TROPICAL MEDICINE IN THE BRITISH EMPIRE

THE PRESENT POSITION IN LONDON

By Sir PHILIP MANSON-BAHR, C.M.G.

NO one can belittle the weight of responsibility which falls upon the British Colonial Empire at this moment, especially in respect to the health and well-being of those millions of primitive peoples entrusted to its care. In 1909 the late Sir William Osler put this matter admirably in these words: "When Isaiah was discussing the burden of Babylon, the burden of Tyre, and the burden of Egypt, I wonder what he would have said could his prophetic eye have glanced at the map on which is depicted the burden of the British Empire. Surely no nation in history has ever had such a load of responsibility. But fit as it has been in the past, it will ever be fit as long as *salus populi* remains *suprema lex*. It only behoves us to see that we are well-equipped for this second great task—the task of the future, to give the teeming millions of our dependencies that greatest of all blessings in life—good health".

A large portion of the Colonial Empire is situated within the tropics in Central Africa, in the West Indies, South America, Malaya and the Far East. There is also the overpowering problem of India, where the conditions are eminently suitable for the spread of diseases peculiar to hot climates.

In the basic discoveries in this branch of medicine British men of science have played a dominant part, and their achievements have been, during the last fifty years, second to none. It is scarcely necessary to recapitulate the achievements of Sir Patrick Manson, who led the way by the discovery of insect-borne disease from 1879 onwards, culminating in the elucidation of the malaria-mosquito problem by Ronald Ross in 1897. This was indeed the golden age of British tropical medicine, and as the result of these researches tropical medicine came to be established as a specialized subject. The unstinted support of Manson for his pupil Ross, as he then was, is well exemplified in the letter addressed to Sir Charles Crosthwaite at the India Office in July 1897:

"So convinced is Ross of the truth of this mosquito theory that lately he took three months' leave and retired to the most unhealthy place he could get access to, to work on the mosquito. He was three months there and got a lot of knowledge, and also a dose of malaria. . . .

"It would be a vast pity if the chance which now presents of making a substantial addition to pathological science should again be lost to Englishmen. We are cutting a sorry figure alongside other nations just at present. To our national shame, be it said that few, very few, of the wonderful advances in the science of the healing art which have signalized recent years, have been made by our countrymen. This is particularly apparent in the matter of tropical diseases, in which we should in virtue of our exceptional opportunities, be *facile princeps*. But, even in tropical diseases, Frenchmen, Italians, Germans, Americans and even Japanese, are shooting ahead of us.

"We have to get a Koch to find for us the cholera germ, and a Haffkine to protect us from it; a Laveran to teach us what malaria is, a Kitasato to show us the germ of plague, and a Yersin or a Haffkine to cure us of its effects. This is very humiliating to everyone but a cynic. But in this matter of malaria here is a chance for an Englishman to rehabilitate our national character and to point out to the rest of the world how to deal with the most important disease in the world—malaria.

"This is not bunkum, but fact. If we don't do it, and do it soon, some Italian, or Frenchman, or American, will step in and show us how to do what we can't or won't do for ourselves. They are on the track, even now. Can you influence the powers that be at the India Office to give Ross the chance of striking a good stroke for England? He asks for little, and may do a great deal indeed."

British Achievements in Tropical Medicine

These warnings were soon taken to heart, and a whole series of striking discoveries redounded to the credit of British science. There came David Bruce and with him the unravelling of the mysterious sleeping sickness, or negro lethargy, of Central Africa. In 1896, he was the first to associate a trypanosome (*T. brucei*) with the nagana disease of horses, cattle and big game and the presence of noxious tsetse flies. The immediate result of this work was to lay bare the enormous unexplored field of trypanosome diseases and to stimulate research on tsetse flies. It culminated in the discovery of trypanosome disease in man by Forde in 1901 and the naming of the parasite, *Trypanosoma gambiense*, by Dutton in 1902. History will record that the final solution of the sleeping sickness problem should also be awarded to Bruce for his work in Uganda in 1903.

Complete understanding of this major scourge of the African Continent would have been impossible without the painstaking work of many medical entomologists, among whom Austen is rightly regarded as a pioneer.

The riddle of 'tick fever' which killed David Livingstone was solved by Dutton who, in association with Todd, proved that it was conveyed by the Central African tick, *Ornithodorus moubata* (1905). Two years later, F. P. Mackie showed that the louse was the vector in that variety of relapsing fever occurring in India. This discovery undoubtedly stimulated interest in this lowly insect and indirectly led to its incrimination by Nicolle in the spread of typhus at a later date.

In the front rank we must also place the identification of the Leishman–Donovan body by Leishman in 1903 which thereby led to the recognition of the group included under the term leishmaniasis. It is to Leiper that we mainly owe the disentangling of the complicated life-history of bilharzia and the recognition of the two main human species of this parasite in 1915.

The introduction in 1912 of emetine in the treatment of amœbiasis and of antimony in kala-azar in the following year was a prime therapeutic contribution by Sir Leonard Rogers. These are but a few of the outstanding British achievements in tropical medicine.

Education in the Principles and Practice of Tropical Medicine

The foundation of schools for research on tropical diseases and special teaching of this subject arose primarily from the precepts of Patrick Manson. The London School, which was his child, opened its doors at the Royal Albert Dock in 1899, almost simul-

taneously with its sister school in Liverpool which owed its inception to Sir Alfred Jones. Manson's School was modelled on the idea of a tropical centre. There were teaching and research laboratories, animal houses, residential quarters and a hospital for patients suffering from tropical diseases, all in intimate association—an ideal arrangement. From the commencement, with Manson's guidance, the scheme proved a success, and the London School of Tropical Medicine, under the ægis of the Seamen's Hospital Society, flourished in its somewhat remote and dingy surroundings for nearly twenty years. As the result of the First World War and, in accordance with a desire to see tropical medicine established in the University quarter of London, the decision was taken to transfer the School to Endsleigh Gardens, in the neighbourhood of Euston, in 1919. The new quarters were adapted to the purpose, and could not be considered very suitable, situated as they were in a building designed primarily for a private hotel and used as an officers' hospital during the war period.

The stay of the School in its new surroundings was a brief ten years, for in 1929 it was merged into the newly instituted London School of Hygiene and Tropical Medicine, at which time the nucleus created by Manson lost its identity as a separate unit. It also led to the separation of the clinical from the purely laboratory and scientific activities. This was regarded by many at the time as a retrograde step and the fruit of this policy is to be seen in the present rather deplorable situation. The Hospital for Tropical Diseases continued to function in the Endsleigh Gardens building as a separate entity under the Seamen's Hospital Society and permitted the number of beds to be increased to seventy-five. As such it continued to do good work and to meet a definite public demand. Clinical and pathological material from the Hospital was utilized for teaching purposes for the student classes from the School of Hygiene and Tropical Medicine.

Rumours of war then darkened the skies above Bloomsbury and in August 1939, a week before the declaration of hostilities, the Hospital for Tropical Diseases was evacuated by order of the Government as unsafe and dangerous. The equipment was dispersed to many centres and its staff scattered to the winds. That these fears were justified is seen by the partial destruction of the building by enemy action in 1941. No provision could be made for the treatment of tropical cases in any other hospital or centre in London, and it is a matter of sincere regret and very considerable inconvenience that no facilities for sufferers from tropical diseases have existed in London during these six years of war. However, steps are now being taken to set up a separate hospital for this purpose early this year. It is hoped that this small refuge will constitute the seed from which an institution more worthy of the greatness of the British Empire and its tropical dependencies will eventually germinate. It will, at any rate, serve to anchor the main interests in clinical tropical medicine in the Metropolis until more favourable opportunities present themselves, for it is hard to believe that, though we have more Colonial possessions than any other country, we are now perhaps the least well equipped to teach young men the treatment of these tropical diseases they are most likely to encounter in their service overseas. It is a matter of common knowledge that such countries as Holland, Belgium and Italy had far better equipped tropical hospitals than anything in Great Britain, and that the best example of all was to be found in Hamburg in a Germany even when bereft of all its tropical colonies.

Undoubtedly some voices will be heard declaiming that the most suitable place to impart clinical instruction in the diseases of the tropics is in some medical centre situated within the torrid zone[1]. This is undoubtedly desirable, but it is scarcely practicable under the present conditions. It has been proved possible in the past—in London at any rate—to provide adequate clinical material for teaching the main tropical diseases, such as malaria, dysentery, sprue and their sequelæ.

It will no doubt be possible in the future for particular students to specialize in tropical medicine and hygiene as consultants. They should be permitted to hold approved hospital appointments in tropical countries as part of the prescribed post-graduate experience in this branch of medicine, as foreshadowed in the Goodenough Report.

Discoveries and Achievements in Tropical Medicine during the War

Let us now examine some of the recent achievements in this vast field and the opportunities they present to future workers in the British Empire. There is much food for thought here, as well as subjects to attract teams of research workers from the London School of Tropical Medicine, the Medical Research Council and other bodies who may be dispatched to different parts of the tropics, to investigate some particular pressing problem.

The introduction of the sulphonamide drugs has exerted an enormous influence on tropical therapeutics. There is, for example, the almost magical influence of sulphapyridine on pneumonia and cerebrospinal meningitis, both of which constituted terrible scourges to primitive peoples. Sulphaguanidine and sulphasuccidine, less soluble products of sulphapyridine, introduced in 1941, when promptly and scientifically administered, have proved most effective in the treatment of bacillary dysentery, with the result that the incidence of this disease has been reduced to minimal proportions, so that, as a war menace, it has practically disappeared. It is stated that the mortality rate, formerly considerable, has now been reduced to less than 1 : 5,000[2]. Many medical officers have recorded series of cases of 700 or more without a single fatality.

The potentialities of penicillin in the treatment of many tropical infections are coming to be appreciated, and it is scarcely as yet possible to estimate how far its benefits may extend. In yaws, that universal and maiming affection of the tropics, this wonder drug appears to produce results as magical as in its sister-disease—syphilis.

Thus Whitehill[3] and Austrian[4] have treated seventeen cases of active primary and secondary yaws with intramuscular injections, in doses of 15,000 units four-hourly day and night for 5–6 days. The spirochætes were observed to disappear within sixteen hours. All lesions had completely healed within three weeks. These sensational results have been confirmed by Findlay, Hill, Macpherson[5], Lofgren[6] and others.

Equally favourable are the results reported in tropical ulcer. This is notorious as one of the most disabling diseases of primitive peoples. The incapacity it brings about is enormous, and the destruction it causes of the tissues and even of bone frequently makes amputation inevitable. Many of the ulcers so treated were of several months' standing. They were treated by injection of 100,000 Oxford units and the

application of penicillin ointment, with the result that the highly septic ulcers had become practically sterile, and healthy granulations had filled their bases.

There is also the parallel action of penicillin on other spirochætal diseases. According to Eagle and Magnuson[7], injection of penicillin causes rapid disappearance of the relapsing fever spirochætes in artificially infected rats and mice. Their results seem to indicate that this treatment should also be effective in man. This is important as the present mode of treatment by arsenotherapy has been considered unsatisfactory during these war years. On the organisms (*Spirilla*) of rat-bite fever similar results have been obtained, while in the leptospiroses—Weil's disease, seven-day fever, etc.—Alston and Broom[9] and Cross[10] indicate that the therapeutic results should be equally favourable.

In malaria great and solid additions to knowledge have been achieved mainly as the results of the work of Hamilton Fairley[11] (who in peace-time is physician to the Hospital for Tropical Diseases and lecturer in the London School of Hygiene and Tropical Medicine) and which must be assessed as of great merit. The researches which have now been published were rendered necessary by the alarming incidence of these fevers among combatant troops in the South-West Pacific.

The mode of action and precise value of anti-malaria drugs, including the sulphonamides, mepacrine (atebrin) and quinine, were tested out thoroughly, when used both as suppressants and true causal prophylactics in more than a hundred volunteers (from the Australian Forces) who had been infected with the Papuan strains of benign tertian (*Plasmodium vivax*) and subtertian malaria (*P. falciparum*). These volunteers were exposed, while taking anti-malaria drugs, to bites of malaria-infected mosquitoes. Similarly, the experiments were so planned that volunteers were exposed during suppressive treatment to rigorous conditions, including heroic exertions, physical hardships and exposure to altitudes of 15,000–18,000 ft. in aeroplane flights, without provoking relapses of malaria.

Large doses of malaria-infected blood, ranging from 10 to 200 c.c., even 500–800 c.c., were utilized to produce infection or, even, sometimes to prove that malaria parasites were absent after spells of treatment.

Many positive facts of decisive importance which may profoundly affect our knowledge of malaria have emerged. It has been shown, for example, that when bitten on one arm by an infected anopheles mosquito, the blood taken from the opposite member becomes infective to another volunteer within as short a period as seven minutes, but that afterwards, in the cases of malignant malaria (*P. falciparum*), the blood remains incapable of transmitting further infection for a period of seven days, while in benign tertian this span lasted as long as nine days.

From these premises and others of a similar nature it is argued that the malaria parasites of man may undergo (like those of certain malaria-like parasites of birds—*P. gallinaceum*[12] and *P. cathemerium*) an intracellular development in the endothelial cells of blood vessels prior to entering the red blood corpuscles. This would go far to explain the *raison d'être* of the prolonged latent periods and remissions which characterize the human malaria infections, and would postulate that a further complication has to be added to the known and already complex cycle of development of the malaria parasites. Field experiments definitely proved the practical value of suppressive antimalaria drug treatment, especially that of mepacrine (atebrin), in doses of 0·1 gm. daily in volunteers, though bitten repeatedly over several months by anopheline mosquitoes, infected with both species of local malaria parasites—*Plasmodium falciparum* and *P. vivax*. This amount of mepacrine was found to be quite harmless to the volunteers and in no way incapacitated their well-being. A vast amount of work was devoted to the amount of this drug absorbed into the blood serum (blood levels) necessary to cause suppression of the parasites and it was found that the effective level was not reached until the drug had been taken continuously for 9–10 days. It thus became evident that any reduction of the standard suppressive mepacrine to three or four tablets weekly would result in attacks of overt malaria in those who had been artificially infected.

It was this ineffective method of uncontrolled mepacrine prophylaxis which accounted for those disastrous epidemics of malignant malaria in the severe jungle fighting in the earlier stages of the campaign in New Guinea and Burma.

The net result of these researches was to convince the General Staff of the inherent soundness of mepacrine prophylaxis as applied to combatant troops in the field, so that it was decided to make this subject a disciplinary measure. The success of this ruling was immediately seen in the reduction of the malaria rate from 740 per 1,000 per annum in December 1943 to 26 per 1,000 per annum in November 1944. Furthermore, for the two years prior to VJ Day, the death-rate in the Australian Military Forces for uncomplicated malaria has not exceeded 1 : 3,000 cases; although perhaps other factors have combined to produce these favourable results, such as improved anti-mosquito measures and less severe exposure to infection. These figures must be regarded as the outcome of a splendid achievement.

Prevention of Insect-Borne Disease

The facts stated above must be interpreted in the light of advances in the field of malaria prevention as well as that of other insect-borne diseases by an entirely new weapon, more efficient than any hitherto employed, which has been provided by D.D.T. (dichlor-diphenyl-trichlorethane), the possibilities of which have been tested out on a considerable scale by Prof. P. A. Buxton[13] of the London School of Hygiene and Tropical Medicine. This substance is fortunately, in moderate doses, harmless to man and animals, nor is it irritating to the skin. D.D.T. is a white crystalline powder which possesses a faint, pleasant odour, is non-volatile at ordinary temperatures and dissolves in most ordinary solvents. D.D.T. is probably poisonous to nearly all insects, though the lethal dose varies greatly in various species. The actual dose which kills is exceedingly low, because it kills flies and other insects which have touched dry surfaces impregnated with it with their feet only. It acts apparently on the nervous system, and its action on mosquitoes is most effective in sprays combined with pyrethrum extracts, especially in the form of the 'freon' or aerosol bomb, made by the Westinghouse Company. When the release of this bomb is opened, a mist escapes which has remarkable powers of penetration into small refuges where these insects shelter.

Adult anopheline mosquitoes can be reduced in numbers for as long as 2–3 months after a single spraying in houses. Films spread on the walls are

most effective. When a mosquito enters a house and rests on the wall before attacking man, it picks up enough D.D.T. to prevent its biting. It may also be impregnated on to wide-meshed bed nets, thus rendering them effective barriers against mosquitoes and sandflies. It would also appear probable that the use of D.D.T. may solve the problem of insect transmission by planes and thus prove a safe and, withal, simple measure in combating yellow fever. Against mosquito larvæ it is equally effective, though for this purpose it will be necessary to produce a floating, non-wettable powder containing a sufficiency of D.D.T. At present it is most effective when dissolved in the customary larvicidal oils, by spraying pools and other collections of water containing mosquito larvæ. It is equally effective on that universal pest, the house fly, and when sprayed in kerosene emulsions on various biting flies which plague cattle and other domestic stock; but, most important of all, it has been found by Buxton and Nash that the vicious and dangerous tsetse (*Glossina*) of Central Africa is readily killed by traces of D.D.T. on cloth or on the hair of animals. This method opens up great possibilities in the control of the tsetse, which have so far resisted every other measure to exterminate them. The discovery that they may be either exterminated locally or greatly reduced in numbers by the employment of herds of bait animals, or by impregnating clothing, is obviously of prime importance to the future of Central Africa. The general adoption of these comparatively simple measures should enable domestic animals—cattle, horses and pigs—to thrive in many areas where it was impossible for them to exist on account of the trypanosome diseases conveyed by the tsetse fly.

The impregnation of clothing with D.D.T. for the suppression of lice was one of the major discoveries of the War. When properly applied to shirts it can resist many washings and this fact has resulted in protecting our troops from the ravages of these pests which proved such a disgraceful feature of the First World War. The method of application of D.D.T. in dust by handblowers, by puffing up the sleeves and trouser legs or down the neck and into the waist of skirts and trousers effectively delouses a whole population in a short time. This is the method which was employed in one of the most remarkable pieces of preventive medicine yet recorded, namely, the typhus epidemics in Naples early in 1944.

D.D.T. also acts on bed-bugs, cockroaches and on some species of tick.

Enough has been said to indicate that this new discovery has placed in our hands a weapon of immense importance. Its influence upon health and comfort in the insect-ridden tropical and subtropical lands is bound to be great and it will probably have far-reaching effects upon colonization and development of the British tropical Empire.

The future of tropical medicine is therefore bright. There are still immense, almost limitless, fields to explore and conquer. Verily the harvest is plenteous and the labourers are few, but those who are in a position to know are much perturbed about the present position of tropical medicine in London. Obviously something will have to be done to preserve the ideals of Manson's School. That they should crumble and die is unthinkable.

It can reasonably be urged, in these days of imperial aid for colonial development and of increasing Empire-mindedness of the British Parliament and of the British people, that more whole-hearted support should be forthcoming so as to create in this, the Metropolis of the British Empire, a world centre for the study of tropical diseases, worthy of its greatness and of its glorious heritage and to keep the flag of tropical medicine flying where it ought to be, in London. Such a tropical centre should be remodelled on the lines of Manson's original School with a Hospital for Tropical Diseases, the School of Tropical Medicine with its special departments of protozoology, helminthology and entomology in close association with one another. In view of the remarkable achievements in tropical hygiene—one of the most outstanding victories of the Second World War—this section will have to play a leading part. Special emphasis should be placed upon the desirability of founding a hostel in connexion with the centre where students from overseas can be housed and made to feel at home in the somewhat, to them, forbidding surroundings.

Colonial governors are well aware of the prestige that scientific medicine brings in its train and that the almost instantaneous and magical effects of some of the modern drugs (mentioned in this review) do more to enhance respect in the minds of illiterate people for British administration than almost any other measure.

It therefore becomes incumbent on the British Government to encourage and foster, as it undoubtedly will, tropical medicine as an essential part of Colonial policy.

Let us see to it, therefore, that our young men returning from the wars to take up this most important branch of medicine are given the tools to get on with the job.

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OBITUARIES

Dr. A. C. Oudemans

Since communication has been established with Holland, we have heard from Dr. G. L. van Eyndhoven of the death, at the age of eighty-five years, of Dr. A. C. Oudemans. He died at Arnhem on January 14, 1943.

Dr. Anthonie Cornelius Oudemans, a son of Prof. J. A. Chr. Oudemans, chief engineer of the Geographical Service of the Dutch East Indies, was born in Batavia on November 12, 1858. He came of a gifted family some members of which held important positions, usually of a scientific nature, in the Dutch East Indies. In Holland, two of his uncles were distinguished men of science: Prof. A. C. Oudemans as a chemist and Prof. C. A. J. A. Oudemans as