Medicine

The examples I have given do not in any way exhaust the remarkable discoveries that have been made in the field of tropical medicine during the past thirty or forty years. They serve, however, to illustrate the importance of this branch of medicine as a special subject. It has been said that all the great discoveries in tropical medicine have already been made and that most of the plums have been gathered. In one sense this may be true, and though we hardly expect in the future such dramatic discoveries as the parasite of sleeping sickness or the method of spread of malaria, there are many problems which await solution, as, for instance, the causes of blackwater fever and sprue. It is perhaps in the realms of biochemistry and experimental laboratory research that future discoveries will be made.

From the clinical viewpoint the future of tropical medicine lies in the increasing application of laboratory methods and co-ordinated team work. The keystone to the arch of correct diagnosis frequently lies in the clinical laboratory, and in many instances can only be made by means of its help. Apart from the demonstration of infective agents such as protozoa, helminths, Rickettsia bodies, and spirochaetes, etc., serological, biochemical, and haematological data are becoming more and more essential, not only in diagnosis but also for controlling treatment.

The growing importance of tropical medicine resulted, as I have indicated, in the founding at the beginning of this century of schools of tropical medicine, where this subject could be taught to those taking up medical work in tropical countries. It also had another result, and that was the establishment in London in 1907 of the Society of Tropical Medicine. This society began in a small way, but has steadily grown in membership and importance. It became in 1931 a Royal Society, and in place of the rented rooms which it at first occupied, it now has premises of its own in Portland Place—Manson House—which was opened by the Prince of Wales on March 17th, 1932. On its roll of membership to-day there are nearly 1,700 Fellows, representing tropical medical interests in all parts of the world. Among the Fellows in our own Empire are to be found members of the staffs of all the various tropical schools and institutes; of the Navy, Army, and Air Force; of the Colonial and Indian Services; and of many other organizations which send medical men to the Tropics, while tropical medicine outside our own Empire is fully represented by a long list of Fellows from many other countries. The society, the largest of its kind, now stands as the centre of tropical medicine for our Empire.

Tropical Medicine in Australia

Tropical medicine is of great importance to Australia and her Mandated Territories, and that is why I have dealt with the subject somewhat fully. You have here already malaria, sprue, dysentery, ulcerating granuloma, yaws, leprosy, dengue, and filariasis, and if care is not taken other diseases and parasites may be introduced, just as *Filaria bancrofti* was by the Chinese many years ago. The founding of a Tropical School in Sydney shows, however, that you have appreciated this danger, and if doctors who are destined for the Northern and Mandated Territories are given an adequate training to enable them

to deal with the special diseases to be found in those regions, then all will be well. They will be able not only to recognize them, but also to treat and prevent them. By their knowledge they will be instrumental in stopping the introduction of other scourges, which, if allowed to take root, will bring death or ruined health to many people, and will necessitate vast expenditure of money and labour before they can be effectively controlled or eradicated. As was the case with the construction of the Panama Canal, the success of any enterprise in a tropical country, whether in this or any other land, is directly proportionate to the extent to which tropical diseases are controlled by a proper practice of tropical medicine in all its aspects.

INTUSSUSCEPTION*

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Before commencing the subject of intussusception I would like first of all to pay tribute to my old teacher and colleague, the late Sir Charles P. B. Clubbe, whose work on this condition is well known. It was his intense enthusiasm in the subject which first aroused my own interest in this connexion.

Statistical Review

An analysis of the cases of intussusception which have been treated at the Royal Alexandra Hospital for Children, Sydney, during the years 1921 to 1934 inclusive showed that 486 cases had been treated by ten surgeons; 430 of the patients recovered and fifty-six died, a mortality rate of 11 per cent. Three of the surgeons made a practice of using a preliminary injection of saline per rectum before operating, and their combined mortality rate was 9.8 per cent. The other seven operated in all cases without a preliminary injection, their combined mortality rate being 14 per cent. In the series of 486 cases there were 313 males and 173 females.

The ages of the children were as follows:

1 to 3 months	...	10	12 to 24 months	...	35
3 to 6 months	...	156	3 years	...	6
6 to 9 months	...	190	5 years	...	2
9 to 12 months	...	83	7 years	...	1

The graph (see below) shows the incidence of the condition at different ages from 1 to 21 months.

Although there were generally about an equal number of cases treated during each of the months of the year, there were actually 158 cases treated during the hot months—November, December, January, and February—and 151 during the colder months—May, June, July, and August. This suggests that gastro-enteritis may play a minor part in the causation of some cases.

* Read in opening a discussion in the Section of Diseases of Children at the Annual Meeting of the British Medical Association, Melbourne, 1935.