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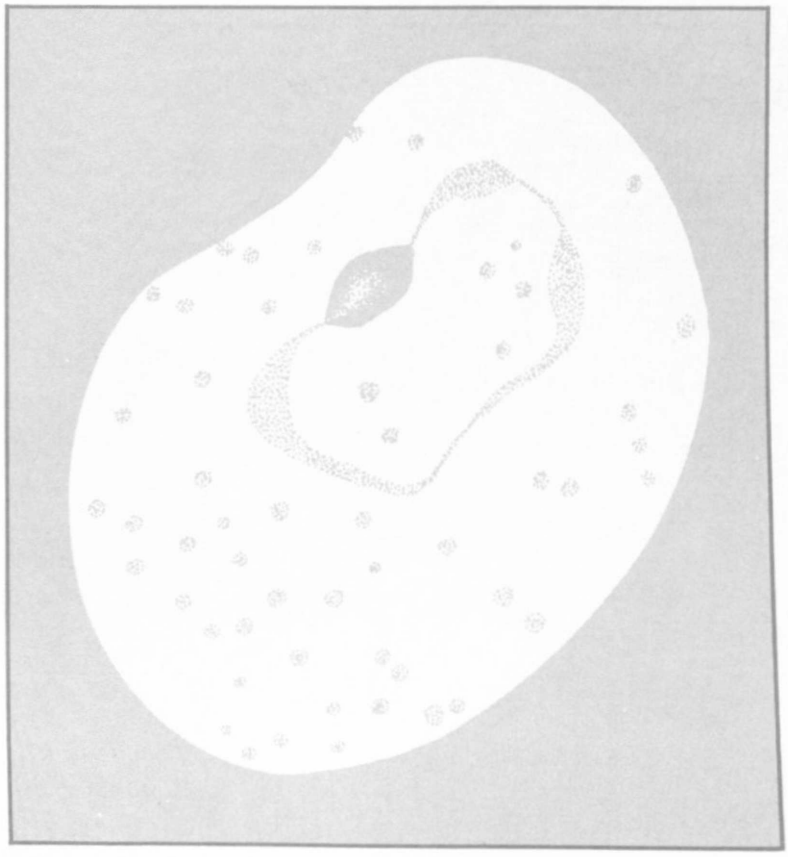
CENTERS FOR DISEASE CONTROL

MALARIA

SURVEILLANCE



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service

P R E F A C E

This report summarizes information received from state health departments, medical departments of the Armed Forces, and other pertinent sources. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

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I. SUMMARY

In 1980, 1,864 cases of malaria were reported to the Centers for Disease Control, a 112.5% increase over the 877 cases reported for 1979. Eighty-one percent of all the reported cases in 1980 were in foreign civilians, representing a 142% increase in this group over 1979. There was a 136% increase in malaria cases reported in the military personnel and a 32% increase among U.S. civilians for 1980 compared with 1979 (Table 1).

Imported Plasmodium vivax infections were more common than P. falciparum (73% versus 12%).

In 13 cases, infection was acquired in the United States; in 7 by congenital transmission; 5 by blood transfusion; and 1 by a mosquito bite (introduced case). One death attributed to malaria was reported for 1980; this occurred in an American tourist who traveled to Kenya and acquired P. falciparum malaria. Two additional cases for 1979 have been included in this report; these were transfusion-induced cases, 1 of which was fatal.

II. TERMINOLOGY

The terminology used in this report is derived from the recommendations of the World Health Organization (1,2). The definitions of the following terms are included for reference purposes.

A. Autochthonous

1. Indigenous - malaria acquired by mosquito transmission in an area where malaria is a regular occurrence.

2. Introduced - malaria acquired by mosquito transmission from an imported case in an area where malaria is not a regular occurrence.

B. Imported

Malaria acquired outside a specific area (the United States, Puerto Rico, and Guam in this report).

C. Induced

Malaria acquired through artificial means, i.e., blood transfusions, common syringes, or malariotherapy.

D. Relapsing

Reappearance of clinical symptoms after the primary attack.

E. Cryptic

An isolated case of malaria not associated with secondary cases as determined through appropriate epidemiologic investigation.

III. GENERAL SURVEILLANCE

For 1980, 1,864 cases* of malaria with onset in 1980 in the United States and territories were reported to the Parasitic Diseases Division, Center for Infectious Diseases, Centers for Disease Control; this represents a 112.5% increase over the 877 cases recorded in 1979. As in 1979 most of the cases reported in 1980 (98%) were in civilians.

There was a marked increase in the number of malaria cases in foreign civilians (Fig. 1); these cases accounted for 82% of all reported malaria cases in 1980. This represents a 142% increase over the number of cases in the foreign civilians reported in 1979. A 32% increase was noted in the number of U.S. civilians who acquired malaria during their travel abroad. Likewise, there was also an increase in the number of malaria cases reported among military personnel, 26 cases in 1980 compared with 11 cases in 1979 (Table 1).

Fig. 1 CASES OF MALARIA IN U.S. CIVILIANS AND FOREIGNERS, UNITED STATES, 1970—1980

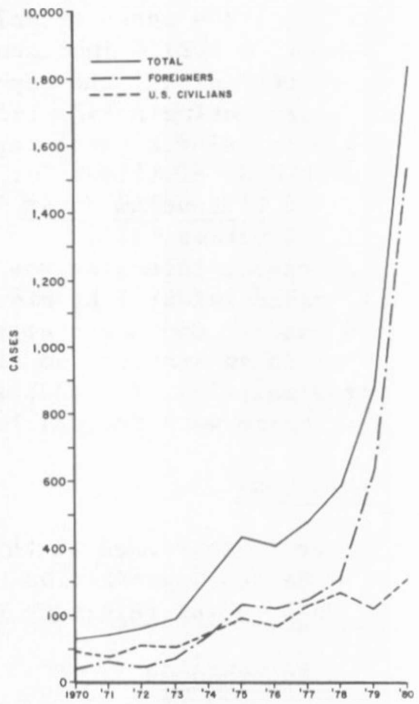


Table 1 Primary Malaria Cases in Civilian and Military Personnel, United States, 1966-1980*

Year	Military	U.S. Civilians	Foreign Civilians	Unknown	Total
1966**	621	89	32	22	764
1967**	2,699	92	51	15	2,857
1968**	2,567	82	49	0	2,698
1969**	3,914	90	47	11	4,062
1970**	4,096	90	44	17	4,247
1971**	2,975	79	69	57	3,180
1972**	454	106	54	0	614
1973**	41	103	78	0	222
1974**	21	158	144	0	323
1975**	17	199	232	0	448
1976**	5	178	227	5	415
1977**	11	233	237	0	481
1978	31	270	315	0	616
1979**	11	229	634	3	877
1980	26	303	1,534	1	1,864

* Onset of illness in the United States and Puerto Rico.

** Figures for these years have been updated to include cases reported after the publication of previous annual summaries.

*A "case" is defined as: 1) an individual's first attack of malaria in the United States, regardless of whether or not he had experienced previous attacks of malaria while outside the country, and 2) the presence of a positive peripheral blood smear examined in the local or state health department laboratory. Blood smears from doubtful cases were referred to the National Malaria Repository, CDC, for confirmation of the diagnosis. A subsequent attack in the same person caused by a different Plasmodium species is counted as an additional case. Repeat attacks in this country caused by the same species are considered relapses or recrudescences, not additional cases.

The largest number of congenital malaria cases noted for the past 20 years was reported in 1980. Most of the infected infants were born to Indochinese refugee mothers, and the majority had P. vivax infection; only a single case was due to P. falciparum. Five cases of transfusion malaria were reported for 1980; 2 cases were due to P. malariae, 2 to P. vivax, and 1 to P. falciparum. An introduced autochthonous case of P. vivax malaria was reported from California. In this case, the person traveled in the vicinity of 3 migrant groups, namely, Mexicans, Asian Indians, and Indochinese refugees, but the exact location where transmission occurred was not determined.

Table 2 Malaria Cases by Plasmodium Species, United States, 1980

Species	Total	Percent
P. vivax	1,365	73.2
P. falciparum	232	12.5
P. malariae	68	3.6
P. ovale	15	.8
Mixed infections	26	1.4
Undetermined	158	8.5
Total	1,864	100.0

The proportion of cases caused by each Plasmodium species was similar to the pattern in 1978 and 1979; P. vivax was the predominant species (Table 2).

As in 1979, Asia accounted for the majority of cases (74.2%), followed by Africa with 12.2%, Central America with 9.3%, North America with 1.8%, South America with 1.0%, and Oceania with 0.6% (Table 3). Infections acquired in Asia in 1980 represent a 194% increase over the number acquired there in 1979, a reflection of the cases in Indochinese refugees. In the past, most of the Asian infections were from India; in 1980 more came from Indonesia (549), the Philippines (69), Thailand (62), and Vietnam (303).

The geographic distribution of the 1,864 malaria cases by the state in which clinical symptoms of the disease first developed in the patient are shown in Fig. 2. This is usually, but not always, where the diagnosis was made. In states reporting large numbers of malaria cases (California, Maryland, Michigan, Minnesota, Pennsylvania, Texas, Virginia, and Washington), more than 50% of their malaria infections are in Indochinese refugees. California is a port of entry for Indochinese refugees and Punjabi Indians and had the most malaria cases (40%).

Fig. 2 GEOGRAPHIC DISTRIBUTION OF MALARIA CASES WITH ONSET IN THE UNITED STATES, 1980

Table 3 Malaria Cases by Distribution of *Plasmodium* Species and Area of Acquisition, United States, 1980

Area of Acquisition	*vivax*	*falciparum*	*malariae*	*ovale*	Mixed	Unknown	Total
AFRICA	**39**	**116**	**15**	**11**	**4**	**42**	**227**
Africa, East	0	1	0	0	0	0	1
Africa, North	*	1	0	0	0	0	2
Africa, South	1	1	0	0	0	0	2
Africa, West & Central	5	13	1	1	0	3	23
Africa, Unspecified	4	10	1	2	1	6	24
Angola	0	2	0	0	0	0	2
Cameroon	2	5	0	0	0	0	7
Congo (Brazz)	1	2	1	0	0	3	7
Ethiopia	2	0	0	1	0	0	3
Gambia	0	1	0	0	0	0	1
Ghana	1	14	3	3	0	1	22
Ivory Coast	1	3	0	0	0	0	4
Kenya	5	12	1	0	1	5	24
Liberia	4	10	2	0	1	5	22
Mali	1	2	0	0	0	0	3
Morocco	0	0	0	0	0	1	1
Mozambique	0	1	0	0	0	0	1
Niger	0	0	1	0	0	2	3
Nigeria	8	24	2	2	1	14	51
Rhodesia, North	0	1	2	0	0	0	3
Rhodesia, South	0	1	0	0	0	0	1
Rwanda	0	1	0	0	0	0	1
Senegal	0	1	0	0	0	0	1
Sierra Leone	1	2	0	1	0	1	5
Sudan	0	2	0	0	0	0	2
Tanzania	2	3	0	0	0	1	6
Togo	0	0	0	1	0	0	1
Uganda	0	3	1	0	0	0	4
ASIA	**1,137**	**85**	**40**	**4**	**19**	**98**	**1,383**
Asia, Southeast	16	4	0	0	1	0	21
Borneo	1	0	0	0	0	0	1
Burma	1	0	0	0	0	0	1
Cambodia	35	6	1	0	1	3	46
China, Peoples' Republic	0	1	0	0	0	0	1
Far East	2	0	0	0	0	0	2
Hong Kong	1	0	0	0	0	0	1
India	211	4	11	0	0	21	247
Indonesia	461	30	15	3	5	35	549
Korea	2	0	0	0	0	0	2
Laos	20	2	0	0	0	2	24
Lebanon	1	0	0	0	0	0	1
Malaya	34	3	1	0	0	2	40
Pacific	0	0	0	0	0	1	1
Pakistan, East & West	3	0	0	0	0	0	3
Philippines	53	4	1	0	3	8	69
Saudi Arabia	0	0	0	0	0	1	1
Singapore	3	0	0	0	0	1	4
Thailand	40	13	2	0	0	7	62
Turkey	4	0	0	0	0	0	4
Vietnam	249	18	9	1	9	17	303
CENTRAL AMERICA AND CARIBBEAN	**132**	**24**	**8**	**0**	**2**	**8**	**174**
Costa Rica	0	0	0	0	0	1	1
El Salvador	51	1	4	0	0	1	57
Guatemala	29	1	1	0	0	3	34
Haiti	4	9	1	0	0	0	14
Honduras	18	11	0	0	2	2	33
Honduras British	1	0	0	0	0	0	1
Nicaragua	29	1	2	0	0	1	33
Panama	0	1	0	0	0	0	1
NORTH AMERICA	**37**	**2**	**3**	**0**	**0**	**1**	**33**
Mexico	18	0	1	0	0	1	20
United States	19	2	2	0	0	0	13
SOUTH AMERICA	**15**	**2**	**0**	**0**	**1**	**1**	**19**
South America, Unspecified	6	1	0	0	0	0	7
Brazil	3	0	0	0	1	1	5
Colombia	1	0	0	0	0	0	1
Peru	4	1	0	0	0	0	5
Venezuela	1	0	0	0	0	0	1
OCEANIA	**7**	**1**	**1**	**0**	**0**	**2**	**11**
New Guinea	6	1	1	0	0	2	10
Oceania	1	0	0	0	0	0	1
UNKNOWN	**8**	**2**	**1**	**0**	**0**	**6**	**17**
TOTAL	**1,375**	**232**	**68**	**15**	**26**	**158**	**1,864**

For 1,466 cases on which the exact date of arrival in the United States and the date of onset of illness were available, clinical malaria developed within 30 days of arrival in the United States in 20.6% of persons with P. vivax infection and in 58.6% of persons with P. falciparum infection (Table 4). Thirty-nine patients (2.6%) became ill with malaria 12 months or longer after their last possible exposure to malaria abroad.

Table 4 Malaria Cases by Period Between Date of Entry Into the United States and Onset of Illness,* and by Plasmodium Species, United States, 1980

Period (in months)	PLASMODIUM SPECIES																Total	
	vivax	(%)	falciparum	(%)	malariae	(%)	ovale	(%)	Mixed	(%)	Undetermined	(%)						
<1	221	(20.6)	116	(58.6)	19	(38.0)	1	(9.1)	4	(22.2)	42	(35.6)					403	(27.5)
1- 2	362	(33.8)	59	(29.8)	17	(34.0)	4	(36.4)	7	(38.9)	35	(29.7)					484	(33.0)
3- 5	266	(24.8)	14	(7.1)	9	(18.0)	3	(27.2)	2	(11.1)	19	(16.1)					313	(21.4)
6-11	189	(17.6)	7	(3.5)	5	(10.0)	1	(9.1)	4	(22.2)	21	(17.8)					227	(15.5)
>12	33	(3.2)	2	(1.0)	0	(0.0)	2	(18.2)	1	(5.6)	1	(0.8)					39	(2.6)
TOTAL	1,071	(100.0)	198	(100.0)	50	(100.0)	11	(100.0)	18	(100.0)	118	(100.0)					1,466	(100.0)

* 398 cases had unknown exact date of entry into U.S. and date of onset of illness.

Of the 1,864 cases for whom hospitalization data were reported, 1,471 (79%) required hospitalization. Sixty-three percent of the patients were initially treated in civilian hospitals (Table 5). Even though malaria is a reportable disease in every state, the numbers reported by private physicians are probably an underestimate of the total malaria cases seen by civilian physicians since reporting by these physicians is largely a matter of individual initiative. The Armed Forces and Veterans Administration have made complete malaria reporting a major responsibility of their hospital staffs.

Table 5 Malaria Cases by Type of Initial Hospital Admission, United States, 1980

Type of Hospital	Number of Patients	Percent
Military	29	1.6
Civilian	1,166	62.6
Public Health Service	59	3.2
Veteran Administration	1	.1
Other	216	11.6
Not hospitalized	393	21.1
Total	1,864	100.0

IV. MILITARY MALARIA

In 1980, 26 cases of malaria were reported among military personnel (Table 6). This represents a two-fold increase over the number of cases reported in 1979 (11); however, the number of malaria cases in military personnel expressed as the proportion of the total number of malaria cases was similar to last year.

Table 6 Malaria Cases in Military Personnel, by Branch of Service, United States, 1980

Branch of Service	Cases	
	Number	Percent
Air Force	2	7.7
Army	9	34.6
Navy	2	7.7
Marine	12	46.2
Unknown	1	3.8
TOTAL	26	100.0

V. MALARIA IN CIVILIANS, ACQUIRED OUTSIDE THE UNITED STATES

The number of imported civilian malaria cases continued to increase in 1980. Compared to 1979 figures, an increase of 32% among U.S. civilians and a 141% increase among non-U.S. civilians was noted. The increase among non-U.S. civilians is due to the number of malaria cases seen among Indochinese refugees coming into this country. For analytic purposes, civilian cases were divided into 3 groups, namely: U.S. civilians, foreign persons other than refugees, and refugees.

A. Malaria in U.S. Civilians

For the period 1970-1980, the number of cases in U.S. civilians increased steadily with the exception of 1976. In 1980, 303 cases of malaria in U.S. civilians were reported, representing a 32% increase over that reported in 1979 (229). A review of the travel histories of these persons showed that 46% of the infections were acquired in Africa, 19% in Asia, and 20% in Central America (Table 7). The species distribution for the U.S. civilians is shown on Table 8. Table 9 shows the age and sex distribution of cases, and Table 10 shows the individuals' occupations.

Table 7 Malaria Cases in U.S. Civilians, by Area of Acquisition, United States, 1970-1980

Area of Acquisition	U.S. Civilians			
	1970-1980		1980	
	Cases	Percent	Cases	Percent
Africa	919	47.2	139	45.9
Asia	447	22.9	57	18.8
Central America	251	12.9	59	19.5
Caribbean	48	2.5	7	2.3
North America				
Mexico	96	4.9	4	1.3
United States	10	.5	6	2.0
South America	93	4.8	17	5.6
Oceania	66	3.4	10	3.3
Unknown	18	.9	4	1.3
Total	1,948	100.0	303	100.0

Table 8 Malaria Cases in U.S. Civilians by Infecting Species, United States, 1980

Species	Cases	Percent
P. vivax	133	43.9
P. falciparum	95	31.4
P. malariae	24	7.9
P. ovale	5	1.7
Mixed	5	1.7
Undetermined	41	13.4
Total	303	100.0

Table 9 Malaria Cases in U.S. Civilians, by Age and Sex, United States, 1980

Age Group	Male	Female	Unknown	Total	(%)
0- 9	23	7	2	32	10.6
10-19	17	12	0	29	9.6
20-29	51	35	3	89	29.4
30-39	40	15	3	58	19.1
40-49	21	15	0	36	11.9
50-59	21	7	0	28	9.2
60-69	9	6	0	15	5.0
>70	3	3	0	6	2.0
Unknown	7	0	3	10	3.3
Total	192	100	11	303	100.0

Table 10 Malaria Cases in U.S. Civilians, by Occupation, United States, 1980

Occupation Cases	Cases	(%)
Tourist	39	12.9
Business Representative	23	7.6
U.S. Government Employee	7	2.3
Missionary	33	10.9
Peace Corps Employee	10	3.3
Seaman	7	2.3
Teacher/Student	35	11.6
Other	56	18.4
Unknown	93	30.7
Total	303	100.0

B. Malaria in Foreign Persons Other Than Refugees

There were 500 cases of malaria in foreign persons other than refugees reported for 1980, a 15% increase over the 435 cases reported in 1979. The distribution of cases by age and sex is shown in Table 11, and Table 12 shows the place of acquisition. In these cases 54.2% of the patients acquired their infection in Asia.

Table 11 Malaria Cases in Foreign Persons Other Than Refugees, by Age and Sex, United States, 1980

Age Group	Male	Female	Unknown	Total	(%)
0- 9	34	21	2	57	11.3
10-19	58	30	1	89	17.7
20-29	99	59	1	159	31.8
30-39	60	22	3	85	17.0
40-49	20	14	2	36	7.2
50-59	14	12	0	26	5.2
60-69	3	5	0	8	1.6
>70	0	4	0	4	0.8
Unknown	5	4	27	36	7.4
Total	293	171	36	500	100.0

Table 12 Malaria Cases in Foreign Persons Other Than Refugees, by Area of Acquisition, United States, 1980

Area	Cases	Percent
Africa	90	18.0
Asia	271	54.2
Central America	95	19.0
Caribbean	6	1.2
North America		
Mexico	16	3.2
South America	13	2.6
Oceania	1	0.2
Unknown	8	1.6
Total	500	100.0

C. Malaria in Indochinese Refugees

The number of malaria cases in Indochinese refugees increased dramatically for 1980: 1,034 cases were reported representing a 453% increase over that reported for 1979 (187). This significant rise was a consequence of the increase in the number of refugees admitted to the United States. Since July 1979, Indochinese refugees have been entering the country at an average rate of 13,000 per month. The estimated malaria case-rates per 1,000 refugees was calculated using demographic data on refugee populations provided by the Quarantine Division, Indochinese Refugee Activity, CDC (Tables 13 & 14). Based on this calculation, it was shown that the malaria case-rate for males (7.8) was higher than for females (4.6). The malaria case-rate was highest in the age groups 10 to 29 years. The overall case-rate for all Indochinese refugees was 6.7. The Vietnamese refugees had the highest reported malaria case-rate (11.1), followed by Cambodians (5.1), and Laotians (0.1). The high malaria case-rate for the Vietnamese can be explained by the fact that most of the Vietnamese refugees stayed in camps in Indonesia where high malaria transmission was known to exist (Table 15). Moreover, in contrast to the Laotians and Cambodians, Vietnamese refugees were less immune to malaria since they came primarily from urban Vietnam, and therefore had a greater tendency to develop clinical symptoms of malaria.

A notable occurrence for 1980 was the increase in the number of congenital malaria cases among babies born to refugee mothers. Seven of the 1,034 malaria cases in the refugees were acquired by congenital transmission, and 1,027 acquired their infection either in their country of origin or in transit camps abroad. Table 15 shows the distribution of malaria cases in refugees by species of infecting organism, country of origin, and camp of detention. Of the 1,027 cases acquired in Asia, 49.6% were acquired in the camps located in Indonesia. The 2 camps in Indonesia with high malaria transmission were subsequently closed in the early part of 1980. *P. vivax* was the most common species (82.5%) of malaria found in the refugees.

Table 13 Malaria Case-Rate per 1,000 Indochinese Refugee Arrivals*, by Age and Sex, January 1-December 31, 1980

	MALE			FEMALE			GRAND TOTAL		
Age Group (Years)	Total No. of Arrivals	No.of Infected Refugees	Rate per 1,000	Total No. of Arrivals	No. of Infected Refugees	Rate per 1,000	Total No. of Refugees**	No. of Infected Refugees**	Rate per 1,000
0- 9	18,024	68	3.7	16,267	40	2.4	34,291	108	3.1
10-19	24,079	245	10.2	17,055	87	5.1	41,134	332	8.1
20-29	23,511	216	9.2	16,622	119	1.8	40,133	335	8.3
30-39	10,354	86	8.3	8,691	32	3.7	19,045	118	6.2
40-49	5,207	34	6.5	4,474	21	4.7	9,681	55	5.7
50-59	2,836	10	3.5	2,768	6	2.2	5,604	16	2.8
60-69	1,550	10	6.4	2,172	5	2.3	3,722	15	4.0
>70	538	3	5.6	949	2	2.1	1,487	5	3.4
GRAND TOTAL**	86,099	672	7.8	68,998	312	4.5	155,097	984	6.4

* Data provided by the CDC's Quarantine Division, Indochinese Refugee Activity.

** Grand Total excludes all refugees (62) and reported malaria cases for which age and sex data were not availa

Table 14 Malaria Case-Rate per 1,000 Indochinese Refugees Entering the United States*, January 1-December 31, 1980

Ethnic Group	Total No. of Refugees Entering U.S. Jan. 1-Dec. 31, 1980	No. of Infected Refugees	Rate per 1,000
Vietnamese	83,655	922	11.0
Laotian	50,031	32	0.6
Cambodian	11,996	61	5.1
Unspecified	9,477	19	2.0
Total	155,159	1,034	6.7

* Data provided by the CDC's Quarantine Division, Indochinese Refugee Activity.

Table 15 Malaria Cases in Refugees, by Country of Origin, Location of Camp, and Species of Infecting Organism, United States, 1980.

Country of Origin	Camp	PLASMODIUM SPECIES vivax	falciparum	malariae	ovale	Mixed	Undetermined	Total
Vietnam	Indonesia	428	28	14	3	5	31	509
	Malaysia	34	3	1	0	0	2	40
	Philippines	36	1	1	0	3	3	44
	Singapore	3	0	0	0	0	1	4
	Thailand	16	5	1	0	0	3	25
	Vietnam	230	16	6	0	9	14	275
	Others	24	2	0	0	2	1	29
	Total	771	55	23	3	19	55	926
Laos	Laos	15	2	0	0	0	2	19
	Thailand	6	0	1	0	0	2	9
	Others	3	0	0	0	0	0	3
	Total	24	2	1	0	0	4	31
Cambodia	Cambodia	27	3	1	0	1	3	35
	Thailand	9	4	0	0	0	1	14
	Others	6	0	1	0	0	2	9
	Total	42	7	2	0	1	6	58
Other refugees		16	3	0	0	0	0	19
Grand Total		853(82.0%)	67(6.0%)	26(3.0%)	3(.3%)	19(2.0%)	65(6.0%)	1,034

VI. MALARIA ACQUIRED IN THE UNITED STATES

In 1980, 5 transfusion-induced cases of malaria and 7 cases of congenital malaria were reported in the United States. The number of congenital cases was the highest reported for the past 2 decades. One introduced case of malaria was reported. In addition, 2 transfusion-induced cases recorded for 1979, one of which was fatal and had not been previously reported, are described below (Cases 6 & 7).

A. Induced Malaria

Case 1 - On August 27, 1980, a 77-year-old woman underwent thoracic surgery for metastic adenocarcinoma. She received 3 units of packed red blood cells during the procedure. In September 1980, she began having daily febrile episodes with diarrhea, headache, nausea, vomiting, and myalgia. Multiple blood cultures and cultures of the sputum and pleural fluid were negative. Examination of a peripheral blood smear during a routine white blood cell count done by her son, a laboratory technician, disclosed the presence of ring forms and gametocytes consistent with *P. falciparum*. The patient was treated with quinine, pyrimethamine, and sulfa with prompt defervescence of fever and disappearance of the trophozoites.

The patient had no history of travel abroad or drug abuse before surgery. The 3 blood donors involved were interviewed; 2 had no history of travel abroad. The third donor was a 38-year-old woman, a native of El Salvador, who came to the United States in March 1980. She was asymptomatic but gave a past history of "fevers" which were self-treated with antimalarial drugs purchased over the counter in her native country. Several thick and thin blood smears on this donor were negative for malaria parasites, but the indirect immunofluorescent antibody titer was 1:4096 for *P. falciparum*, 1:1024 for *P. vivax*, and 1:1024 for *P. malariae*. The donor was treated with chloroquine. The other 2 donors had negative serologic tests for malaria.

(Reported by S. Wilson, M.D., F. Ciferri, M.D., M.P.H., Department of Medicine, Southern California Permanente Medical Group, Los Angeles, California; B. Agee, M.D., Acute Communicable Disease Control, Los Angeles County Health Department; R.R. Roberto, M.D., Infectious Disease Section, California Department of Health Services; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 2 - On June 17, 1980, a 66-year-old woman was admitted to Mount Sinai Medical Center with a diagnosis of spinal stenosis. A lumbar laminectomy was performed on June 20. During surgery the patient received 2 units of packed red blood cells and was given another 2 units postoperatively. On the first postoperative day, fever (temperature-103°F) developed. Physical findings were negative. Blood cultures and chest x-ray were also negative. A positive urine culture for *E. coli* prompted the initiation of antibiotic therapy to which the patient responded. On June 28, the patient became febrile again. All the diagnostic workup including gallium scan, chest x-ray, urinalysis, blood cultures, and complete blood cell count were unrevealing. Antibiotics were discontinued to rule out possible drug fever.

The hematology laboratory technician reading the blood smear identified *P. vivax* malaria. Since the patient had never traveled to malaria-endemic areas, a diagnosis of transfusion malaria was made. Personnel at the blood bank recalled the 4 donors involved; one was later identified as having *P. vivax* on his blood smear. Both the patient and the donor were treated with chloroquine and primaquine.

(Reported by K.R. Razan, M.D., J. Moore, R.N., Mount Sinai Medical Center, Miami; A. Maceo, M.D., Miami Health Department, State Department of Health & Rehabilatative Services; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 3 - On August 13, 1980, a 13-year-old girl was admitted to a New Jersey Hospital with a diagnosis of infectious mononucleosis. Thrombocytopenia, bleeding diathesis, and severe menorrhagia, requiring transfusion with 8 units of platelets and 2 units of packed red cells, developed. The patient had an uneventful recovery from the hematologic complications of infectious mononucleosis until a month later when she developed fever and chills which occurred regularly every 72 hours. A blood smear was done and revealed malaria parasites compatible with P. malariae. The patient had no history of travel to malarious endemic areas, thus this case was labeled transfusion-induced malaria. The patient was treated with chloroquine and responded well.

A serologic investigation for malaria on 20 of 38 donors was done, but none was implicated as the possible donor up to the time of this writing.

(Reported by A. Minefor, M.D., J. Lee, M.D., St. Clares Hospital, New Jersey; B. Mojica, M.D., State Health Department of New Jersey; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 4 - A 41-year-old woman became ill around December 24, 1980, with chills, intermittent fever, and generalized malaise. Upon hospitalization on January 20, 1981, she had persistent fever (temperature-105°F), weakness, hepatosplenomegaly, and progressive anemia. On January 23, 1981, blood smears were reported to be positive for P. malariae based on the observation of typical mature schizonts. The patient was treated with chloroquine and recovered completely.

Further investigation showed that the patient was an archaeologist and had traveled in Europe. She also had lived in Mexico between 1968 to 1970, and for a period in November to December 1977. On November 15, 1980, the woman was involved in an auto accident resulting in numerous fractures. She received 3 units of packed red blood cells 1 month before she became febrile. Three blood donors were identified and questioned about malaria-like illness and travel outside the United States. Two of the donors reported travel to border towns in Mexico, but neither had a history of malaria-like illness. Serum specimens from the 2 were negative for antibodies to 3 Plasmodium species. The third donor was an immigrant from Nigeria and had experienced malaria-like symptoms in the early 1970s. His serum was found to be positive by immunoflorescent tests for antibodies to P. malariae (1:1024) and P. falciparum (1:256). The donor was treated with chloroquine and primaquine.

(Reported by A.F. Taylor, M.P.H., A.M. Stein, M.D., T.D. Stuart, M.D., A.J. Silvergleid, M.D., R.M. Rice, P.H.N., L. Mahoney, M.D., San Bernardino County Department of Public Health; R.R. Roberto, M.D., Infectious Disease Section, California Department of Health Services; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 5 - An 84-year-old man was admitted to the surgical service of a New York hospital for vague pain in his chest and abdomen associated with nausea, vomiting, anorexia, and guaiac-positive stools. He was afebrile on

the day of admission but subsequently developed daily temperatures ranging from 101°F to 104°F. The patient had other problems such as respiratory insufficiency, metabolic acidosis, and hypotension. On June 6, he was transferred to the medical services. On June 11, a hematologist noted malarial parasites on his blood smear. Initial reading was P. falciparum, and the patient was started on oral quinine, pyrimethamine, and sulfadiazine because of the suspicion of cerebral malaria. A consultant from the New York City Department of Health was called in to see the patient and reread the smear as P. vivax. The above medications were stopped, and the patient was started on chloroquine. Thereafter, the parasitemia decreased rapidly, and the patient became afebrile and more alert. Unfortunately, he continued to be dyspneic and ultimately died of respiratory failure.

The patient had no previous history of malaria and had received no blood transfusions during his present hospitalization. However, he had traveled to Mexico City a month before he was hospitalized in New York. Later history revealed that while he was in Mexico City, he had been hospitalized for gastrointestinal bleeding and had received 1 or more blood transfusions.

(Reported by J.L. Gladstone, M.D., J. Schwartz, M.D., G. Fernandez, R. Recco, Coney Island Hospital, Brooklyn, New York; New York City Department of Health; and Parasitic Diseases Division, Centers for Infectious Diseases, CDC.)

Case 6 - Around December 21, 1979, a 60-year-old man with chronic lymphocytic leukemia developed a febrile illness after receiving numerous blood transfusions for his underlying illness. His illness was initially diagnosed as P. falciparum malaria but was later identified as being due to P. malariae when the blood smears were examined by the California Department of Health Services Microbial Diseases Laboratory and CDC. The patient had received 44 units of blood or platelets in the period August 29 to December 21, 1979. He reportedly had not traveled to an endemic malaria area in the previous 4 years except for a 1-day trip to Tijuana, Mexico, shortly before he became ill. However, it was learned from an extensive investigation that he lived in and around Chihuahua, Mexico, from age 9 to 20 years, before settling in Fresno and Ventura counties in California. Serologic tests performed at CDC on blood from 33 of the 44 donors failed to implicate any of the 33 donors.

(Reported by R.A. Murray, M.P.H., R.R. Roberto, M.D., Infectious Disease Section, California Department of Health Services; M. Billimec, R.N., Ventura County Health Care Agency; J. Auth, United Blood Services of Ventura County; P.R. Thompson, M.D., American Red Cross Blood Services, Los Angeles-Orange County Region; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Editorial Note: This case is labeled transfusion-induced malaria because the patient received 44 units of blood from August 29 to the beginning of his illness on or around December 21, 1979. The incubation period for P. malariae would fall into the reported range of incubation period of transfusion-induced P. malariae infection, i.e., 6-106 days. It was unfortunate that not all donors could be serologically tested. Although the patient had resided in a malarious area 40 years before onset of illness and may have had a latent P. malariae infection that became symptomatic due to his underlying illness and treatment with immunosuppressive drugs and concomitant radiation, it seems as likely that this infection was transfusion-induced.

Case 7 - On July 29, 1979, a 53-year-old man was admitted to a hospital in Springfield, Ohio, for bleeding esophageal varices secondary to hepatic cirrhosis and portal hypertension. At this hospital the patient was given 13 units of packed red cells. After the patient became stabilized, he was transferred to another hospital in Columbus, Ohio, where he underwent a Warren portocaval shunt and splenectomy on August 9, 1979. During these surgical procedures he received a total of 55 units of red cells and several units of fresh frozen plasma. The patient did well postoperatively, but on August 24-25, parasites resembling P. falciparum were noted in his blood. The patient was allowed to go home for 2 days while the diagnosis was being confirmed by the State Department of Health laboratory. The patient returned to the hospital with a greater degree of parasitemia on August 27, 1979. At no point before his readmission did he have any fever or any symptom. The patient was immediately started on chloroquine, but he deteriorated rapidly and died on August 29, 1979.

The donor cards for the 55 units of blood he received in Columbus were reviewed and of 55, 4 had a history of travel outside the United States. These 4 individuals were contacted and blood smears obtained, but none revealed malaria parasites. There were no indications that serologic tests were done on these donors.

(Reported by F. Holtzhauer, T. Kramer, T. Halpin, M.D., State Epidemiologist, Ohio State Department of Health; R. Westphal, M.D., American Red Cross Blood Services, Columbus, Ohio; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

B. Congenital Malaria

Case 1 - On March 6, 1980, a 5-week-old Vietnamese boy was seen by a private physician in California for fever and anemia. The child was born in Texas to a 24-year-old Vietnamese mother who was treated for falciparum malaria in January 1980. The blood smear done on the day the baby was initially seen was positive for P. falciparum. The baby was started on chloroquine by mouth and apparently improved clinically. A repeat blood smear done on March 25 showed persistent parasitemia, and the baby was treated with a 10-day course of quinine, trimethoprim, and sulfamethoxazole for presumed chloroquine-resistant falciparum malaria. After the triple therapy was initiated, follow-up smears were negative for malaria parasites. Further follow-up of the baby showed weight gain and improvement of anemia.

(Reported by T. Bates, M.D., F.A.A.P., G. Harris, P.H.N., Monterey County Health Department, California; R.R. Roberto, M.D., Infectious Disease Section, California Department of Health Services; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 2 - On May 24, 1980, a 6-week-old Vietnamese baby boy was admitted to the Children's Hospital of Philadelphia for evaluation of fever, anemia, jaundice, and failure to thrive. The child was born in the United States, after an uncomplicated delivery, to a 21-year-old Vietnamese refugee. The child did well until 3 weeks of age when vomiting after feeding developed as well as diarrhea and failure to gain weight. Physical findings on admission showed a thin infant with a blood pressure of 98/palpable, weight 2.64 (fifth percentile), heart rate of 140, temperature of 37.3°C, with jaundice and scleral icterus. Laboratory examination showed a hemoglobin of 5.1 gm, bilirubin of 7.1 mg/dl, normal SGOT and SGPT, and P. vivax parasites in the blood smear. The infant was started on chloroquine and responded well.

The infant's parents had a history of malaria on arrival in this country. The mother had malaria during pregnancy, trimester unknown, but received no therapy. After congenital malaria was diagnosed, the infant's mother was referred to another hospital for further evaluation and therapy.

(Reported by B. Cohlan, M.D., Children's Hospital of Philadelphia; R.G. Sharrar, M.D., State Epidemiologist, Department of Public Health Community Health Services, Philadelphia, Pennsylvania; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 3 - A 7-week-old Cambodian baby girl was seen on July 9, 1980, by a private physician in Jefferson, North Carolina, for fever and vomiting. Physical findings were unremarkable except for a temperature of 101.6°F. A clean catch urine for urinalysis and culture was obtained, and the baby was placed on amoxacillin. On follow-up the next day, her temperature was 99.2°F, she was not vomiting, and urine culture was negative. On July 31, the baby became febrile again and when seen by a physician had a hemoglobin of 7.3 gm, and a urine culture grew 100,000 mixed gram-positive organisms. The baby was placed on trimethoprim and sulfamethoxazole. A follow-up 15 days later showed that the baby was afebrile, hemoglobin was 8.5 gm, and a blood smear showed P. vivax. The baby was treated with chloroquine and primaquine.

The baby was born in the United States to a 31-year-old Cambodian refugee who had been in the country for 1 year. Both parents had a history of malaria in 1976 and at that time were treated with only 1 pill.

(Reported by N. Hakmeh, M.D., Wadesboro, North Carolina; S. Pegram, Jr., M.D., North Carolina Baptist Hospital, Winston-Salem, North Carolina; J.N. MacCormack, M.D., M.P.H., Communicable Disease Control Branch, North Carolina Division of Health Services; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 4 - On July 12, 1980, a 3 1/2-week-old Cambodian boy was admitted to a South Dakota hospital for lethargy, irritability, poor feeding, and vomiting. The baby was born in the United States and was well until the day of admission. On admission, the baby appeared alert, although irritable with a temperature of 102.8°F rectally. Pertinent physical findings showed that the baby had a systolic ejection murmur, massive splenomegaly, and mild hepatomegaly. Laboratory findings consisted of a hemoglobin of 11.6 gm, and hematocrit of 33.6%; P. vivax parasites were seen on a white blood count peripheral smear. After hydration, the hemoglobin dropped to 9.3 gm. The baby was treated with chloroquine.

The baby's mother was a 26-year-old Cambodian refugee whose date of arrival in the United States was not available. Review of the blood smear examination of the mother on the date of delivery showed P. vivax; she was treated with chloroquine and primaquine.

(Reported by V.R. Bradenburg, M.D., Sioux Falls; G. Bendewald, K. Senger, Communicable Disease Program, South Dakota Department of Health; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 5 - A 23-day-old Laotian girl was brought to the emergency room of a Seattle hospital on August 22, 1980, after a 2-day history of fever. The infant was born in Seattle on July 29 to a 13 1/2-year-old Hmong refugee from Laos who arrived in the United States in February 1980 from a refugee camp in Thailand. The infant had been well when examined by a physician at 2 weeks of age.

In the emergency room, the physical examination revealed a temperature of 39.9°C (103.8°F), mild jaundice, and hepatosplenomegaly. Cultures of blood, urine, and cerebrospinal fluid (CSF) were obtained, and the patient was given ampicillin and gentamicin for presumed sepsis. CSF examination was normal. The infant's serum bilirubin was 4.1 mg/dl, hematocrit was 28%, WBC was 6,900/mm^3, and platelets were 32,500/mm^3. The hematology technician noticed that 1%-2% of the red blood cells on smear contained malaria parasites, and the diagnosis of P. vivax malaria was made. The infant was treated with chloroquine and responded well.

The infant's mother had been asymptomatic and afebrile at prenatal examinations in April and June 1980. Because of an elevation of temperature to 38°C (100.4°F) at the time of delivery, cultures were taken and she was treated with ampicillin without sequelae. When congenital malaria was diagnosed in her daughter 3 weeks postpartum, a careful review of the smears from the mother's routine blood counts in April and at the time of delivery revealed P. vivax. The mother was treated with chloroquine and primaquine.

(Reported by G.J. Mertz, M.D., T.C. Quinn, M.D., R. Jacobs, M.D., Department of Medicine and Pediatrics, University of Washington, Seattle, Washington; J. Allard, Ph.D., State Epidemiologist, Washington State Department of Social and Health Services; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 6 - A pregnant 17-year-old Cambodian refugee arrived in the United States on June 30, 1980. Two months later fever developed and she went into labor, giving birth to a female infant on August 29. The mother's admission blood smears revealed P. vivax parasites, and she received antimalarial therapy after delivery. The newborn infant, who appeared well, was not tested or treated for malaria. At 16 days of age, the infant developed fever and irritability, and vivax malaria was diagnosed from a blood smear. When admitted to a Kentucky hospital on September 18, the infant was found to have jaundice, hepatosplenomegaly, anemia, and thrombocytopenia. The infant was treated with chloroquine, and the parasites were cleared from the blood by September 22.

(Reported by A. Roby, M.D., G. Adams, M.D., Children's Hospital, University of Louisville; R.V. Mills, R.N., J.W. Skaggs, D.V.M., Acting State Epidemiologist, Kentucky State Department for Human Resources; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

Case 7 - In November 1980, a baby Vietnamese boy, 19 days of age, was admitted to a Boston hospital following a 2-day history of fever. The infant was alert and responsive. His temperature was 39.5°C (103.1°F), and he had hepatosplenomegaly with the liver 1 cm below the umbilicus. A blood smear revealed a parasitemia with P. vivax calculated at 54,000/mm^3. The baby was treated with chloroquine and responded well.

The baby had been born to a Vietnamese refugee who arrived in the United States in May 1980 after living for 1 year in an Indonesian refugee camp. Six months later, at the time of her delivery, a malaria smear was read as negative. Three days postpartum she returned to the hospital with fever and was found to have vivax malaria and was treated with chloroquine and primaquine without adverse sequelae, despite a negative G6PD deficiency. At that time the baby was well and his blood smears were negative.

(Reported by D.J. Wyler, M.D., Division of Geographic Medicine, Tufts University, Boston, Massachusetts; R. Ott, M.D., Boston; N.J. Fiumara, M.D., State Epidemiologist, Massachusetts State Department of Public Health; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

C. Introduced Autochthonous Malaria

Case 1 - On August 20, 1980, a 55-year-old truck driver left his home in San Bernardino County and drove his rig north to haul grapes from vineyards to wineries along the agricultural Central Valley of California. He worked long hours in good health until October 2, 1980, when he had onset of malaise, nausea, myalgias, and drowsiness. These symptoms persisted for about 5 days when he had onset of chills, followed by high fever and profuse sweats. He attributed his symptoms to "flu" but noted that they recurred almost each evening between 5 and 7 p.m. At these times he would have to lie down in his truck and cover himself with blankets. By morning he usually felt well enough to continue his trucking. On October 20 he felt so ill that he decided to return to San Bernardino. Enroute home on October 21 he vomited blood and experienced abdominal pain on his left side. He was seen that day by his family doctor who prescribed antacids and antispasmodics, pending a gastrointestinal workup. The following day he went to the emergency room of Loma Linda University Medical Center where a diagnosis of malaria was made when a laboratory technologist identified Plasmodium vivax while doing a routine complete blood count (confirmed by the State's Microbial Diseases Laboratory). In the hosptial, he was found to have hematuria, duodenal ulcers and anemia. A computer-assisted tomographic scan of his abdomen showed small splenic hematomas and infarctions. He was treated with antimalarials (chloroquine phosphate and primaquine) and had prompt resolution of his initial symptoms.

An investigation of possible sources of the patient's malaria showed that he had never received blood or blood product transfusions, had never used I.V. drugs or shared needles, had never been in military service, nor had he ever traveled in countries with endemic mosquito-transmitted malaria (in 1975 he had momentarily stepped across the Mexico-California border at Tijuana). His last travel outside California was a brief vacation to Arkansas in November 1979.

To help ascertain where he had become infected, the patient provided a detailed travel history aided by information recorded in his daily diary and hauling invoices. The patient drove and slept alone in his truck. He had traveled several thousand miles among more than 20 vineyards and wineries in 11 counties of the San Joaquin and Sacramento Valleys, and Napa and Sonoma Counties, before onset of his illness. The distance between the southernmost county (Kern) and the northernmost county (Glenn) was about 250 miles. The patient's usual routine was to arrive at a vineyard during the night, sleep in his unscreened truck sleeper cab until dawn, load the grapes, and deliver them to a winery. He received many mosquito bites during that time.

The State's Vector Biology and Control Section performed an extensive survey along the patient's routes which included review of weekly mosquito surveillance reports for the period August 24 to October 11, 1981, contacts with local health and mosquito abatement agencies, and field visits. Of the 14 areas visited by the patient, 8 showed no Anopheles freeborni or A. punctipennis; 5 showed trace activity (0.01 to 0.08 Anopheles females per trap night); and only the light trap near Artois in Glenn County showed significant activity (15.28 Anopheles freeborni females per trap night). Qualitative observations by mosquito abatement district workers who lived in the Artois area corroborated the light trap data. Inspection of the ranch near Artois,

which was visited 6 times by the patient (September 9,10,11,12,18, and 19), showed that anophelines would have been abundant on those dates. Also, recorded temperatures there were compatible with the requirements for the development of P. vivax in A. freeborni or A. punctipennis. Rice fields are as close as 1 mile away (rice fields are a favored habitat of A. freeborni). The rice fields in this area would have been drained between late August and mid-September, resulting in increased anopheline activity at that time. Many farm workers, recent immigrants from malarious areas of India, Mexico and possibly Central America, worked and lived near the Artois vineyard and in the orchards and farms along Interstate 5 in Glenn County. Also, several Cambodian families, newly arrived from Southeast Asia during August and September, were living in a town 4 miles north of the Artois vineyard.

A survey of emergency rooms, hospitals, and physicians by local health officers for unreported cases of malaria, failed to reveal any other suspect cases of mosquito-transmitted malaria in areas where the patient had traveled. Several other truckers hauling grapes from the same vineyard in Artois denied any illness in September and October. Review of the other 742 cases of malaria reported to the California Department of Health Services in 1980 also failed to reveal any other suspect local mosquito-borne malaria infections (imported from endemic areas, 739; transfusion-associated, 2; congenital, 1).

It is likely that the patient acquired his vivax malaria by the bite of an infected Anopheles mosquito in the western corridor of the Sacramento Valley. The most probable place of exposure would have been in the vicinity of the Artois vineyard in Glenn County or along his southward route on Interstate 5 through Colusa and Yolo counties, where there are also many rice fields, abundant A. freeborni, and a large number of seasonal farm workers from the endemic malaria areas of Mexico and India. (Reportedly, no recent immigrants or nationals from malaria endemic countries were employed at the Artois ranch. Employees present at the ranch denied malaria in the past or recent febrile illnesses.) No cases of malaria were reported in Glenn County residents for all of 1980. However, 61 documented cases of imported vivax malaria (all in immigrants from India and Indochina who may have commuted to work in the Artois area) were reported from adjacent Yolo, Sutter, and Butte counties in 1980. It is also possible that infected immigrant farm workers with subclinical parasitemias or with unrecognized mild clinical malaria could have infected mosquitoes which bit the patient.

The patient worked at the vineyard in Artois and traveled through the malaria-receptive counties of Glenn, Colusa, and Yolo only in the 13 to 23 days before the onset of his illness, an interval compatible with the usual incubation range of 10 to 40 days for vivax malaria (average 14 days).

(Reported by A.F. Taylor, M.P.H., S. Gaspers, P.H.N, L.E. Mahoney, M.D., San Bernardino County Health Department; T. Rowsell, M.D., Loma Linda University Medical Center; L.E. Pine, R.S., D. Dragoni, M.D., Glenn County Health Department; K. Whitesell, Glenn County Mosquito Abatement District, J. Buckingham, Diablo Valley Mosquito Abatement District; G. Grodhaus, E.E. Lusk, R. Yescott, D. Womeldorf, Vector Biology and Control Section; R.R. Roberto, M.D., Infectious Disease Section, California Department of Health Services; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

VII. MALARIA DEATHS AND COMPLICATIONS IN THE UNITED STATES

A. Malaria Deaths

One death due to malaria was reported in the United States in 1980. The victim was an American civilian who went to Sierra Leone without taking any malaria chemoprophylaxis. In addition, 1 unreported death in 1979 is included here (Case 7, page 14) bringing the total number of deaths in the United States to 3 for 1979.

Case 1 - A 66-year-old woman who spent 2 weeks in Sierra Leone, December 26, 1979, to January 4, 1980, was brought to a hospital emergency room in Carson City, Nevada, on January 13, with a history of diarrhea, excessive fatigability, vomiting, fever, and chills. Watery diarrhea developed in the patient 3 days before she left Africa. When she came back to the United States, nausea and vomiting associated with fever and chills developed. The initial clinical diagnosis was shigellosis, and the patient was treated with I.V. fluids and ampicillin. Blood cultures and malaria smears done on the first day of hospitalization were negative. On the third hospital day, P. falciparum malaria was identified on her blood smears. The patient was given quinine, pyrimethamine, and gantrisin. The patient rapidly developed cinchonism with decreased hearing and gastrointestinal upset, and her renal status deteriorated. On the sixth hospital day, chloroquine was started. At the same time she developed a bleeding diathesis. Renal failure and bleeding problems worsened and were later associated with respiratory decompensation and profound acidosis. On January 24, arrangements were made to transfer her to another hospital for further management, but she went into cardiac arrest that morning. The patient was promptly resuscitated; however, she developed further complications such as perforated duodenal ulcer, subdural empyema, respiratory failure, and sepsis to which she finally succumbed.

(Reported by D.C. Johnson, M.D., Washoe Medical Center, Reno, Nevada; R.T. Bagett, M.D., Carson Tahoe Hospital, Carson, Nevada; and Parasitic Diseases Division, Center for Infectious Diseases, CDC.)

B. Malaria Complications

Complications of malaria, aside from death, were reported in 129 persons in 1980 (Table 16).

Table 16 Malaria Cases by Complications and Species of Infecting Organism, United States, 1980

	PLASMODIUM SPECIES						
Complications	vivax	falciparum	malariae	ovale	Mixed	Undetermined	To
Hemolysis	67	28	5	0	0	2	1
Cerebral	1	7	0	0	1	0	
Renal	5	3	0	0	0	0	
Others	10	0	0	0	0	0	
TOTAL	83	38	5	0	1	2	1

VIII. REPORT FROM THE NATIONAL MALARIA REPOSITORY, 1980

The presence of *Plasmodium* species or agreement that there were no parasites present was confirmed in blood films from 264 patients submitted to the National Malaria Repository in 1980. In 1 case the film was submitted as *P. falciparum*, and the smear was read as negative at CDC. One specimen submitted as negative was read as positive for *P. falciparum* at CDC. In 6 cases the species diagnosis of the National Malaria Repository differed from that of the institution submitting the slide. The origin and species diagnosis of malaria smears examined by the repository are shown in Tables 17 and 18.

Table 17 Malaria Cases by Institutions Submitting Positive Slides to the National Malaria Repository*, United States, 1978-1980

Cumulative	Army	Navy	Air Force	VA Hosp.	Health Agency	Other Hospitals, Clinics, Physicians, etc.	Total
Cumulative total positive 1980	0	2	1	2	172	27	204
Cumulative total positive 1979	0	1	0	1	89	44	135
Cumulative total positive 1978	0	0	4	1	94	48	147

Table 18 Malaria Cases by *Plasmodium* Species Identified by National Malaria Repository*, United States, 1978-1980

Species	1980	1979	1978	1977
P. vivax	145	72	79	73
P. falciparum	35	43	44	34
P. malariae	3	6	4	1
P. ovale	9	8	9	2
Plasmodium sp.	12	6	11	10
Negative	60	95	70	61
Total	264	230	217	181
Cumulative positive	204	135	147	120

*CDC

IX. PREVENTION OF MALARIA

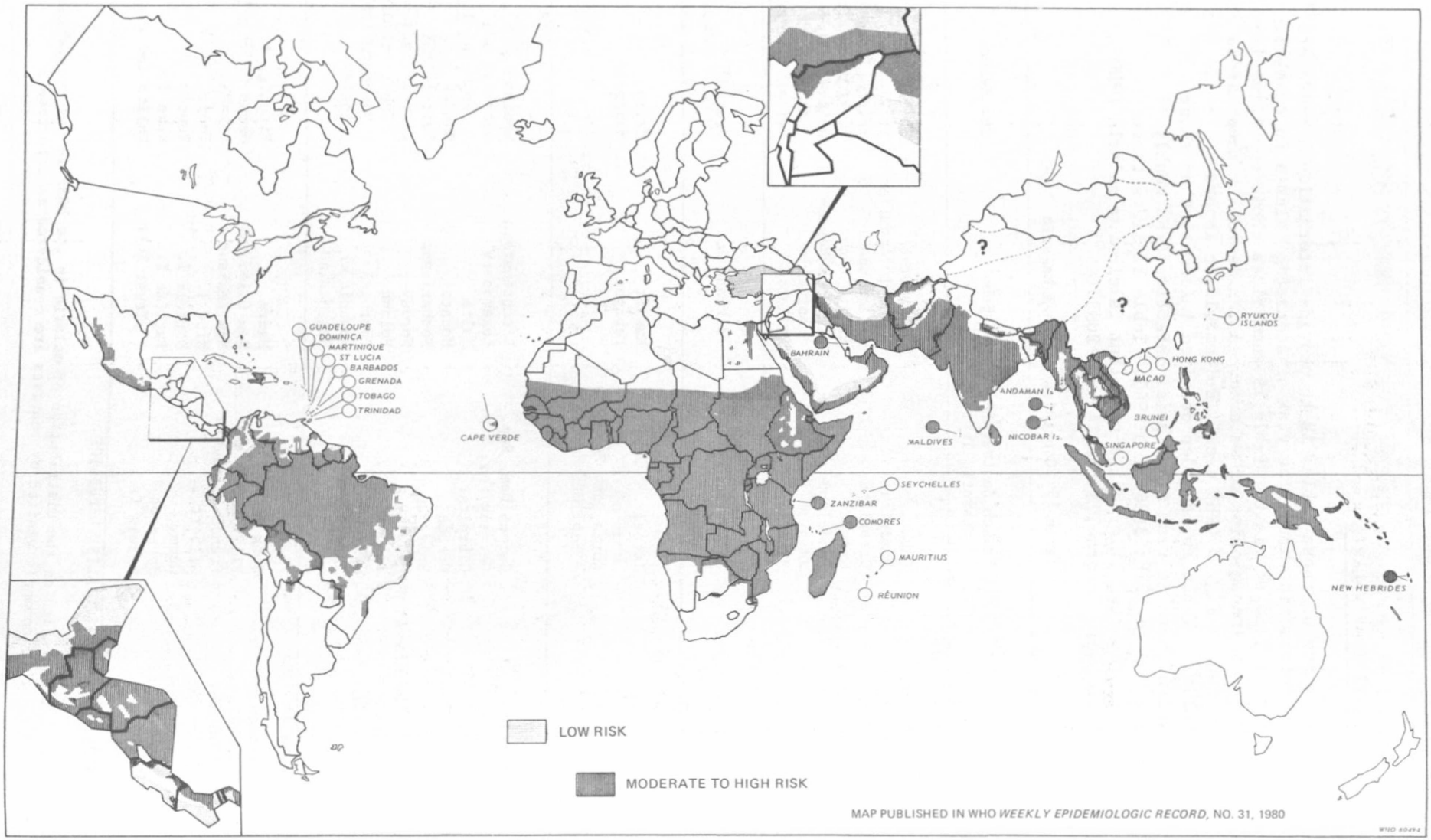
The purpose of these tables is to provide international travelers with current information about the risk of acquiring malaria in areas of the world they intend to visit. Table 19 summarizes those countries in which there is no transmission of malaria. A map depicting these areas of risk is shown in Fig. 3 (WHO Weekly Epidemiologic Record 1980;55(31):236). Table 20 provides detailed information on those countries where there is risk of malarial infection (WHO Weekly Epidemiologic Record 1978;53(26):190-196). Table 21 lists those countries with reported chloroquine-resistant falciparum malaria (WHO Weekly Epidemiologic Record 1981;56(26):201-208).

Table 19 Countries or Areas Malaria Free

AFRICA			
Chagos Arch.	French Southern and Antarctic Terr.	Lesotho	St. Helena
AMERICA, NORTH			
Antigua	Cuba	Montserrat	St Pierre and Miquelon
Bahamas	Dominica	Netherl. Antilles	St Vincent
Barbados	Greenland	Panama Canal Zone	Trinidad and Tobago
Bermuda	Grenada	Puerto Rico	Turks and Caicos I.
Brit. Virgin I.	Guadeloupe	St Kitts-Nevis-Anguilla	United States of America
Canada	Jamaica	St Lucia	United States Virgin I.
Cayman I.	Martinique		
AMERICA, SOUTH			
Brit. Antarctic Terr.	Chile	Falkland I.	Uruguay
ASIA			
Brunei	Israel	Kuwait	Macao
Cyprus	Japan	Lebanon	Mongolia
Hong Kong	Korea Dem. People's Rep. of		
EUROPE			
Albania	German Dem. Rep.	Liechtenstein	Spain
Andorra	Germany Fed. Rep.	Luxembourg	Svalbard and Jan Mayen I.
Austria	Gibraltar	Malta	Sweden
Belgium	Greece	Monaco	Switzerland
Bulgaria	Holy See	Netherlands	United Kingdom of Great Britain and Northern Ireland
Czechoslovakia	Hungary	Norway	Yugoslavia
Denmark	Iceland	Poland	
Faroe I.	Ireland	Portugal	
Finland	Isle of Man	Romania	
France	Italy	San Marino	
OCEANIA			
American Samoa	Cook I.	Nauru	Pitcairn I.
Australia	Fiji	New Caledonia	Samoa
Canton and Enderbury I.	French Polynesia	New Zealand	Tokelau I.
Christmas I. (Australia)	Gilbert I.	Niue I.	Tonga
Cocos	Guam	Norfolk I.	Tuvalu
	Johnston I.	Pacific I. (Trust Terr.)	Wake I.
	Midway I.		Wallis and Futuna I.
UNION OF SOVIET SOCIALIST REPUBLICS			

Offical information on the distribution of malaria in the USSR is not available. However, areas commonly visited by tourists are considered malaria free.

AREAS OF RISK FOR MALARIA TRANSMISSION, DECEMBER 1978



MAP PUBLISHED IN WHO *WEEKLY EPIDEMIOLOGIC RECORD*, NO. 31, 1980

Table 20. INFORMATION ON COUNTRIES WITH MALARIA RISK

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Afghanistan	All	Yes	May-Nov	2,000	None
Albania	None				
Algeria	Ouargla Wilaya (Dept in East-Central region) Ouedel-Areb (Annaba Wilaya, extreme Northeast corner of Country).	No	May-Nov	All	None
American Samoa	None				
Angola	All	Yes	All	All	None
Antigua	None				
Argentina	Small area near border with Bolivia[1]	No	Oct-May	1,200	None
Australia	None				
Austria	None				
Azores	None				
Bahamas	None				
Bahrain	All	Yes	All	All	None
Bangladesh	All except Dacca City	Yes	All	All	Areas bordering States of Assam Meghalaya, Tripura, and Mizoram, India; and Burma
Barbados	None				
Belgium	None				
Belize	All except Belize Dist.	No	All	400	None
Benin	All	Yes	All	All	None
Bermuda	None				
Bhutan	All except Chirang, Sanchi	No	All	1,600	None
Bolivia	All[2]	No	All	2,000	None
Botswana	Northern part of country (North of 21° S)	Yes	Nov-May	All	None
Brazil	Acre State, Territories of Amapa, Rodonia, Roraima; parts of rural areas of States of Amazonas, Bahia, Espirito Santo, Goias, Maranhao, Mato Grosso, Minas Gerais, Para, Parana, Piaui, and Santa Catarina	No[3]	All	900	States in interior of country and Espirito Santo State (coastal area north of Rio de Janeiro)
Brunei	None				
Bulgaria	None				
Burma	All	Yes[4]	Apr-Dec	1,000	All malarious areas

*Meter = approximately 3.3 ft

[1] Rural areas of Departments of Iruya, Oran, San Martin, Santa Victoria (northern Salta Prov.) and eastern Ledesma (Jujuy Prov.)

[2] Except no risk in Provinces of LaPaz, Oruro, and Potosi.

[3] Except risk exists in urban areas in Amazon River region.

[4] Except Rangoon and urban areas of Mandalay, Magwe, Pegu, Sagaing, and Tenasserim Divisions.

Table 20. INFORMATION ON COUNTRIES WITH MALARIA RISK (Continued)

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Burundi	All	Yes	All	All	None
Cameroon, United Republic of	All	Yes	All	All	None
Canada	None				
Canal Zone	None				
Canary Islands	None				
Cape Verde	Parts of rural areas of Concelho de Santa Cruz (Sao Tiago Island)	No	All	?	None
Cayman Islands	None				
Central African Republic(formerly Central African Empire)	All	Yes	All	All	None
Chad	All	Yes	Jul-Nov	All	None
Channel Islands	None				
Chile	None				
China, People's Republic of	Parts of Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shangdong, Sichuan, Yunnan, Xingjiang, and Zhejiang Proviences/ autonomous regions[5]	?	North of 33°N: Jun-Oct; 25°N-33°N: May-Dec; South of 25°N: All	?	Parts of Provinces of Guangdon (including Hainan Island), Guangxi, and Yunnan, adjacent to Burma, Lao People's Democratic Republic, and Vietnam
China, Republic of (Taiwan)	None				
Christmas Island (Indian Ocean)	None				
Colombia	In general, all except Bogota and vicinity[6]	No	All	800	All malarious areas except along the West (Pacific) Coast
Comoros	All	Yes	All	All	None
Congo	All	Yes	All	All	None
Cook Islands	None				
Costa Rica	Rurals areas of Alajuela, Guanacaste, and Puntarenas Provinces	No	All	500	None
Cuba	None				
Cyprus	None				

*Meter = approximately 3.3 ft

[5] See map on page 22. Travelers visiting cities and popular rural sites on usual tourist routes are not at risk. Travelers on special scientific educational, or recreational visits should check whether their itinerary includes areas of risk.

[6] Risk exists in rural areas of Urbaa(Antioquia, Choco Dept); Bajo Cauca-Nechi (Cauca, Antioquia Dept); Magdalena Medio, Caqueta (Caqueta Intendencia); Sarare (Arauca Intendencia); Catatumbo (Norte de Santander Dept), Pacifico Central & Sur, Putumayo (Putumayo Intendencia); Ariari (Meta Dept); Alto Vaupes (Vaupes Comisaria).

Table 20. INFORMATION ON COUNTRIES WITH MALARIA RISK (Continued)

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Czechoslovakia	None				
Democratic Kampuchea (formerly Cambodia)	Yes	Yes	All	All	Whole country[7]
Denmark	None				
Djibouti (formerly Afars and the Issas, French Territory of the)	All	?	?	?	None
Dominica	None				
Dominican Republic	In general, areas bordering Haiti[8]	No[9]	All	400	None
Ecuador	In general, all except Quito, its vicinity, and Galapagos Islands[9]	No[10]	All	1,500	Provinces in interior of country bordering Colombia
Egypt	Nile Delta, El Faiyum area, the oases, and part of southern (upper) Egypt	No	Jun-Oct	All	None
El Salvador	All	No	All	1,000	None
Equatorial Guinea	All	Yes	?	All	None
Ethiopia	All	Yes	All	2,000	None
Falkland (Malvinas) Islands	None				
Faroe Islands	None				
Fiji	None				
Finland	None				
France	None				
French Guiana	All except Cayenne City	Yes	All	All	Isolated reports
French Polynesia (Tahiti	None				
Gabon	All	Yes	All	1,000	None
Gambia	All	Yes	All	All	None
German Democratic Republic (East)	None				
Germany, Federal Republic of (West)	None				
Ghana	All	Yes	All	All	None
Gilbraltar	None				
Greece	None				
Greenland	None				
Grenada	None				
Guadeloupe	None				
Guam	None				

*Meter = approximately 3.3 ft

[7] Resistance to pyrimethamine-sulfadoxine is also possible.

[8] Municipios of Pedernales (Pedernales Prov), Elias Pina, El Llano, Banica (Elias Pina Prov), Dajabon, Partido (Dajabon Prov), Pepillo Salcedo (Monte Cristi Prov).

[9] Risk exists in Provinces of Esmeraldas, Guayas, Manabi and El Oro; rural areas of Provinces of Babahoyo, Guayaquil, Machala, Manta, Morona Santiago, Napo, Portoviejo, Puyo, and Zamora Chinchipe.

[10] Except Esmeraldas, Guayas, Manabi and El Oro Provinces.

Table 20. INFORMATION ON COUNTRIES WITH MALARIA RISK (Continued)

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Guatemala	In general, all except Guatemala City and central highlands[11]	Yes	Jun-Nov[12]	1,500	None
Guernsey, Alderney, and Sark	None				
Guinea	All	Yes	All	All	None
Guinea-Bissau	All	Yes	All	All	None
Guyana	In general, all except coastal areas from Georgetown to New Amsterdam; Essequibo River delta and islands[13]	No	All	900	Areas in interior of country
Haiti	All	Yes	All	300	None
Honduras	All except Ocotepeque Dep.	No	All[14]	1,000	None
Hong Kong	None				
Hungary	None				
Iceland	None				
India	All	Yes	All	All	State of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, and Tripura[15]
Indonesia	All except cities of Djakarta and Surabaya and vicinities	Yes	All	1,200	East Kalimantan (Island of Borneo), Irian Jaya (Island of New Guinea)
Iran	All except Provinces of East and West Azerbaijan, Gilan, Isfahan, Khorasan, Mazandaran, Semnan, Yazd, Zanjan, and parts of Provinces of Hamadan, Kerman, Kordestan, and Teheran	No	Jul-Nov	1,500	None
Iraq	Northern region: Dahuk Erbil, Kirkuk, Ninawa, Sulaimaniya provinces	Yes	May-Nov	1,500	None
Ireland	None				
Isle of Man	None				
Israel	None				
Italy	None				

*Meters = approximately 3.3 ft

11 Risk exists in rural and urban areas of Departments of Alta Verapaz, Huehuetenango, Izabal, Jutiapa, Retalhuleu; rural areas of Departments of Baja Verapaz, Chiquimula, Escuintla, Jalapa, El Peten, El Progreso, El Quiche, Santa Rosa, Schitpequez, Zacapa; Cities of San Martin Jilotpeque (Chimaltenango Dept), Coatepeque (Quelzaltenango Dept), Malacatan, and Ocos (San Marcos Dept).

12 Risk during all months in northeastern part of country.

13 Risk exists in Northwest and Rupununi Regions.

14 Risk exists from May-Dec in Departments of Copan, Intibuca, La Paz, Lempira, and Olancho.

15 Except for Orissa State, these areas are north and east of Bangladesh where foreign tourists are not permitted to travel.

Table 20. INFORMATION ON COUNTRIES WITH MALARIA RISK (Continued)

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Ivory Coast	All	Yes	All	All	None
Jamaica	None				
Japan	None				
Jersey	None				
Jordan	Rural areas of the Jordan River Valley and the Kerak lowlands	No	Apr-Nov	All	None
Kenya	All[16]	Yes[17]	All	2,500	Isolated reports[18]
Kiribati (formerly Gilbert Islands)	None				
Korea, Democratic People's Republic of (North)	None				
Republic of (South)	None[19]				
Kuwait	None				
Lao People's Democratic Republic	All except Vientiane	Yes	All	All	All malarious areas
Lebanon	None				
Lesotho	None				
Liberia	All	Yes	All	All	None
Libyan Arab Jamahiriya (formerly Libyan Arab Republic)	Southwest quarter of the country	No	Feb-Aug	All	None
Liechtenstein	None				
Luxembourg	None				
Macao	None				
Madagascar (Malagasy Republic)	All[20]	Yes	Sep-Mar	1,100	None
Madeira	None				
Malawi	All	Yes	All	All	None
Malaysia	All[21]	No	All	1,700	All malarious areas
Maldives	All except Male Island	Yes	All	All	None
Mali	All	Yes	All	All	None
Malta	None				
Martinique	None				
Mauritania	Yes	?	?	?	None
Mauritius	All	?	?	?	None

*Meters = approximately 3.3 ft

[16] Normally no risk in highlands above 2,500 m of Central, Rift Valley, Eastern, Nyanza, and Western Provinces.

[17] Except city of Nairobi.

[18] A few cases have been documented; however, for prophylaxis chloroquine is still the drug of choice.

[19] No cases reported since 1978. Previous risk existed in whole country during May-Oct at all altitudes except north and north-east border areas.

[20] Except no risk in sous-prefectures Ambatolampy, Ambohidratrimo, Andramasina, Antanifotsi, Antsirabe, Arivonimamo, Faratsiho, Manjakandriana, Tananarive, Tananarive-Banlieue.

[21] Except no risk in most of the coastal areas of Malaya Peninsula and Sarawak.

Table 20. INFORMATION ON MALARIA RISK BY COUNTRY (Continued)

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Mexico	States of Campeche, Chiapas, Guerrero, Michoacan, Nayarit, Oaxaca, Quintana Roo, Tabasco, Veracruz (eastern part), Yucatan[22]	No	All	1,000	None
	Morelos State, parts of states of Chihuahua, Dunargo, Jalisco, Puebla, and Sinaloa. Alamos City in Sonora State.	No[23]	May-Oct	1,000	None
Monaco	None				
Mongolia	None				
Montserrat	None				
Morocco	Rural areas of Khemisset Province and certain rural areas of Provinces of Kenitra and Tata	No	May-Oct	?	None
Mozambique	All	Yes	All	All	None
Namibia	Yes	?	?	?	None
Nauru	None				
Nepal	All[24]	No	All	1,200	None
Netherlands	None				
Netherlands Antilles	None				
New Caledonia and Dependencies	None				
New Hebrides (see Vanuatu)					
New Zealand	None				
Nicaragua	All except urban areas	No[25]	May-Dec	1,000	None
Niger	All	Yes	All	All	None
Nigeria	All	Yes	All	All	None
Niue	None				
Norway	None				
Oman	All	Yes	All	All	None
Pacific Islands, Trust Territory of the USA	None				
Pakistan	All	Yes	All	All	None
Panama	Rural areas of Provinces of Darien, Bocas del Toro, and Colon; Districts of Santa Fe (Veraguas Province), Chepo, and Chiman (Panama Province); Comarca de San Blas	No	All	800	All malarious areas east of Canal Zone including San Blas Islands
Papua New Guinea	All	Yes	All	All	All

*Meters = approximately 3.3 ft

[22] Except no risk in major tourist resort developments along Pacific and Gulf coasts.

[23] Except city of Alamos in Sonora State.

[24] Primarily Terai District and all hill districts below 1,200 meters.

[25] Except risk exists in outskirts of towns of Chinan, Leon, Granada, Managua, Nandaine, and Tipitapa.

Table 20. INFORMATION ON MALARIA RISK BY COUNTRY (Continued)

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Paraguay	In general, area bordering Brazil[26]	No	Oct-May	All	None
Peru	In general, all except Lima and vicinity and coastal area south of Lima[27]	No	All	1,500	None
Philippines	All except: Provinces of Catanduanes, Cebu, Leyte, Misamis Occidental; part of Bohol Province; and plains areas of islands of Negros and Panay	No	All	600	Luzon Island, Basilan Island, and Sulu Archipelago, Mindoro Island, Palawan Island
Pitcairn Island	None				
Poland	None				
Portugal	None				
Puerto Rico	None				
Qatar	Doha (Ad Dawha)	Yes	Mar-May Sep-Nov	All	None
Reunion	None				
Rhodesia (see Zimbabwe)					
Romania	None				
Rwanda	All	Yes	All	All	None
Ryukyu Islands	None				
Saint Helena	None				
Saint Kitts-Nevis-Anguilla	None				
Saint Lucia	None				
Saint Pierre and Miquelon	None				
Saint Vincent	None				
Samoa	None				
Sao Tome and Principe	Yes	?	?	?	None
Saudi Arabia	All except Alhasa, Arar, Jauf, Quraiya (Gurayyat), Riyad, Tabuk, Taif	Yes[28]	All	All	None
Senegal	All	Yes	All[29]	All	None

*Meters = approximately 3.3 ft

[26] Rural parts of Amambay, Canendiyu, and Alto Parana Departments.

[27] Risk exists in rural areas of Departments of Amazonas, Cajamarca (except Hualgayoc Province) La Libertad (except Otuzco, Santiago de Chuco Provinces), Lambayeque, Loreto, Piura (except Talara Province), San Martin and Tumbes; Provinces of Santa (Ancash Dept); parts of La Convencion (Cuzco Dept), Tayacaja (Huancavelica Dept). Satipo (Junin Dept).

[28] Except urban areas of Jeddah, Mecca, Medina, Qatif.

[29] Dakar: risk exists Jul-Dec; Cap-Vert: risk is less from Jan-Jun.

Table 20. INFORMATION ON MALARIA RISK BY COUNTRY (Continued)

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Seychelles	None				
Sierra Leone	Yes	All	All	All	None
Singapore	Rurals areas on northern part of main island, Changi Village, offshore islands	No	All	All	None
Solomon Islands	All except some eastern and southern outlying islands	Yes	All	400	None
Somalia	All	Yes[30]	All	All	None
South Africa	In general, areas bordering Botswana Mozambique, Zimbabwe[31]	Yes	All	1,200	None
Spain	None				
Spanish Sahara	None				
Sri Lanka (formerly Ceylon)	In general, all except Colombo[32]	Yes	All	800	None
Sudan	All	Yes	All	All	None
Surinam	All except Paramaribo District and coastal areas North of 5° N	No	All	All	All malarious areas
Swaziland	Northern border areas: Bordergate, Lomahasha, Mhlume, and Tshaneni	Yes	Dec-Mar	All	None
Sweden	None				
Switzerland	None				
Syrian Arab Republic	All except Districts of Deir-es-zor, Hama, el Hasakeh, Homs, Latakia, Sweida, Tartus	No	May-Oct	600	None
Tanzania, United Republic of	All	Yes	All	All	Isolated reports[33]
Thailand	All	No	All	All	All malarious areas[34]
Togo	All	Yes	All	All	None
Tonga	None				
Trinidad and Tobago	None				
Tunisia	Northern rural areas	No	May-Nov	All	None
Turkey	Cukorova/Amikova areas and southeast Anatolia	Yes	Mar-Oct	All	None
Tuvalu	None				
Uganda	All	Yes	All	1,800	None

*Meters = approximately 3.3 ft

[30] Mogadishu: very low risk.

[31] Risk exists in north, east, and western low altitude areas of Transvaal and in Natal coastal areas north of Richards Bav.

[32] Risk exists in Districts of Amparai, Anuradhapura, Batticaloa, Hambantota, Jaffna, Kandy, Kegalle, Kurungala, Mannar, Natale, Matara, Moneragala, Polonnaruwa, Puttalam, Ratnapura, Trincomalee, Vavuniya, and parts of Badulla and Nuwar Eliya Districts.

[33] A few cases have been documented; however, for prophylaxis, chloroquine is still the drug of choice.

[34] Resistance to pyrimethamine-sulfadoxine documented in refugee camps in eastern part of country near border with Democratic Kampuchea.

Table 20. INFORMATION ON MALARIA RISK BY COUNTRY (Continued)

Country	Areas with risk	Risk in urban areas	Months of risk	Risk exists below given altitude (meters*)	Areas with known chloroquine resistant *P. falciparum*
Union of Soviet Socialist Republic	Few scattered areas adjacent to borders with Iran and Afghanistan[35]	?	?	?	None
United Arab Emirates (formerly Trucial Sheikhdoms)	All	Yes	All	All	None
United Kingdom	None				
United States of America	None				
Upper Volta	All	Yes	All	All	None
Uruguay	None				
Vanuatu	All except Futuna Island	Yes	All	All	None
Venezuela	In general, all except coastal area between Maracaibo and border and Guyana[36]	No	All	600	All malarious areas
Viet Nam	All except delta region in the north	?	?	?	All malarious areas
Virgin Islands (British)	None				
Virgin Islands (USA)	None				
Wake Island	None				
Yemen	All except Hajja and Sada Prov.	Yes	Sep-Feb	1,400	None
Yemen, Democratic	All except Aden and airport perimeter	Yes	All	All	None
Yugoslavia	None				
Zaire	All	Yes	All	All	None
Zambia	All	Yes	Nov-May	All	None
Zimbabwe (formerly Rhodesia)	Yes	?	?	?	None

*Meters= approximately 3.3 ft

[35] No risk in tourist sites.

[36] Areas with risk: Rural areas in parts of Terr. Fed. Amazonas, and States of Apure, Bolivar, Barinas, Merida, Tachira, and Zulia.

Table 21 Areas with Chloroquine-Resistant *P. falciparum* Malaria

Country	Name of Area
AFRICA	
Comoro Islands	Isolated reports
Madagascar	Isolated reports
Kenya	Isolated reports
Tanzania	Isolated reports
AMERICAS	
Brazil	States in interior of country; Espirito Santo State (coastal area north of Rio de Janeiro)
Colombia	All malarious areas
Ecuador	Provinces in interior of country bordering Colombia
French Guiana	Isolated reports
Guyana	Brazil-Guyana border area
Panama	All areas east of Canal Zone including San Blas
Surinam	All malarious areas
Venezuela	All malarious areas
ASIA	
Bangladesh	Border areas with Assam State, Meghalaya, Tripura, Mizoram, India, border areas of Burma
Burma	All malarious areas
China, People's Republic	Parts of Provinces of Guangdon (including Hainan Island, Guangxi, and Yunnan, adjacent to Burma, Laos, and Vietnam
Dem. Kampuchea	All malarious areas
India	Arunachal Pradesh, Assam State, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Tripura
Indonesia	East Kalimantan (Island of Borneo) Irian Jaya (Island of New Guinea)
Nepal	Isolated reports
Laos	All malarious areas
Malaysia	
West	All malarious areas
Sabah	All malarious areas
Papua New Guinea	All malarious areas
Philippines	Luzon Island, Brazilan Island and Sulu Archipelago, Mindoro Island, Palawan Island
Solomon Islands	All malarious areas
Thailand	All malarious areas
Vietnam	Widespread

Chemoprophylaxis of Malaria

All tourists who travel in a malarious area should use a prophylactic drug no matter how brief their visit. The drug of choice for most areas is chloroquine phosphate 500 mg (300 mg base) once a week beginning 1-2 weeks before entering the malarious area and continuing for 6 weeks after departure from the malarious area. The pediatric dose of chloroquine phosphate is 5 mg per kg (base) once a week. Alternatives to chloroquine phosphate, which are given at the same intervals as chloroquine, are hydroxychloroquine sulfate 400 mg (310 mg base) and amodiaquine hydrochloride 520 mg (400 mg base). These drugs will suppress a clinical attack of malaria. Primaquine phosphate can be used for terminal chemoprophylaxis, but it should not be given routinely. Its use depends on the intensity of exposure to malaria and on whether the patient is glucose-6-phosphate dehydrogenase (G6PD) deficient. The dose is 26.3 mg (15 mg base) a day for 14 days after the patient's last exposure. Subsidiary measures to reduce contact with night-biting mosquitoes include the use of insecticides, mosquito nets and screens, and long sleeves and trousers.

There are areas of the world in which malaria due to P. falciparum is resistant to chloroquine. These areas include parts of Asia and South America and are summarized in Table 20. A combination of pyrimethamine and sulfadoxine, a long-acting sulfonamide, has proven to be effective in the prevention of chloroquine-resistant P. falciparum malaria. This drug is not presently available in the United States, but it is marketed in other countries in a single tablet form, under the trade names Fansidar, Falcidar, or Methipox*. Administration of 2 tablets on alternate weeks during and for 6 weeks after exposure to malaria has been found to be effective in the prevention of chloroquine-resistant malaria. More information on the chemoprophylaxis of malaria may be found in the MMWR 1978;27(Suppl):81-90.

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*Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

X. MICROSCOPIC DIAGNOSIS OF MALARIA

Early diagnosis of malaria requires a high level of clinical suspicion and, in particular, the careful taking of a travel history from every patient with a fever of unknown origin. Once malaria is suspected, a Giemsa-stained smear of peripheral blood should be examined for the presence of parasites. Since the accuracy of diagnosis is dependent on the quality of the blood film, the following guide is offered for the proper preparation of thick and thin blood smears.

1. Manufacturers' "pre-cleaned" slides are not considered clean enough for use in malaria diagnosis. Before use, such slides should be washed in mild detergent, rinsed thoroughly in warm running water, then in distilled water, and dipped in ethyl alcohol (90% to 95%). Slides may then be wiped dry with a lintless cloth or tissue for immediate use or stored in 95% alcohol until needed.
2. The patient's finger should be cleaned with alcohol and wiped dry with a clean cloth or gauze.
3. After puncturing the finger with the blood lancet, allow a large globule of blood to form.
4. Place cleaned surface of slide against drop of blood and with a quick circular motion, make a film the size of a dime in the middle third of 1 end of the slide. Ordinary newsprint should be barely legible through such a wet drop (Fig. 4). (Excessive mixing or stirring with a second slide leads to distortion of blood cells and parasites.)
5. The finger should then be wiped dry and a small drop of blood gently squeezed from the puncture and placed at the edge of the middle third of the same slide (Fig. 5).
6. Apply a clean "spreader" slide to the edge of the small drop at a 45° angle and allow the blood to extend about two-thirds of the slide width; then keeping even contact, push the spreader forward along the slide. This will produce an even layer of red blood cells with a "feathering" at the lower edge (Fig. 6).
7. The blood film should be kept horizontal and protected from dust and insects while the thick film dries (minimum of 6 hours at room temperature)*.
8. Label the slide in the upper part of the thin film with the date and the name or initials of the patient as illustrated (Fig. 6).

*If a rapid diagnosis is desired, the thin and thick films may be made on separate slides. The thin film can be air dried, fixed with methyl alcohol, and stained immediately. If no parasites are found on the thin film, the thick film should be examined subsequently for rare organisms not detected on the thin preparation.

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Fig. 4

in all their phases. The importance of the examination of blood films for the presence of malaria parasites will be fully understood

Fig. 5

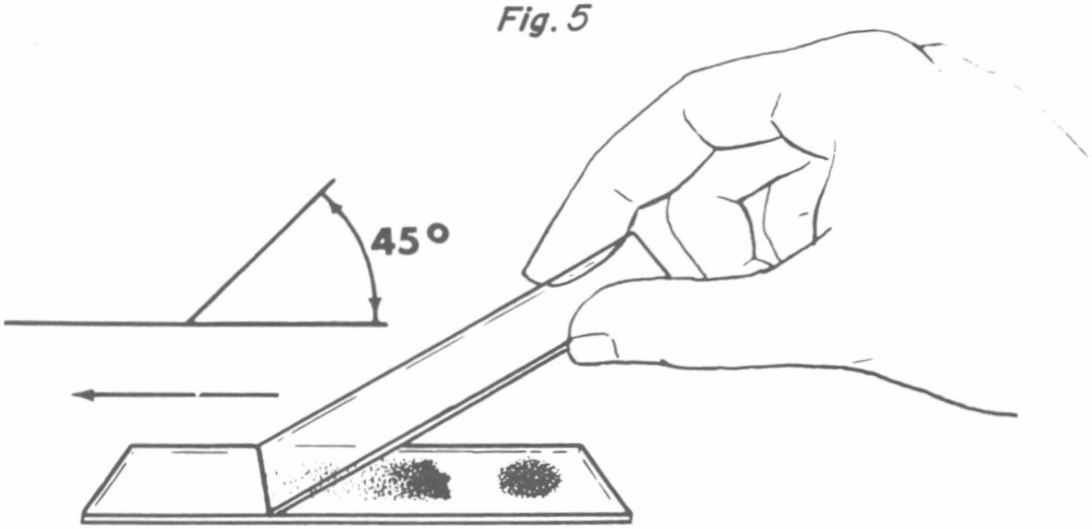
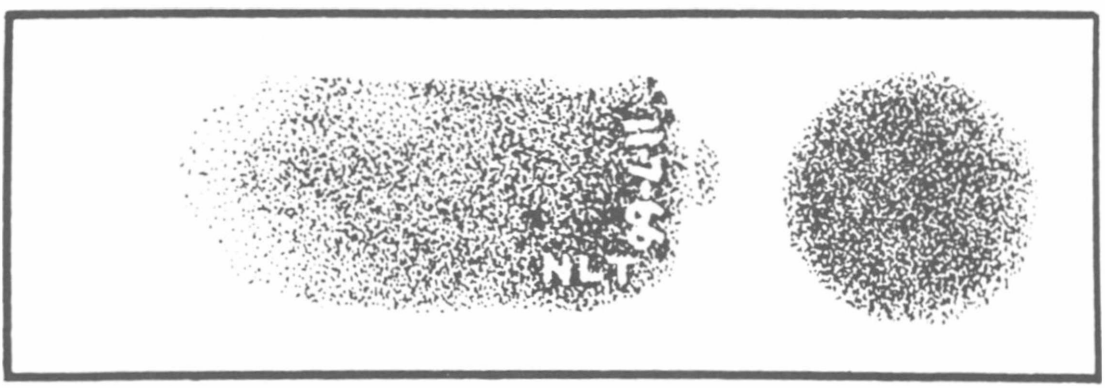


Fig. 6



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