

MALARIA IN RURAL MALAYA

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IT HAS long been known that malaria is prevalent in many parts of rural Malaya. It does not, however, make the same impact on the public as does malaria in urban areas or agricultural holdings. In these latter places, the population is more concentrated and the cost per head of protecting them is relatively low while at the same time the economic effects of malaria are so evident that anti-malaria measures are instituted early. Until recently, these measures consisted of drainage, oiling and drug prophylaxis, all of which are costly and involve recurrent expenditure and cannot be applied to vast areas with a scattered and impoverished population. Hence, malaria in rural areas has been for the most part neglected. Naturalistic measures limiting the multiplication of vectors have been tried without obtaining consistent results. Residual insecticides have been introduced since World War II and this offers a possible line of attack for the rural areas because of its relative cheapness.

MALARIA IN MALAYA IN RELATION TO TOPOGRAPHY

Malaya lies in the equatorial zone with a constantly high temperature and humidity suited for the perennial transmission of malaria. The intensity of transmission, however, varies from place to place; in general, it may be said that malaria exists in most parts of Malaya in endemic, and in some places, hyperendemic form.

Brackish Water Zone: The prevalence of malaria in any locality is largely determined by whether or not conditions exist there for the breeding of vector species of *Anopheles*. The untouched mangrove swamps along the coast are relatively free from malaria because of the absence of vectors. When the mangrove is cleared and the tidal waters are allowed to come in contact with collections of fresh water exposed to sunlight, *A. sudaicus*, Rodenwaldt, 1925 breeds prolifically and transmits malaria.

Coastal Plains: This zone which extends from the sea to the hills, if they remained as untouched jungle swamps, would be sparsely populated. If houses are built in cleared areas inside or close to the edge of such swamp forests (that is within half a mile, the distance which is the average flight range of mosquitoes) or if workers take shelter in the jungle during the day, they may be bitten by *A. umbrosus* Theobald, 1903. In north-east Malaya, where climatic conditions approach those of the monsoon countries to the north of Malaya, *A. balabacensis balabacensis* Baisas, 1936, is found in the swamp and hill forest and transmits malaria.

The cleared areas of the coastal plain may remain as open swamps or be under rice cultivation; in such areas the most important vector is *A. campestris*, Reid, 1962, and to a less extent *A. nigerrimus*, Giles, 1900. If the cleared area is a kampong or is under coconut or rubber cultivation, *A. letifer*, Sandosham,

1944, plays a part in transmission. If the cleared coastal plains are close to cleared hill forests, then *A. maculatus*, Theobald, 1901, the most important malaria vector of Malaya, takes a share in the transmission.

The Hills and Mountains: If this remained as virgin jungle, it would be sparsely populated. The Orang Asli (Aborigines) and jungle tribes living in such areas have malaria which may have been transmitted to them by members of the leucosphyrus group or other jungle species, but more often infection is due to *A. maculatus* which establishes itself in streams and seepages in hill-slope 'ladangs' or clearings prepared for their shifting cultivation. The Orang Asli also move around the country and may encamp close to malarious areas in the hills or in the coastal plains and become infected there, and take malaria from place to place.

Whenever the cover of jungle is cleared from hilly areas *A. maculatus* breeds prolifically in seepages and streams and is mainly responsible for the high malaria endemicity in the rubber and oil palm estates on the hill slopes. The rice fields in the valleys and ravines between the hills are also malarious because of *A. maculatus* breeding in the exposed seepages along the hill slopes or streams. The rubber-cultivated and partially cleared valleys may also breed *A. letifer* which may transmit malaria.

PREVALENCE OF MALARIA IN THE COUNTRY

Throughout the history of tropical enterprises, the opening up of land, especially with non-immune imported labour, has produced violent outbreaks of malaria and Malaya is a typical example of this. In assessing the economic losses caused by malaria, one should take into account not only the value of the lives lost but also the cost of medical care, loss of working time, lessened efficiency of labour, property losses by depreciation, loss of crop, etc. Government, estate managers and health officers recognised the extent of the economic losses and instituted anti-malaria measures early in Malaya. There has been an exacerbation of malaria in the country every few years which has often been associated with the periodic influx of foreign labour in connection with new planting and replanting of rubber. After a period of high incidence of malaria, the community develops a relatively high degree of immunity and therefore enjoys a period of decreasing endemicity. The natural removal of older immune members of the community

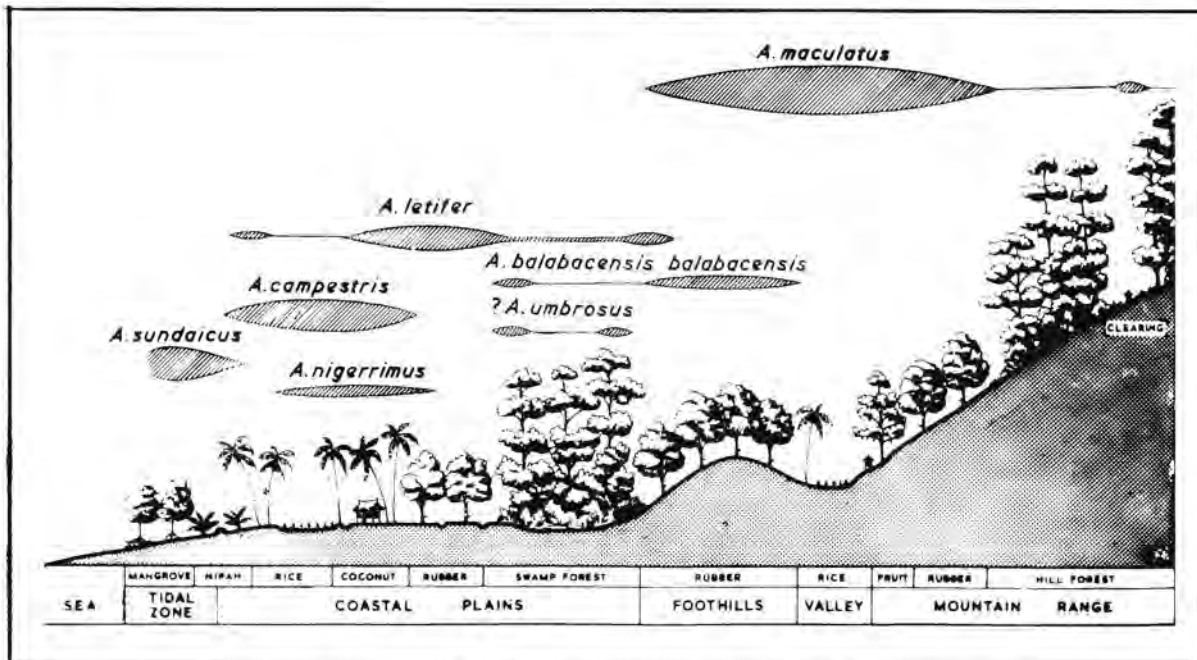
by death and the introduction of non-immunes by birth and immigration produce conditions particularly suited for increased prevalence of malaria. If this coincides with an increase in the population of vectors, as it happens during the opening up of new land and replanting of rubber, then conditions are suited for malaria to attain epidemic proportions.

PREVALENCE OF MALARIA IN RURAL AREAS

The malaria situation in rural areas of Malaya will depend largely on where the kampong is situated. It may be in an area of the country where malaria vectors are absent or rare, in which case there will be no malaria. Clearings and land development may make an area, previously free of vectors, suitable for the breeding of vectors. Thus fisherfolk living along the coast and riverine estuaries create conditions for *A. undaicus* to breed by clearing the mangroves in the brackish water area. The flat coastal plains may be cleared for coconut, rubber or rice cultivation and *A. letifer* and *A. campestris* appear. If the kampongs adjoin swamp or hill forest in N.E. Malaya and if there is logging or other activities in these forests, then *A. balabacensis balabacensis* may transmit malaria. If the kampong is on a hill slope or adjoins a hill which is cleared for development, the dangerous *A. maculatus* will start to breed and transmit malaria.

In many of these kampongs, no anti-malaria work has been done and malaria is prevalent in holo and hyperendemic forms, but clinical manifestations of the disease are often not so evident among these people. Malaria surveys carried out in many rural areas and offshore islands in Malaya have shown high parasite rates among the population which manages to carry out its normal daily chores. They are people who have developed immunity to child morbidity and mortality.

A malaria survey in four rural valleys in the Kuala Pilah District of Negri Sembilan, where control measures had not been carried out, done by the staff of the Institute for Medical Research (Edeson et al 1957) in 1948 and 1949 showed that among a population of 4,000 examined, the spleen and parasite rates of children varied from 54 to 60% and 26 to 37% respectively. In a similar kampong some miles away, where there were no medical facilities, spleen and parasitic rates in 1948 were 79% and 18% respectively among 130 children examined and were still about the same in 1952, i.e. 74 and 35% respectively in 95 children examined.



The distribution and abundance of vectors of malaria in different ecological zones in Malaya.

NEED FOR ANTI-MALARIA MEASURES IN RURAL AREAS

The rural community constitutes about 60% of the total population of Malaya and little has been possible for them in the past because of the prohibitive cost and impracticability of chemoprophylaxis and anti-larval measures over a large expanse of the country. With the advent of the cheaper residual insecticides, there is a no justification for postponing the attempt to control the infection among our rural folks.

It may be argued that if the folks have malaria parasites in their circulation and yet can carry on their normal activities, why interfere? This, to my mind, is a defeatist attitude. I have already mentioned that the immunity the people have gained is at the expense of a high child morbidity and mortality. Those children must be saved from dying and from suffering from the harmful effects of malaria. They deserve to have the benefits of modern science so that they can develop to the fullest their potentialities to enjoy life, be educated and become normal healthy citizens of this country. It has been said that the rural folks of Malaya have a 'tida-apa' or apathetic attitude towards life. If that is true, it may well be due to the continuous destruction of red blood cells from

malaria and the consequent anaemia leading to lethargy. If free of malaria, the rural folks may become more ambitious and work harder and improve their lot and nutrition and take their place side by side with the industrious urban folks. As equal citizens of the country, they have every right to expect Government to provide them that protection.

Another reason why we should attempt to control malaria in rural Malaya is that there is a constant danger of the infection being introduced to the urban and estate community which is relatively better protected. The urban areas carry out anti-malaria work and spend considerable sums of money keeping the vector population down. Even so, building operations, road construction, expansion of city into suburban areas, etc. that are continuously going on, keep producing conditions favourable for vector breeding. The urban population is relatively free of malaria and the small amount of breeding, limiting the numbers of vectors to a level below the critical density, will make little difference. But a continuous stream of gametocyte carriers from the rural areas visiting relatives, seeking treatment, etc., in cities, will constitute a serious menace. If this rural influx of malaria carriers can be stopped or if the rural areas can be freed of malaria, then the urban health

authorities can afford to relax and cut down on anti-malaria activities which are costing the City Councils so much in recurrent expenditure.

There is also an extensive programme of land development and resettlement of newly-opened up areas in the country at the present time. These are potential grounds for vector breeding and if malaria is introduced from various parts of rural Malaya, there is every likelihood of a flare-up. It will be much easier to keep malaria out of an area than to try and control or eradicate it after it has obtained a foot-hold.

MEP IN NEIGHBOURING COUNTRIES

Ideally, the disease should be eradicated from a country. The big question is whether eradication is technically and administratively attainable within a reasonable period of time. I raised this question back in 1962 after my experience with WHO. If achieving eradication is not time-limited, then is it economically justifiable? Would it not be more expedient to try and bring down the infection to a low level and maintain it at that level?

The doubt as to whether malaria eradication should be attempted in Malaya arises from the experience gained in some of the neighbouring countries like Thailand, Philippines, Ceylon and India. In Thailand, the total cost has far exceeded the original estimated figures and the target date for achieving eradication has long gone by and the prospects of attaining the goal early are not good. For instance, in 1968 the MEP officials report that in the areas they examined, there were about ninety thousand positive blood films. Among the problems there are: (1) a high turn-over rate of trained field personnel, (2) the migratory habits of the population, (3) the legal and illegal opening up of new areas at periphery of settlements, (4) the wide distribution of chloroquine-resistant falciparum malaria and (5) the exophagic and exophilic habits of *A. balabacensis*. About 25% of the total cost has so far been contributed by USAID, and with the cessation of that source of income this year, it has been suggested as a measure of economy that attempts should be made to maintain the gains achieved so far and modify the programme in the low receptive areas to a mere protective level.

In the Philippines, another of the early countries to start eradication, malaria endemicity in most areas is said to be low (below 2 percent prevalence rate in 334 indicator villages and between 2 and 12 percent in 336 others), but certain localities in Mindoro, northern Luzon, Palawan and Sulu Archipelago, are

still highly malarious. Here, too, the movement of people, including the nomadic tribes and the opening up of fringe areas for cultivation, constitute a big problem to the areas which have been cleared of malaria but where the vectors have been allowed to come back. It must be remembered that a malaria eradication programme does not envisage the eradication of vectors although the almost wholly house-resting mosquitoes like *A. minimus* and *A. campestris* may remain scarce after the campaign.

In Ceylon, after five years of comparative freedom from malaria and where malaria incidence had been reduced to about 10 indigenous cases in a whole year, nearly two million cases have been reported, and has necessitated a further eradication programme of at least 10 years' duration and at a cost of many millions of rupees.

In India, transmission has been re-established in areas in the maintenance phase and it has accordingly been necessary to reinstate spraying in many parts of the north and central regions of the country.

ERADICATION PROGRAMME IN MALAYA

The 85-million-dollar (originally estimated at 118 millions) malaria eradication programme was launched in Malaya on July 1st, 1967 according to information provided at the WHO 6th Asian Malaria Conference held in Kuala Lumpur last October. The plan entails the staggering of the Preparatory, Attack and Consolidation phases State-wise, starting at the north-west area of the Peninsula so that the whole country will be covered over a 11-year period. Houses are sprayed with DDT (75% WDP being used) at six-monthly intervals at the rate of 2 grams of technical DDT per square metre of sprayable surface. This is supplemented by radical chemotherapy of positive malaria cases and presumptive drug treatment of fever cases.

At the national level, the MEP is directed by the Head of the Malaria Division at the Ministry of Health. At the State level, the State Malariologist receives operational directions from the MEP Headquarters at the Ministry of Health, but is under the overall administrative supervision of the State Chief Medical and Health Officer.

Exophagic and Exophilic Vectors

The present malaria eradication programme in Malaya consists of DDT-spraying of the inside of houses and the exhibition of drugs. The 1962 survey in Perlis (Sandosham et al 1963) had shown that the vector was *A. balabacensis balabacensis* and that transmission was going on to the extent of more than

half the people being infected although the Government Health Department had been spraying the houses with dieldrin for about two years. Similarly, it was found that residual spraying in Negri Sembilan in an area where *A. maculatus* was the vector did not prevent the continued transmission of malaria though it was at a low level. In view of the difficulties of giving drugs to a scattered rural community, with an infection producing little obvious clinical manifestations, it is going to be difficult to achieve eradication by these means. When giving daily treatment in Perlis to those having parasitemia and suspected of having chloroquine-resistant falciparum malaria, it was often difficult to find the individuals at home because they had left for work. It was also difficult to persuade them to take the drugs even under direct supervision of the doctor and it is not likely that they can be expected to follow a treatment regimen if the drugs are distributed by lay personnel with the instructions they are to observe. This is understandable as the individuals are not suffering from obvious clinical symptoms of the disease like high fever, chills, sweating, etc. and cannot understand why they should be drugged.

Chloroquine-resistant falciparum malaria

It has been shown (Sandosham et al 1963, 1966) that a strain of chloroquine-resistant falciparum malaria was present in North Malaya and transmitted by *A. balabacensis balabacensis*. Cheong (1963) had shown that this strain could develop readily in *A. maculatus*, the important vector of malaria in Malaya. At that time, it was pointed out that this strain of malaria parasite appeared to be confined to north Malaya and that steps should be taken to prevent its spread in the rest of the country. There is growing evidence that troop movements, migration of people to land settlement areas and elsewhere have resulted in a wider distribution of the chloroquine-resistant strain of falciparum malaria in the country (McKelvey 1969 and Fredericks, personal communication) which is going to make the task of the eradication of the disease with the present armamentarium difficult.

ADMINISTRATIVE MACHINERY

It is questionable if the State Chief Medical and Health Officer is the best person to be placed in administrative charge of the State Malariologist. It has been said that to achieve success, an eradication programme has to be prosecuted with the vigour and thoroughness as in waging war. Can the necessary intimate knowledge and devotion be expected of an officer who has so many other responsibilities to

shoulder and who is so frequently changed from State to State because of the exigencies of service? In a health service, which is inadequately staffed, isn't there a danger that the State Malariologist will be expected to shoulder other health responsibilities as well? Isn't there a danger that the Chief Medical and Health Officer and the State Malariologist (who combine other administrative and health duties) are likely to be overwhelmed and tend to neglect the eradication campaign especially at a time when their attention is most needed, that is when the disease incidence has been brought to a low level? Could Professor Gabaldon's assertion, "Having personal knowledge of many tropical health administrators, I am convinced that the regular local health services are entirely incompetent to take care of the actions required during the maintenance phase" apply to Malaya also?

Use of Primaquine

A disturbing aspect of the MEP in Malaya is the use of Primaquine (an 8-amino-quinoline) in daily dosage of 15 mg. for 5 days in the treatment of the people. Lie-Injo Luan Eng et al (1966) have shown that Glucose-6-Phosphate Dehydrogenase deficiency has a frequency among the local population of Malaya of about 2 per-cent and that among them they reported 45 cases of haemolysis, most of them severe, in 2 years at the General Hospital, Kuala Lumpur. They stated that "this abnormality poses an important medical problem and is one of the major causes of acute haemolysis at least in Malaya." They also reported that the degree of G6PD deficiency was greater in Asia than in Africans and others so that the exhibition of primaquine in Asia becomes doubly serious. Lie-Injo et al (1964 & 1969) also reported that the frequency of G6PD deficiency was particularly high (9 to 23%) among the (Malayan Orang Asli (aborigines); in spite of this, it is proposed to use primaquine for mass treatment among them. (MEP Hqs K.L. M.C. 5.3.68). It is well recognised that erythrocyte G6PD deficiency is an inherited abnormality and results in acute haemolytic anaemia after ingestion of 8-amino-quinolines. The Orang Asli are a very shy and sensitive people and it has taken Government and Medical Officials years of patient work among them to gain their confidence to the present level as a result of which they are beginning to seek modern medical treatment. There is a danger that if the exhibition of primaquine on a mass scale handed out by non-medical personnel as part of the MEP should result in untoward accidents, then we

may lose the confidence of the Orang Asli and defeat our objective, namely the eradication of malaria in Malaya.

CONTROL VERSUS ERADICATION

As pointed out by Professor Gabaldon, the discredited concept of malaria control leading to a reduction of the disease incidence to a level at which it ceases to be a major public health problem, should be the immediate aim of many developing countries. The question is whether in Malaya we should not confine our activities to an attempt to reduce the prevalence of malaria to a low level by concentrating only on the heavily infected areas and ignoring those areas where the infection is low or practically absent. By doing this, it should be possible for spraying teams to cover a much wider area more quickly for the same amount of money and manpower. Once the prevalence is brought down, the prevention of an exacerbation of malaria will be relatively easier and cheaper by maintaining mobile teams to deal with emergencies than having to spray the inside of every house every six months for three years or more and continue with the expensive surveillance and maintenance programmes probably indefinitely.

CONCLUSION

In the short time allotted to me, I have tried to

outline the malaria situation in Malaya with special reference to the rural areas. I have also emphasised the importance of carrying out anti-malaria measures in the rural areas. As becomes a talk at a seminar, open for discussion, I have tried to be provocative and critical. I have outlined the results of MEP in neighbouring countries, problems of exophily of certain vectors, drug resistant malaria, etc. and have suggested that control leading to a reduction of the disease to a level at which it ceases to be public health problem may be a more readily achievable and a more economic target than complete eradication. I have also questioned the wisdom of exhibiting one of the 8 amino-quinolines among a population known to have a high degree of G6PD deficiency.

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