

THE STATUS OF MALARIA CONTROL IN THAILAND

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Malaria has long occurred throughout Thailand, being most prevalent in hilly areas where stream conditions offer ideal habitats for the principal vector, *Anopheles minimus*. During 1945-49 reported malaria deaths averaged more than 45,000 annually in a population then approaching 18,000,000. Over half of the population lived in malarious areas and malaria cases were estimated at around 5,000,000 per year. While diagnosis was largely non-professional, subsequent technical surveys have confirmed that malaria has been the major cause of death and debilitation in the kingdom. *Plasmodium falciparum* and *P. vivax* are prevalent in all areas, but the former species usually predominates; *P. malariae* is distinctly rare. *A. minimus* is the only vector known to be effective in maintaining the disease in Thailand.

Malaria control has been an organized national health program since 1930, the work in earlier years depending largely on malaria treatment and self-protection from the disease. The present intensive anti-malaria campaign began in 1950 when the Ministry of Public Health was assisted by WHO (World Health Organization) and UNICEF (United Nations International Children's Emergency Fund) in a pilot project demonstrating residual house-spraying to eliminate malaria transmission. Technical and economic assistance by ICA (International Cooperation Administration) began in 1951 to expand the spraying campaign and supplementary activities into a nationwide program directed toward malaria eradication.

The antimalaria organization currently numbers two ICA advisers, 16 medical officers, and over 300 technical personnel. Several thousand temporary foremen and spraymen are employed during the house-spraying campaign each year. All operations are conducted by the Division of Malaria and Filariasis Control, Department of Health, Ministry of Public Health. The program has been established in 63 provinces, the remaining eight provinces in the kingdom being relatively small in area, with little endemic malaria, and grouped around the capital in the central plains. It is expected that prior to 1960 malaria will be largely eliminated throughout Thailand and a well-developed program of anti-malaria vigilance will continue wholly on the regular Thai Government Budget. The program has reached virtually all malarious areas and directly protects over 10,000,000 population (half of the present national population) with large-scale activities in house-spraying, technical surveys, antimalaria vigilance, malaria treatment, training, and public information.

House-spraying is scheduled during the first half of each year, mainly during the dry season which offers the best field conditions and precedes the period of greatest malaria transmission. The houses are sprayed once each year for a variable number of years, depending on the results of the annual technical surveys. Usually spraying for about three successive years is sufficient to eliminate malaria transmission and cause the disease to decline to a point nearing eradication. DDT is used for the most part in 5 percent aqueous suspension, mixed from 75 percent water-dispersible powder carried to each village, and applied at a standard rate of 2.0 gms./sq. m. with compressed-air hand-sprayers. DDT is also applied in emulsion, and some dieldrin is being used at rates of 0.25 gm. and

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0.50 gm./sq. m. *A. minimus* is highly susceptible to control by DDT and dieldrin and can rarely be recovered as adults or larvae in sprayed village areas. The homes of over 10,000,000 people have been sprayed, once to several times each since 1950. The peak in the campaign is believed to have been reached in 1956, with more than 7,000,000 population included in this year's spraying program.

Technical surveys are scheduled during the last half of the year, mainly during the wet season when there is an increase in vector abundance and malaria prevalence. Routine procedures include daytime inspections of houses and typical larval habitats for anophelines, dissection of female anophelines for malaria oöcysts and sporozoites, spleen examination of children (aged 2-9 years), and blood examination of children (same age group) and infants (aged 1-12 months). The surveys reach at least 20 percent of all operational villages each year, the sample being distributed to reach every canton (administrative group of villages) and those villages selected as likely to represent the most malarious conditions. Over 4,000 villages are reached by the annual surveys, exclusive of special investigations. The results of the routine surveys are analysed, at the close of the survey period each year, with respect to criteria established to judge further control requirements.

Anti-malaria vigilance—a permanent program of protective surveillance and incidental control operations—is instituted on the basis of the following criteria: *A. minimus* not found in adult and larval collections, malaria infection not found in infants, malaria parasite rate less than 1 percent and spleen rate less than 10 percent in children, and adequate protection of the area against resurgence of malaria. On the basis of these criteria the house-spraying campaign has been discontinued and anti-malaria vigilance instituted in areas of over 3,055,000 population. Re-spraying has been required in less than

10 percent of the areas of protective surveillance, and it is estimated that over 90 percent of all malarious areas in Thailand will be in the vigilance program by 1960. Special features of anti-malaria vigilance are now under development, including the cooperation of hospitals, health centers and other agencies in providing for blood examination of suspected malaria cases.

Malaria treatment supplements the house-spraying campaign as a control measure and is an important feature of anti-malaria vigilance. Large quantities of chloroquine drugs (Aralen and Nivaquine) are supplied to the malaria control field headquarters and other health agencies for treatment of all suspected malaria cases. Atabrine (or Mepacrine) has been distributed widely throughout Thailand, largely in previous anti-malaria programs. Limited quantities of Camoquine and Daraprim have been used in the present project, and Primaquine has been stocked for use in radical cure of *vivax* malaria.

Training activities include advanced study and observation abroad by key medical officers, technical training of laboratory and field assistants, and in-service training of technical aides and local house-spraying squads. Nine of the medical officers have received training at the Malaria Institute of India, followed by training in the United States and elsewhere abroad, and like provisions are being made for others. The technical assistants are trained in Thai Government courses leading toward civil service appointment in the anti-malaria service. The course and facilities were expanded at the Chiangmai Center in 1952 with ICA assistance, and 93 technicians have since received training there. Over 100 technical aides and several thousand foremen and spraymen have had in-service training at the various field headquarters. The Chiangmai Center and a similar institution at Phrabuddhabat are being developed for training and research in vector-borne disease investigation and control. The training activities also

include specially arranged courses for anti-malaria personnel from other countries, especially Laos which is developing its technical staff through a series of training courses in Thailand.

Public information on malaria and its control is disseminated through posters, leaflets, booklets, talks in village centers, home contacts, exhibits at public gatherings, ten field motion picture outfits, and newspaper, magazine and radio features. The field work of the informational program is closely coordinated with the house-spraying campaign and the technical surveys. In addition to the wide-spread informational accomplishments through the above media and activities, the anti-malaria program has carried a practical

demonstration of the value of international cooperation directly into the homes of more than half of the national population.

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