

## **Malaria Surveillance**

### **Introduction**

Before the implementation of the four-phase malaria control program in 1947, some 1.2 million people in Taiwan were infected with malaria. In 1965 after 18 years of program implementation, the World Health Organization officially declared that Taiwan was free of malaria. This was a remarkable achievement in the public health history of Taiwan<sup>(1)</sup>. In the last 35 years, the maintenance phase of the malaria control program has continued. With the exception of a few sporadic infections in coastal areas in 1972, the cases reported each year are imported cases. This report presents the difficulties that have been encountered in the maintenance phase of the eradication program, and also ways in which the eradication status can be maintained.

### **Major Tasks during the Maintenance Phase**

Since being officially declared to be Malaria-free by the World Health Organization in 1965, Taiwan has not seen any indigenous malaria cases with the exception of a few new indigenous cases in 1972. However, malaria mosquitoes are still found in some 20 townships in Tainan County, Kaohsiung County, Pingtung County, Taitung County and Hualien County. The major tasks of the maintenance phase are, therefore, to continue to conduct

surveillance of the habitude and ecological distribution of the malaria vectors, and to identify and immediately report imported cases of malaria to prevent imported cases becoming sources of indigenous infection.

### **Program Implementation**

A special unit at the central level and laboratory personnel at local levels exist to implement the prevention and control program. There also is a reporting network with a special unit at the central level, and laboratory personnel at local levels, responsible for the immediate reporting of cases to ensure effective control. In their surveys the Division of Vector-borne Infectious Diseases of the Center for Disease Control, and the Department of Health have not found any vectors of *Anopheles minimus* in any densely populated areas of Taiwan. Due to the lack of disease vectors, advances in medical science, and the ability to treat malaria cases immediately and effectively, Taiwan is in a better position to interrupt and control the transmission of malaria.

### **Difficulties Encountered in the Maintenance Phase**

Some difficulties encountered in the maintenance phase, if not properly attended to, can be obstacles to the control of malaria. These difficulties are as follows:

1. Unjustified and overly optimistic attitudes.

Many people wrongly believe that malaria has been completely eradicated from Taiwan, and that the eradication program is no longer needed. In fact, some 2.5 million people in the world still die of malaria each year.<sup>(1)</sup> Most difficulties encountered in the surveillance of malaria derive from this illusory thinking.

2. The lack of experienced malaria control workers.

Most of the experienced malaria workers at all levels of government have either retired, are about to retire, or have been transferred to other

healthcare projects. Those who are in charge of the control program are part-time personnel with little experience and training. Statistics of the last ten years (1989 to 1998) show that each year in Taiwan about 40 imported cases of malaria are identified ( Table 1 ) . As the number of cases is relatively few, clinical experience is not easy to develop. How to alert clinicians to the possibility of malaria infection, and thus avoid mistakes in diagnosis is one of the tasks that require further reinforcement.

3. Resistance of falciparum malaria to chloroquine, and the expansion of the geographic distribution of *plasmodium*.<sup>(2,3)</sup>

4. Increasing frequency of international exchanges.

The number of tourists has increased sharply each year in recent years.<sup>(4)</sup> At the same time, many foreign workers have been brought into Taiwan from the malaria-infested countries of the southeast Asia.<sup>(5)</sup> They have contributed to the increase in the sources of imported infections. In a few areas in Taiwan, *Anopheles minimus* is still found. Thus the control program should not be relaxed.

## **Ways to Maintain the Eradication Status**

### 1.To create public awareness

When an infection has been controlled for some time, people tend to become less vigilant. With the enterovirus infection and the indigenous dengue fever cases in the past year, people in Taiwan have become more appreciative of the importance of public health. The malaria-free status is hard-attained, it should be maintained. There are still some deaths due to imported malaria infections each year; the seriousness of this fatal infection should be the concern of everyone. More therefore should be done through various mass media and web sites, e-walls, and booklets to disseminate to the public the concept of malaria control. The population should be informed of the precautions to be taken when traveling in malaria-infected areas, and upon return to immediately notify health authorities immediately of any symptoms.

## 2. To set up an effective warning system

Malaria cases identified during recent years are not indigenous. They are imported cases brought in by alien laborers, foreign wives, and local people traveling abroad for trade or tourism. For effective disease control, people of these high-risk groups should be screened. For the early detection of suspected cases and follow-up of identified cases, passengers arriving from disease-affected or high-risk areas should be required to fill in the health statement form upon their arrival.

- 1) Alien laborers and foreign wives: according to regulations, alien laborers are required to undergo a health examination upon visa application, before entry and another one within three days after entry at a hospital designated by the Department of Health. However, the incubation period of malaria is from 14 to 30 days; and individuals from epidemic areas, having developed some resistance to malaria, tend to have a longer incubation period. If they develop fever or any symptoms after their arrival in Taiwan, they should be given a blood test for *plasmodium*. If they are found positive, they should be deported immediately.
- 2) Local people traveling to disease-infected areas: in order not to infringe on human rights and for the sake of efficiency, this group need not be routinely screened. They should, instead, be made aware of to the importance of disease control. Billboards and e-walls can be set up at airports and ports of entry to remind them of the precautions to be taken.
- 3) Employers of alien laborers: health education materials should be developed for them. The Council of Labor Affairs should be coordinated into the eradication program by reminding employers when they apply for alien laborers that they need to concern themselves with the health of their foreign employees. If they develop any symptoms, they should be given immediate medical attention including blood testing.

## 3. To improve the accuracy of blood testing

- 1) Training courses on the identification and assessment of *plasmodium* should be organized for primary healthcare workers to improve their skills in assessment, and thus to facilitate the implementation of patient diagnosis and disease control measures.
- 2) Clinicians should be given more opportunities to learn about the

diagnosis and treatment of malaria.

#### 4.To strengthen the reporting system

Diseases should be reported immediately through modern Internet information system, telephones and communicable disease reporting forms. When the blood test is positive, the following measures should be taken immediately: (1) report names and addresses of cases to local health authorities, (2) local health authorities report to Division of Parasite Diseases of the Center for Disease Control, Department of Health; blood slides should be kept until the arrival of the CDC officials for re-examination, and (3) positive blood slides with very low numbers of *plasmodium* should be properly marked at the time of assessment for the easy identification of follow laboratory workers.

The Center for Disease Control is set up to monitor disease situations and to control them effectively. For the control of malaria, in addition to the continuing collection of available new information on prevention and control<sup>(6)</sup>, mistakes made and difficulties encountered during the process of disease control should also be noted and recorded for the improvement of program implementation.

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**Table 1. No. of Imported Malaria Cases by Year and by Type**

Year Type	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989
Totals	49	47	38	38	35	36	42	30	35	46
falciparum malaria	22	26	12	20	15	10	16	11	18	20
vivax malaria	27	18	23	17	20	25	24	18	15	24
ovale malaria		2	1			1			1	
malariae malaria			1				1	1	1	2
Combined Infection		1	1	1			1			
No. of Deaths	2	1	1	4	1	2	0	2	2	1

**Table 2. Sources of Imported Malaria Cases, 1998**

		1998											
		p.v		p.f		p.m		p.o		mix		Total	
		M	F	M	F	M	F	M	F	M	F	M	F
Asia	Indonesia	2	1	1								3	1
	Thailand	2										2	0
	Myanmar	7	2	1	1							8	3
	Mainland China	2	1									2	1
	India	3	1	1								4	1
	Malaysia	2										2	0
	Cambodia			1								1	0
	Philippines	2		2								4	0
Total		20	5	6	1							26	6
Africa	Malawi			1								1	
	Gambia	1		1								2	
	Nigeria			2	1							2	1
	Chad				1							1	
	Liberia				2							2	
	Senegal			1								1	
	Ivory Coast			1								1	
	Madagascar			1								1	
	Burkina Faso			1								1	
Total		1		8	4							9	4
Oceania	Solomon Islands			2	1							2	1
	Papua New Guinea	1										1	
Total		1		2	1							3	1
Grand Total		22	5	16	6							38	11
													49