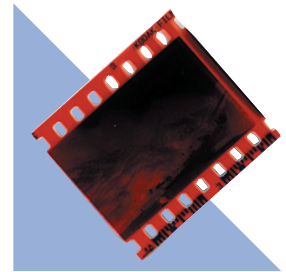


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Malaria Prevention Measures during the Maintenance Phase



On July 26, 1965, the government promulgated Wei-nuei Order No. 40848 "Taiwan Provincial Government Malaria Prevention and Control Measures", and Taiwan's antimalaria work entered the maintenance phase. As soon as this phase began, the official responsibility for malaria surveillance was transferred to the general health authorities. The TAMRI remained the center of technical coordination, providing technological guidance and assistance in matters of malaria prevention work.

I. Organizational development of health administration

From 1958, the TAMRI had expanded its field of activities, moving extensively into parasitology and medical entomology. On March 17, 1971, the Department of Health (DOH), under the Executive Yuan, was established to administer health services throughout the country, with the Bureau of Communicable Disease Control (BCDC) set up under the DOH to take charge of the control and prevention of infectious diseases. On December 16, 1964, the TAMRI was officially renamed the Taiwan Provincial Institute of Infectious Diseases (TIID). Malaria surveillance remained its top priority. On September 30, 1988, TIID was incorporated into the DOH's National Institute of Preventive Medicine (NIPM), and malaria surveillance became the responsibility of the Malaria and Parasitology Section. On July 1, 1989, the National Quarantine Service (NQS) was established under the DOH to conduct inspection and quarantine at international ports, as well as to monitor epidemic diseases. In response to the changing patterns of infectious diseases, and with the intention of consolidating disease prevention resources and establishing a system for disease prevention and control, the Center for Disease Control (CDC) was set up under the DOH on July 1, 1999, by merging the BCDC, the NIPM and the NQS.



Examination of blood smears

II. Malaria prevention and control measures

(I) 1965 to 1988

Case detection: This included the screening of arriving passengers (Taiwan became open to tourists in 1979), case reporting by military surgeons, clinics and volunteers, screening of fever cases at health centers, and other case detection networks (case reporting by school teachers, active case detection in designated localities, and so on.)

Case investigation: Each case of malaria that was identified became the subject of an epidemiological investigation.

Entomological surveillance: The TAMRI assigned entomological investigation teams to fixed mosquito catching stations and other strategic locations to study the presence and density of *An. minimus*.

Provision of antimalarial drugs: From July 1987 onward, the antimalarial drug, chloroquine, was provided free of charge at the TIID and the quarantine stations at the international ports of Kaohsiung and Taipei.

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(II) From 1989 onwards

1. Quarantine at international ports

Under the Regulations Governing Quarantine at International Ports, in the event that crew members of vessels, airliners or other means of transport died of an indeterminate cause or of an infectious disease or suspected infectious disease, the responsible individual is obliged to notify the quarantine units. Between 1989 and 2004, 15 foreign crewmen were confirmed to have been infected with malaria.



Health examination of foreign laborers

2. Health checks for foreign laborers

In 1989, the policy of allowing foreign laborers to come to Taiwan was launched, and the health and labor authorities agreed on the methods to manage health checks for such laborers. Among the items to be performed – until it was removed from the requirement on April 17, 2000 – was a malaria blood smear.

3. Malaria Eradication Maintenance Operation Guidelines

On July 20, 1989, in order to safeguard Taiwan's malaria-free status and the people's health, the DOH Wei-shu-fang Announcement No. 792965, Malaria Eradication Maintenance Operation Guidelines, laid out the following guidelines, which remained in force until January 31, 2001.

- (1) The Department of Health (hereafter, "this department") had especially drafted these guidelines in order to safeguard Taiwan's malaria-free status, and with it, the nation's health.
- (2) Health and medical organizations at all levels must make malaria surveillance a priority, constantly conduct case detection, store all forms of antimalarial medications and apparatus, take preventive measures in a timely fashion and obtain assistance from organizations and local personnel committed to this public health issue.
- (3) When health organizations conduct blood examinations on the groups listed below, the persons being examined are obliged to cooperate:
 - *Persons infected with malaria (hereafter, malaria patients)
 - *People living with malaria patients, the neighbors of malaria patients, and suspected sources of malaria transmission.



*Patients suspected of having malaria symptoms.

*Residents – or others who carry out daily activities – within areas susceptible to malaria transmission.

*People who have come from or passed through malaria-risk areas.

*Others believed by health organizations to require examinations.

- (4) The National Institute of Preventive Medicine (NIPM) under this department is required to strengthen its communication with all relevant organizations, and to request such organizations to provide information on all persons coming (including returning) to Taiwan from malaria-risk areas, and to ensure that blood examinations and monitoring in relation to such persons are handled in coordination with local health bureaus and relevant authorities.

- (5) Medical centers and examination centers at all levels must collect blood samples from all suspected malaria patients and send the extracted samples to the local health bureau within 48 hours (to be accompanied with test reports if available).

- (6) If, following testing, a patient is diagnosed with malaria, the health authorities must immediately trace the source of the infection, administer radical cure treatment and conduct a survey of the epidemic situation. Doctors or other medical personnel must supervise the administration of medication, such medications being provided free of charge by the health authorities.

- (7) Once the health authorities administer radical cure treatment, they must follow up on its therapeutic efficacy.

- (8) The health authorities must appraise the epidemic situation in the patient's place of residence, and mark the boundaries within which emergency antimalaria measures must be carried out.

- (9) When a malaria patient is discovered, the health authorities must, when necessary, dispatch personnel to the patient's home and surrounding areas, or the aircraft or vessel which carries the patient and is within Taiwan's borders, to collect *Anopheles* mosquitoes or spray insecticide. The owners, users or persons responsible for such property must cooperate with such actions.

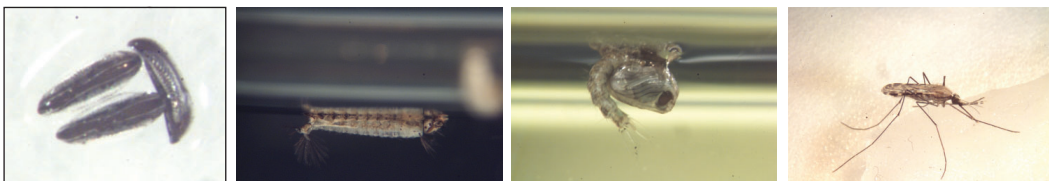


Polymerase chain reaction examination

- (10) If a malaria patient moves from one residence to another while health authorities are still following up on the therapeutic efficacy of his or her treatment, the patient must notify the health authorities in his or her original place of residence, who, in turn must transfer the case to the health authorities in the patient's new place of residence to continue the follow-up.
- (11) If a person other than the patient or his or her family discovers a suspected malaria patient and immediately makes a report to the health authorities, and the patient is confirmed after examination by the NIPM to be suffering from malaria, the NIPM shall pay a reward of NT\$2,000, of which NT\$1,200 will be paid to the diagnostician, NT\$400 to the blood collector, and NT\$400 to the technician. In the case of a person who is not a medical professional but reports a case directly to the health authorities, NT\$1,000 shall be paid, except when the patient has already been diagnosed and is being followed up on therapeutic efficacy.
- (12) Medical or examination centers at all levels must improve detection of malaria parasites when performing blood transfusions, and when they discover a suspected malaria patient, they need to notify the health authorities of the results of his or her blood test within 24 hours.

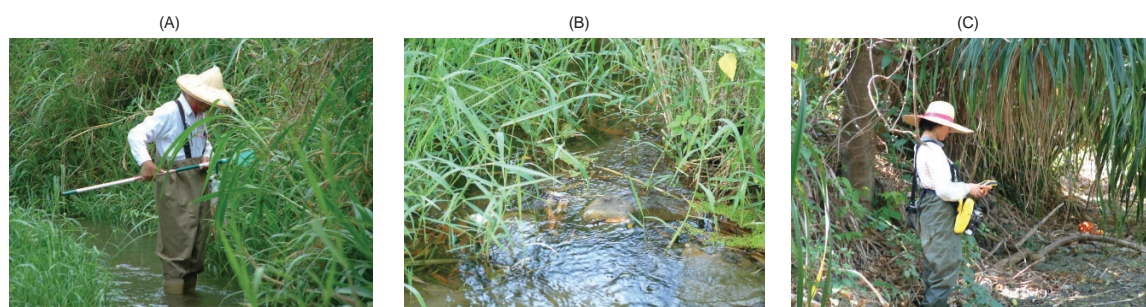
4. Survey of vector mosquitoes

As the campaign against malaria entered the maintenance phase after Taiwan was declared malaria-free, the range of distribution of *An. minimus* was also substantially reduced. In addition, extensive work on the infrastructure was taking place throughout Taiwan, followed by the nation's economic development and increase in the population. These factors contributed to changes in the water quality of the nation's natural water resources. The rearing of water buffalo and other livestock in villages had been sharply reduced and households had installed screens on their doors and windows. All this had caused a considerable decline in the areas of distribution of *An. minimus* (Graphic 1). In recent years, in certain parts of the world, there has been a trend for malaria to resurface, and the number of Taiwanese traveling overseas increases on a daily basis. So, although the population of *An. minimus* mosquitoes in Taiwan has been greatly reduced, they do exist in certain areas, which means that the possibility of malaria resurging still exists. Surveillance of the vector mosquito was conducted by the NIPM until June 1988, when the CDC was established, which took over this work and has continued with it to this day.



Graphic 1. *An. minimus*. From left to right: eggs, larva, pupa, and adult mosquito. (Photography by Chu Mei-lien)

Taiwan's methods of surveying the malaria vector mainly involve surveying pupae (Graphic 2) and adult mosquitoes. Surveying pupae involves using a long or short-stemmed ladle to collect samples in streams that are possible breeding grounds (for example, from banks where the flow is relatively slow and there is plant life). Larvae-count is calculated by either the number collected by each individual within a certain time frame or the average number of larvae collected in each ladle, and the Global Positioning System (GPS) can be used in conjunction with geographical data software to map out pupa distribution in Taiwan. There are many methods for investigating adult mosquitoes (Graphic 3). These are all conducted at night and include the use of light to attract them, the use of animals as baits (from experience the best animals to choose are cattle and wild boars), and the use of mono-stratum bed nets. When seeking to attract mosquitoes using lights, the types of lights used include Pest-Olight and the CDC's own lights. They are hung for one to three consecutive nights, and the addition of dry ice normally makes them all the more effective. Because the density of *An. minimus* is low in Taiwan, it was general practice to use many different methods at the same time when surveying adult mosquitoes.



Graphic 2. (A) Collecting pupae using a long-stemmed ladle. (B) A malarial mosquito breeding point. (C) Using GPS to determine one's position.



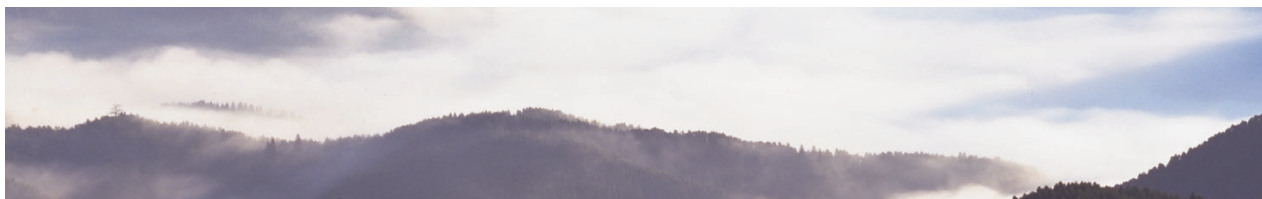
Graphic 3. (A) A Pest-Olight mosquito light trap. (B) A CDC mosquito light trap. (C) A mono-stratum bed net. (D) Mosquito baiting with animals.

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Surveying the distribution of *An. minimus* on the island of Taiwan from 1992 to 1995 involved random selection of two townships with streams from each county for conducting pupa surveys. Pupae of *An. minimus* were collected in 22 townships in Tainan County, Kaohsiung County, Taitung County, and Hualien County, and their breeding grounds were mainly irrigation ditches and streams. This was done between October and March when the water level in streams was relatively stable and pupa populations relatively large. From July 1997 to June 1998, townships in the vicinity of a village in which an *An. minimus* breeding ground had been discovered, as well as townships in the north which had been within *An. minimus* distribution area, were surveyed both for pupae and, at night time, for adult mosquitoes, and the boundaries of the area of distribution were extended to include five counties, 19 townships and 41 villages (Table 1). From 2001 to 2003, GPS was used to determine the precise locations of the catching stations for *An. minimus* in order to establish a geographical information system of streams where *An. minimus* bred, while the outlying islands of Penghu, Green Island and Orchid Island were once again confirmed not to have *An. minimus* breeding grounds.

County	Years: 1997- 1998		Years: 2000 - 2005	
	Township	Village	Township	Village
Tainan County	Longqi Zuozhen Guanmiao Xinhua Nanhua	Qiding, Tuqi, Shicao Erliao, Ganglin, Chengshan Shenkeng, Xinguang, Xinpu Jiaokeng, Zhiyi Xipu	Longqi Zuozhen Guanmiao Xinhua	Tuqi, Daping, Longchuan, Shicao, Qiding Ganglin, Chengshan Xinguang Jiaokeng, Dakeng
Pingtung County	Mudan Manzhou Shizi Checheng Hengchun	Mudan, Xuhai, Dongyuan, Gaoshi, Silin Changle, Jiupeng, Gangzai Caopu, Neiwen, Danlu Baoli, Wenquan Wangsha, Kending	Mudan Manzhou Shizi Checheng Hengchun	Mudan, Xuhai, Dongyuan, Gaoshi, Changle, Jiupeng, Gangzai, Lide, Manzhou, Xianglin Neiwen Baoli, Wenquan, Tongpu Wangsha, Kending, Chengnan, Qiehu
Taitung County	Donghe Daren Beinan Chenggong Yanping	Taiyuan, Longchang Anshuo, Senyong, Nantian Chuli Sanxian, Zhongxiao Hongye	Donghe Daren Beinan Chenggong Taimali Dawu	Xingchang, Longchang Anshuo, Nantian, Xinhua Mingfeng Xinyi, Zhongxiao Jinlun Danlao
Hualien County	Shoufeng Ruisui Xiulin	Chinan, Yuemei Qimei Wenlan	Shoufeng Ruisui	Chinan, Yuemei, Xikou, Fengping, Pinghe, Gonghe Qimei, Ruisui
Kaohsiung County				
Total	19 townships	41 villages	17 townships	46 villages

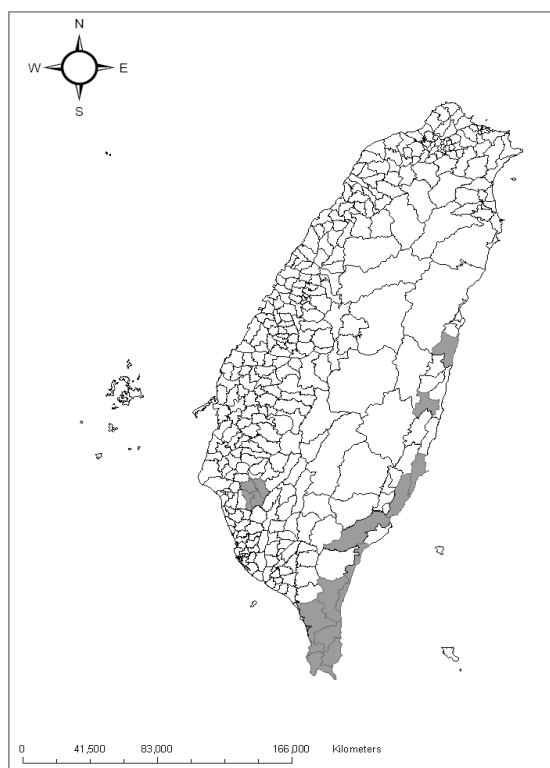
Table 1. Villages where collections of *An. Minimus* were recorded



In 2003, a case of introduced malaria was identified in Jinlun Village, in the Taimali Township of Taitung County. As a result, in 2004, in 21 townships under the jurisdiction of five counties where there were records of *An. minimus*, a survey was conducted in 214 villages by using mosquito light traps to collect anopheline adults. In each district, two positions were chosen, and the lights were hung for two or three nights. The highest collection record was for Jinlun Village, Taimali Township, where in one evening, a single mosquito light trap collected 192 female *An. minimus*. No more than ten were collected elsewhere. The combined results of all surveys for pupae and adult mosquitoes collected since the year 2000 show that *An. minimus* are distributed in 44 villages within 17 townships in four counties. For details, see Tables 1 to 4. Currently, the four most common species of mosquitoes collected with light traps in residential areas are, in descending order of prevalence, *An. sinensis*, *An. maculatus*, *An. ludlowae*, and the *An. minimus*; but the physical features of each species vary from one area to another. The statistics from 2004 revealed that the most commonly found species in Hualien County, Taitung County, Pingtung County and Tainan County were respectively was *An. ludlowae* 39.57%, *An. sinensis* 34.85%, *An. ludlowae* 95.74%, and *An. sinensis* 65.88%.

With great variations in its physical features and many similar-looking sister species, the classification

of *An. minimus* can be difficult and prone to errors. The only similar looking sister species recorded in Taiwan is *An. fluviatilis*, but following comparison of samples collected of the two in Taiwan, it has been concluded that *An. fluviatilis* is in fact a variant of *An. minimus* (Harrison, 1980; Lien, 1997). This corresponds with the findings of recent research in southern China. Samples of *An. fluviatilis* from southern China have recently undergone examination by comparison of appearance and by molecular biological methods, and they have been concluded to be mere variants of *An. minimus* (Chen et al., 2002). Investigations to date, moreover, have discovered no *An. fluviatilis*. The CDC has commissioned Dr. Ho Chau-mei of National Yang Ming University to research the types of *An. minimus* in the Taiwan region, and the findings have shown that they all belong to the type A.



Graphic 4. Map of the distribution of townships with *An. minimus* in Taiwan

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5. Providing antimalarial drugs to travelers

During this period, the DOH issued free antimalarial drugs at the NQS and its branch offices, and at epidemic surveillance centers, so that the drugs could be readily available to people going to work or visiting relatives in malaria-risk areas. The TIID under the DOH also formally requested the PHA's cooperation with antimalaria policy, and starting in November 1998, all county and city health bureaus have installed antimalarial medication supply stations, for the convenient distribution of such medication to people visiting malaria-risk areas.



Providing antimalarial drug to travelers

6. Handbook on the prevention and control of infectious diseases

In May 1992, a handbook on the prevention and control of infectious diseases was published for the first time, covering malaria prevention measures, including case definition, matters concerning collection and dispatch of samples for analysis, and methods of prevention (doctor's reports, visits to hospital clinics, investigation of fever patients at health bureaus/rooms, management of malaria patients, epidemic survey, emergency eradication, health education, work reports, examinations, costs, assessments and reviews, monitoring of *Anopheles* mosquitoes, and so on). This was for the reference of health bureaus conducting malaria prevention and control. The handbook was revised in 2001 and 2004 respectively, in line with changes among the government's epidemic control agencies and in relevant regulations.



Handbook on the prevention and control of infectious diseases

7. Health requirements for blood donors

Under the regulation laid down by the DOH *Wei-shu-yi* Announcement No. 0900005150 on January 16, 2001, people who have returned to Taiwan from a malaria-risk area within the previous year, or who have suffered from malaria within the previous three years, are temporarily banned from donating blood.

8. Border control measures

(1) Purpose:

In response to the Severe Acute Respiratory Syndrome (SARS) epidemic, international airports, seaports and entry and exit points for the Small Three Links were installed with infrared thermal monitoring systems on August 10, 2003, to take the temperature of arriving and departing passengers. In addition, temperature taking now becomes a routine quarantine inspection measure, making full use of the capacity to conduct screening for fevers at the country's borders. On September 24, 2004, DOH *Shu-shou-ji* Announcement No. 0930000988, which was a table titled ***Border Control Measures Against Infectious Diseases*** (Table 2), introduced quarantine screening indicators to identify passengers with abnormal temperature and at risk of malaria infection as subjects for screening.

(2) Enforcement results:

The types and quantities of samples extracted at international airports are given in Table 3. The number of arriving and departing passengers, and of those with fever identified through screening as having an infectious disease, are shown in Table 4.

- A. Between April 10 and December 31, 2003, of the 7360 passengers with fever screened at international ports, only one was identified as a malaria patient after examination.
- B. In 2004, of the 24,062 passengers with fever screened at international ports, three were identified as malaria patients after examination.

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Table 2

Table of Border Control Measures Against Infectious Diseases September 24, 2004, DOH *Shu-shou-ji* Announcement No. 0930000988, revised on January 27, 2005

Name of infectious disease	Malaria
Symptom characteristics/ Differential diagnosis	<ol style="list-style-type: none"> Typically three stages of clinical symptoms, in the following order: aversion to cold, high fever, perspiration. Interval of manifestation of symptoms depending on the period required for asexual reproduction of the Plasmodium in question: <ol style="list-style-type: none"> Vivax malaria: 48 hours. Ovale malaria: 48 hours. Malariae malaria: 72 hours. Falciparum malaria: irregular. Falciparum malaria symptoms are the most serious, even including such extreme indications as splenomegaly, jaundice, shock, liver and kidney failure, acute mental illness, coma, and death. In differential diagnosis of malaria, microscopic examination is the most accurate method for identifying the Plasmodium.
Quarantine screening indicators	<ol style="list-style-type: none"> Incubation period: One to three weeks Fever ($\geq 38^{\circ}\text{C}$) Aversion to cold, fever, perspiration Having stayed in a malaria-risk area for a week or more before arriving at Taiwan.
Malaria-risk country or area	The main malaria-risk areas are: South East Asia, West Africa, North Africa, Central and South America. (For details, see the CDC's website on International Quarantine.)
Type of sample used	Blood
Amount and method of sampling	<ol style="list-style-type: none"> Collect one to three cc. of blood Place the blood inside a lavender-top (EDTA) tube containing anticoagulant and send for testing.
If you encounter the disease	Provide health advice to fellow passengers. Inform a doctor as quickly as possible if you suspect malaria symptoms, being sure to advise the doctor of your travel history, and having a blood sample collected for examination.
Matters to be noted for quarantine purposes	None
Remarks	



Table 3

Statistics of blood samples collected at international airports

Airport Year	Kaohsiung International Airport		Chiang Kai Shek International Airport	
	Malaria (blood smear)	Malaria (complete blood count)	Malaria (blood smear)	Malaria (complete blood count)
2003	32	127	415	0
2004	216	16	0	2266
Total	248	143	415	2266

Table 4

Statistics of arriving and departing passengers, passengers with fever and those found by screening as having been infected with diseases during 1990-2004

Year	Arrival	Departure	Total	Arriving passengers with fever	Dengue fever	Bacillus dysentery	Cholera	Malaria
1990	4,917,472	4,892,564	9,810,115					
1991	5,341,509	5,288,067	10,629,656					
1992	6,168,779	6,184,641	12,353,501					
1993	6,666,381	6,509,820	13,176,283					
1994	6,936,697	6,984,972	13,921,752					
1995	7,385,310	7,473,628	14,859,022					
1996	8,221,534	7,889,401	16,111,020					
1997	8,502,062	8,225,818	16,727,966					
1998	7,522,294	7,450,735	14,973,116					
1999	8,653,248	8,387,365	17,040,701					
2000	9,784,202	9,324,002	19,108,293					
2001	10,000,077	9,781,656	19,781,823					
2002	9,584,002	9,607,248	19,191,341					
2003	10,470,825	9,107,631	19,578,548	7,360	14	32	0	1
2004	10,589,159	9,340,415	19,929,667	24,062	57	43	1	3

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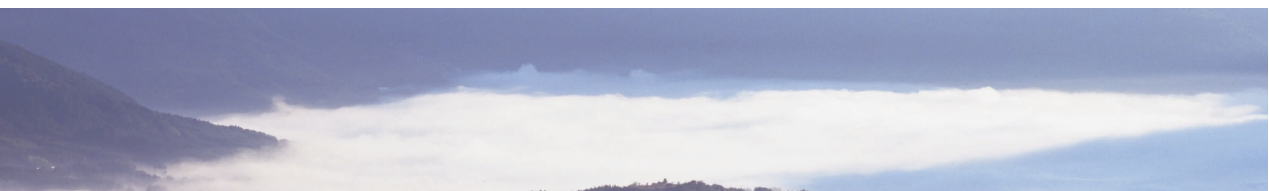
9. Control measures for imported malaria cases

In September and November 2003, Taitung County discovered the first cases of introduced malaria since 1965, with malaria parasites having been brought back to Taiwan by residents previously contracted for lumbering work on the Solomon Island. Much importance was attached to this by the health authorities, and in response, the CDC drafted the “Flow Chart of Trial Monitoring Measures to be used on Taiwanese Travelers Returning from the Solomon Islands to Guard Against Malaria” (Graphic 4), and “Standard Procedure for Residual Spraying Against Malaria” (Graphic 5). On September 24 of the same year, it announced the introduction of its Tables of Border Control Measures Against Infectious Diseases, in which malaria quarantine screening indicators were drawn up as follows: fever of 38°C or above, and having stayed in malaria-risk area for a week or more before arriving in Taiwan, requires the collection of a blood sample for examination.

10. Research and development of technologies for examination and diagnosis

Preliminary diagnosis of malaria can be established from a patient's symptoms, physical examination, and knowledge of his or her travel history in relation to malaria-risk areas. A confirmed diagnosis, however, still relies on laboratory examination for the presence of the malaria parasite or substance indicative of its presence to be confirmed. The standard method of identification in laboratory diagnosis is microscopic examination of thick and thin blood smears, but there are also methods involving antigen detection and molecular diagnosis. The use of PCR (polymerase chain reaction) to detect the *Plasmodium* gene, while more accurate than microscopic examination, involves heavy set up costs. Currently it is only used by the parasitology laboratory of the CDC's Laboratory Research and Development Center to assist with microscopic diagnosis.

In August 2004, the CDC began to adopt the molecular diagnostic techniques for malaria to screen fever patients at airports, in order to prevent the disease from being brought into Taiwan from overseas. By the end of December, it had screened 749 people and, in mid-November, it identified a feverish Nigerian businessman as a *malariae* malaria patient, a diagnosis which was corroborated by microscopic examination confirming the presence of *P. malariae*.





11. Using electronic immigration data

On January 1st, 2005, the Immigration Office of the National Police Agency, under the Ministry of the Interior, implemented the Operations for Processing Electronic Immigration Applications from Public Authorities, which facilitated the effective command of the arrival and departure details of suspected malaria patients, adding a useful weapon to combat the disease.

12. Dissemination of health information and provision of training

(1) Dissemination of health information

The CDC has distributed leaflets printed with health advice, established a website about malaria, visited hospitals and patients, and participated in media call-in programs to boost the dissemination of health education information, in order to remind people traveling to or from malaria-risk areas about matters which they should be aware of.



Health education materials for malaria

(2) Provision of training

A. Survey of vector mosquitoes

In the CDC's surveys into the distribution and density of *An. minimus* from July 1997 to June 1998, in Hualien County, Taitung County, Pingtung County, Kaohsiung County and Tainan County, 59 epidemic control staff from local health bureaus participated in the field study, gaining a rudimentary understanding of the features of *An. minimus's* breeding grounds and of the methods of surveying larvae and adult mosquitoes.

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In 2004, in the five counties of Tainan, Kaohsiung, Pingtung, Taitung and Hualien, practical training in malaria prevention work was conducted. The curricula included an introduction to malaria prevention, collecting adult mosquitoes, hanging mosquito light traps, site selection, and field exercises of surveying and collecting larvae. The recipients of the training were staff from the health centers of each township. The purpose was to give them the skills necessary to conduct collections of adult mosquitoes using mosquito light traps and simple larvae surveys within their respective jurisdictions.

B. Examinations for malaria

For the coordinator of the disease control and prevention section and technicians of the laboratory section at health bureaus, and for doctors of infection control and medical technologists from medical centers, the CDC held workshops on the identification of the malaria parasite, in order to strengthen the fundamental understanding of malaria prevention work on the part of grassroot level epidemic prevention staff.

The curricula of the workshops put equal emphasis on both practice and theory, and included courses such as: an introduction to the history of malaria, the life cycle of a malaria parasite, the morphology of a malaria parasite, practical training in identifying malaria parasites, the creation of blood slides, staining techniques, and internships.

Between 2002 and 2004, eight such workshops were held, with 250 participants. In March 2005, medical technologists at Kaohsiung Municipal Hsiao-kang Hospital (participants of the CDC workshops on malaria parasite identification) discovered a malaria case while conducting examinations, and reported it of their own accord, which was a testimony to the success of the training.



C. Training for tropical medicine personnel

From August 15 to 28, 2004, the CDC conducted practical training at the Faculty of Tropical Medicine, Mahidol University in Bangkok, Thailand. Among the courses included in this training were an introduction to epidemiological analysis, practical training concerning the vector, microscopic examination of parasites, and practical clinical training. Fifteen trainees participated, nine of whom were CDC epidemic prevention staff, and six of whom were doctors from the nationwide infectious disease symptoms medical network (two from northern Taiwan, one from central Taiwan, one from southern Taiwan, one from the Kaohsiung and Pingtung area, and one from eastern Taiwan). The trainees were required to collaborate on the matters listed below:

- (a) When responding to an outbreak of the disease, or when engaging in international cooperation, trainees must conduct prevention, investigation, research and other related work in accordance with the terms of their enlistment by the CDC.



Courtesy call on Mahidol University



Courtesy call on the department of disease control, Thailand



Training on blood smears



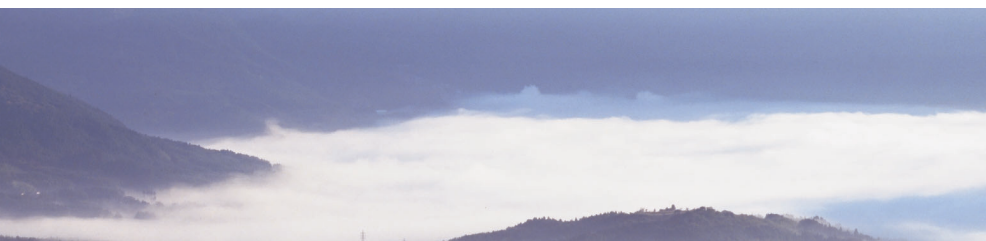
Field investigation of insects

- (b) Trainees must serve on specialist epidemic control and consulting teams in respect of the disease in question, and assist the CDC and each bureau within the respective jurisdiction to plan standard operating procedure for control of the particular epidemic, guidelines on its prevention work, and manuals on standard procedure, and they must serve as the CDC's seed teachers to train domestic specialists.
- (c) Trainees must, in tandem with the infectious disease treatment network, help to build a tropical medicine infectious disease surveillance network, so as to hasten the nation's progress towards a perfect epidemic prevention system.

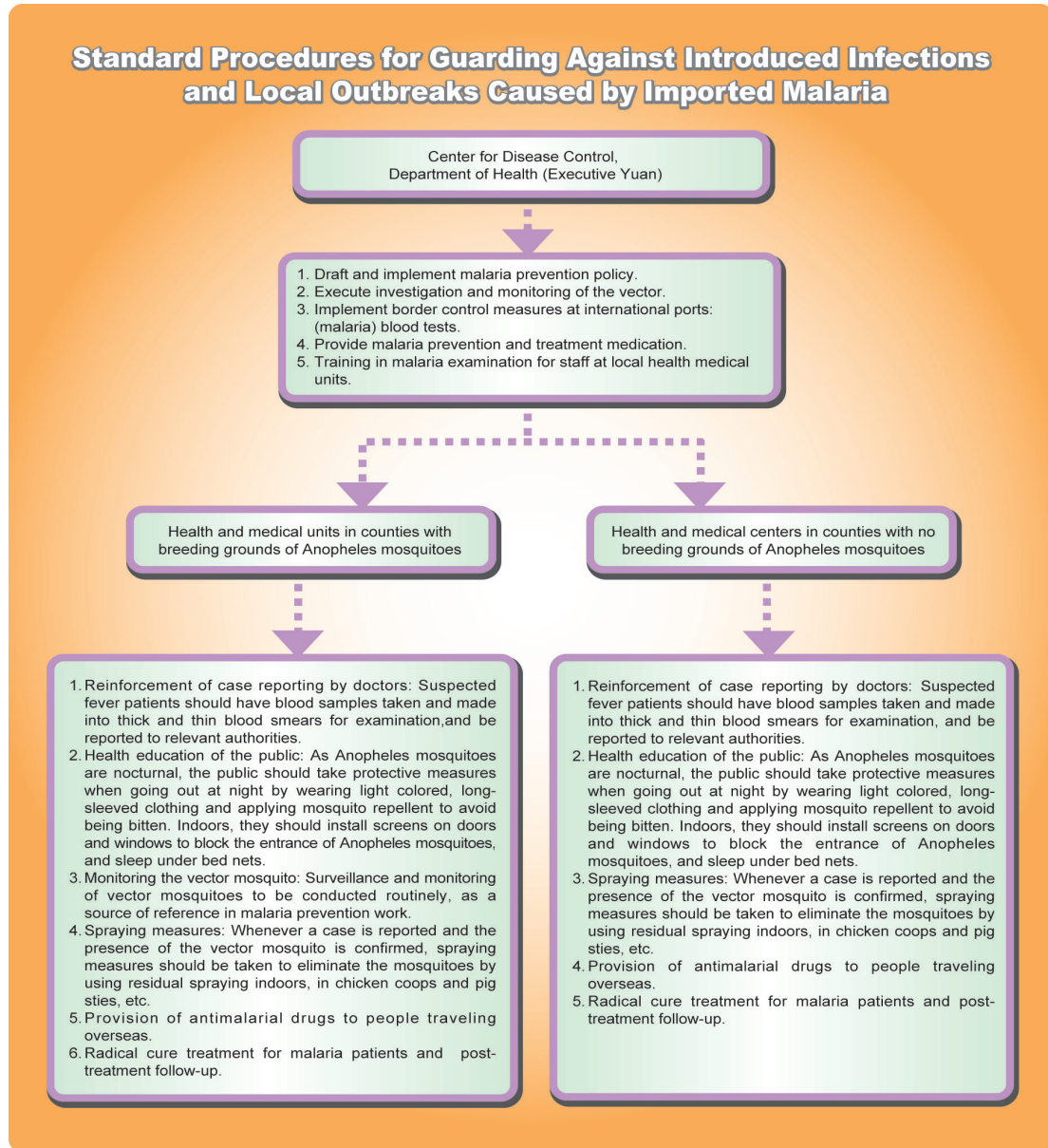
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III Difficulties encountered in the maintenance phase

- (I) Misapprehensions: Many people have the misapprehension that since malaria has been eradicated, there is no further need for malaria prevention work. As there are still cases of imported malaria each year, and as there are still breeding grounds of the vector mosquito in certain areas of Taiwan, any slight carelessness can lead to an outbreak of the disease. In the implementation of the malaria surveillance program, most of the problems that have emerged stemmed from this ungrounded optimism.
- (II) Lack of experienced malaria prevention personnel. Most of the experienced malaria prevention personnel have already retired or are about to retire, and current personnel lack experience and appropriate training. Statistics from the last 40 years (from 1965 onward) show that there has been an average of 30 to 40 cases of imported malaria in Taiwan each year. Because these figures are relatively low, some doctors lack experience in the diagnosis of the disease. Therefore, raising clinical doctors' level of alertness towards suspected malaria patients to avoid delayed diagnosis and treatment, which might put patients' lives in jeopardy, is an area of work that needs to be improved.
- (III) There is only a limited number of drugs to treat malaria, and drug resistance increases on a daily basis. Currently, the drugs used to treat malaria, apart from quinine, consist of such medications as choloquine, primaquine, mefloquine and artemisinin, all of which have to be especially imported. As statistics from the CDC show, the highest number of relapses in one case is three times (an imported case of vivax malaria from the Solomon Islands), which indicates that the virus has developed serious resistance against the drugs.
- (IV) Global interaction increases daily: Ever since the people of Taiwan were permitted to go overseas as tourists, the number of people traveling overseas for vocation or work each year has risen constantly. Overseas Chinese returning to Taiwan to visit relatives or to work, and foreigners who are mostly laborers and foreign spouses from South East Asia, might also lead to an increase in the number of sources of imported infection. Taiwan itself, moreover, still has a few areas of distribution of An. minimus, so prevention against malaria remains on high alert. Two introduced cases were reported in Taitung County in 2003, which undoubtedly provided a powerful warning for malaria prevention.



Graphic 4



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Graphic 5

