

that hypothesis, and when it was found to lead in the wrong direction seeking out another trail until at last the truth was made known.

Those who knew most about the subject were the people who were most quickly convinced of the value of the great discovery, but it is safe to say that Ross himself was the only one who appreciated rightly the enormous significance of his own work.

In 1902 Sir Ronald had the opportunity of making the first great demonstration of the vast possibilities of his discovery by freeing Ismailia of malaria at a time when the evacuation of the town was being seriously contemplated. Soon after his return from Ismailia in December 1902 he was awarded the Nobel Prize of nearly £8,000, being the second recipient of the prize for medicine. This was the only substantial reward which he received for a discovery which has been worth many millions of pounds to the human race apart altogether from the saving of life and the prevention of sickness.

The after work of Ross has consisted in teaching the world how to prevent malaria. To some extent this was a thankless task, his discovery was made too soon, the intelligent sections of the world were not sufficiently well educated to realise the importance of his work, so that his teaching met with apathy and indifference except from a few enlightened men who converted his precepts into practice, to the great benefit of themselves and of the human beings whose lives they saved.

The Panama Canal could never have been constructed but for the work of Ross, even this great object lesson has not dispelled the inertia of the world and there are still vast areas which are lying desolate which might be converted into fruitful fields if only the advice of Ross were carried out. Some of the more important honours and awards which were made to Ross are:—

Fellowship of the Royal Society	..	1901
C. B.	1902
Nobel Prize	1902
Royal Gold Medal, Royal Society	..	1909
K. C. B.	1911
K. C. M. G.	1918

It will be noticed that the adequate State recognition of his work came years after his greatest work was done, and it was only the other day that the Ross Institute was opened by H. R. H. The Prince of Wales. The object of this institute is to honour Sir Ronald and to continue the work on malaria which lies so near to his heart.

It is to be hoped that Sir Ronald will be spared to see the adequate recognition of his discovery in the form of energetic practical application of the principles which he laid down so many years ago.

J. W. D. M.

SPECIAL ARTICLES.

THE DISPENSARY TREATMENT OF MALARIA IN INDIA.

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OF late years there has been a constant agitation in India for the establishment of Ayurvedic dispensaries. Also Government has been asked to establish training schools for Ayurvedic practitioners. Educated in an English school of medicine, I believe modern medicine of to-day to be superior to any indigenous school. Yet after seventy years of experience of practitioners trained on the same lines in this country, many educated Indians and the great bulk of the population of India are not converted to this belief. Religion, the strength of tradition and political considerations all account to some extent for the failure to convert the people of India to the superiority of modern methods in medicine. (I purposely do not speak of any special school or system of medicine because at the present day the modern school of medicine is prepared to accept and incorporate in its own teaching any proved facts of value.) I believe however that the main factor in this failure to convert the masses, is their actual experience of modern medical practitioners. To the bulk of the population the representative of modern medicine is the district or municipal dispensary, in charge possibly of an assistant surgeon, but more often of a sub-assistant surgeon.

If I were asked to select a disease in the tropics to prove the efficiency of modern methods, I would select malaria. Its diagnosis with a microscope is easy and certain, its treatment well defined and simple, and the result of treatment rapidly obtained. What then is the experience of the *ryot* when he applies to the representative of modern medicine for the relief of malaria?

My former district is a malarious one, and the principal disease treated in it is malaria. I investigated the records of four typical dispensaries and the experience of 698 patients with malaria. The results are as follows:—

One attendance	48 per cent.
Two attendances	20 per cent.
Three attendances	12 per cent.
Four attendances	8 per cent.
Five attendances	4 per cent.
Over five attendances	8 per cent.

These figures are for all four dispensaries, but when worked out for individual dispensaries they were found to be practically the same. Where a patient attended over five times there was as a rule some obvious

explanation. Thus out of three cases at one dispensary, one was the medical officer's son, one the dispensary servant, and the third the station-master's son. In another dispensary out of eleven cases registering over five attendances, five cases belonged to the family of the postmaster living a few yards away, two cases had, from the start, been represented by friends, and may not have been malaria, while two more had registered over twenty-five attendances up to the point I followed them, and I think we may assume they were not malaria. What do these figures prove? To the cheerful optimist that 48 per cent. were cured by one attendance and 20 per cent. by two. To the pessimist 48 per cent. never came back because they concluded that it was not worth the time and trouble. Where lies the truth? We may be guided to a correct conclusion by ascertaining the treatment these patients received.

On enquiry I was informed that each case was given three doses of the stock quinine mixture, *if he brought a phial*. If he did not he got one dose. There was no provision to give the patient a phial. If the patient came from a distance he got six doses, but that was only if he specially appealed for it. I gained the impression that this was more an answer to my question than a fact. The stock mixture of the dispensary pharmacopœia is ten grains of quinine to the ounce, but in three out of the four dispensaries it was only made up to half that strength, the reason being that the quinine supply was not sufficient to last the year if made up in the official strength. An analysis of one of these stock mixtures further revealed the fact that it only contained three grains to the ounce.

From the above facts I think we may safely conclude that at least 92 per cent. of patients suffering from malaria received insufficient quinine to cure their malaria and that some of the remaining 8 per cent. were not cases of malaria and so were not cured.

Is it to be wondered at that the people have little faith in modern medicine? It gives them little more than the Ayurvedic system and a good deal less than some patent medicines for malaria.

Recent observations go to prove that 30 grains of quinine in solution daily, given for three consecutive days, will cure 43 per cent. of cases of benign tertian malaria. Relapses occurred in the remaining 57 per cent., but in the great majority of these cases the parasites and fever either disappeared spontaneously or as the result of one more three-day course of quinine.

Surely we can so organise our medical relief that each case of malaria shall receive 90 grains of quinine in solution when he visits a dispensary? It is not reasonable to expect a malaria patient to walk several miles daily to obtain 15 grains of quinine. Even

when he does do so, he may only get 9 grains as the recent analysis shows.

Why are these inadequate quantities given? Primarily the difficulty is one of finance. To take one of the dispensaries investigated, its requirements in quinine at 90 grains per case would cost Rs. 720 per annum. Its total budget allotment for drugs, medical and surgical requisites, etc., is Rs. 500 per annum. It actually spends on quinine Rs. 288 per annum, and receives in addition quinine to the value of Rs. 144 from the Public Health Department; a total of Rs. 432 per annum. There are some dispensaries better than this and some worse, but all are in the same position as regards finance. We must also remember that adequate treatment would result in an enormous increase in attendances.

We come now to the second factor in our failure to convert the people to a belief in the superiority of modern medicine. Are the medical officers in charge of these dispensaries good representatives of modern medicine?

Three of the dispensaries have been supplied with good microscopes. One of them was in use when I inspected the dispensary, the medical officer being a graduate of the Calcutta University. In the case of the others the microscopes were locked away, and the medical officers frankly owned that they did not know how to use a microscope. Is there not something very seriously wrong with our system of medical education and examination when we find a registered practitioner in a tropical country unable to make use of a microscope for ordinary clinical work?

The latest development in medical policy in Bengal is the starting of medical schools in various districts, and the utilisation of the Sadr hospitals for training sub-assistant surgeons. Is this a sound policy? I venture to think not.

With ten candidates applying for every vacancy in the Calcutta Medical College would it not be better to extend the opportunities for training to university standards? Granted enough graduates are turned out, economic pressure will drive them out into the districts. The sub-assistant surgeon was originally trained to work under supervision. His very title implies that. At the present day he is being put in independent charge, and although a limited number are doing well, the vast majority are not, if judged by the standards of modern medicine.

Nor are our Sadr hospitals suitable training-grounds. We must remember that a student's training-school represents to him the highest ideal to which he must work up to. Are any of our Sadr hospitals even representative modern hospitals? We have only to think of their limited staffs, their unsatisfactory buildings, their poor sanitation, their poor equipment, their lack of special departments, their almost absolute lack of nursing

to realise that they are not. Can anyone compare, say the hospital at Chinsura, with one of the provincial teaching hospitals in England, such as Manchester or Newcastle, and not realise how inadequate it is to turn out satisfactory representatives of modern medicine?

Starting with a good general education, studying in his own language, and with a knowledge of chemistry and physics, the General Medical Council of the United Kingdom has laid down that five years is the minimum period in which a student can acquire a working knowledge of modern medicine. Even then it is complained that the curriculum is overcrowded and that extra time must be spent on tropical diseases, if the graduate is going to practise in the tropics. Starting as we do in India with a poorly educated student, whose text-books and teaching are in a foreign language, can we aspire to achieve that minimum in the same period, or less? The scattering of these under-trained medical practitioners over the country is I believe undermining what little faith the masses have in modern medicine, and paving the way for the revival of the indigenous systems of medicine.

It was Flexner who pointed out that in the big towns a bad doctor could make his living, but not in the country. In the town his mistakes were not common knowledge, but in the country every one heard of them. The theory that the poorly-trained doctor will be content to stay in the *mofussil* villages, will, I think, prove incorrect. He will make his small income more easily in the towns.

THE FUTURE OF ANTI-MALARIAL RESEARCH.

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and

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'Go where Death's pickets hide—
Unmask the shapes they take,
Whether a gnat from the waterside,
Or stinging fly in the brake,
Or filth of the crowded street,
Or a sick rat limping by,
Or a smear of spittle dried in the heat—
That is the work of a spy.'—*Kipling.*

Introductory—the general need for research.

ALTHOUGH Kipling wrote these lines more than twenty years ago they summarise almost the whole activity of tropical medical research, even at the present day. And his instinctive sympathy for the worker, who, whatever his work, has to contend with the intractability of things or of men, lent him insight.

We are not concerned to describe the ravages of malaria since these are already well known: but a correct idea of their magnitude is necessary in order to appreciate the possible value of research, considered as an investment which will diminish them. Malaria extends round the world, being found in places so far north as the Baltic, and so far south as Natal. Far from being confined to the tropics, as is well known, many parts of Southern Europe, notably Italy and Greece, contain foci of virulent infection. In a recent address Dr. Andrew Balfour has estimated that the annual death roll from malaria is 200 millions, and that the annual loss to the world which it occasions is between 50 and 60 millions sterling. These figures are certainly not exaggerated, since in India alone one million three hundred thousand persons died of malaria in 1920, and it has been estimated that in 1923 there were ten million cases in the Russian dominions. The disruption and delay caused by the death and sickness of labourers occasions incalculable loss to organised industries, and even to agriculture, since neither ploughing nor reaping wait upon convalescence. Apart from the misery and loss occasioned by actual sickness and death, the invalidism caused by chronic malaria robs inspiration, and by depleting vital energy, levies a heavy toll upon both European and native initiative in the tropics. Therefore without reference to humanitarian considerations, and using an expression derived from the clarified preceptions of finance, the "present value" of any discovery making it possible to eradicate malaria, or even considerably to increase the ease, and diminish the cost of dealing with it, would amount to hundreds of millions of pounds. Yet only a few thousand pounds a year are spent on malarial research in the Empire. There seems to be no escape from the dilemma, either that practical men are not really practical in their dealings with malarial research, or that there is very little to be hoped from it.

This supposition involves two alternatives, namely either that research is bankrupt, and that money spent on it must therefore necessarily be money wasted: or that existing preventive measures are so nearly perfect that no better are needed. We believe that the last supposition is almost the exact opposite of the truth. This we will briefly proceed to show, devoting the remaining pages to a discussion (necessarily limited) of the enormous possibilities of anti-malarial research, organised on a world, or at least on an Empire-wide scale, and carried forward unflinchingly, with bold and wide-ranging initiative, under enlightened and really scientific guidance.

The defences against malaria are twofold. Either the parasites which cause it may be