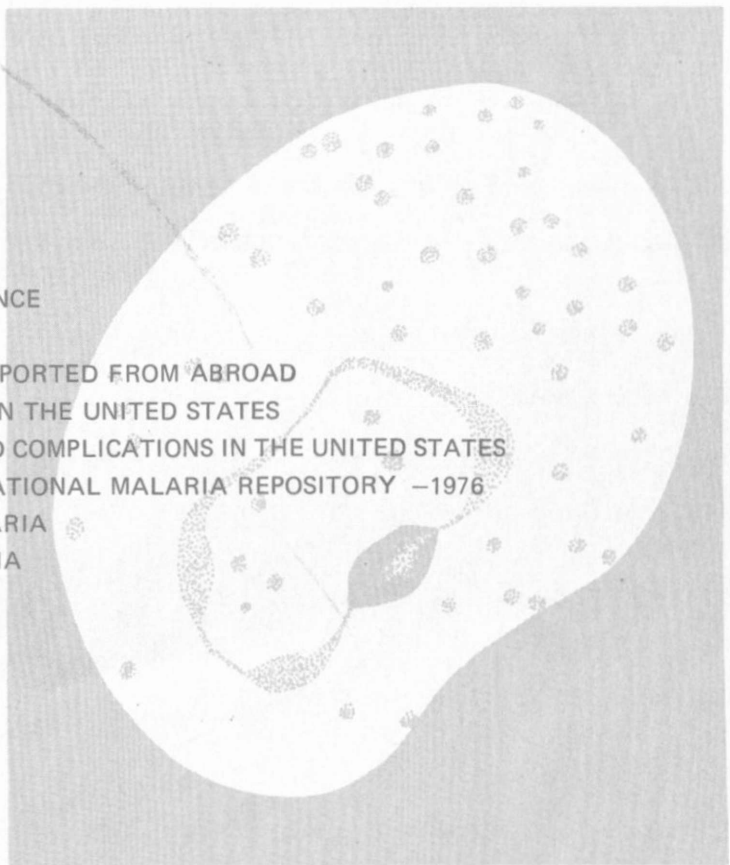
ANNUAL SUMMARY 1976
Issued September 1977

CENTER FOR DISEASE CONTROL

MALARIA

SURVEILLANCE



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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

PREFACE

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.

Contributions to the Surveillance Report are most welcome. Please address them to:

Center for Disease Control
Attn: Malaria Surveillance
Parasitic Diseases Division
Bureau of Epidemiology
Atlanta, Georgia 30333

SUGGESTED CITATION

Center for Disease Control: Malaria Surveillance Annual Summary 1976
Issued September 1977

*Through June 30, 1977

I. SUMMARY

In 1976, 406 cases of malaria were reported in the United States, a 9.9% decrease compared with the 447 cases reported in 1975. Only 5 cases (1% of all cases reported in the United States) were in military personnel in 1976, the smallest number since 1959. As in previous years, imported Plasmodium vivax infections were more common than P. falciparum (66.5% versus 20.2%).

In 3 instances infection was acquired in the United States: in 1 case infection was induced by transfusion and in 2 the disease was transmitted congenitally. Five deaths attributed to malaria were reported in 1976, compared with 4 in 1975. All deaths occurred in civilians; 4 patients were infected with P. falciparum, 1 patient with P. vivax. The P. falciparum malaria death-to-case ratio of 3.6% was higher than that in 1975 (0.9%), but did not differ significantly from the 10-year (1966-1975) ratio of 1.6%.

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

C. Induced

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

D. Relapsing

Renewal of clinical activity occurring after an interval from the primary attack greater than that due merely to periodicity.

E. Cryptic

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

III. GENERAL SURVEILLANCE

In the period January 1, 1976, through May 30, 1977, 406 cases* of malaria with onset in 1976 in the United States, Puerto Rico, and Guam were reported to the Parasitic Diseases Division, Center for Disease Control; this represents a 9.9% decrease over the number seen in 1975 when 447 cases were reported. As in 1975 most of the reported cases were in civilians. Although civilian cases decreased from 430 in 1975 to 401 in 1976, they comprised 99% of all cases diagnosed in this country (Table 1). Cases of malaria among military personnel continued to decline, a trend first noticed in 1971. The number of military cases fell from 17 in 1975 to 5 in 1976 and comprised only 1% of all cases of malaria diagnosed in this country compared with 4% in 1975 (Fig. 1).

Table 1
Military and Civilian Malaria Cases,
United States, 1959-1976*

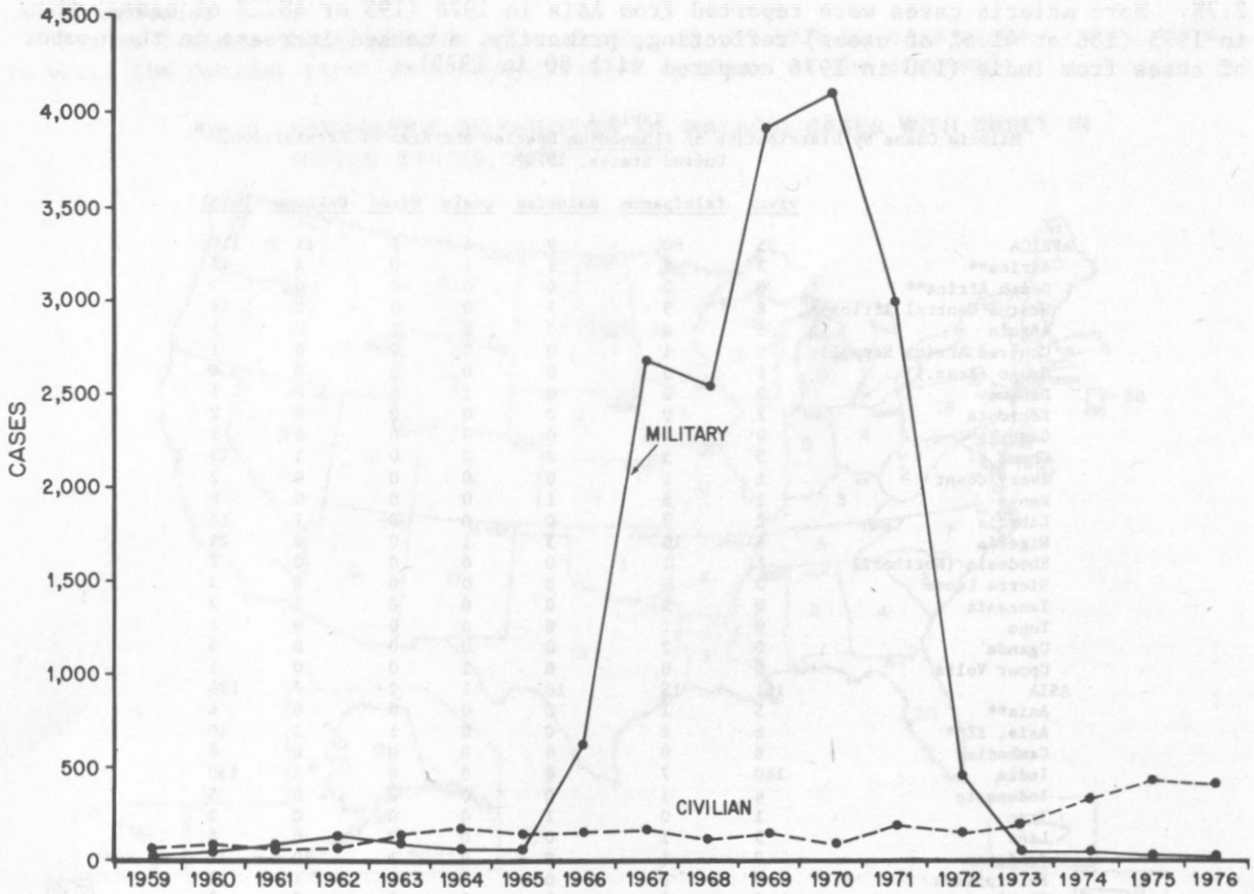
Year	Military	Civilian	Total
1959	12	38	50
1960	21	41	62
1961	45	37	83
1962	75	40	115
1963	58	90	148
1964	52	119	171
1965	51	105	156
1966**	621	143	764
1967**	2,699	158	2,857
1968**	2,567	130	2,697
1969**	3,914	145	4,059
1970**	4,096	151	4,247
1971**	2,975	205	3,180
1972**	454	160	614
1973**	41	175	216
1974**	21	302	323
1975**	17	431	448
1976	5	401	406

*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 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. A subsequent attack in the same individual 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, not additional cases. All cases included in this report were diagnosed as malaria on the basis of a positive peripheral blood smear examined in the local or state laboratory. Doubtful cases were referred to the National Malaria Repository, CDC.

Figure 1

MILITARY AND CIVILIAN CASES OF MALARIA, UNITED STATES, 1959-1976



In 3 of the 401 civilian cases and in none of the military cases, did patients acquire their infections in the United States. In 1 case P. falciparum malaria was induced by blood transfusion; in 2 other cases P. vivax infection resulted from congenital transmission.

In 1976 the ratios of cases caused by the various Plasmodium species generally showed little change from 1975 (Table 2).

Table 2
Malaria Cases by Plasmodium Species,
United States, 1976

Species	Total	Percent
P. vivax	269	66.5
P. falciparum	83	20.2
P. malariae	21	5.2
P. ovale	5	1.2
Mixed Infections	2	0.5
Undetermined	26	6.4
Total	406	100.0

The countries in which the 406 patients contracted malaria in 1976 are shown in Table 3. Asia accounted for 48.1% of cases, Africa for 29.1%, Central America and the Caribbean for 14.6%, North America for 4.4%, Oceania for 0.7%, and South America for 2.7%. More malaria cases were reported from Asia in 1976 (195 or 48.1% of cases) than in 1975 (186 or 41.6% of cases) reflecting, primarily, a marked increase in the number of cases from India (130 in 1976 compared with 80 in 1975).

Table 3
Malaria Cases by Distribution of Plasmodium Species and Area of Acquisition, United States, 1976*

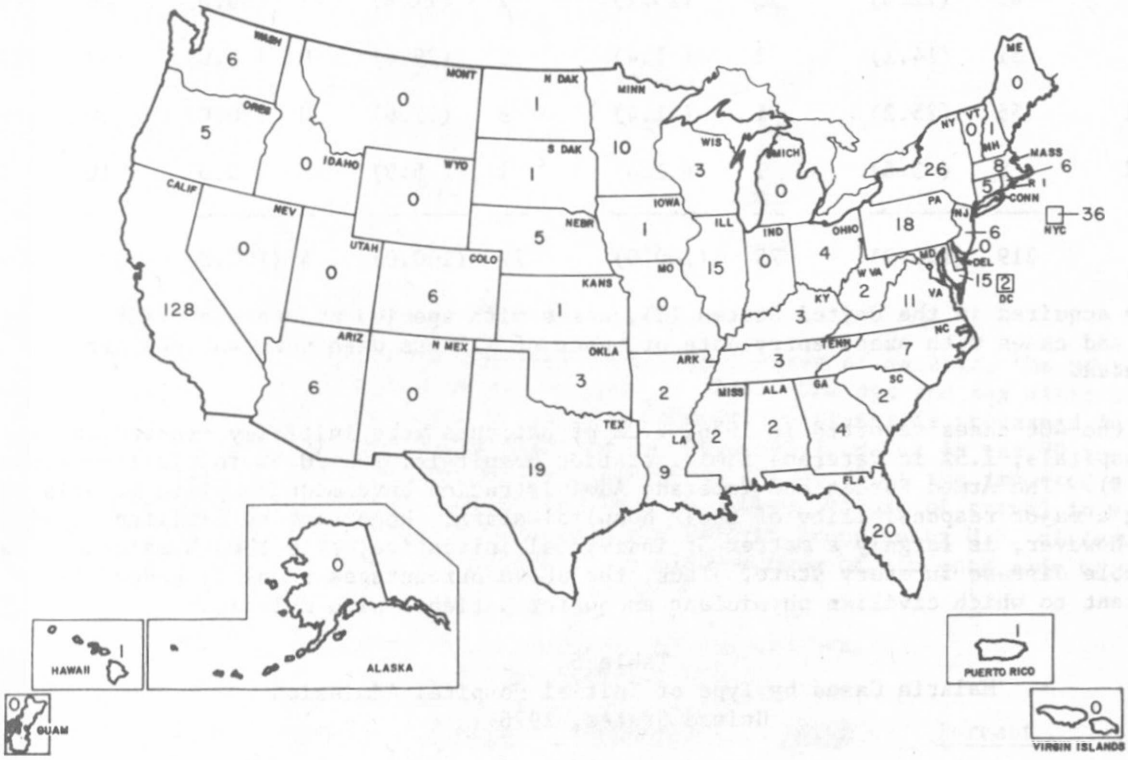
	vivax	falciparum	malariae	ovale	Mixed	Unknown	Total
AFRICA	35	60	9	4	0	11	119
Africa**	3	8	1	1	0	2	15
South Africa**	0	2	0	0	0	0	2
West & Central Africa**	8	9	2	0	0	0	19
Angola	1	0	0	0	0	0	1
Central Africa Republic	0	1	0	0	0	0	1
Congo (Braz.)	1	3	0	0	0	0	4
Dahomey	0	0	0	1	0	0	1
Ethiopia	2	0	0	0	0	0	2
Gambia	0	1	0	0	0	0	1
Ghana	5	5	2	0	0	1	13
Ivory Coast	1	1	0	0	0	0	2
Kenya	2	5	1	0	0	0	8
Liberia	2	7	0	0	0	1	10
Nigeria	6	13	3	1	0	6	29
Rhodesia (Northern)	1	1	0	0	0	0	2
Sierra Leone	3	0	0	0	0	0	3
Tanzania	0	1	0	0	0	1	2
Togo	0	1	0	0	0	0	1
Uganda	0	2	0	0	0	0	2
Upper Volta	0	0	0	1	0	0	1
ASIA	161	15	10	1	2	7	196
Asia**	5	1	0	0	0	0	6
Asia, SE**	6	2	0	0	1	1	10
Cambodia	8	0	0	0	0	0	8
India	110	7	8	0	0	5	130
Indonesia	4	1	0	0	0	0	5
Iran	1	0	1	0	0	0	2
Laos	5	1	0	0	0	0	6
Pakistan	9	1	0	0	1	0	11
Philippines	0	0	0	0	0	1	1
Thailand	6	0	1	1	0	0	8
Trucial Oman	0	1	0	0	0	0	1
Turkey	2	0	0	0	0	0	2
Vietnam	5	0	0	0	0	0	5
Yemen	0	1	0	0	0	0	1
CENTRAL AMERICA AND CARIBBEAN	51	4	0	0	0	4	59
Central America**	6	0	0	0	0	0	6
Costa Rica	1	0	0	0	0	0	1
El Salvador	18	0	0	0	0	1	19
Haiti	0	3	0	0	0	1	4
Honduras	3	0	0	0	0	0	3
Nicaragua	23	1	0	0	0	2	26
NORTH AMERICA	16	0	0	0	0	1	17
Mexico	14	0	0	0	0	0	14
United States	2	0	0	0	0	1	3
OCEANIA	1	1	0	0	0	1	3
Oceania**	0	0	0	0	0	1	1
New Guinea	1	1	0	0	0	0	2
SOUTH AMERICA	5	3	2	0	0	1	11
South America**	1	1	1	0	0	0	3
Brazil	3	0	0	0	0	0	3
Chile	0	1	0	0	0	0	1
Colombia	1	1	0	0	0	1	3
Surinam	0	0	1	0	0	0	1
EUROPE**	0	0	0	0	0	1	1
TOTAL	269	83	21	5	2	26	406

*Onset of illness in the United States, Puerto Rico, and Guam
**Country not specified

As in 1975 the largest number of cases from any single country were reported from India (130), comprising 32% of all reported cases in 1975. Of the imported cases a large number of patients acquired their infections in Nigeria (29), Nicaragua (26), and El Salvador (19).

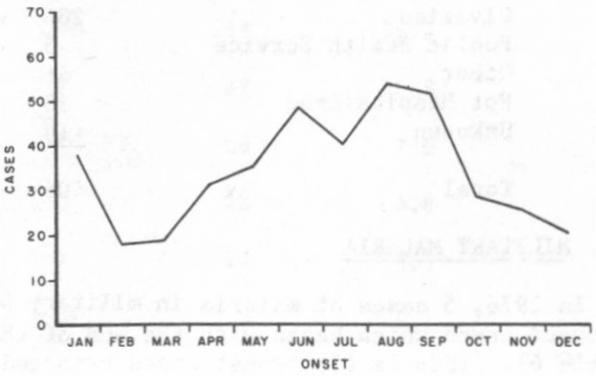
Figure 2 shows the geographic distribution of the 1976 malaria cases by the state in which the patient first developed clinical symptoms of the disease.

Fig. 2 GEOGRAPHIC DISTRIBUTION OF MALARIA CASES WITH ONSET IN UNITED STATES, 1976



In 1976 as in 1975 the seasonal distribution of malaria cases showed a distinct pattern; a definite peak in cases (excluding cases with unknown date of onset) was apparent in the summer months (Fig. 3). During the Vietnam conflict, this seasonality was obscured by the year-round return of military personnel. A general increase in travel by Americans during the summer months probably accounts for the pattern.

Fig. 3 MALARIA CASES BY MONTH OF ONSET, UNITED STATES, 1976



For cases in 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 75.6% of persons with P. falciparum infection and in 34.8% of those with P. vivax infection (Table 4). Within 6 months after returning to this country, 97% of patients with P. falciparum malaria and 71% of those with P. vivax malaria developed clinical symptoms. Eight patients (3.6%) with P. vivax malaria became ill more than 1 year after the last possible exposure to malaria abroad.

Table 4
Malaria Cases by Interval Between Date of Entry Into the United States and Onset of Illness, and by Plasmodium Species, United States, 1976*

Interval (in months)	Plasmodium Species								All Cases	
	Vivax	(%)	Falciparum	(%)	Malariae	(%)	Ovale	(%)		
< 1	76	(34.8)	57	(75.6)	6	(35.3)	2	(50.0)	140	(44.6)
1-2	49	(22.3)	15	(20.2)	2	(11.8)	2	(50.0)	68	(21.6)
3-5	31	(14.1)	1	(1.4)	5	(29.4)	0	(0.0)	37	(11.8)
6-11	55	(25.2)	1	(1.4)	3	(17.6)	0	(0.0)	59	(18.8)
≥ 12	8	(3.6)	1	(1.4)	1	(5.9)	0	(0.0)	10	(3.2)
Total	219	(100.0)	75	(100.0)	17	(100.0)	4	(100.0)	314	(100.0)

*Cases acquired in the United States (3), cases with species undetermined (26) or mixed (2), and cases with exact entry date or onset of illness date unknown (60) are not included.

Of the 406 cases reported in 1976, 2.2% of patients were initially treated in military hospitals, 1.5% in Veterans Administration hospitals, and 70.4% in civilian hospitals (Table 5). The Armed Forces and Veterans Administration have made complete malaria reporting a major responsibility of their hospital staff. Reporting by civilian physicians, however, is largely a matter of individual initiative, even though malaria is a reportable disease in every state. Thus, the above percentages probably underestimate the extent to which civilian physicians encounter patients with malaria.

Table 5
Malaria Cases by Type of Initial Hospital Admission, United States, 1976

Type of Hospital	Number of Patients	Percent
Military	9	2.2
Veterans Administration	6	1.5
Civilian	286	70.4
Public Health Service	5	1.2
Other	46	11.4
Not Hospitalized	38	9.4
Unknown	16	3.9
Total	406	100.0

IV. MILITARY MALARIA

In 1976, 5 cases of malaria in military personnel were reported, continuing the downward trend which began with the end of the American military involvement in Vietnam (Table 6). This is the fewest cases reported since 1959.

Table 6
Malaria Cases in Military Personnel,
by Branch of Service, United States, 1976

Branch of Service	Cases	
	Number	Percent
Army	0	0
Navy	0	0
Air Force	2	40.0
Marine	0	0
Unknown	3	60.0
Total	5	100.0

V. CIVILIAN MALARIA IMPORTED FROM ABROAD

In contrast to the continuing decrease in military cases of malaria, the number of imported civilian cases remained about the same in 1976. The age and sex distribution of the 401 civilian cases that occurred in the United States is presented in Table 7. As in previous years a predominance was observed in males in the 20 to 29-year-old age group. United States citizens accounted for 43.2% of the imported civilian cases for which nationality was available (Table 8). When purpose of travel in malarious areas was considered, tourists comprised the largest group among U.S. citizens, while among foreign visitors or immigrants, college teachers or students made up the largest group.

Table 7
Civilian Malaria Cases, by Age and Sex,
United States, 1976

Age Group	Male	Female	Unknown	Total	Percent
0-09	20	15	2	37	9.2
10-19	35	18	3	56	14.0
20-29	98	49	8	155	38.7
30-39	49	16	2	67	16.8
40-49	20	8	0	28	7.0
50-59	21	7	0	28	6.8
60-69	6	8	0	14	3.5
≥ 70	2	3	0	5	1.2
Unknown	6	1	4	11	2.8
Total	257	125	19	401	100.0

Table 8
Imported* Civilian Malaria Cases, by Occupation While in Malarious Area, and Nationality, United States, 1976

Occupation	U.S. Citizen	Foreign Visitor	Total	Percent
Tourist	28	2	30	7.6
Businessman	23	7	31	7.6
Government Representative	3	6	9	2.3
Missionary	13	1	14	3.5
Peace Corps	7	0	7	1.8
Seaman	2	8	10	2.5
College Student or Teacher	26	60	86	21.7
Other	31	62	93	23.4
Unknown	38	79	117	29.6
Total	171	225	397	100.0

*Induced (1), cryptic (1), and congenital (2) cases not included.

VI. MALARIA ACQUIRED IN THE UNITED STATES

In 1976, 2 cases of congenitally-acquired and 1 case of transfusion-induced malaria were reported in the United States. No cases of introduced malaria were reported (Fig. 4).

A. Congenital Malaria

Case 1- On June 5, 1976, a 17-day-old baby girl was admitted to a hospital in Minnesota with a 3-day history of listlessness, fever, vomiting, and progressive jaundice.

The child had been born in the United States to a 17-year-old Laotian mother after an uncomplicated full-term pregnancy. The mother gave a history of malaria 18 months previously while in Laos, for which she had received treatment with an unknown drug. She had been asymptomatic during her 2-1/2 month stay in the United States.

On admission the child was dehydrated and icteric. She had a temperature of 104.8 F and a palpable spleen 4 cm below the left costal margin. Her hemoglobin was 16.5gm per 100 ml and her total bilirubin was 9.0 mg per 100 ml (Direct = 4.5 mg per 100 ml). Blood smears revealed *P. vivax*. The infant was successfully treated with a 4-day course of chloroquine phosphate.

Malaria serology on the mother's blood revealed a titer of 1:4096 to *P. vivax* and 1:1024 to *P. falciparum* by the fluorescent antibody technique, but blood smears were negative. The infant also demonstrated elevated IgG titers to the same species of malaria but IgM antibodies were not detected. Treatment of the mother was advised.

(Reported by F.D. Kapps, M.D., Coon Rapids, Minnesota; John W. Washburn, Communicable Disease Section, and John S. Andrews, Jr., M.D., Acting State Epidemiologist, Minnesota Department of Health; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Case 2 - On December 20, 1976, a 4-week-old boy was admitted to a hospital in North Carolina with a 2-week history of temperature of 104 F.

The child had been born in the United States to a 21-year-old Laotian mother after an uncomplicated full-term pregnancy. The mother had been living in the United States since leaving Laos 1 year ago. She allegedly had had malaria in Laos, but it was not known whether or not she had received treatment.

On admission the child appeared pale but was in no acute distress. He had a temperature of 104 F, and both liver and spleen were palpable. Initial laboratory findings included a hemoglobin of 7.7 gm per 100 ml, a white cell count of 21,000 per mm^3 (63% lymphocytes), and a platelet count of 55,000 per mm^3.

On admission blood smears were positive for P. vivax. The patient received a course of chloroquine phosphate. Primaquine phosphate was given in a daily dose of 0.3 mg per kg per base for 14 days. He became afebrile and was discharged 12 days after admission.

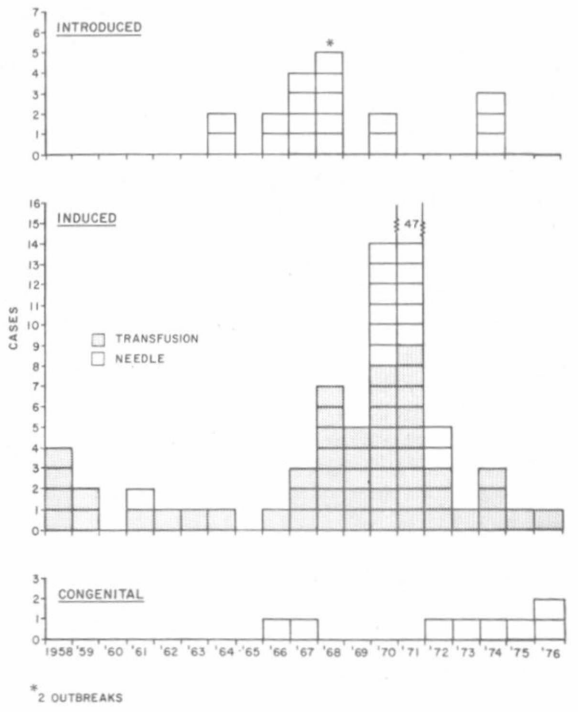
Blood smears on the mother were negative for malaria parasites, but a serum specimen showed a titer of 1:4096 to P. vivax by indirect immunofluorescence. Treatment of the mother was recommended.

(Reported by James Volk, M.D., Hendersonville, North Carolina; George F. Bond, Director, Henderson County Health Department; Martin P. Hines, D.V.M., M.P.H., State Epidemiologist, North Carolina Division of Health Services; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

B. Transfusion-Induced Malaria

Case 1 - On December 19, 1975, a 76-year-old male with no history of recent travel underwent coronary artery bypass surgery with saphenous vein grafts. He bled extensively during surgery and received 19 units of blood during or shortly after surgery. He recovered uneventfully and was discharged 12 days after surgery on digitalis, propanolol, a diuretic, a narcotic analgesic, and a mild hypnotic. That same day while at home the patient became confused and restless. On readmission to the hospital 24 hours later the patient complained of frontal headache, and appeared disoriented. His temperature was 102.7 F, pulse was regular at 115 per minute, and he had a blood pressure of 180/100 mm Hg. On physical examination the patient was disoriented as to time and place but was cooperative; findings included a well healing median sternotomy scar, few anterior basilar rales in the right lung, a grade I-II over VI systolic murmur along the left sternal border, and recent well healing surgical incisions in both legs. The physical examination was otherwise normal. Neurologic examination was normal except for disorientation.

Fig. 4 MALARIA ACQUIRED IN THE UNITED STATES, 1958 – 1976



Laboratory findings included a hemoglobin of 14.1 gm per 100 ml, a white blood cell count of 77,000 per mm^3 with a normal differential, platelets appeared adequate on smear, blood urea nitrogen was 33 mg per 100 ml, creatinine was 2.3 mg per 100 ml, serum potassium was 4.8 meq per liter, and serum CO_2 content was 32 meq per liter. Additional abnormal findings included an alkaline phosphatase of 120 IU and an LDH of 370 with normal transaminases and a total bilirubin of 1.1 mg per 100 ml. Examination of a catheterized urine specimen showed clear urine with only a few RBC's per high power

field. On admission a lumbar puncture revealed normal CSF pressure, clear fluid, a protein of 102 mg per 100 ml, normal glucose, and only 2 red blood cells per cu mm.

The patient's clinical course in the first 5 days in the hospital was characterized by persistent disorientation and spiking temperatures. Multiple blood cultures were reported negative for bacteria. A chest x-ray, liver-lung scan, intravenous cholangiogram, and a brain scan were essentially normal. An electroencephalogram showed generalized slowing. He was started on IV ampicillin empirically 2 days after admission without defervescence; a cooling blanket was used and he was given chlorpromazine for hyperthermia. His urine output had dropped to 10 ml per hour, and IV diuretics failed to produce an increase in urine flow. Urine turned amber color and a catheterized specimen showed marked hematuria and 2+ protein. Blood urea nitrogen rose to 155 mg per 100 ml with a creatinine of 7.8 mg per 100 ml, and there was evidence of partially compensated metabolic acidosis and hyperkalemia. There was good arterial oxygenation with the patient under oxygen by mask. Hemoglobin dropped to 9.3 gm per 100 ml on the 7th day from an admission value of 14.1 gm. Platelets were noted to be decreased on smear, but prothrombin time and partial thromboplastin time were normal. A white blood cell count had remained within normal limits and there was a normal differential.

On the 7th hospital day during the examination of a blood smear for a differential white blood cell count, the red blood cells were found to contain P. falciparum organisms. The patient was immediately started on quinine sulfate, pyrimethamine, and gantrisin by NG tube, and an initial parenteral dose of 600 mg of quinine dihydrochloride was given.

The patient underwent peritoneal dialysis on the 7th hospital day; he continued oliguric and had electrolytic imbalance; there was evidence of mild upper gastrointestinal bleeding and hypotension. The patient died on the 8th day after admission.

At postmortem examination on peripheral blood smear, there was "extensive parasitemia" attributed to P. falciparum. In addition the brain showed the blood vessels to be engorged with malaria parasites and pigment. The kidneys showed changes compatible with acute tubular necrosis. There was complete occlusion of the bypass graft to the left descending coronary artery but no evidence of myocardial infarction or inflammatory infiltrates. In the liver Kupffer cells were enlarged and filled with malaria pigment and parasites. Adrenal glands and lungs were unremarkable.

All 19 donors were interviewed. There was history of recent foreign travel in none. One donor, however, gave a history of malaria in 1970. He was a 28-year-old Vietnam veteran who was treated for P. falciparum malaria 2 months after returning to the United States from Vietnam. He received a course of quinine, chloroquine, and sulfadiazine. A serum specimen from this donor revealed a 1:4096 to P. falciparum by IFA. Further investigations are underway.

(Reported by Earl J. Baker, M.D. and Mark Kartub, M.D., Phoenix, Arizona; John Erben, M.D., Health Officer, Maricopa County Health Department, Phoenix, Arizona; Lee B. Dominguez and Frank Marks, epidemiologists, and Jon M. Counts, Dr. P.H., Acting State Epidemiologist, Arizona State Department of Health Services, Phoenix, Arizona; Patrick M. Morgan, D.V.M., Dr. P.H., State Epidemiologist, Oklahoma State Department of Health; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

C. Cryptic Malaria

Case 1 - On September 20, 1976, a 6-year-old girl was admitted to a hospital in Arkansas with a 2-week history of fever, cough, and abdominal pain. A diagnosis of malaria due to P. vivax was made by the hospital and confirmed by the Arkansas State Health laboratory. She received a course of chloroquine and primaquine with improvement.

The patient had not traveled outside the United States nor received any blood transfusions in the past. An epidemiologic investigation was conducted by the Arkansas State Health Department. No secondary cases of malaria were found in the area, and the occurrence was thus classified as a case of cryptic malaria.

(Reported by Paul White, M.D., State Epidemiologist, Arkansas State Department of Health, and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

VII. MALARIA DEATHS AND COMPLICATIONS IN THE UNITED STATES

A. Malaria Deaths

Five malaria deaths were reported in the United States in 1976. Four were caused by P. falciparum, and the other was a case of P. vivax malaria with splenic rupture. In addition, a previously unreported case of P. falciparum infection from 1975 is included.

Case 1 - See transfusion-induced malaria, Case 1.

Case 2 - A 35-year-old man returned to the United States from Thailand on February 23, 1976, with a 3-day history of fever, chills, headache, myalgia, weakness, and anorexia. Ten days after the onset of his symptoms, he was admitted to a hospital in Los Angeles, California, where the diagnosis of malaria was made.

The patient had lived in Bangkok, Thailand, for the past 12 years, where he had had 3 previous episodes of malaria. He also gave a history of an exploratory laparotomy and splenectomy in the 1950s, following an auto accident.

An admission examination revealed a blood pressure of 100/60 and a pulse of 100 per minute without postural changes. The only abnormal physical findings were a 30 centimeter midline surgical scar on the abdomen and a left upper quadrant fullness believed to be a prominent left lobe of the liver. Abnormal laboratory studies on admission included a hemoglobin of 10.6 gm per 100 ml, a white cell count of 3,700 per mm^3, and a platelet count of 50,000 per mm^3. Further blood tests revealed a normal prothrombin time, normal partial thromboplastin time, and normal thrombin time. A peripheral blood smear showed trophozoites and gametocytes of P. vivax.

The patient was immediately started on a course of oral chloroquine phosphate (2.5 gm of salt or 1.5 gm of base) over a 48-hour period, and he rapidly became afebrile and asymptomatic. However, 4 days after admission he awoke with complaints of dizziness. While attempting to go to the bathroom, he fell and struck his head. The patient was found to have no detectable blood pressure. Approximately 8 minutes after the fall, he had a cardiopulmonary arrest; resuscitation efforts were unsuccessful. A limited autopsy showed a ruptured spleen weighing 1,600 grams, atypical in appearance, and 4 liters of blood in the peritoneal cavity.

(Reported by A. Underman, M.D., G. Savitch, M.D., Los Angeles; S. Fanning, M.D., Los Angeles County Health Department; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Case 3 - On May 28, 1976, a 30-year-old man was admitted to a hospital in Madison, Wisconsin, with fever, confusion, hypotension, and a 3-week history of fatigue, myalgia, fever, sore throat, cough, and occasional vomiting.

He had arrived in the United States 4 days prior to admission after having spent 18 months in Saudi Arabia working as a helicopter pilot for an American business firm. He had not taken any malaria chemoprophylaxis during his stay abroad.

On admission to the hospital his temperature was 104 F, pulse 100 per minute, and blood pressure 90/60 mm Hg. Abnormal physical findings included sluggish mentation, mild dehydration, slight icterus, and hepatosplenomegaly. His hematocrit was 24%, white blood cell count was 5,300 per mm^3, BUN was 135 mg per 100 ml, and creatinine was 7.3 mg per 100 ml. Arterial blood gases showed a metabloic acidosis. A coagulation profile on admission revealed a reduced plasma fibrinogen and elevated prothrombin and partial thromboplastin time. His platelet count was 80,000 per mm^3. A peripheral blood smear on admission revealed P. falciparum.

The patient was started on intramuscular chloroquine, was given dexamethasone for suspected cerebral malaria, and received heparin and packed red blood cells for disseminated intravascular coagulopathy, and anemia. Progressive respiratory difficulty required intubation and ventilatory assistance. A central venous line placed on admission suggested the presence of fluid overload which was refractory to diuresis, and the patient underwent hemodialysis. Attempts to maintain his blood pressure with dopamine and levarterenol were unsuccessful. Electrocardiographic monitoring revealed recurrent ventricular and supraventricular arrythmia. A cardiopulmonary arrest occurred 18 hours after admission to the hospital, and resuscitation efforts were unsuccessful.

At postmortem examination the lungs showed focal edema, desquamation of alveolar cells, and hyaline membrane formation. Diffuse subendocardial petechial hemorrhages were present in the heart. The kidneys showed evidence of tubular degeneration. The brain showed only minimal edema and congestion.

(Reported by Luther Rhoades, M.D., Madison, Wisconsin; H. Grant Skinner, M.D., State Epidemiologist, Wisconsin State Department of Health and Social Services, Madison, Wisconsin; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Case 4 - On June 1, 1976, a 49-year-old man was hospitalized in Vallejo, California, with a 6-day history of malaise, fever, chills, headache, dry cough, and myalgia. His symptoms began on the first day after returning from a 3-week trip to Ghana, during which he failed to take malaria chemoprophylaxis.

On admission to the hospital his temperature was 104.2 F, pulse 100 per minute, and blood pressure 190/94 mm Hg. Physical examination was otherwise normal. Initial laboratory findings included a hemoglobin of 15 gm per 100 ml, a white blood cell count of 4,600 per mm^3, a blood urea nitrogen of 9 mg per 100 ml, and a total bilirubin of 1.4 mg per 100 ml. Thin and thick blood smears on admission and a thin blood smear 1 day after admission showed no malaria parasites.

During the first 6 days of hospitalization, the patient continued to experience a daily peak temperature of 104-105 F, but did not appear seriously ill and remained ambulatory. Chest x-ray, blood cultures, cerebrospinal fluid, and a tuberculin skin test were negative. On the 7th hospital day, fatigue and headache developed, and the patient became lethargic and slightly confused. The following day he had a shaking chill and vomited coffee ground material containing blood, but the hemoglobin remained normal. He had increasing respiratory difficulty and hypotension developed. The blood urea nitrogen had gone up to 70 mg per 100 ml from an admission value of 9 mg per 100 ml. Blood smears obtained on the previous day were found to contain many P. falciparum organisms. The patient was started on oral chloroquine by nasogastric tube. His condition deteriorated rapidly and he died that same day, 8 days after admission to the hospital.

Abnormal findings on postmortem examination included diffuse perivascular cerebral edema with marked congestion of brain capillaries with malarial parasites and pigment, ring hemorrhages, and granuloma formation. The lungs showed evidence of acute alveolar edema, and the pulmonary capillaries were engorged with malarial pigment and parasites. The kidneys showed tubular degeneration and dilatation.

(Reported by George F. Brooks, M.D., Martinez, California; Orlyn Wood, M.D., Health Officer, Contra Costa County Health Department, Martinez, California; Ronald Roberto, M.D., Deputy Chief, Infectious Diseases Section and James Chin, M.D., State Epidemiologist, California State Department of Health; and Parasitic Diseases Division, Bureau of Epidemiology, CDC).

Case 5 - On December 3, 1976, a 54-year-old male was admitted to a hospital in Glen Cove, New York, with a 7-day history of fever and "flu-like" illness. On the day prior to admission he experienced an episode of syncope, and on the morning of the day of admission he appeared disoriented.

He had spent 6 days working as an electronic consultant in Uganda and Nigeria and had arrived in the United States 2 weeks prior to admission. While in Africa the patient failed to take any malaria chemoprophylaxis.

On admission to the hospital the patient was in a semicomatose state with a temperature of 102 F, pulse 104 per minute (regular), and blood pressure 125/80 mm Hg. The pupils reacted slowly to light, there was nuchal rigidity, and the lungs had occasional rales on both bases. On neurologic examination the patient did not respond to stimuli, and deep tendon reflexes were hyperactive. Abnormal laboratory findings on admission included a BUN of 65 mg per 100 ml, a bilirubin of 4.2 mg per 100 ml, a platelet count of 35,000 per mm^3, prothrombin time of 140 seconds (control= 13 sec), and a partial thromboplastin time of over 150 seconds (control 33-45). Examination of the cerebrospinal fluid was unrevealing, and the hemoglobin was 14.4 grams per 100 ml, with a white blood cell count of 8,900 per mm^3. The cardiogram showed a left anterior fascicular block, and the chest x-ray was reported normal.

Blood smears on admission were positive for P. falciparum malaria. The patient was immediately started on chloroquine phosphate of which he received a total of 0.9 gm of base by NG tube during the first 10 hours in the hospital.

The patient had a rapid downhill course with hypotension refractory to vasoactive amines and volume replacement, and he experienced repeated episodes of cardiac arrest requiring external cardiac massage. The patient became oliguric and urine color turned amber, the azotemia increased, and metabolic acidosis developed; he received sodium bicarbonate and dexamethasone. The serum potassium remained at the lower limits of normal in spite of the marked metabolic acidosis. Hemoglobin dropped to 9.0 gm per 100 ml on the 2nd hospital day, from an admission value of 14.4 gm. Irregular respirations of the Cheyne Stokes type were noted, and the patient underwent tracheal intubation with ventilatory assistance after the first episode of cardiorespiratory arrest. Blood smears were still positive for malarial parasites 19 hours after having been started on chloroquine phosphate.

The patient died 25 hours after admission after his 3rd episode of cardiac arrest.

On postmortem examination the brain showed thrombosis of small vessels with malarial parasites and pigment; the lungs showed marked acute congestion and intraalveolar hemorrhage with focal thrombosis of small vessels; the heart showed interstitial myocarditis and malarial congestion of small vessels, and the kidneys showed focal interstitial nephritis. The adrenal glands were unremarkable.

(Reported by Thomas Abruzzo, M.D., Health Officer, Nassau County Health Department, New York; Donald Lyman, M.D., Director, Bureau of Disease Control, State of New York Department of Health, Albany, New York; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

The following is a previously unreported case of fatal malaria that occurred in 1975. This brings the total number of malaria fatalities in the U.S. up to 4 for 1975.

On May 19, 1975, a 27-year-old Vietnamese female refugee was admitted to a Guam hospital with a history of fever, lethargy, confusion, jaundice, nausea, vomiting, and dark urine of undetermined duration. She had arrived from Vietnam earlier that month.

On admission her temperature was 102.8 F with a pulse of 124 per minute and a blood pressure of 100/50; other abnormal physical findings were lethargy, jaundice, and tenderness in the upper abdomen. Pertinent laboratory findings on admission were hemoglobin 11.5%, WBC 2,600 per mm^3, BUN 82 mg per 100 ml, and creatinine 4.6 mg per 100 ml. Arterial blood gasses revealed a metabolic acidosis. Cerebrospinal fluid contained 20 cells per mm^3 (18 lymphocytes) but had a normal protein and sugar. Blood smears showed P. falciparum with 20% to 25% of the red cells parasitized. The patient received intravenous quinine and dexamethasone. When her urine output failed to improve after rehydration and diuretics, she was transferred to another hospital for dialysis.

On admission to the second hospital, the patient showed electrocardiographic changes consistent with quinine toxicity (widened QRS and flattened T-waves). A blood smear obtained 3 days after initiation of quinine therapy showed rare parasites. Her clinical course over the next 7 days was marked by coma, respiratory failure, hypotension, hypothermia, and progressive renal deterioration with metabolic acidosis. The patient underwent peritoneal dialysis, required respiratory assistance, and was administered dopamine to maintain a normal blood pressure. She died 8 days after admission.

Pertinent findings at postmortem examination included cerebral edema with tonsillar herniation plus diffuse focal hemorrhages and brain stem necrosis. Microscopic examination revealed malarial organisms and pigment inside the brain capillaries. Other findings included pulmonary edema with hyaline membrane formation, a gram-negative bronchopneumonia, and large edematous kidneys with microscopic findings consistent with acute tubular necrosis.

(Reported by Patient Administration Division, Tripler Army Medical Center, Hawaii; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

B. Malaria Complications

Seventy-nine complications of malaria, aside from death, were reported in 1976 (Table 9).

Table 9
Malaria Complications by Species, United States, 1976

	vivax	falciparum	malariae	ovale	Mixed	Undetermined	Total
Hemolysis	27	21	2	1	0	3	54
Cerebral	2	8	0	0	0	1	11
Renal	3	9	0	0	0	2	14
Total	32	38	2	1	0	6	79
Total Number of Cases Diagnosed	269	83	21	5	2	26	406

VIII. REPORT FROM THE NATIONAL MALARIA REPOSITORY - 1976

In 1976 the presence of Plasmodium species or agreement that there were no parasites present was confirmed in blood films from 195 cases submitted to the National Malaria Repository. There were 2 instances in which specimens were submitted as negative and were later found to be positive at CDC. There were no specimens submitted as containing malaria organisms and later found to be negative at CDC. In 15 instances 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 10 and 11.

Table 10
Institutions Submitting Positive Slides for Malaria to the National Malaria Repository*, 1974-1976

	ORIGIN							
	Army	Navy	VA Hosp	Air Force	Health Dept. (State, County, City)	PHS Hosp	Other Hospitals Clinics, Physicians, etc.	Cumulative
Cumulative total positive 1976	3		1	1	62	4	63	134
Cumulative total positive 1975	2	30	0	1	25	2	65	125
Cumulative total positive 1974	4	28	2	3	36	10	23	106

*CDC

Table 11
Species of Malaria Identified by National Malaria Repository*, 1973-1975

Species	Total 1976	Total 1975	Total 1974
P. vivax	79	57	46
P. falciparum	43	48	46
P. malariae	4	3	4
P. ovale	4	13	8
Plasmodium sp.	4	4	2
Negative	63	96	84
Total examined	197	221	190
Cumulative positive	134	125	106

*CDC

ACKNOWLEDGMENT

The Malaria Surveillance Report, prepared annually at the Center for Disease Control, is based on information provided in individual case reports. The excellent support given to malaria surveillance by state and local health departments and personnel of the preventive medicine services of the U.S. Army, Navy, and Air Force is greatly appreciated.

REFERENCES

1. World Health Organization: Terminology of malaria and of malaria eradication, 1963, p 32

2. World Health Organization: Expert committee on malaria, 10th report, Tech Rep Ser No. 272, 1964, p 34

IX. PREVENTION OF MALARIA

The purpose of this table is to provide international travelers with current information about the risk of acquiring malaria in areas of the world that they intend to visit. This information is abstracted from the World Health Organization's Weekly Epidemiologic Record 51: 181-200, 1976, and 52:28-29; 70-73, 1977. (Also see Fig. 5.)

Table 12 Information on Malaria Risk by Country

Country or area (If a country is not listed, it is malaria free.)	Malaria risk	For countries where malaria risk exists			
		Areas *without* risk	For all other areas not shown in column 3		
			Months with risk	Altitude below which risk exists (metres):	Risk in urban areas
AFRICA					
Algeria	Yes	Most of the country, excl. Wilaya (= Dep.): Blida, el Asnam, Medea, Tiaret (Risk limited).	Jun-Oct	1200	No
Angola	Yes	?	?	?	?
Benin	Yes	None	All	All	Yes
Botswana	Yes	Kgalagadi, Kweneng (part.), Ngwaketse, D.; southern part of: Central, Ghanzi, D.	Nov-May	All	Yes[1]
Brit. Indian Ocean Terr.	?	?	?	?	?
Burundi	Yes	?	?	?	?
Cameroon[2]					
Cape Verde	Yes	?	?	?	?
Central African Rep.	Yes	None	All	All	Yes
Chad	Yes	None	Jul-Nov	All	Yes
Comoros	Yes	None	All	All	Yes
Congo	Yes	None	All	All	Yes
Dahomey[3]					
Egypt	Yes	Most of the country, except the Nile delta, El Faiyûm area, the oases, and part of Upper Egypt.	Jun-Oct	All	No[4]
Equatorial Guinea	Yes	?	?	?	?
Ethiopia	Yes	None	All	2000	Yes
Gabon	Yes	None	All	1000	Yes
Gambia	Yes	None	All	All	Yes
Ghana	Yes	None	All	All	Yes
Guinea	Yes	None	All	All	Yes
Guinea-Bissau	Yes	?	?	?	?
Ivory Coast	Yes	None	All	All	Yes
Kenya	Yes	None	Apr-Jun & Nov-Dec[5]	2000[6]	Yes[7]
Liberia	Yes	None	All	All	Yes
Libyan Arab Rep.	Yes	Whole country, except 2 small foci in the southwest of the country.	Feb-Aug	All	No
Madagascar	Yes	Ambatolampy, Ambohidratrimo, Andramasina, Antanifotsy, Antsirabe, Arivonimamo, Faratsiho, Manjakandriana, Tananarive, Tananarive-Banlieue, Sous-Préfecture.	Sep-Mar	1100	Yes
Malawi	Yes	None	All	1700	Yes

[1] Except Gaborone, Francistown, Lobatsi, Selebi-Pikwe.
[2] *v.* United Rep. of Cameroon
[3] *v.* Benin.
[4] Except outskirts.
[5] North Eastern, Nyanza, Western, Coast, Prov.: all months.
[6] Rift Valley Prov.: 2500; North Eastern Prov.: 1500.
[7] Risk very low Nairobi Area, Central Prov., Rift Valley Prov. Low risk Eastern, Nyanza, Western, Coast, Prov. Moderate risk North Eastern Prov.

Table 12 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	For countries where malaria risk exists			
		Areas *without* risk	For all other areas not shown in column 3		
			Months with risk	Altitude below which risk exists (metres):	Risk in urban areas
Mali	Yes	None	All[1]	All	Yes
Mauritania	Yes	?	?	?	?
Mauritius					
Morocco	Yes	Agadir, Boulmane, Casaolanca, Chaouen, El Hoceima, El Jadida, Figuig, Ksar-Es-Souk, Rabat-Salé, Tanger, Tarfaya, Taza, Tétouan, Tiznit, Prov.	May-Oct	?	No[2]
Mozambique	Yes	?	?	?	?
Namibia	Yes	?	?	?	?
Niger	Yes	None	Jul-Nov[3]	All	Yes
Nigeria	Yes	None	All	All	Yes
Rwanda	Yes	None	All	All	Yes
Sao Tome and Principe	Yes	?	?	?	?
Senegal	Yes	None	All[4]	All	Yes[5]
Sierra Leone	Yes	None	All	All	Yes
Somalia	Yes	None	All	All	Yes
South Africa	Yes	Cape Prov. (excl. Molopo and lower Orange River areas; Orange Free State;	Feb-May	1200	No[6]
		Transvaal (excl. north, east and western low altitude areas);	All	800	Yes
		Natal (excl. North Zululand).	All	500	No
Southern Rhodesia	Yes	?	?	?	?
Spanish Sahara[7]					
Sudan	Yes	None	All	All	Yes
Swaziland	Yes	Most of the country.[8]	Dec-Mar	All	Yes
Togo	Yes	None	All	All[9]	Yes
Tunisia	Yes	Whole country, but occasionally risk exists.	May-Nov	All	No
Uganda	Yes	Kigezi D. (southern part).	All	1800	Yes[10]
United Rep. of Cameroon		None	All	All	Yes
United Rep. of Tanzania	Yes	None	All	All	Yes
Upper Volta	Yes	None	All[11]	All	Yes
Zaire	Yes	None	All	All	Yes
Zambia	Yes	None	Nov-May	All	Yes
AMERICA, NORTH					
Belize	Yes	None	All	500	Yes
Brit. Honduras[12]					
Costa Rica	Yes	Mountainous centre of the country.	All	500	No

[1] Excl. Less risk: Apr-Jun.
[2] Except outskirts.
[3] Agadés Dep.: Aug-Oct.
[4] Cap-Vert: less risk during Jan-Jun.
[5] Dakar, town–ville: no risk during Jan-Jun.
[6] Mogadishu: very low risk
[7] *v.* Western Sahara.
[8] Excl. northern border areas: Bordergate, Lomahasha, Mhlume, Tshaneni.
[9] Above 600 m. marked reduction of risk.
[10] Entebbe, Fort Portal, Jinia, Kampala, Mbale: O.
[11] Djibo, Oudalan, cercles: Jun-Dec.
[12] *v.* Belize.

Table 12 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	For countries where malaria risk exists			
		Areas *without* risk	For all other areas not shown in column 3		
			Months with risk	Altitude below which risk exists (metres):	Risk in urban areas
Dominican Rep.	Yes	Whole country (excl. Municipios: Bánica, Dajabón, Eliás Piña, El Llano, Partido, Pedernales, Pepillo Salcedo).	All	500	No
El Salvador	Yes	None	All	1000	No
Guatemala	Yes	Baja Verapaz, Chimaltenango, El Progreso, Guatemala, Jalapa, Sacatepequez, Solola, Totonicapan, Dep.	Jun-Nov.[1]	1000	No
Haiti	Yes	Dep. Sud-Ouest, Dep. Nord, Dep. Nord-Est.	Jun-Feb	500	No[2]
Honduras	Yes	Ocotepeque Dep.	All[3]	1000	No
Mexico	Yes	Aguascalientes, Baja California Norte, Baja California Sur, Coahuila, Distrito Federal, Guanajuato, Nuevo Leon, Tlaxcala, States. Part of: Chihuahua, Durango, Hidalgo, Mexico, Puebla, Queretaro, San Luis Potosi, Sonora, Tamaulipas, Yucatan, Zacatecas, States.	All[4]	1800	No
Nicaragua	Yes	None	All	1000	No
Panama (excl. Canal Zone)	Yes	Cuidad Panama, Ciudad Colon; Prov.: Herrera, Los Santos, Chiriqui (excl. Baru Distr.), Cocle (excl. Penonome, La Pintada, Distr.).	All	700	No
AMERICA, SOUTH					
Argentina	Yes	Most of the country, malaria risk exists only in: Oran, San Martin Dep. (Salta Prov.); Ledesma, Dep. (Jujuy Prov.).	Sep-May	2000	No
Bolivia	Yes	La Paz (Highlands), Oruro, Potosi, Dep.	All	2,000	No
Brazil	Yes	Alagoas, Ceara, Distrito Federal, Paraïba, Pernambuco, Rio Grande do Norte, Rio Grande do Sul, Rio de Janeiro, Sao Paulo, Sergipe, States; Fernando de Noronha, Terr. Fed.; Part of: Bahia, Espirito Santo, Goias, Maranhao, Mato Grosso, Minas Gerais, Parana, Piaui, Santa Catarina, States.	All	900	No[5]
Colombia	Yes	Bogota, Dep.; San Andres, Providencia, Is.; Part of: Cundinamarca, Huila, Tolima, Dep.	All	1500[6]	No
Ecuador	Yes	Tungurahua Prov., Arch. de Colon (Galapagos Is.); Part of: Azuay, Bolivar, Carchi, Chimborazo, Cotopaxi, Imbabura, Zamora-Chinchipe, Prov.	All[7]	1500[8]	No[9]
French Guiana	Yes	Cayenne City	All	All	Yes
Guyana	Yes	East Berbice, West Berbice, East Demerara, West Demerara, Essequibo Is., Essequibo Coast.	All	All	No

[1] Alta Verapaz, Izabal, Dep.: All months.
Higher risk: Alta Verapaz, Izabal, Huehuetenango (northern part). El Petén (southern part), Dep. Low risk in forest areas Jun-Nov.

[2] Except outskirts

[3] Copán, Intibucá, la Paz, Lempira, Olancho, Dep.: May-Dec.

[4] Higher risk during Jun-Nov in: Campeche, Chiapas, Colima, Guerrero, Jalisco, Michoacan, Morelos, Nayarit, Oaxaca, Quintana Roo, Sinaloa, Tabasco, Veracruz.

[5] Except Acre, Amazonas, Pará, States; Amapá, Rondônia, Roraima, Terr. Federales.

[6] Boyacá, Norte de Santander, Santander, Dep.; Caquetá, Casanare, Putumayo, Intendencias: 1000 m.

[7] Cañar, Loja, Prov.: Dec-Jul.

[8] Morona-Santiago, Napo, Pastaza, Zamora-Chinchipe: 1000 m.

[9] Concerning only the urban centres of: Guayaquil (Guayas Prov.); Manta, Portoviejo (Manabi Prov.); Macas (Morona Prov.).

Table 12 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	For countries where malaria risk exists			
		Areas *without* risk	For all other areas not shown in column 3		
			Months with risk	Altitude below which risk exists (metres):	Risk in urban areas
Paraguay	Yes	Alto Paraguay, Boqueron, Central, Chaco, Concepcion, Cordillera, Guaira, Itapua, Misiones, Nueva Asuncion, Neembucu, Presidente Hayes, San Pedro, Dep.	Sep-May[1]	All	Yes
Peru	Yes	Amazonas (excl. Bagua, Luya, Prov.), Ancash (excl. Santa Prov.), Apurimac, Arequipa, Ayacucho (excl. Huanta, La Mar, Prov.), Cajamarca (excl. Cutervo, Jaen, S. Ignacio, Contumaza, Celendin, Cajamarca, Cajabamba, Prov.), Callao, Cuzco (excl. part. La Convencion, Prov.), Huancavelica, Huanuco (excl. Pachitea, Tingo Maria, Prov.), Ica, Junin (excl. Satipo Prov.), La Libertad (excl. Pacasmayo, Trujillo, Bolivar, Prov.), Lambayeque (excl. Lambayeque, Ferrenafe, Prov.), Lima, Madre de Dios, Moquegua, Pasco (excl. Oxapampa Prov.), Piura (excl. Ayabaca, Huancabamba, Morropon, part. Piura, Prov.), Puno, Tacna, Tumbes (excl. Tumbes, Zarumilla, Prov.), Dep.	All[2]	1500	No
Surinam	Yes	Commewijne, Coronie, Para, Paramaribo, D.	All	All	Yes[3]
Venezuela	Yes	Anzoategui (excl. Mapire, Municipio), Aragua, Carabobo, Cojedes, Falcon, Guarico (excl. Cabruta, Espino, Mun.), Lara, Miranda, Monagas (excl. Colon, San Simon, Tabasca, Mun.), Nueva Esparta, Protuguesa, Sucre (excl. El Paujil, Rio Caribe, Tunapui, Union, Yaguaraparo, Mun.), Trujillo, Yaracuy, States; Distrito Federal; Territorio Federal Delta-Amacuro (excl. Pedernales, Tucupita, Dep.).	All	600	No
ASIA					
Afghanistan	Yes	None	May-Nov	2000[4]	Yes
Bahrain	Yes	None	All	All	Yes
Bangladesh	Yes	Bogra, Dacca, Dinajpur, Faridpur (part.), Jessore, Khulna (part.), Kushtia, Pabna, Rajshahi, Tangail, D.	All	All	Yes
Bhutan	Yes	Sanchi, Chirang.	Mar-Oct	1600	Yes
Burma	Yes	Rangoon City & suburbs; Mandalay City; Maymyo Town; Naung-U Township (Pagan); Taunggyi Town & Inle Lake area.	Apr-Nov	900	No[5]
Cambodia[6]					
China	?	?	?	?	?
Dem. Kampuchea	Yes	?	All	All	Yes
Gaza Strip (Palestine)	Yes	None[7]	Jun-Oct	All	Yes

[1] Amambay Dep.: risk very low, and in small parts only.
[2] Piura Dep.: Dec-Jul.
[3] Except Albina, Moengo (Marowijne D.), Nickerie, Wageningen (Nickerie D.).
[4] Occasionally risk above 2000 m.
[5] Generally no risk in most urban areas.
[6] *v.* Dem. Kampuchea.
[7] Risk very limited.

Table 12 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	For countries where malaria risk exists			
		Areas *without* risk	For all other areas not shown in column 3		
			Months with risk	Altitude below which risk exists (metres):	Risk in urban areas
India	Yes	Andhra Pradesh S.: Nellore, D.	Mar-Oct	1600	Yes
		Arunachal Pradesh S.: Kameng, Siang, Subansiri, D.	Mar-Oct	1600	Yes
		Himachal Pradesh S.: Chamba, Kinnaur, Lahaul Spiti, Mahasu, Mandi, Simla, Sirmaur (part.), D.	Mar-Oct	1600	Yes
		Jammu & Kashmir S.: Anantnag, Ladakh, Punch, Srinagar, D.	Mar-Oct	1600	Yes
		Karnataka S.: Coorg, N. Kanara, S. Kanara, D.	Mar-Oct	1600	Yes
		Kerala S.: Kottayam, Palghat, Trivandrum (part.), D.	Mar-Oct	1600	Yes
		Nagaland S.: Mon, Wokhe, D.	Mar-Oct	1600	Yes
		Sikkim; Sikkim North, Sikkim East.	Mar-Oct	1600	Yes
		Tamil Nadu S.: Batlagundu, Coimbatore (part.), Madurai, Nilgiris, D.	Mar-Oct	1600	Yes
		Uttar Pradesh S.: Almora (part.), Almora & Champawat, Chamoli, Dehradun (part.), Garhwal, Nainital (Teh), Pithoragarh, Tehri Garhwal, Uttar Kashi, D.	Mar-Oct	1600	Yes
		West Bengal S.: Darjeeling (part.), D.	Mar-Oct	1600	Yes
Indonesia	Yes	Jakarta Raya, Surabaya, Municip.	All	1200	Yes
Iran	Yes	Ostans (= Regions): Azarbaijan (East), Azarbaijan (West), Bushehr, Guilan, Hamedan, Isfahan, Khorasan, Kluzestan (excl. Sharestans (= Prov.): Behbehan, Izeh, Masjed Soleyman), Kordestan, Markazi (Central/Teheran), Mazandaran, Yazd; Sharestans (=Prov.): Abadeh, Estahban, Neyriz, Shiraz (Fars Ostan); Kerman, Rafsanjan, Sirjan (Kerman Ostan); Borujerd (Lorestan Ostan); Zabol, Zahedan (Sistan & Baluchistan Ostan).	Jul-Nov	1500	No[1]
Iraq	Yes	Most of the country, excl. northern region: Dehok, Erbil, Kirkuk, Ninawa, Sulaimaniya, Prov.	May-Nov	1500	Yes
Jordan	Yes	Whole country, with exception of Jordan Valley and Karak Lowlands where there is some risk, but, normally not visited by tourists.	Apr-Nov	All	No
Korea					
Rep. of Korea	Yes	Whole country, excl. northern areas of: Chungchong-Pukdo, Kyongsang Pukdo, Prov.	Jun-Sep	All	No
Lao People's Dem. Rep.	Yes	Vientiane, and two neighbouring subdistricts.	All	All	Yes
Malaysia	Yes	None	All	1700	No[2]
Maldives	Yes	Male I. (Cap.), Kaaf Atoll (Male Atoll).	All	All	No[3]

[1] Except Minab Bandar Abbas, Jiroft, Chahbahar, Iranshahr.
[2] Except Sabah (excl. Kota Kinabalu, Sandakan, Tawau, Victoria, Towns) and West Malaysia: Small towns near foothills.
[3] There are no urban agglomerations in the malarious areas except the capital city.

Table 12 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	For countries where malaria risk exists			
		Areas *without* risk	For all other areas not shown in column 3		
			Months with risk	Altitude below which risk exists (metres):	Risk in urban areas
Nepal	Yes	Dhaulagiri Anchal (= Prov.), Karnali Anchal.	Jun-Nov[1] All[2]	1200	Yes
Oman	Yes	None	All	1000	Yes
Pakistan	Yes	None	Mar-Oct[3]	2000	Yes
Philippines	Yes	Bohol, Catanduanes, Cebu, Leyte, Is.; plain areas of: Negros, Panay, Is.	All	600	No[4]
Qatar	Yes	None	All	All	Yes
Saudi Arabia	Yes	Alhasa, Arar, Jauf, Quraiya (Gurayyat), Riyad, Tabuk, Taif, and urban areas of Jeddah, Mecca, Medina.	All	?	Yes[5]
Singapore	Yes	City District (southern part of the island).	All	All	No
Sri Lanka	Yes	Galle, Kalutara, Colombo (part.).	All	800	Yes
Syrian Arab Rep.	Yes	Damascus, Deir-ez-Zor, Hama, al Hasakeh, Homs, Latakia, Sweida, Tartus, D.	May-Oct	600	No
Thiland	Yes	Ang Thong, Nakhon Pathom, Nonthaburi, Pathum Thani, Phichit, Phra Nakhon (Bangkok & Thon Buri), Phra Nakhon Si Ayutthaya, Samut Prakan, Samut Sakhon, Samut Songkhram, Sing Buri, Prov. Part of: Buri Ram, Chachoengsao, Chai Nat, Chiang Mai, Chon Buri, Kanchanaburi, Khon Kaen, Lamphun, Lop Buri, Maha Sarakham, Nakhon Nayok, Nakhon Ratchasima (Korat), Nakhon Sawan, Nakhon Si Thammarat, Narathiwat, Phangnga, Phetchaburi, Phitsanulok, Phuket, Prachin Buri, Prachuap Khiri Khan, Ratchaburi, Roi Et, Songkhla, Sukothai, Suphan Buri, Surat Thani, Surin, Ubon Ratchathani, Udon Thani, Uthai Thani, Yasothon; Prov.	All	All	No[6]
Timor, East	Yes	None	All	All	Yes
Turkey	Yes	Whole country excl. plain of Cucurova (Adana, Hatay, Icel (part.), Prov.); Hakkari, Siirt (part.), Prov.	Jul-Oct[7]	1000	No
United Arab Emirates	Yes	None	All	All	Yes
Viet-Nam					
Dem. Rep. of Viet-Nam	Yes	None	Mar-Nov	1000	No
Rep. of South Viet-Nam	Yes	?	?	?	?
Yemen	Yes	Hajja, Sada, Prov.	Sep-Feb	1400	Yes
Yemen, Democratic	Yes	First Governorate (Aden and airport perimeter)	All	All	Yes

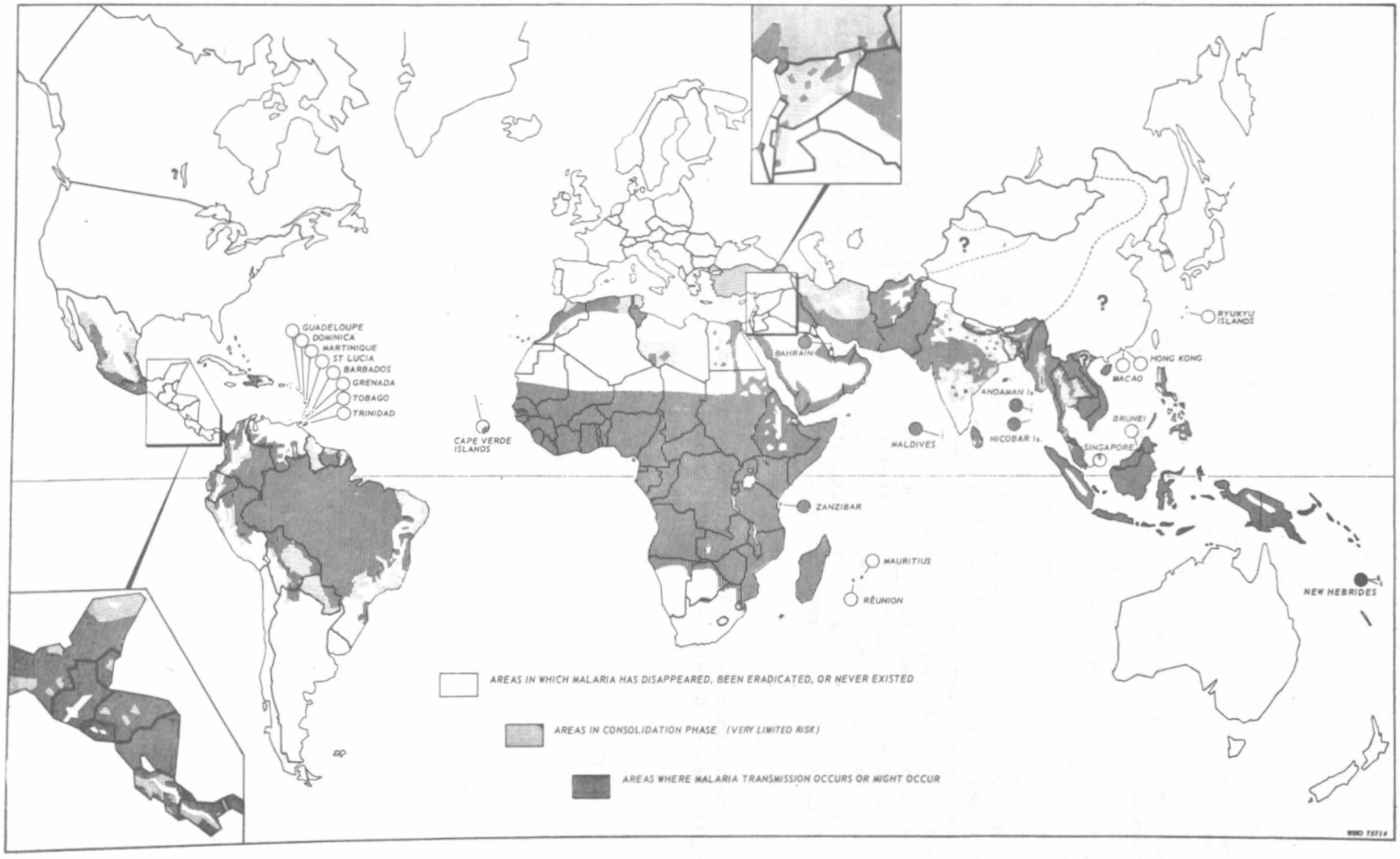
[1] In cultivated areas (below 250 m.) and in hill valleys (750-1 200 m.).
[2] 250-750 m.
[3] North-West-Frontier Prov., hilly areas of Baluchistan and Punjab Prov. Jun-Sept.
[4] Practically no risk.
[5] Except Jeddah, Mecca, Medina, Qatif.
[6] In Bangkok and in most urban areas.
[7] Hakkâri Prov.: Aug-Oct; Siirt Prov.: Jul-Sept.

Table 12 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	For countries where malaria risk exists			
		Areas *without* risk	For all other areas not shown in column 3		
			Months with risk	Altitude below which risk exists (metres):	Risk in urban areas
EUROPE					
Denmark[1]	No				
France[2]	No				
Greece	Yes	Practically the whole country	Jun-Nov	All	No
OCEANIA					
British Solomon Is.	Yes	Some eastern and southern outlying islets.	All	400	Yes
New Hebrides	Yes	Port Vila, Futuna I.	All	All	Yes
Papua New Guinea	Yes	None	All	?	Yes
SOVIET SOCIALIST REPUBLICS, UNION OF					
Union of Soviet Socialist Rep.	Yes[3]	?	?	?	?

[1] Excl. Faeroe Is. and Greenland shown separately.
[2] Excl. Overseas Departments, namely French Guiana, Guadeloupe, Martinique and Réunion, shown separately.
[3] Excl. Byelorussian Soviet Socialist Rep. and Ukrainian Soviet Socialist Rep.

Fig. 5 AREAS OF RISK FOR MALARIA TRANSMISSION
December 1975



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 week before entering the malarious area and continuing until 6 weeks after departure. The pediatric dose of chloroquine phosphate is 5 mg per kg (base) weekly. 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 tertian malaria and on whether the patient is glucose-6-phosphate dehydrogenase (G-6-P-D) deficient. The dose is 26.3 mg (15 mg base) daily 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 the accompanying table, abstracted from the World Health Organization's Weekly Epidemiological Record 52:70-73, 1977. The reader is encouraged to consult the above reference for more detailed information on these areas. 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 Antemal. Administration once a week during and after exposure similar to that outlined above for chloroquine has been found to be effective in the prevention of chloroquine-resistant malaria.

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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, Education, and Welfare.

Areas in which chloroquine-resistant strains of *P. falciparum* have been reported

Country	Name of Area	Year(s) of Study
AMERICAS		
Brazil	States in interior of country; Espirito Santo State (coastal area north of Rio de Janeiro)	1961-69
Colombia	Malarious areas in northern third of country: interior provinces bordering Venezuela and Brazil	1961-73
Ecuador	Provinces in interior of country bordering Colombia	1975
Guyana	Brazil-Guyana border area	1969, 71
Panama	All areas east of Canal Zone	1969-75
Surinam	All malarious areas	1973-75
Venezuela	Provinces in interior of country bordering Colombia, Brazil, and Guyana	1964-74
ASIA		
Bangladesh	Border areas with Assam State, India, and Burma	1970-75
Burma	All malarious areas	1969-75
Cambodia	Whole country	1962
India	Assam State	1973
Indonesia	East Kalimantan (Island of Borneo)	1974
	Irian Jaya (Island of New Guinea)	1974
Malaysia		
West	All malarious areas	1963
Sabah	All malarious areas	1971-75
Sarawak	Sarawak-Sabah border area	?
Philippines	Luzon Island	1969-75
	Basilian Island and Sulu Archipelago	1975
	Mindoro Island	1974
	Palawan Island	1969
Thailand	All malarious areas	1961-71
Vietnam	All malarious areas in south: Status of chloroquine resistance in north is unknown	1962

particular, the careful taking of a travel history from every patient with a fever of unknown origin. Once the diagnosis 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. Prior to 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. 6). (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. 7).
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. 8).
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. 8).

*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.

Fig. 6

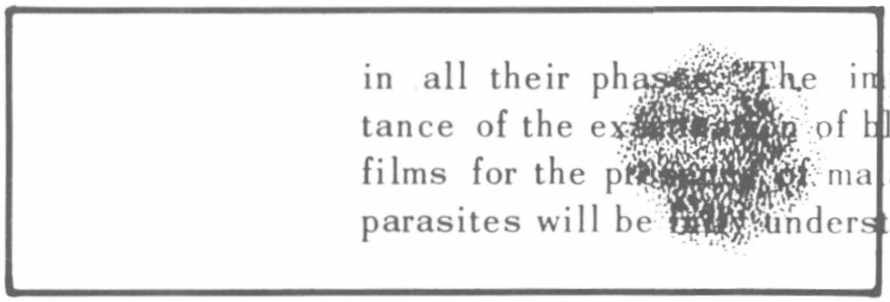


Fig. 7

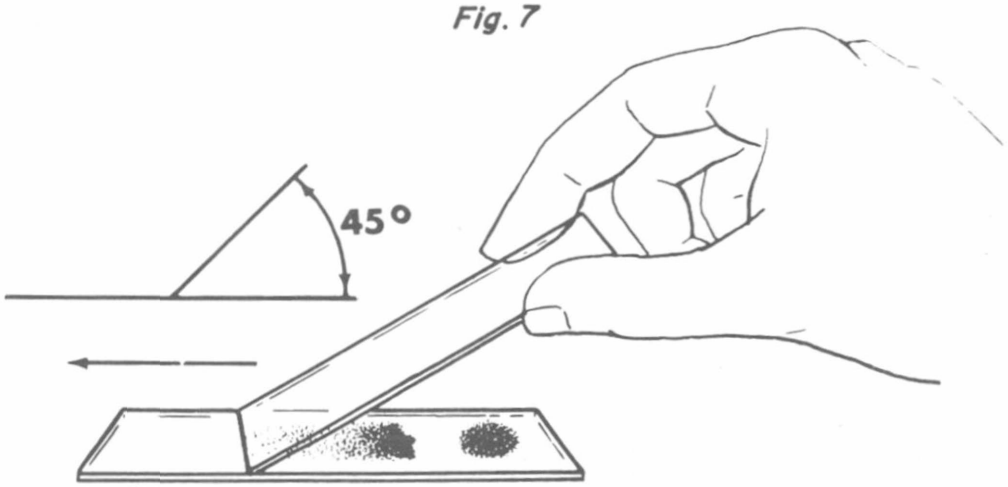
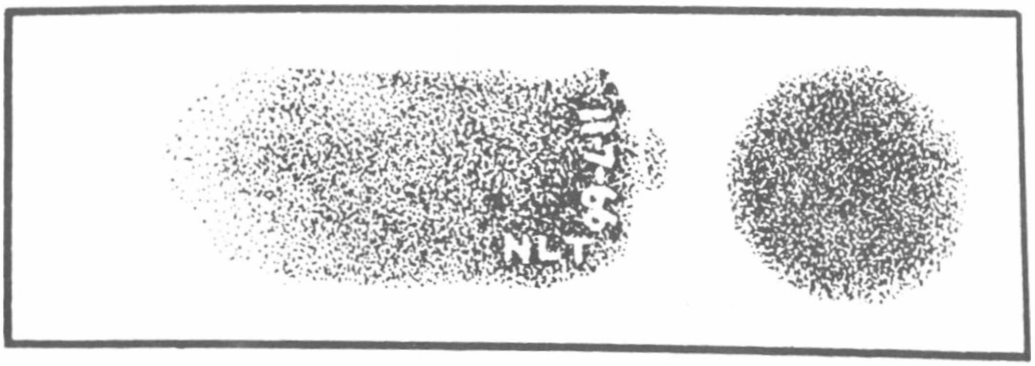


Fig. 8



* U.S. GOVERNMENT PRINTING OFFICE: 1977--740-116/7060 Region No. 4

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Key to all disease surveillance activities are those in each state who serve as State Epidemiologists. Responsible for the collection, interpretation, and transmission of data and epidemiologic information from their individual states, the State Epidemiologists perform a most vital role. Their contributions to this report are gratefully acknowledged.

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9/2/77