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WORLD HEALTH ORGANIZATION

ORGANISATION MONDIALE DE LA SANTÉ

INTER-REGIONAL CONFERENCE ON MALARIA FOR THE EASTERN MEDITERRANEAN AND EUROPEAN REGIONS

Provisional agenda item 3.1

WHO/Mal/169
16 April 1956

ORIGINAL: ENGLISH

THE ADVISABILITY AND PRACTICABILITY OF MALARIA ERADICATION IN TAIWAN, CHINA

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The primary objective of the four-year malaria control programme in Taiwan was to bring the disease under control and to reduce the incidence of malaria to the point where it would no longer constitute a public health and a socio-economic problem. It was originally planned that the DDT spraying operations be conducted extensively in the malarious areas for three years on an island-wide scale following the pilot project and later be gradually supplanted by surveillance activities incorporated into general rural health services which might result in the disappearance of malaria. In the light of the experiences expressed in the Second Asian Malaria Conference and in view of the dramatic results obtained through the current malaria control measures, the original strategy was boldly modified and the concept shifted from a mere malaria control followed by a long-term surveillance to the elimination of the disease in a short period of time with intensified efforts.

As a matter of fact, the Japanese Government had struggled against malaria for 35 years before World War II, trying to stamp out the disease from this island. The intensive and extensive efforts for therapeutic treatment including a mass blood examination of 3.9 million slides a year kept the malaria incidence at a very low level during that period. However, the transmission of malaria had never been stopped and malaria came back again immediately after the efforts were discontinued. Now, with the modern control measures applied during the last few years, the incidence of malaria has been brought down to a level which has never been achieved before. The prospect of malaria eradication foreseeable at present provides an unique opportunity which, unless seized in the present planning, may

be lost completely. Is the malaria eradication programme in Taiwan advisable, and if so, is it practicable at all? We shall try in this paper to foresee some of the problems and attempt to discuss the feasibility of malaria eradication from this island.

(a) The insular conditions here in Taiwan provide an ideal situation for the eradication of any communicable diseases. The stretch of the surrounding water surface is the most complete natural insulation against the invasion of vectors or diseases. Plague and cholera were once most dreadful in Taiwan. These diseases once eliminated in the old days have never come back to the island in an endemic status, despite a constant menace projected from the southern coast of mainland China which lies only 150 kilometres away from the island. The island has been free from these diseases for more than 40 years, except some small epidemics through the importation of infection from outside which were immediately eliminated on each occasion. There is every reason to believe that malaria will follow the same pattern when it is completely eliminated. It seems very likely that the island, once freed from malaria, would be maintained indefinitely free from sources of infection merely by protection against travellers from outside as observed in the case of plague or cholera. The successful malaria eradication programmes demonstrated in Sardinia, Cyprus and Mauritius and the bitter experiences of the resurgence of malaria epidemics on the island after the discontinuation of malaria control efforts by the Japanese, all point to the great advisability of a malaria eradication plan for this island.

(b) The success of malaria eradication by residual house spraying with chlorinated hydro-carbon insecticides depends largely upon the susceptibility of the vector species, both physiological and behaviouristic, to the insecticides used. Although the vector species, A. minimus minimus, has been proved to be very susceptible to DDT residual house spraying, and in fact, both adults and larvae have not been found in most of the sprayed areas, it may become DDT-resistant some day as realized in Greece with A. sacharovi or in parts of Java with A. sundaicus. It is therefore highly desirable to intensify our efforts towards malaria eradication while the local vector is still dying and malaria disappearing rapidly from the whole of Taiwan. Any prolongation of the programme would certainly increase the danger of the development of DDT-resistance among the vector population.

(c) Three years' island-wide DDT sprayings have brought malaria down from the top-ranking disease to the level of little public health importance. The 1955 island-wide infant surveys, including a sample of 63 460 babies which is one-fifth of the total babies born on the island in a year, gave only eight cases of positives or an infant parasite rate of 0.013 per cent. Where are these positives found? A simultaneous parasite survey on an island-wide scale conducted on 17 December 1955 indicated a parasite rate of 0.20 per cent. or 30 positives out of 14 759 pre-school children examined, whereas the same survey conducted on 17 December 1952 showed 9.74 per cent. Again, where are those positive cases found in the current survey? Through the efforts of our epidemiological surveillance units, a great majority of the positive cases were found to be from, or traceable to, a few foot-hill foci. Apparently malaria has been pushed back into some foot-hill regions where low transmission might have been maintained. The problem of malaria today or in days to come is confined to some inadequately controlled foci, which constitute the last stronghold to be taken by storm. Through the present local health networks and mobilization of trained health personnel, the detection and mopping-up operations of these confined areas seem to be practicable.

(d) Public health networks have been well established in Taiwan in recent years. The 22 prefectural health centres and the 355 township health stations, with full-time health workers, are well distributed over the island. More than one-third of these township health stations located in the formerly malarious areas have facilities for malaria parasite examination with antimalaria technicians who have been working as microscopists since the Japanese days and who received refresher training at the present Malaria Research Institute. These conditions provide a favourable factor in undertaking DDT spraying operations as well as surveillance activities. Health personnel are right in the field and they can be mobilized when necessary. Through the effective utilization of the facilities and personnel, the malaria eradication programme seems to be feasible in Taiwan.

(e) Financing of the programme is another decisive factor leading to the success of malaria eradication. In an average malarious country, the financial situation is generally poor. Therefore, in many instances, the programme is carried out with international or bilateral assistance. In any case, the difficulties of

getting sufficient funds for malaria eradication may be increased as malaria goes down. Taiwan's programme is certainly no exception. There have been three main sources financing the malaria programme, namely the provincial government, the local government and the US aid. The funds are made available for the malaria project by commitments of the three sources on a fiscal year basis. There has been no long-term commitment to assure the completion of the programme. From all three sources, there have been signs of increased difficulties in obtaining adequate funds for malaria as time goes on. It is therefore highly desirable to complete malaria eradication from the island while the financing is still adequate. The prolongation of the programme would mean an increase of the difficulties and may finally make eradication impracticable.

(f) A nation-wide campaign such as malaria eradication requires certain physical implements and certain favourable conditions of biological and naturalistic aspects. A sound organization, a good many trained workers with ample funds for operations and some favourable conditions of the vector species, of geographical, topographical and climatological aspects, all these factors are very critically related to the practicability of malaria eradication from a country. However, these factors alone may not be decisive in assuring the success of a malaria eradication programme. It must be remembered that the programme is carried out for the people and by the people and therefore, an equally important factor must be one of the human aspects, such as sincerity of the workers and support of the general public, neither of which is readily visible. Even within the country where all the physical conditions are the same, the job can be done in different ways. It has been frequently observed that the same DDT under the same organization produces different results merely by different workers. It is not a matter of uniformity in the technical aspect, but a matter of sincerity or enthusiasm among the workers. In the first year's pilot project in Taiwan, voluntary labour was tried in one of the townships which claimed no funds. The results were not satisfactory. It might have saved five cents in the operational expenses, but lost one dollar for others and, besides, accomplished no results. Since then, special efforts have been made for the selection of sincere workers in the first place and secondly, for adequate payments to the workers, even a little better than the average. So far, the working morale among the workers has

been maintained at a fairly high level. In comparison with the overall expenditure such a small sum for a little better payment means almost nothing; however, it is so critical that without it the programme may not seem to be practicable.

The enthusiasm or support of the general public is also another important aspect to be taken into consideration when a malaria eradication programme is to be attempted. If the door of a house is locked when the spray team arrives, or if the sprayed DDT is wiped off immediately after the spray team has left the house, how can a good spraying job be done? In Taiwan's spraying operations, the initial application of DDT provoked a sensational support of the programme among the general public and spray teams were welcomed everywhere. People were not necessarily excited about the programme objective but about the deaths of the pest insects. Despite the publicity and warnings made by health authorities, the general public were not happy at all when they saw that houseflies and culicine mosquitos were not very effectively diminished in the second application. In the third year's application, some people even refused to have their houses sprayed. Very fortunately most of the refusals were from people living in the centre of towns where malaria transmission is practically nil. Again, the prolongation of the programme would mean an increase of the resistance of the general public and might make the programme impracticable in Taiwan. For this reason alone, an all-out malaria eradication plan in a short period of time is highly advisable and still more promising than a long-term plan for malaria control.

SUMMARY

The experiences expressed in the Second Asian Malaria Conference and the dramatic results obtained through the current control measures in Taiwan prompted us to change our strategy from mere malaria control to an all-out effort towards malaria eradication as the goal. Various factors associated with the advisability and the practicability of such efforts in Taiwan are discussed and the importance of the early completion of the programme is stressed.

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