Chapter X

MILITARY COOPERATION

The military antimalaria operation was an integral part of the Taiwan Malaria Eradication Program (MEP) from start to finish. Initiation of close cooperation of civilian and military antimalaria operations was facilitated by the financial assistance from JCRR and ICA/CUSA.

With numerous military establishments scattered all over Taiwan and thousands of new recruits from the general population entering the military services every year, unified operations were needed for speedy achievement of malaria eradication. The eventual unification of civilian and military operations, effected in December 1958, provided the needed geographical and chronological continuity during the consolidation and maintenance phases. This was one of the most remarkable characteristics contributing to the success of the Taiwan MEP.

In early 1950 military servicemen stationed in the malarious areas of Taiwan were given a weekly dose of paludrine as a prophylactic measure. In May 1950 a military antimalaria center was set up in Fengshan, southern Taiwan, to experiment with DDT residual spraying against malaria transmission. Although encouraging results were obtained, reducing the malaria morbidity rate from eight to one percent in the study area, a large-scale application of this measure did not immediately take place due to financial, personnel and materiel (supplies and equipment) limitations.

The Surgeon General's Office (SGO) of the Chinese Army, having received 75% water-dispersible DDT powder from the U.S. Military Assistance Advisory Group (MAAG), appointed an antimalaria planning committee, and requested the National Defense Medical College (NDMC) to organize a three-month course of malaria control to train selected field medical officers.

Negotiation for coordinated application of military and civilian antimalaria measure began at a meeting in Taipei in September 1952, and was institutionalized with the formation of the National Malaria Coordination Committee in November 1952. Through successive committee meetings and direct intervening contacts, representatives of the SGO, TAMRI and the WHO Malaria and Insect Control Team exchanged information for synchronous DDT spraying operations which began in 1953.

DDT SPRAYING

A malaria control unit. including a DDT spraying team, was organized in 1953 in each army corps. There were 20 such units, each under the supervision of a medical officer. In addition, there were two supervisory groups, one each for northern and for southern Taiwan. In March 1956 the SGO assigned two liaison officers to work in TAMRI. There were 25 military spraying teams, each with one foreman and six spraymen - eight in central, eight in northern, two in eastern, and seven in southern Taiwan. The military units on the outlying islands (Penghu, Kinmen and Matsu) organized their own spraying teams. TAMRI technicians assisted in training military spraying personnel and in repairing spraying equipment.

Until 1957 spraying of military camps and dependents' dwellings was done by the military spraying personnel. Effective in 1958, such spraying operations were carried out by civilian teams, accompanied by military malaria surveillance personnel. Table 44 summarizes military spraying operations from 1956 through 1961.

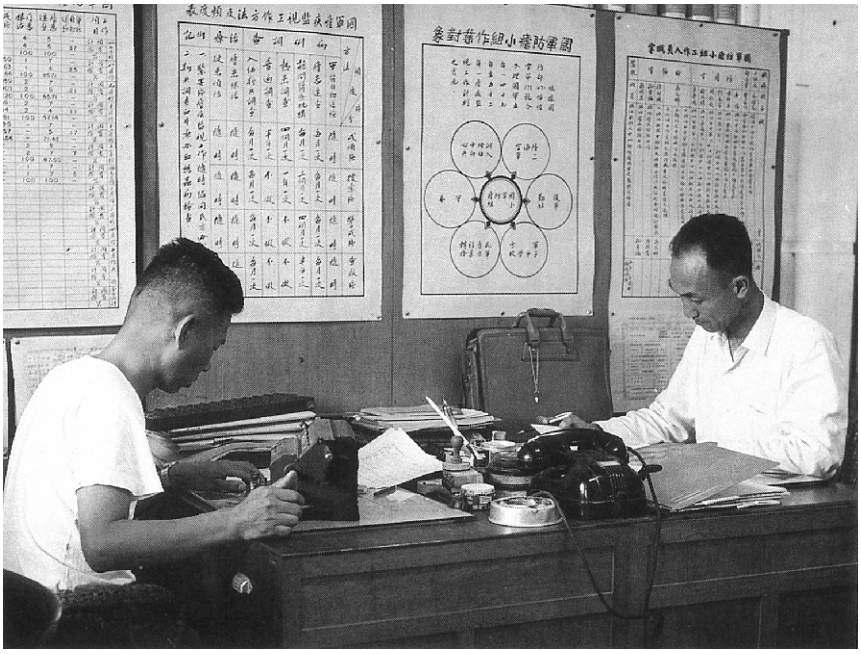

Fig. 75: Military malaria unit at TAMRI

Fig. 76: Training of military spraying personnel

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Military DDT House Spraying, 1956 - 1961

Year	Surface Area Sprayed (m^2)	Insecticide Used (kg)		Military Personnel Employed				
		75% DDT	Mixture*	Super-visors	Fore-men	Spray-men	Drivers	Total
1956	13,052,839	34,808	0	2	25	147	25	199
1957	5,100,951	0	14,959	2	23	115	23	163
1958	719,076	0	2,084	3	0	0	2	5
1959	264,266	0	774	3	0	0	2	5
1960	20,157	0	64	3	0	0	2	5
1961	1,906,152	0	5,574	3	0	0	2	5
Total	21,063,441	34,808	23,455					

* Mixture consisted of 75% DDT and 6.5% gamma-BHC.

MALARIA SURVEILLANCE AND VIGILANCE

In late 1958 a 27-member Military Malaria Surveillance Section (MMSS) was set up as an integral unit to implement the five-year malaria surveillance program in Taiwan. The MMSS carried out surveillance measures in military installations which could not be covered by civilian workers. The military program followed the same stratification and methodology as the civilian program.

In October 1963 thirty-three malaria vigilance groups, each with five members, were added to the existing force to intensify case detection activities. Blood smears collected by these surveillance agents were examined by a network of 10 blood examination posts manned by microscopists trained by TAMRI. The number of vigilance groups was increased to 180, with 820 members, during the period 1967 - 1969. By 1969, however, the number of blood examination posts was reduced to six. In August 1965 the SGO had instructed all military units to adopt malaria vigilance as one of their regular health activities during the maintenance phase. The military vigilance system was disbanded in 1972, but case reporting continued until 1974; thereafter, only a few confirmed cases were registered, as shown in Table 45.

Table 45

Blood Smears Examined and Cases Found (1956 - 1979)

Year	Smears Examined	Cases Found	Year	Smears Examined	Cases Found
1956	1,029	3	1968	4,578	1
1957	2,496	1	1969	6,657	2
1958	10,183	3	1970	2,486	7
1959	33,473	5	1971	5,096	9
1960	33,248	5	1972	10,927	7
1961	45,386	511	1973	134	11
1962	40,131	68	1974	171	18
1963	30,984	8	1975	38	30
1964	31,764	4	1976	10	11
1965	N/A	N/A	1977	4	3
1966	9,387	1	1978	2	2
1967	17,364	1	1979	0	0

Note: All cases reported in 1964 and thereafter were found by the military medical services, except one detected in 1964 in the survey of recruits.
N/A = figure not available.

OPERATION KUOLEI

The soundness of the Taiwan MEP in general, and the efficiency of civilian-military collaboration in particular, was critically tested in early 1961. Chinese military servicemen and their dependents (totaling 4,400) in the highly malarious Sino-Thai-Burmese border area began moving to Taiwan starting on March 20,1961. The parasite rate among these military servicemen and their dependents, tested upon their arrival in Taiwan, was over 10%, compared to the existing parasite rate of 0.01% among the population in Taiwan. This mass movement of military personnel to Taiwan was officially called Project Kuolei (literally "national thunder"), and the evacuees were called "returning patriots" or just "returnees." The importation of so many malaria cases represented a dramatic challenge to the entire malaria eradication program, as devastating malaria epidemics could have been caused in nearly malaria-free Taiwan by the influx of hundreds of parasite carriers. Almost immediately, a remarkable demonstration of civilian-military collaboration and international cooperation took place.

On March 10, 1961 upon learning of the impending military movement, the SGO and TAMRI met to discuss the anticipated influx of malaria cases and the need to institute emergency measures - including immediate spraying of houses intended to accommodate the returnees, the spraying of the surrounding civilian dwellings, and the prompt initiation of malaria treatment. On March 14, following general orientation at the SGO-TAMRI meeting, a detailed emergency plan was elaborated at a TAMRI staff meeting attended by both civilian and military malaria personnel. In accordance with the plan, eleven MMSS members were immediately dispatched to Chaochou (Pingtung county), Fengshan (Kaohsiung county), Wujih (Taichung county) and Sanchia (Taipei county) to train local army personnel for spraying operations, blood sampling, drug administration and a health education campaign. These eleven MMSS members also acted as spraying foremen for 35 spraymen selected from among the local army health personnel. Five groups of military malaria collaborators were organized for passive case detection at the accommodation camps. Bilingual returnees who spoke Chinese and at least one of the local Burmese dialects were enlisted to serve as interpreters.

To collaborate with this emergency operation, TAMRI sent, on March 22, a four-member entomology team, two three-member epidemiological investigation teams, and a two-member engineering team to visit encampments in southern, central and northern Taiwan.

The returnees began arriving in Taiwan on March 20, 1961, and by June 30 between 4,400 and 4,600 had been accommodated in various military camps. The following antimalaria activities were carried out before, during and after the arrival of these returnees.

* *Residual house spraying with DDT and gamma BHC.* 1,906,152 m^2 of surface area of military camps and civilian dwellings were sprayed, directly protecting 29,768 persons.

* *Radical cure treatment.* 4,392 returnees were treated upon their arrival between March and June 1961; a second radical cure treatment was given to 4,595 persons between April and September 1963.

* *Blood examination.* 9,029 blood smears were taken through mass blood surveys before radical treatment, as post-treatment follow-up, and in subsequent fever case surveys. The number of newly-registered cases was 467 or 10.63%, including 62 *P. falciparum*, 369 *P. vivax*, 23 *P. malariae* and 13 mixed infections.

* *Follow-up malaria surveillance* (including monthly fever case surveys, positive case follow-up, as well as mass blood surveys where the camps were located in formerly hyperendemic areas) continued until June 1964. During the surveillance follow-up (i.e., after June 1961), 40 more new *P. vivax* cases were found in 1961 (July - December), 34 cases in 1962, four cases in 1963, and none in 1964.

In addition to the above-mentioned antimalaria measures, returnees were examined for filariasis infections. Of 4,256 returnees examined, two were found infected with *W. bancrofti* and were treated with hetrazan. DPT vaccine was given to all children in 1961.

The prompt and efficient implementation and execution of the Kuolei Project was made possible by the excellent collaboration among military, civilian and international organizations. While TAMRI and MMSS provided the technical personnel, ICA/CUSA, the provincial and county governments, and the SGO supplied the needed operational funds, insecticides, sprayers, field equipment, antimalaria drugs and facilities needed for the operation. A very prompt shipment of 200,000 tablets of primaquine from WHO/Geneva was greatly appreciated when the

stock of this drug at TAMRI was very low - barely enough to sustain the operation for a few days. Because of this well-coordinated action, the massive importation of malaria parasite carriers did not result in resumption of local malaria transmission. However, the difficulties encountered in implementing emergency Antimalaria measures were truly colossal and deserve special mention.

* *Difficulty of communication and identification.* Returnees could be divided into five or six groups depending on their different spoken dialects. Many of the military dependents who spoke only one dialect and no Chinese could not communicate with people of other groups. Even the volunteer interpreters often had to solicit help from the dependents' spouses or close friends. For purposes of identification, a temporary I.D. card was issued to each returnee, using a phonetic equivalent in Chinese of his or her name. Even then, there was frequent confusion in identification, as many names sounded similar. Finally, smear numbers, dates of blood sampling and drug treatment had to be written on the I.D. cards to provide more certain identification. Corrections had to be made on the name lists during almost every visit.

* *Uncontrolled movement of returnees.* Returnees' movements within their respective accommodation camps were not regulated. Every day, a significant number of returnees left their camps on duty or on leave. Frequent reassignment of living quarters further complicated the problem. High-ranking officers and personnel with special duties moved quite freely in and out of their camps with their dependents, often without disclosing their destination. Consequently, many rounds of time-consuming search for individuals were needed to complete each survey and drug treatment cycle. For example, during monthly case follow-ups in 1961, 28 cases could not be located in August, 15 in September, one in November and two in December.

* *Inadequate comprehension.* Many returnees, because of their limited knowledge of basic health principles and because of communication difficulties, failed to understand the importance of the malaria work, resulting in numerous refusals of blood examination and drug administration. Any course of radical cure treatment interrupted by an individual's absence or refusal was considered useless and was repeated, if at all possible, after much persuasion.

* *Dispersion of risk of transmission*. By December 1962, the returnees were distributed to 57 villages in 35 townships of 18 counties in Taiwan province (in addition to some outlying islands). The number of returnees per county ranged from one to 1,822.

FILARIASIS CONTROL

In July 1958, MMSS also participated in a filariasis control program initiated by TAMRI. Blood smears for microfilarial examination were collected at nine training centers for new recruits and at one training center for college graduates. Blood smears were also periodically collected from servicemen posted on outlying islands. From July 1960 to December 1964, 315,388 blood smears were examined and 603 were found to be positive for filariasis (599 for *W. bancrofti* and four for *B. malayi*). These filariasis cases were treated with hetrazan.

When three TAMRI malariologists were simultaneously called for a six-month military service beginning on October 1, 1956 (a critical time for the Taiwan MEP), the SGO reassigned them to TAMRI headquarters to carry out military filariasis control.