ANNUAL SUMMARY 1974
Issued July 1975

CENTER FOR DISEASE CONTROL

MALARIA

SURVEILLANCE

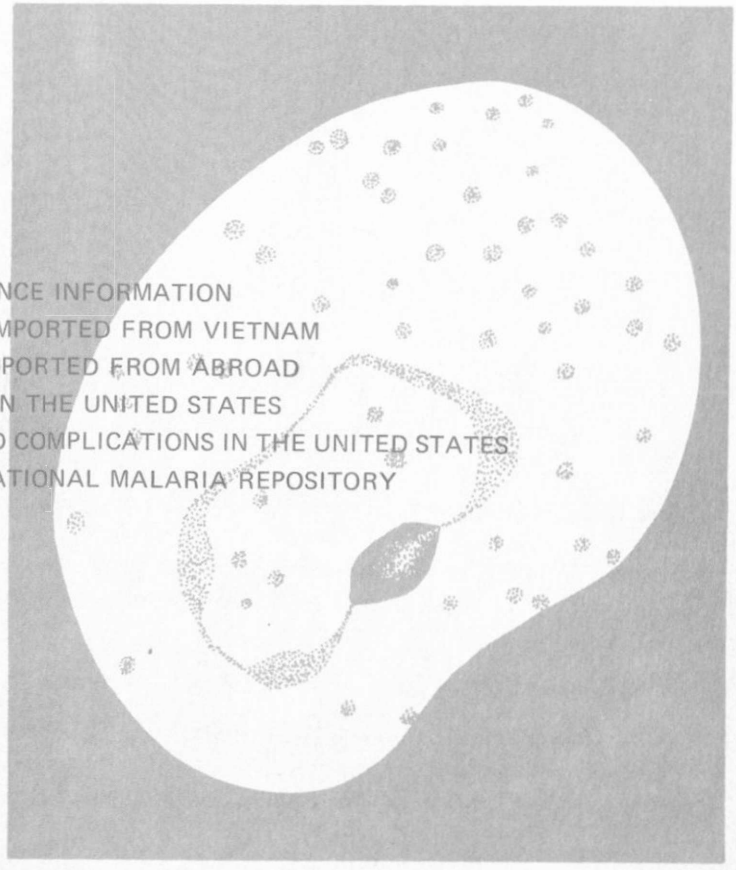


TABLE OF CONTENTS

I. SUMMARY
II. TERMINOLOGY
III. GENERAL SURVEILLANCE INFORMATION
IV. MILITARY MALARIA IMPORTED FROM VIETNAM
V. CIVILIAN MALARIA IMPORTED FROM ABROAD
VI. MALARIA ACQUIRED IN THE UNITED STATES
VII. MALARIA DEATHS AND COMPLICATIONS IN THE UNITED STATES
VIII. REPORT FROM THE NATIONAL MALARIA REPOSITORY
IX. ADDENDUM I
X. ADDENDUM II

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 and Veterinary
Public Health Service
Bureau of Epidemiology
Atlanta, Georgia 30333

SUGGESTED CITATION

Center for Disease Control: Malaria Surveillance, Annual Summary 1974
Issued July 1975

Center for Disease Control ..... David J. Sencer, M.D., Director

Bureau of Epidemiology ..... Philip S. Brachman, M.D., Director

Parasitic Diseases and Veterinary
Public Health Division ..... Myron G. Schultz, D.V.M., M.D., Director

Malaria Surveillance ..... Richard E. Brodsky, M.D.*
Pete K. Shaw, M.D.

Collaborators

Bureau of Laboratories

General Parasitology Branch, Parasitology Division ..... George R. Healy, Ph.D., Chief

National Malaria Repository ..... Margaret Welch, M.T. (ASCP)
L. Jean Adams, B.S.

Fluorescent Antibody Laboratory ..... Alex J. Sulzer, Ph.D., Chief
Marianna Wilson, B.S., M.S.

Computer Systems Office ..... Howard Vickers

*Through June 30, 1975

I. SUMMARY

In 1974, 323 cases of malaria were reported in the United States. This represents a 49.5% increase compared with the 216 cases reported for a similar period in 1973 and was primarily related to a substantial increase in the number of malaria cases that occurred in civilians. In 1974, only 21 cases (7% of all cases reported in the United States) were reported among military personnel, the smallest number since 1960. Coincident with the end of the Vietnam War, only 9 cases originated from Vietnam, down from 31 in 1973. As in previous years, imported Plasmodium vivax infections were more common than P. falciparum (50.8% versus 28.8%), although P. falciparum accounted for a larger percentage of malaria cases (an increase of 7.5%) than in 1973.

In 7 instances, infection was acquired in the United States, with 3 induced by transfusion, 1 transmitted congenitally, and 3 acquired through local mosquito transmission in the Sacramento Valley of California. The introduced malaria outbreak was the first since 1970. There were 6 malaria deaths reported in 1974, compared with 4 in 1973. All 6 deaths occurred in civilians infected with P. falciparum malaria acquired in Africa. The P. falciparum malaria death-to-case ratio of 6.4% was slightly lower than that in 1973 (8.6%), but did not differ significantly from the 10-year (1964-1973) ratio of 3.2%.

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.

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

2. Imported
   Malaria acquired outside of a specific area (the United States and Puerto Rico in this report).

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

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

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

DHEW Publication No. (CDC) 76-8259

III. GENERAL SURVEILLANCE

Between January 1, 1974, and June 1, 1975, 323 cases* of malaria with onset of illness in 1974 in the United States and Puerto Rico were reported to the Parasitic Diseases and Veterinary Public Health Division, Center for Disease Control; this represents a 49.5% increase over a similar period in 1973 when 216 cases were reported. The increase in reported cases was due principally to an increase of malaria in civilians. Civilian cases increased from 175 in 1973 to 302 in 1974 and comprised 93% of all cases diagnosed in this country (Table 1), compared with 81% in 1973. Cases of malaria among military personnel continued to decline, a trend first seen in 1971. Military cases declined from 41 in 1973 to 21 in 1974 and comprised only 7% of all cases diagnosed in this country, compared with 19% in 1973 (Figure 1).

Table 1

Military and Civilian Malaria Cases,
United States, 1959-1974*

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**	2699	158	2857
1968**	2567	130	2697
1969**	3914	145	4059
1970**	4096	151	4247
1971**	2975	205	3180
1972**	454	160	614
1973	41	175	216
1974	21	302	323

*Onset of illness in the United States and Puerto Rico

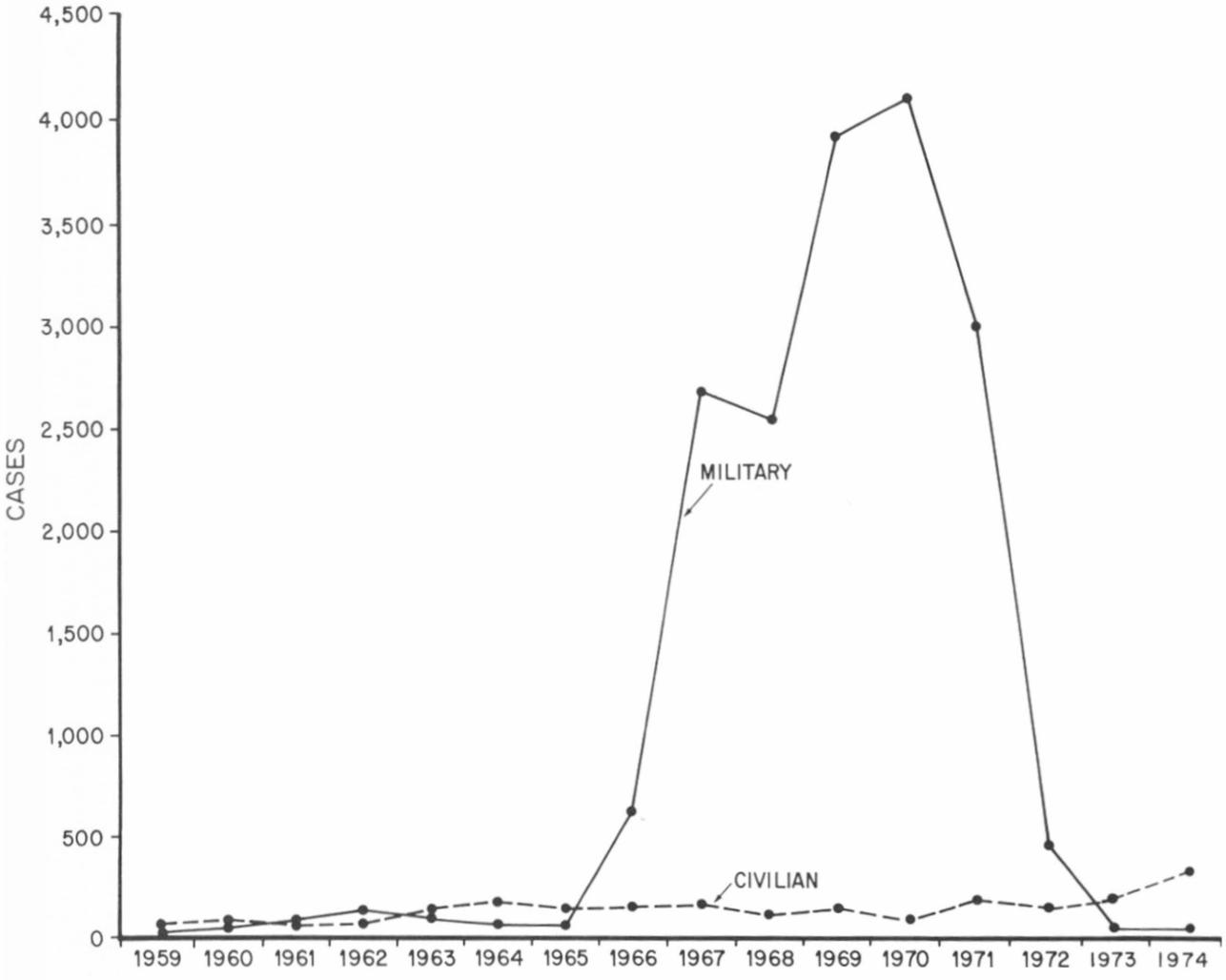
**Figures for these years have been updated to include cases reported after the publication of previous annual summaries.

---

*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 a local or state laboratory. Doubtful cases were referred to the National Malaria Repository, CDC

Figure 1

MILITARY AND CIVILIAN CASES OF MALARIA, UNITED STATES, 1959-1974



In 1974, in 7 of the 302 civilian cases and in none of the military cases, the patients acquired their infections in the United States. In 3 cases, transmission was by blood transfusion, and 1 case resulted from congenital transmission. These 4 cases were all caused by Plasmodium malariae. The remaining 3 epidemiologically related cases of malaria acquired within the United States were caused by P. vivax.

A noticeable change in the ratios of cases caused by the various plasmodium species occurred between 1973 and 1974. In 1974, P. falciparum accounted for 28.8% of infections, an increase of 7.5% from 1973. The increase in the overall proportion reflected a statistically significant increase in reported cases imported from Africa due to P. falciparum (35% in 1973 to 54.4% in 1974, $p < 0.01$, 2x2 Chi Square). P. vivax was responsible for 50.8% of infections (Table 2) and represented a 2.4% decrease from 1973. The frequency of P. ovale cases declined from 6.5% in 1973 to 2.8% in 1974, while the frequency of P. malariae cases remained essentially constant. The 2 mixed infections were caused by coexistent P. vivax and P. falciparum.

Table 2

Malaria Cases by Plasmodium Species,
United States, 1974

Species	Total	Percent
P. vivax	164	50.8
P. falciparum	93	28.8
P. malariae	26	8.0
P. ovale	9	2.8
Mixed Infections	2	0.6
Undetermined	29	9.0
TOTAL	323	100.0

The countries in which the 323 patients contracted malaria in 1974 are shown in Table 3. Areas of acquisition were identifiable for all cases of malaria reported in 1974, whereas in 1973 the areas of acquisition were unknown for 11.1% of reported cases. In 1974, Africa accounted for 42.1% of cases, Asia for 35.0%, Central America for 9.3%, North America for 9.0%, South America for 3.1% and Oceania for 1.5%. The percentage of cases in which persons were exposed in Asia in 1974 was 6.1% lower than in 1973 (N.S.), whereas the percentage of cases with infection acquired in Central America and the Caribbean increased by 4.9% (significant at $p < 0.05$, 2x2 Chi Square); this overall increase was related to an increase in cases from El Salvador (from 2 to 11) in 1974. Africa, North America, Oceania and South America accounted for the same percentage of cases in 1974 as in 1973. The number of cases in which infection was acquired in Vietnam continued to decline in 1974; only 9 cases were reported this year, compared with 32 in 1973, and 435 in 1972. The largest number of cases from any single country were reported from India (50), comprising 15.8% of all reported cases in 1974, compared with 8.3% in 1973. This increase was significant ($p < 0.05$, 2x2 Chi Square). Taking into account immigrants and non-immigrants of Indian birth, plus American travelers entering the U.S. from India in 1974, there was an 8.7% increase in the number of persons entering this country with recent travel in India over 1973, 94,793 versus 87,193 (3,4). However, the small magnitude of this increment cannot completely account for the large (213%) increase in the number of malaria cases imported from India in 1974. Of more importance is the marked, inexorable resurgence of malaria in India over the last decade; official figures show a gradual increase from 100,185 positive blood smears for malaria in 1965 to 1,640,623 (provisional) in 1973 (5). Other countries where exposure occurred in a large number of imported cases were Nigeria (27), Pakistan (24), Mexico (22), Liberia (18), and El Salvador (11).

A history of previous malaria while abroad was obtained in 94 of the 313 imported cases (30%). Patients with P. vivax malaria appeared more likely to give a history of having had malaria previously (33.8%) than patients with either P. falciparum (22.2%) or P. malariae infection (29.2%).

The geographic distribution of the 1974 malaria cases in the United States is shown by the state in which the patient first developed clinical symptoms of the disease (Figure 2).

While the seasonal distribution of malaria cases has shown no distinct pattern in recent years, a definite peak in cases (excluding cases with unknown date of onset) was seen in 1974 in the summer months (Figure 3). This seasonality may reflect a general increase in travel by Americans during the summer months, but why this pattern has not been apparent in the past is not clear.

Table 3

Malaria Cases by Distribution of Plasmodium Species and Area of Acquisition, United States, 1974*

	vivax	falciparum	malariae	ovale	Mixed	Unknown	Total
AFRICA	24	74	11	9	1	17	136
Africa**	8	11	1	2	0	2	24
East Africa**	2	4	2	0	0	0	8
West and Central Africa**	1	11	2	2	1	2	19
Angola	1	2	0	0	0	0	3
Cameroon	0	0	0	1	0	0	1
Dahomey	0	0	0	1	0	0	1
Ethiopia	1	0	0	0	0	0	1
Gabon	0	1	0	0	0	0	1
Gambia	0	0	0	0	0	1	1
Ghana	0	7	0	0	0	1	8
Ivory Coast	0	1	0	1	0	0	2
Kenya	1	1	1	1	0	0	4
Liberia	0	14	1	0	0	3	18
Nigeria	8	12	4	0	0	3	27
Sierra Leone	0	0	0	0	0	2	2
Sudan	0	1	0	0	0	0	1
Tanzania	1	4	0	0	0	1	6
Uganda	0	2	0	1	0	0	3
Upper Volta	0	1	0	0	0	0	1
Zaire	1	2	0	0	0	2	5
ASIA	86	8	9	0	1	9	113
Asia**	2	0	0	0	0	1	3
Middle East**	0	1	0	0	0	0	1
S.E. Asia**	1	1	0	0	0	1	3
Formosa	1	0	0	0	0	0	1
India	41	0	7	0	1	1	50
Indonesia	3	0	1	0	0	0	4
Iran	1	0	0	0	0	0	1
Laos	2	0	0	0	0	1	3
Malaysia	1	0	0	0	0	0	1
Pakistan	17	4	0	0	0	3	24
Philippines	4	1	1	0	0	0	6
Saudi Arabia	1	0	0	0	0	0	1
Sri Lanka	2	0	0	0	0	0	2
Thailand	4	0	0	0	0	0	4
Vietnam	6	1	0	0	0	2	9
CENTRAL AMERICA and CARIBBEAN	20	8	1	0	0	1	30
Central America**	2	0	0	0	0	0	2
Costa Rica	0	1	0	0	0	0	1
El Salvador	11	0	0	0	0	0	11
Guatemala	1	0	0	0	0	1	2
Haiti	0	3	0	0	0	0	3
Nicaragua	6	2	1	0	0	0	9
Panama	0	2	0	0	0	0	2

*Onset of illness in the United States and Puerto Rico

**Country not specified

Table 3 (Cont.)

	vivax	falciparum	malariae	ovale	Mixed	Unknown	Total
NORTH AMERICA	22	1	5	0	0	1	29
Mexico	19	1	1	0	0	1	22
United States	3	0	4	0	0	0	7
OCEANIA	4	0	0	0	0	1	5
Oceania**	1	0	0	0	0	1	2
New Guinea	3	0	0	0	0	0	3
SOUTH AMERICA	8	2	0	0	0	0	10
South America**	1	1	0	0	0	0	2
Brazil	1	1	0	0	0	0	2
Colombia	6	0	0	0	0	0	6
TOTAL	164	93	26	9	2	29	323

As in previous years, clinical malaria developed within 30 days of arrival in the United States in 81.6% of P. falciparum and 34.9% of P. vivax infections for which both the exact date of arrival and the date of onset were available (Table 4). Within 6 months after returning to the country, 98.8% of patients with P. falciparum malaria and 72.3% of those with P. vivax malaria developed clinical symptoms. Only 8 patients (5.3%) with P. vivax malaria became ill more than 1 year after their last possible exposure to malaria abroad. The longest interval between entry into the United States and clinical illness in 1974 was 59 months for a patient with P. vivax malaria and 11 months for a patient with P. falciparum malaria.

Of the 323 cases reported in 1974, 7.1% of patients were initially treated in military hospitals, and 1.2% received care in a Veterans Administration Hospital; in 67.8% of the reported malaria cases, the patients were initially treated in civilian hospitals, an increase of 8.1% over 1973 (Table 5). The Armed Forces and the 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 substantially underestimate the extent to which civilian physicians encounter cases of malaria.

Fig. 2 GEOGRAPHIC DISTRIBUTION OF MALARIA CASES WITH ONSET IN UNITED STATES, 1974

Fig.3 MALARIA CASES BY MONTH OF ONSET, UNITED STATES, 1974

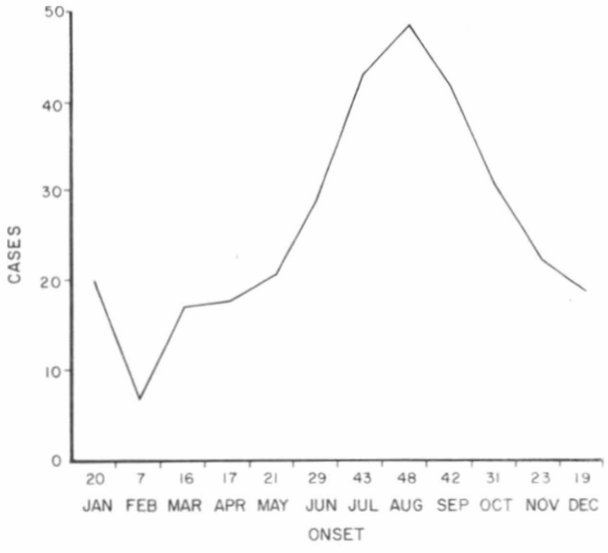


Table 4

Malaria Cases by Interval Between Date of Entry Into the United States and Onset of Illness, and by Plasmodium Species, United States, 1974

Interval (in months)	Plasmodium species									
	Vivax	(%)	Falciparum	(%)	Malariae	(%)	Ovale	(%)	All Cases	(%)
<1	53	(34.9)	71	(81.6)	14	(60.9)	3	(33.3)	141	(52.0)
1-2	29	(19.0)	14	(16.1)	3	(13.0)	1	(11.1)	47	(17.3)
3-5	28	(18.4)	1	(1.1)	2	(8.7)	3	(33.3)	34	(12.5)
6-11	34	(22.4)	1	(1.1)	3	(13.0)	0	(0.0)	38	(14.0)
≥ 12	8	(5.3)	0	(0)	1	(4.3)	2	(22.2)	11	(4.1)
Total	152	(100.0)	87	(99.9)	23	(99.9)	9	(99.9)	271	(99.9)

*Cases acquired in the United States (7), cases with species undetermined (29) or mixed (2), and cases with exact entry date or onset of illness date unknown (14) are not included.

Table 5

Malaria Cases by Type of Initial Hospital Admission,
United States, 1974

Type of Hospital	Number of Patients	Percent
Military	23	7.1
Veterans Administration	4	1.2
Civilian	219	67.8
Public Health Service	12	3.7
Other	13	4.0
Not Hospitalized	52	16.1
TOTAL	323	99.9

IV. MILITARY MALARIA

In 1974 there were 21 cases of malaria reported among military personnel and 9 of the 21 (42.9%) were reported from Vietnam (Table 6). This represents a 74.2% decrease from the 31 cases imported from Vietnam in 1973. The number of total military malaria cases has now fallen to pre-Vietnam War levels. No new reports of P. vivax malaria relapses among Vietnam returnees were reported to CDC in 1974. Terminal chemoprophylaxis for malaria changed at the end of 1971 from the 8-week chloroquine-primaquine regimen to a single 600 mg (base) dose of chloroquine and 14-day course of 15 mg (base) primaquine: this regimen remained in use until the end of the Vietnam War in 1973.

Since relapse of P. vivax infection is unusual after 3 years, no cases of P. vivax infection should be expected in veterans returning from Vietnam up through 1971; however, there may be additional relapses among veterans who returned in 1972 and 1973. These returnees, however, represent a very small proportion of the military personnel who acquired malaria during the Vietnam War and so the actual number of relapses that may yet occur should be extremely small.

Table 6

Malaria Cases in Military Personnel, by Branch of Service,
United States, 1974

Branch of Service	Number of Cases	Percent of Cases
Army	7	33.3
Navy	2	9.5
Air Force	2	9.5
Marines	7	33.3
Unknown	3	14.3
TOTAL	21	99.9

V. CIVILIAN MALARIA IMPORTED FROM ABROAD

In contrast to the continuing decrease in military cases of malaria, the number of imported civilian cases increased in 1974. The age and sex distribution of the 302 civilian cases which occurred in the United States is presented in Table 7 and, as in previous years, shows a predominance in males in the 20 to 29-year-old age group.

Table 7

Civilian Malaria Cases, by Age and Sex,
United States, 1974

Age Group	Male	Female	Unknown	Total	Percent
0-9	20	9	1	30	9.9
10-19	27	12	0	39	12.9
20-29	80	30	2	112	37.1
30-39	33	12	3	48	15.9
40-49	27	2	0	29	9.6
50-59	20	3	1	24	7.9
60-69	4	4	0	8	2.6
>70	1	1	0	2	0.7
Unknown	4	2	4	10	3.3
TOTAL	216	75	11	302	99.9

United States citizens accounted for 51.2% of the imported civilian cases for which nationality was available (Table 8). When purpose of travel in malarious areas is considered, tourists comprise the largest group among U.S. citizens and foreign visitors (26.1%). Of note is the significant increase in incidence of malaria acquisition by tourists from the United States in 1974 compared with 1973 (12.1% of imported cases in 1973 versus 22% in 1974, $p < 0.001$, 2x2 Chi Square). While the number of Americans traveling to malaria-endemic areas has increased by approximately 8.4% over the last year (from 2.2 to 2.38 million travelers) (3,4), the increase in malaria incidence among U.S. citizen tourists was much greater, 225%. Other factors must, therefore, have been contributory. These variables may include changing lengths of stay abroad, increased intensity of malaria exposure (due either to more travel by visitors to areas with high malaria risk or spread of malaria to frequently traveled areas that were previously malaria-free), decreased precaution by travelers against mosquito bites, or possible inadequacy of particular chemoprophylactic drugs taken by certain American travelers.

Table 8

Imported* Civilian Malaria Cases, by Occupation While in Malarious Area
and Nationality, United States, 1974

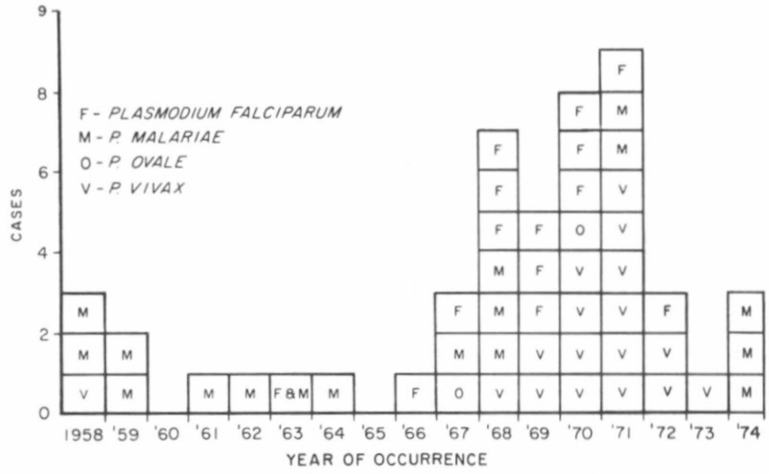
Occupation	U.S. Citizen	Foreign Visitor	Total	Percent
Tourist	65	12	77	26.1
Businessman	22	17	39	13.2
Government representative	10	7	17	5.8
Missionary	13	2	15	5.1
Peace Corps	3	--	3	1.0
Seaman	5	14	19	6.4
College Student or Teacher	15	41	56	19.0
Other	12	33	45	15.3
Unknown	6	18	24	8.1
TOTAL	151	144	295	100

*Introduced, Induced and Congenital Cases not included.

VI. MALARIA ACQUIRED IN THE UNITED STATES

In 1974, 7 persons acquired malaria infection in the United States, the largest number for any year since 1971. This increase was due to the number of cases of transfusion-induced malaria (Figure 4), and a small cluster of introduced malaria cases in California. One congenitally-acquired case was reported in the United States; that case, and the 3 that were induced by blood transfusion were all caused by P. malariae. The 3 introduced cases were caused by P. vivax.

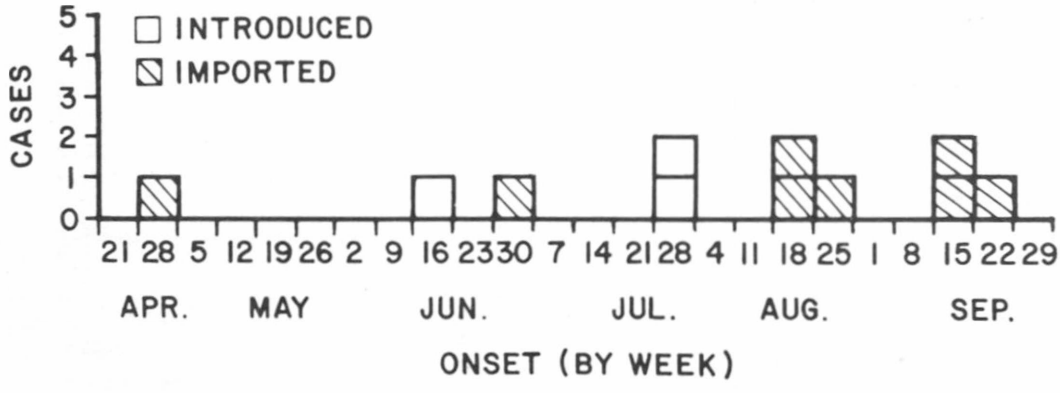
Figure 4 TRANSFUSION MALARIA CASES, UNITED STATES, 1958-1974



A. Introduced Malaria

Between April 1 and September 30, 1974, 11 cases of malaria were recognized in Sutter, Yuba, and Butte counties, California (Figure 5). Three cases were found to be definitely introduced, while the remainder were imported.

Fig. 5 MALARIA CASES, BY DATE OF ONSET, SUTTER, YUBA, AND BUTTE COUNTIES, CALIFORNIA, APRIL 28-SEPTEMBER 28, 1974



Index Case. On May 14, 1974, a 14-year-old boy was seen by a private physician in Yuba City, Sutter County, California, with an 11-day history of fever, chills, and sweats. On physical examination, his spleen was firm and enlarged. Plasmodium vivax organisms were seen on blood smear. He was treated with quinacrine and primaquine and became asymptomatic, with his spleen remaining slightly enlarged. The boy had emigrated from Punjab State, India, arriving in San Francisco on April 21, 1974; he stayed in San Jose for 1 week before joining his family on April 28 in a rural area near Gridley, Butte County, California. One year earlier, while in India, he had an illness characterized by fever every other day; he was treated with an unknown medication for a few days and had no symptoms thereafter until the present.

The index case represents an imported case of vivax malaria, in that the patient had a history of periodic intermittent febrile illness in India 1 year prior to his arrival to the United States, had received short-term therapy (not radical cure), and had a firm and enlarged spleen on examination in the United States.

Introduced Case 1. On June 26, 1974, a 52-year-old man from northwestern Yuba County was admitted to a hospital in Yuba City with a 6-day history of fever, chills, retro-orbital pain, headache, and diffuse myalgia. On admission he had a temperature of 106° F., and his spleen was not palpable. Plasmodium vivax organisms were seen on blood smear. He was treated with chloroquine and primaquine and made an uneventful recovery. In 1943 in North Africa, the man had been treated for malaria. He has not been out of the United States since 1949 and gave no history of blood transfusions or parenteral drug use. He lives on a ranch 8 miles north of Marysville, California, between the Feather River and the rice fields, and operates an earth-leveling business that requires extensive travel over the 3-county area. From May 15 through 18, he worked in a mosquito-infested gravel pit in northwest Yuba City about 4 miles from a home the index case often visited. The man (Case 1) worked within 1/2 mile of this home on June 17 and 18. He undoubtedly represents a case of introduced (mosquito-transmitted) P. vivax malaria. The index case could have been the source of his infection. However, a 33-day intrinsic incubation period, which is long for a presumedly tropical strain of P. vivax malaria, must be postulated for transmission to have occurred at that site. Therefore, the likelihood exists that because of the man's rather broad mobility, some other geographic connection with the index case existed, or that there was another unidentified source of infection.

Introduced Case 2. On August 7, 1974, a 51-year-old woman was admitted to a hospital in Yuba City with a 6-day history of fever, chills, myalgia, sweats, diarrhea, and weight loss. Her spleen was not enlarged. Plasmodium vivax organisms were seen on a blood smear. She was treated with amodiaquine and primaquine and has recovered. She has not been out of the country since 1942 and has no history of blood transfusions. She lives within 1/4 mile of Case 1, and was at home, where mosquitoes are plentiful, for the majority of the 8 to 21-day period preceding her illness. A major source of recreation for her is sitting outside on a lawn chair after supper. She worked part-time in Yuba City, and shopped occasionally in Marysville.

Introduced Case 3. On August 9, 1974, an 8-year-old boy who emigrated 1-1/2 months previously from Leon, Guanajuato State, Mexico, was admitted to a hospital in Sutter County with fever, chills, and myalgia of 8-days' duration. On admission he was afebrile and had no organomegaly. A peripheral blood smear was positive for Plasmodium vivax. Therapy was begun with chloroquine and primaquine, and he soon became asymptomatic. There was no apparent history of malaria in the patient or his family, the home origin is reportedly malaria-free, and he did not pass through known malaria-endemic areas enroute to the United States.

The boy lives in western Yuba City, but during the 8-to 10-day period prior to onset of his symptoms he worked with his father on a ranch within 1/2 to 1 mile from the homes of Cases 1 and 2. He and his family had no history of malaria in the past, and serum specimens obtained from family members and tested for malaria gave negative titers for P. vivax. The 42-day hiatus between the onset of symptoms in Case 1 and in 2 and 3 is consistent with mosquito-borne transmission, with Case 1 serving as a possible reservoir of infection.

(Reported by William J. Vasquez, M.D., E. A. Hanson, M.D., Lester Fuller, M.D., and Jerry F. Toller, M.D., Private Physicians; Thomas Leavenworth, M.D., Director, Sutter County General Hospital; Rae C. Lindsay, Health Officer, Sutter-Yuba Health Department; Eugene Kaufman, Manager, Sutter-Yuba Mosquito Abatement District; Ralph Erlingheuser, M.D., Health Officer, Yuba County; Ronald Roberto, M.D., Medical Epidemiologist, Mitchell Singal, M.D., Medical Epidemiologist, and Cathy Powers, Senior Microbiologist, Microbial Diseases Laboratory, California State Department of Health; and 1 EIS Officer.)

The 8 imported cases were all in persons of Punjabi origin. No epidemiologic connection between the imported cases other than the index case and the introduced cases could be found. While this epidemic resembled the 10 previously recorded introduced malaria outbreaks in this country in that the infecting species was Plasmodium vivax (Table 9), a unique factor was that the first introduced malaria case was separated from the second and third introduced cases by 6 weeks, raising the possibility of secondary transmission (Figure 5).

A cluster survey carried out in the area of malaria transmission failed to reveal any unreported Plasmodium vivax malaria cases. However, a significantly higher percentage of individuals from the Punjab exhibited serologic evidence of previous malaria infection, when compared with all other ethnic groups. Although dissections of 2002 Anopheles freeborni mosquitoes, insects that are quite prevalent in the Sacramento Valley of California, failed to uncover any plasmodium oocysts, the vector density was demonstrated to be significantly higher in the area of postulated malaria transmission than in a comparable control area.

This epidemic is notable in light of the significant increase in the incidence of civilian malaria diagnosed in the United States over the past 5 years, with exposure occurring in India. The number of malaria cases imported from India was significantly greater in 1974 than in 1973. This situation may reflect the resurgence of malaria in India; indeed, in the Punjab, positive blood smears for malaria increased over 93-fold between 1966 and 1971, and nearly doubled again by 1972 (5).

B. Congenital Malaria

Case 1 - On June 17, 1974, a 5-month-old girl was admitted to a hospital in New York City for evaluation of a fever of unknown origin of approximately 4 months' duration. She weighed 6 lbs. 13 oz., was the product of a full-term uncomplicated gestation, and was delivered by Caesarean section, necessitated because of a placental abruption. The infant was well until age 2 months, when she began to have intermittent fever, ranging from 101°to 103° F. daily, and usually occurring between 2 p.m. and 6 p.m. She had been seen by several physicians and treated with various antibiotics, but the fever continued.

On physical examination she was active, alert, and appropriate size and weight for age. However, hepatosplenomegaly was present. On hospital admission, laboratory studies included the following: bilirubin 0.5 mg%, SGOT 34 mU per ml, SGPT 21 units, hemoglobin 10.8 gm%, hematocrit 31.5%, platelets 111,000 per mm^3, white blood cell count 8,500 per mm^3. A diagnosis of malaria was made from a blood smear obtained at admission; the technician noted intraerythrocytic parasites which were later identified as Plasmodium malariae by the hospital's parasitology laboratory. The patient was treated with a 3-day course of chloroquine phosphate, and 4 days after the onset of therapy, thick and thin blood smears revealed no evidence of parasitemia. Since treatment, the patient has remained afebrile. Malaria indirect immunofluorescence tests performed at CDC showed a titer of 1:1024 with P. malariae antigen and were negative with P. vivax and P. falciparum antigens.

The patient's mother was born in Taisun, China, a malaria endemic area; nevertheless, the mother claimed that she never had an illness compatible with clinical malaria. She migrated to Hong Kong in 1949, where she was reported to have had a flu-like illness for 2 days. In 1962, the family moved to New York City where they have remained, except for 1 trip to Ohio. The mother received a blood transfusion 45 minutes after the infant's birth but had no prior history of blood transfusion or parenteral drug use. Although no plasmodium organisms were found on her blood smear, the mother was found to have a malaria indirect immunofluorescence test titer of

1:4096 with P. malariae antigen.

Additional family studies revealed no evidence of parasites on thick and thin smears submitted by the patient's parents and 2 older siblings. Malaria indirect immunofluorescence tests have been negative in all family members except the mother. (Reported by Mary Tsai, M.D., Private Physician, New York City; Virginia C. Canale, M.D., Associate Professor of Pediatrics, Director of Transfusion Clinic, David Zigelman, M.D., Pediatric Resident, Donald Hoskins, M.D., Clinical Associate Professor, and Thomas Jones, M.D., Assistant Professor of Medicine, New York Hospital, Cornell Medical Center; John S. Marr, M.D., New York City Principal Epidemiologist; and Alan R. Hinman, M.D., Assistant Commissioner for Epidemiology and Preventive Health Services, New York State Department of Health.)

C. Transfusion-Induced Malaria (Figure 4)

Case 1 - On May 15, 1974, a 15-year-old girl was admitted to a hospital in Tennessee with a history of intermittent, spiking fever of unknown origin. A paroxysmal fever characterized by 72-hour cycles of temperature elevation began on May 11, 1974, and was associated with chills and sweating. Additional symptoms included malaise, myalgia, anorexia, headache, nausea, vomiting, and abdominal pain. A peripheral blood smear revealed the presence of rings, trophozoites, and schizonts of Plasmodium malariae. The patient was treated with chloroquine and primaquine and recovered uneventfully.

The patient had resided in Tennessee for the preceding 12 years and had never traveled outside the United States. She had no previous history of malaria. However, she had a history of chronic renal failure and had been receiving continuous hemodialysis for the previous 7 months. She also had a history of uterine bleeding and anemia which was diagnosed as endometriosis. In February 1974, after developing acute abdominal pain, she had an exploratory laparotomy. During her illnesses she received 14 units of frozen blood from 14 donors. None of the 14 donors had a history of malaria, and none except 1 donor had ever lived or traveled in any areas designated as malarious. Peripheral blood smears examined from all 14 donors were negative for malaria parasites. Serologic examinations of all donors by indirect immunofluorescent antibody tests were negative, except for the 1 individual whose serum revealed high antibody titers against P. malariae and P. falciparum and a low titer against P. vivax. This donor was a 28-year-old Nigerian male who entered the United States in 1966. Since his arrival in this country, he has never traveled outside the United States. He had no history of malaria symptoms and had never previously donated blood. Repeated blood smears from this patient have all been negative for plasmodia. (Reported by G. Reza Najem, M.D., Director, Division of Preventive Health Services and Robert Hutcheson, Jr., M.D., Assistant Commissioner of Public Health, Director, Bureau of Personal Health Services, Tennessee Department of Public Health; Parasitic Serology Branch, Bureau of Laboratories and Parasitic Diseases Branch, Parasitic Diseases and Veterinary Public Health Division, Bureau of Epidemiology, CDC.)

Case 2 - On July 30, 1974, a 42-year-old white female was admitted to a hospital in New York City for partial hepatectomy as treatment for metastic colonic carcinoma. Abdominal bleeding occurred on 2 occasions post-operatively, requiring 64 units of packed red blood cells, platelets, or plasma between July 31 and August 2, 1974. A splenectomy was performed on August 2, 1974. Following discharge on August 15, the patient was seen periodically as an outpatient. On September 9, she complained to her physician of spiking fevers of 2 to 3 days' duration. Physical examination and radiologic evaluation were unremarkable. Despite antibiotic treatment, she returned 1 week later on September 16 because of continued daily fever spikes to 101° F., nausea, dizziness, lethargy, and increasing confusion. On September 18, the patient was readmitted to the hospital with an initial diagnosis of either transfusion-induced hepatitis or drug toxicity secondary to weekly chemotherapy. She was treated for hepatic insufficiency with neomycin and appeared to respond. Her neurologic function and general clinical status improved, and, although still febrile, she was discharged on September 28. On October 7, the patient was readmitted to the hospital because of continued nightly fevers, chills, difficulty breathing and speaking and deteriorating

mental status. At that time her peripheral blood smear was reported positive for Plasmodium malariae organisms. Antimalarial treatment was begun immediately, and the patient responded with a rapid defervescence and a striking improvement in her mental status. She was discharged on October 14, 1974. Serum specimens obtained prior to transfusions on July 28 and subsequent specimens obtained on September 23 and October 10 were tested for anti-malarial antibodies. The first 2 specimens were reported negative; the specimen dated October 10 was positive with a titer of 1:4096 for P. malariae. Of 64 donors, 17 had no previous history of malaria, history of birth, residence, or travel in malaria-endemic areas. Seventeen had insignificant travel histories, and 30 had higher risk travel or residence histories.

A 38-year-old male born in 1936 in Lavenaca, Cyprus, where he lived for 23 years before coming to the United States via Paris, France, was found to be the positive donor. Since 1959, he had lived in either New York City or New Jersey with periodic trips to Cyprus in 1963, 1967 and 1970. He had never been to Africa, Asia, or India and denied any history of illness compatible with malaria. He had donated blood once before, in 1953, but had not done so again until July 27, 1974, when he responded to pleas from his Greek former-countrymen. Blood was donated at a Greek Cypriot social club in Queens and was subsequently given to the patient described above. Indirect immunofluorescent antibody testing of his serum revealed a P. malariae titer of 1:1024, but multiple thick and thin smears were negative for malaria parasites.
(Reported by Donald Armstrong, M.D., Chief, and Michael Tapper, M.D., Clinical Fellow, Infectious Disease Service, Memorial Hospital, Sloan Kettering Cancer Center; John S. Marr, M.D., M.P.H., Director, Bureau of Infectious Disease Control and Howard B. Shookhoff, M.D., Chief, Division of Tropical Medicine, New York City Department of Health and an EIS Officer).

Case 3 - On August 6, 1974, a 78-year-old black female, a life-long resident of North America, was admitted to a Brooklyn hospital for rectal bleeding secondary to chronic diverticulosis. The patient received 14 units of whole blood or packed red blood cells by transfusion during the period August 8 to September 9, 1974. Because of continued bleeding, the patient underwent a subtotal colectomy and splenectomy on August 15, 1974. During an unremarkable recuparative period, Plasmodium malariae parasites were noted on routine blood smear on September 26, 1974. A subsequent indirect immunofluorescent antibody titer for P. malariae was positive at 1:1024. The patient was treated with chloroquine from September 26 to October 2, 1974, with complete recovery. The patient had no previous history of malaria, travel to malaria-endemic areas, or blood transfusions prior to August 8, 1974.

Of 14 blood donors, 5 had no previous history of malaria, past history of residence in or travel to endemic areas; 2 had insignificant travel histories; 4 donors could not be reached, and 3 had lived or traveled in malaria-endemic areas. The 3 individuals with travel-exposure in malaria-endemic areas were screened for malarial antibodies, and 2 of them proved negative. The remaining donor was a 53-year-old woman who was born in 1921 in Sparta, Greece, where she lived for 31 years prior to emigrating to the United States. Since 1952, she has lived in Brooklyn, New York. She denied any other travels outside the United States, or history of malaria; however, she said she had fever at age 6 in Greece, for which she was treated with quinine. She had never donated blood before, but finally did so at a Red Cross-sponsored drive at a Greek church on August 7, 1974, in response to solicitations by fellow Greek-Americans in support of their former-countrymen involved in the Greek-Turkish War on Cyprus of July 1974. Indirect immunofluorescent antibody titers on a sample of her serum revealed a titer of 1:4096 for P. malariae; multiple thick and thin smears were negative for malaria parasites.
(Reported by Marisa Pezzulich, M.D. and Charles LaPunzina, M.D., Brooklyn-Cumberland Medical Center; John S. Marr, M.D., M.P.H., Director, Bureau of Infectious Disease Control and Howard B. Shookhoff, M.D., Chief, Division of Tropical Medicine, New York City Department of Health and an EIS officer.)

Table 9

Introduced Malaria, 1952-1974

All cases due to *P. vivax*

Year	State	Probable Index Case	Probable Transmission Period	# Cases	Probable Vector
1952	California	Veteran from Korea	July	35	*A. freeborni* *A. punctipennis*
1954	Arizona	Veteran from Korea	June-July	4	Not established
1956	California	Mexican agricultural workers	August-September	3	*A. freeborni*
1957	California	Mexican agricultural workers	July	4	*A. freeborni*
1964	Georgia	Veteran from Korea	June-July	2	*A. quadrimaculatus*
1966	Kentucky	Serviceman	June-October	2	*A. quadrimaculatus* *A. punctipennis*
1967	Kentucky	Serviceman from Vietnam	May	4	*A. quadrimaculatus*
1968	Alabama	Not established	July	4	*A. quadrimaculatus*
1968	Georgia	Serviceman from Vietnam	July	1	*A. crusciens*
1970	Texas	Mexican agricultural worker	August-September	2	*A. punctipennis* *A. pseudopunctipennis*
1974	California	Punjabi immigrant	May-July	3	*A. freeborni*

VII. MALARIA DEATHS AND COMPLICATIONS IN THE UNITED STATES

In 1974, 6 malaria deaths were reported. All were caused by P. falciparum and occurred in civilians who acquired their infection in Africa. Although there was an increase in the number of deaths attributed to infection with P. falciparum, there was a slight reduction in the P. falciparum death-to-case ratio (6.4%) in 1974 compared with that in 1973 (8.7%). This ratio does not differ significantly from the 10-year (1964-1973) ratio of 3.2%.

Case 1 - On March 10, 1974, a 56-year-old employee of a North American mining corporation returned to the United States in apparent good health after a 1-month field trip to Liberia. Ten days later he traveled to Venezuela, and on March 24, 5 days after arrival, he was hospitalized in a company-operated hospital in Port Ordes for suspected food poisoning. On admission his symptoms included diarrhea and weakness.

On March 31, he arrived back in the United States and was admitted to a hospital in metropolitan Miami, Florida, with the additional symptom of dypsnea. On examination, he was diaphoretic, confused, and restless. He was hypotensive and afebrile; no hepatomegaly or splenomegaly was apparent. The initial diagnostic impression was cardiogenic shock, but within a few hours, the diagnosis of Plasmodium falciparum malaria was established by microscopic examination of a peripheral blood smear. It was estimated that 20% of the peripheral circulating erthrocytes were parasitized. Results of other laboratory studies were hemoglobin 17.8 gm%, hematocrit 50%, white blood cell count 14,500 with a differential of 77% polymorphonuclear leukocytes, 14% stabs, 7% lymphocytes, and 2% monocytes, platelet count 60,000 per mm^3, serum creatinine 4.2 mg%, and blood urea nitrogen 92 mg%. He subsequently developed a progressive hyperbilirubinemia with a peak bilirubin of 14 mg%.

After early administration of fluid therapy, the patient's blood pressure returned to 130/90, and his temperature rose to 102° F. Antimalarial therapy was begun using quinine hydrochloride administered intravenously and pyramethamine and sulfamethozizole administered through a naso-gastric tube. After 2 days of therapy it was determined that the patient had not been in a region where chloroquine-resistant P. falciparum malaria has been identified, and his therapy was changed from the above regimen to intravenous chloroquine hydrochloride. However, despite specific antimalarial treatment and general supportive therapy, his condition deteriorated. The onset of seizures was followed by progressive obtundation and finally cardiopulmonary arrest on April 3, 1974.

Pathologic examination demonstrated a heavy P. falciparum parasitemia with marked hepatic and splenic enlargement. A pinkish discoloration of the pia and cortex of the brain was grossly evident, and microvascular occlusion by parasitized red blood cells accompanied by perivascular extravasation was apparent on microscopic examination. During his trip to Liberia, the patient did not take malaria chemoprophylaxis. (Reported by Luisa Yu, Supervising Technologist, and Francis O. Niel Young, M.D., Chief of Pathology, Hialeah Hospital; Bernard Halperin, M.D., Private Physician; Phineas Hyams, M.D., Consultant; Joseph L. Burton, M.D., Assistant Pathologist, Joseph H. Davis, Chief Pathologist, Office of the Medical Examiner, Dade County; Myriam Enriquez, M.D., Head, Disease Control Section, Milton S. Saslaw, M.D., Director, Dade County Department of Public Health; and Chester L. Nayfield, M.D., State Epidemiologist, Florida Division of Health.)

Case 2 - On March 28, 1974, a 22-year-old man was admitted to a hospital in Patchogue, New York, with a history of intermittent, spiking fevers and chills over the 9 days prior to admission. On admission he was weak and pale and looked chronically ill. Pertinent physical findings included a palpable spleen and mild icterus. On the evening of admission, he had a severe, shaking chill, followed within the next few hours by apathy and unresponsiveness. He required cardiopulmonary resuscitation and controlled ventilation via tracheostomy. A peripheral blood smear revealed a 33% parasitemia with Plasmodium falciparum, and a diagnosis of cerebral malaria was made. Urinalysis revealed mild glycosuria but was otherwise normal, as was the cerebrospinal fluid. Hemoglobin was 11 gm% initially, declining subsequently to the point where transfusions were required. He was mildly azotemic with a BUN of 50 mg%. An initial

electroencephalogram revealed cerebral irritation. Despite maintenance with fluids, pressors, parenteral chloroquine, and subsequently quinine, the patient responded poorly, becoming totally unresponsive without spontaneous respiration; a subsequent electroencephalogram revealed no cerebral activity. The patient died on April 10, 1974.

At autopsy, there was extensive bilateral organizing bronchopneumonia, purulent bronchitis and tracheitis, severe autolysis of the brain (felt to be secondary to prolonged respirator therapy), extensive hypophysial infarction, splenomegaly (380 gm), and diffuse membranous glomerulitis. Imprint smears from brain and spleen showed abundant granular pigment of presumed malarial origin.

Between November 1973 and early March 1974, the patient had traveled extensively throughout East, Central, and West Africa. It is not clear whether or not he took malaria chemoprophylaxis.

(Reported by Jack R. Muth, M.D., Attending Physician, Family Practice Service and Robert Chernack, M.D., Physician, Patchogue, New York; James S. Mogidson, M.D., Director of Laboratories, Brookhaven Memorial Hospital; Max B. Backer, M.D., Suffolk County Health Department; and Alan R. Hinman, M.D., Assistant Commissioner for Epidemiology and Preventive Health Services, New York State Department of Health.)

Case 3 - On July 8, 1974, a 62-year-old woman was admitted comatose to a hospital in Minneapolis, Minnesota. The patient had returned to the United States 3 days before admission after doing missionary work in Africa for the previous 5 months. One week before admission, while still in Africa, she had become febrile and lethargic and had had occasional episodes of confusion. In the 3 days before admission she continued to be lethargic and had intermittent fever. On the morning of admission she became progressively somnolent and was later found unconscious.

Physical examination on admission revealed a comatose patient who was slightly dehydrated. There was a yellow tinge to her skin, and petechiae were on her lips. Her temperature was 105° F. Respiratory rate was 40 per minute with periods of apnea. The patient was unresponsive to painful stimuli and had limb flaccidity and hypoactive reflexes.

Admission laboratory studies revealed a hemoglobin of 10.2 gm%, a platelet count of 58,000 and a reticulocyte count of 1.3%. Fibrin split products were greater than 40 µg per ml; prothrobin time was 15.4, with a control of 12.1 seconds, and partial thromboplastin time was 34.7, with a control of 41.2 seconds. A blood smear was positive for Plasmodium falciparum. Electroencephalogram showed diffuse symmetrical slowing.

Treatment was begun with chloroquine, pyrimethamine, and quinine via a feeding tube since parenteral preparations were not immediately available. Her temperature fell to 99.4° F. with the use of cooling blanket and aspirin. She was treated with Decadron* and mannitol to prevent cerebral edema and with heparin to prevent capillary thrombosis. Her condition remained stable until the following morning.

On the morning of the second hospital day her hemoglobin dropped to 4.4 gm%. She had a respiratory arrest followed by ventricular fibrillation. Despite continued support, her condition deteriorated and she died July 9, 1974. Postmortem examination showed findings consistent with P. falciparum malaria with marked cerebral involvement, cerebral edema, pulmonary edema, bronchopneumonia, and bilateral pulmonary granulomas of unknown etiology.

The patient had no previous history of malaria, and she had not taken malaria chemoprophylaxis while in West Africa.

(Reported by Vincent L. Fronke, M.D., Private Physician, Minneapolis; M. Blehert Fine, M.D., Resident in Pathology and T.D. Gillund, M.D., Pathologist, Abbott-Northwestern Hospital; John Washburn, Assistant Epidemiologist, and D.S. Fleming, M.D., Director, Division of Personal Health Services, Minnesota Department of Health; and an EIS officer.)

*Use of trade names for identification does not imply endorsement by the Public Health Service, U.S. Department of Health, Education, and Welfare.

Case 4 - On July 29, 1974, a 45-year-old resident of Tucson, Arizona, was found unresponsive in his apartment and pronounced dead on arrival at a local hospital. Postmortem examination showed the immediate cause of death to be malarial myocarditis from Plasmodium falciparum infection.

The man had returned to the United States on June 30, 1974, after a 1-month tour of Ethiopia and Tanzania; he took no malaria chemoprophylaxis. In addition, he had a history of malaria acquired in Korea in the early 1950s. On returning to the United States, he visited friends in Cincinnati, where he complained of headache and said he thought he was having a recurrence of malaria. After returning to Tucson, he consulted a physician and complained of headache, but malaria was not considered. He continued to complain of headaches, but because he lived alone, no other symptoms are known.

(Reported by Robert Hirsch, M.D., Private Physician, Tucson, Arizona; Joseph J. Halka, M.D., Deputy Medical Examiner, Pina County, Arizona; Philip Hotchkiss, DVM, Bureau of Acute Disease Control, Arizona Department of Health Services.)

Case 5 - On December 10, 1974, a 69-year-old woman, who belonged to a religious group that refuses all medical therapy, returned to Hartford City, Indiana, after a 3-month stay as a missionary in Nigeria. While in West Africa, she had developed a pox-like rash, appearing first on the legs, then on the trunk and face. The rash, which was accompanied by no constitutional symptoms, soon receded in a reverse order and left no scar. Two weeks later, she returned to the United States, where upon arrival she began having malaise, with intermittent chills and fever. She sought no medical attention. After 10 days these symptoms became more severe, and on the 12th day after her return to the United States, she became incoherent, lapsed into coma, and died on the evening of December 25. Postmortem examination revealed widespread deposition of malarial pigment and masses of plasmodium-infected erythrocytes in the hepatic and splenic vasculature. The plasmodium species has not yet been identified, and the final report on the histopathology of neurologic tissue is pending.

The patient took no chemoprophylaxis while in Africa or on returning to the United States.

(Reported by Charles L. Barrett, M.D., Medical Epidemiologist, Indiana State Board of Health.)

Case 6 - On December 27, 1974, a 49-year-old petroleum engineer from San Diego, California, had acute shaking chills, with generalized myalgia and headache occurring the next day. Three days later the chills recurred, and the man had a temperature of 40° C., abdominal cramps, nausea, vomiting, and diarrhea. His wife telephoned a local physician, who prescribed penicillin. Three days later the man became delirious and tachypneic and was taken to a local hospital, where he was seen by another physician. On admission he had a temperature of 40.1° C., a pulse of 136 per minute, and a blood pressure of 100/70. He was obtunded and had Kussmaul respirations. In addition, his liver and spleen were enlarged, and he was icteric. Laboratory data were compatible with hepatic and renal impairment, hemolytic anemia, and metabolic acidosis. A blood smear revealed plasmodium organisms that were initially interpreted as P. malariae, although later the Microbial Disease Laboratory of the California State Department of Health determined them to be P. falciparum. Cerebrospinal fluid was normal. Treatment was immediately begun with chloroquine hydrochloride (200 mg of chloroquine base) intravenously every 6 hours. The patient's blood pressure remained stable, and his urine output remained 100 ml per hour. Despite intensive therapy, however, the metabolic acidosis continued to worsen, and the patient died 14 hours after admission. Postmortem examination revealed intravascular parasites in most organs, including the capillaries of the liver and spleen, but tissues obtained from the brain were normal.

The patient had been in the area of Pointe Noire, Peoples Republic of the Congo (Brazzavile) from the middle of March 1974, until returning to the United States on December 14, 1974. Although the patient reportedly took chloroquine each week for the last 2 months he was in Africa, he may not have used it regularly prior to that period; and he did not take it after returning to the United States.

(Reported by Jeffrey R. Granett, M.D., Private Physician, Escondido, California; Donald G. Ramras, M.D., Acting Director of Public Health, San Diego County;

James Chin, M.D., Chief, Infectious Diseases Section, California State Department of Health; the Parasitic Disease Branch, Parasitic Diseases and Veterinary Public Health Division, Bureau of Epidemiology, CDC, and an EIS officer.)

Fifty-eight complications of malaria, aside from death, were reported in 1974 (Table 10). Several occurred together in the same patient. Hemolysis was the most frequent problem, accounting for 12.7% of the total number reported; it occurred in nearly one-fourth (23.7%) of P. falciparum infection cases, compared with only 7.9% of P. vivax and 7.7% of P. malariae cases. Cerebral malaria was observed in 10.8%, and renal failure in 5.4% of P. falciparum cases; neither complication was reported in cases caused by other plasmodium species where the organism could be identified.

Table 10

Malaria Complications by Species, United States, 1974

	Vivax	Falciparum	Malariae	Ovale	Mixed	Undeter.	Total
Hemolysis	13	22	2	0	1	3	41
Cerebral	0	10	0	0	0	1	11
Renal	0	5	0	0	0	1	6
Total	13	37	2	0	1	5	58
Total Number of Cases Diagnosed	164	93	26	9	2	29	323

VIII. REPORT FROM THE NATIONAL MALARIA REPOSITORY - 1974

In 1974 the presence of plasmodium species or agreement that there were no parasites present was confirmed in blood films from 190 cases submitted to the National Malaria Repository. There were no instances where blood film submitted as containing malaria organisms were found not to have organisms present. No specimens were submitted as negative and later found to be found positive at CDC. Tables illustrating the origin (Table 11) and species diagnosis (Table 12) of malaria smears examined by the repository are shown below. Totals for the calendar year 1972 and 1973 are included for comparison.

Table 11

Institutions Submitting Positive Slides for Malaria to the National Malaria Repository*, 1972-1974

ORIGIN

	Army	Navy	VA Hosp.	Air Force	Health Dept. (State, County, City)	PHS Hosp.	Other Hospitals, Clinics, Physicians etc.	Cumulative
Cumulative total positive 1974	4	28	2	3	36	10	23	106
Cumulative total positive 1973	6	0	3	4	31	2	63	109
Cumulative total positive 1972	25	2	51	14	35	5	67	199

*CDC

Table 12

Species of Malaria Identified by National Malaria Repository*, 1972 - 1974

Species	Cumulative Total 1974	Cumulative Total 1973	Cumulative Total 1972
P. vivax	46	46	149
P. falciparum	46	41	39
P. malariae	4	1	-
P. ovale	8	20	7
Plasmodium sp.	2	3	4
Negative	84	81	96
Total examined	190	192	295
Cumulative positive	106	111**	199

* CDC
**2 mixed infections included

ACKNOWLEDGMENT

The Malaria Surveillance Report, prepared annually at the Center for Disease Control, is based on information provided in individual 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.

Thorough and comprehensive evaluation of all cases of malaria reported in the United States constitutes the most effective approach to preventing reestablishment of malaria transmission subsequent to importation.

All cases of malaria, whether first attacks or relapses, regardless of where they are acquired, should be promptly reported to the appropriate health department. Clinical and epidemiologic information on each case should be provided on the Malaria Case Surveillance Report Form 4.80 (CDC) (Rev. 10-74). Extra copies of this form are available on request. Every effort should be made to obtain pretreatment thick and thin blood films for each case. These films may be submitted with the Surveillance Form.

REFERENCES

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

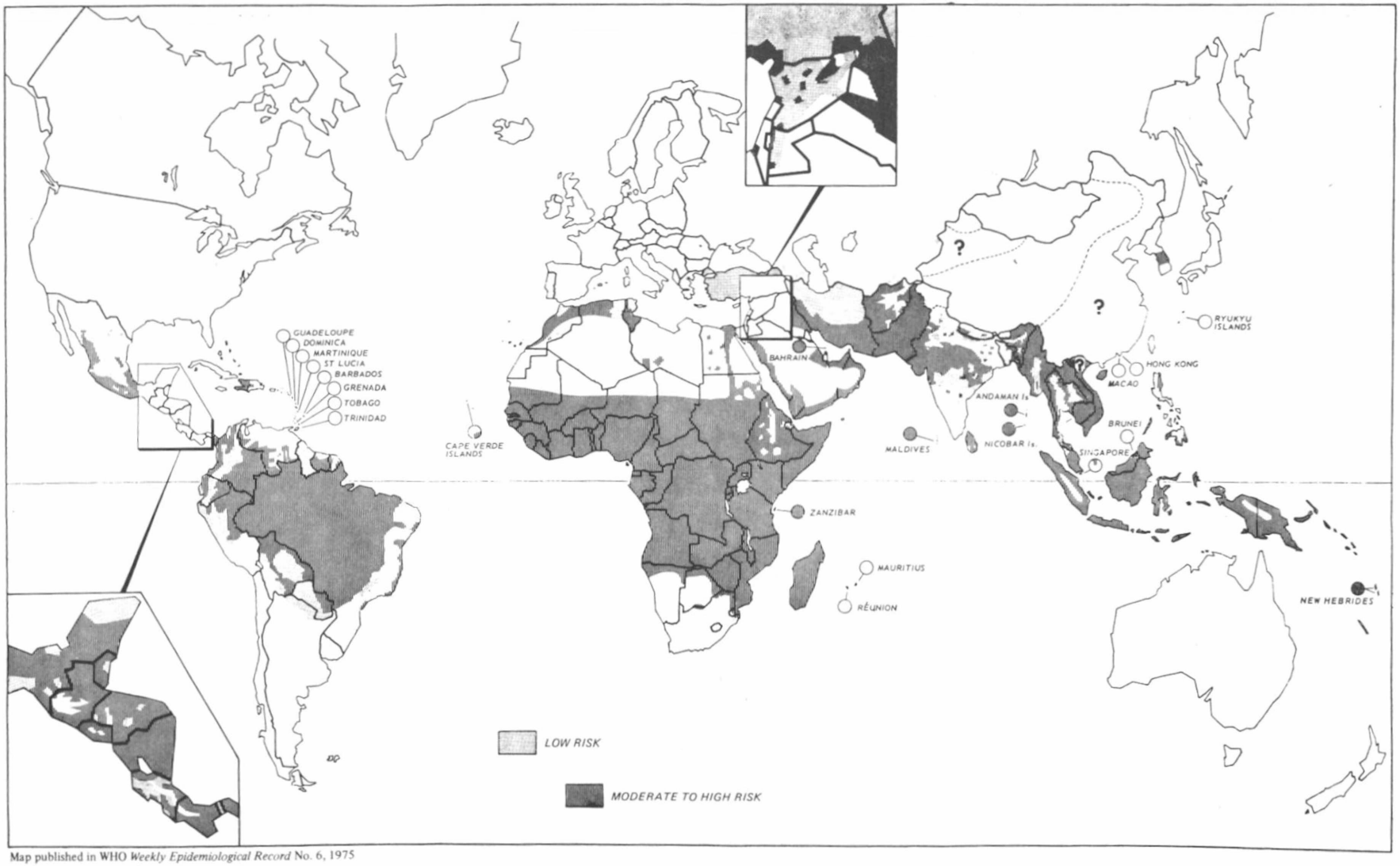
2. World Health Organization: Expert committee on malaria, 10th report, Tech Rep Ser no. 272, p 34

3. U.S. Department of Justice, Immigration and Naturalization Service Annual Report, 1973

4. U.S. Department of Justice, Immigration and Naturalization Service Annual Report, 1974

5. National Malaria Eradication Program of India, Annual Reports, 1965-1973

AREAS OF RISK FOR MALARIA TRANSMISSION
DECEMBER 1973



Map published in WHO *Weekly Epidemiological Record* No. 6, 1975

IX. ADDENDUM I

The Prevention of Malaria

The purpose of this addendum 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 taken from the World Health Organization's Weekly Epidemiological Record 48, 25-45, January 19, 1973.

The information in the table is presented in 6 columns. Note that for North America, Europe, and Oceania, if a country does not appear in Column 1 it can be assumed it has no malaria risk. In other regions the absence of malaria is noted by 0 in Column 2. If a country is malarious but there are areas of no risk within it this is noted by X in Column 3. These areas are listed by country at the end of the table. High altitude areas, urban areas, and seasons without malaria risk are shown in Columns 4, 5, and 6. A + in Column 5 indicates malaria exists at all altitudes. A dash indicates that the information is not available.

TABLE - INFORMATION ON MALARIA RISK BY COUNTRY

			For Countries Where Malaria Risk Exists		
			For All Areas Not Shown in Col. 3		
Country	Malaria Risk	Areas Without Risk	Months with Risk	Altitude below which risk exists (meters):	Risk in Urban Areas
Col. 1	2	3	4	5	6
AFRICA					
Algeria	X	X	6-10[1]	1,500	0
Angola incl. Cabinda	X	-	-	-	-
Botswana	X	X	10-3	+	X[2]
Brit. Indian Ocean Terr.[3]	X	-	-	-	-
Burundi	X	-	-	-	-
Cameroon	X	0	1-12	+	X
Cape Verde Is.	X	-	-	-	-
Central Africa Rep.	X	0	1-12	+	X
Chad	X	-	-	-	-
Comoro Is.	X	0	1-12	+	X
Congo, People's Rep. of	X	0	1-12	+	X
Dahomey	X	0	1-12	+	X
Egypt	X	-	-	-	-
Equatorial Guinea[5]	X	-	-	-	-
Ethiopia	X	-	-	-	-

1 Oasis, Saoura, Wilaya (= Dep.):2-8
2 Kasane, Maun, towns
3 Comprising Chagos Arch. (formerly dependency of Mauritius) and the islands of Aldabra, Farquhar, and Des Roches (formerly dependency of Seychelles)
4 Brazzaville
5 Fernando Poo (incl. Annobon), Rio Muni (incl. Corisco, Elobeys).

Dep. - Department
D. - District
S. - State

(Table continued next page

TABLE (continued)

Country	For Countries Where Malaria Risk Exists	For All Areas Not Shown in Col. 3			
	Malaria Risk	Areas Without Risk	Months with Risk	Altitude below which risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
French Southern & Antarctic Terr.[1]	0				
French Terr. of the Afars and the Issas	0				
Gabon	X	0	1-12	1,000	X
Gambia	X	0	1-12	+	X
Ghana	X	0	1-12	+	X
Guinea	X	-	-		-
Ivory Coast	X	0	1-12	+	X
Kenya	X	0	4-6 & 11-12[2]	2,000[3]	X[4]
Lesotho	0				
Liberia	X	0	1-12	+	X
Libyan Arab Rep.	X	X	-	-	-
Madagascar	X	X	9-3	1,100	X[5]
Malawi	X	0	1-12	1,700	X
Mali	X	0	1-12[6]	+	X
Mauritania	X	-	-	-	-
Mauritius[7]	0				
Morocco	X	-	-	-	-
Mozambique	X	-	-	-	-
Namibia[8]	X	-	-	-	-
Niger	X	0	7-11[9]	+	X
Nigeria	X	0	1-12	+	X
Portuguese Guinea	X	-	-	-	-
Reunion	0				
Rwanda	X	-	-	-	-
St. Helena[10]	0				
Sao Tome & Principe	X	-	-	-	-
Senegal	X	0	1-12[11]	+	X[12]

1 Comprising the islands of St Paul and Amsterdam, the Kerguelen and Crozet Arch. and Adelie Coast
2 North Eastern, Nyanza, Western, Coast, Prov.:1-12
3 Rift Valley Prov: 2,500; North Eastern Prov.:1,500
4 Risk very low: Nairobi Area, Central Prov., Rift Valley Prov. Low-risk - Eastern, Nyanza, Western, Coast, Prov. Moderate risk - North Eastern Prov.
5 Excl. Ambositra, Antsirabe, Tananarive
6 Less risk - 4-6
7 Incl. Rodrigues, Agalega, St. Brandon, Is.
8 Incl. Walvis Bay, which is an integral part of South Africa but administered as if it were part of Namibia
9 Agades Dep.:8-10
10 Incl. Ascension, Tristan da Cunha
11 Cap-Vert: less risk during 1-6
12 Dakar, town - no risk during 1-6

(Table continued next page

TABLE (continued)

Country	For Countries Where Malaria Risk Exists: Malaria Risk	Areas Without Risk	For All Areas Not Shown in Col. 3: Months with Risk	Altitude below which risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
Seychelles	0				
Sierra Leone	X	0	1-12	+	X
Somalia	X	0	1-12	+	X[1]
South Africa[2]	X	X	1-12[3]	1,200	0[4]
Southern Rhodesia	X	-	-	-	-
South West Africa[5]					
Spanish North Africa[6]					
Spanish Sahara[7]	0				
Sudan	X	X	-	-	-
Swaziland	X	X	-	-	-
Togo	X	0	1-12	+[8]	X
Tunisia	X	X	5-11[9]	+	0[10]
Uganda	X	X	1-12	1,800	X[11]
United Arab Rep[12]					
United Rep. of Tanzania					
Tanganyika	X	0	1-12	+	X
Zanzibar	X	-	-	-	-
Upper Volta	X	0	1-12[13]	+	X
Zaire	X	0	1-12	+	X
Zambia	X	0	11-5	+	X
AMERICA, NORTH -					
Malaria Risk Only in Countries Noted Below					
Belize	X	0	1-12	500	X
Costa Rica	X	X	-	500	0
Dominican Rep.	X	X	1-12	500	0
El Salvador	X	0	1-12	800	0[14]
Guatemala	X	X	6-11[15]	1,000	0
Haiti	X	X	7-3	500	0

1 Mogadishu: very low risk
2 Walvis Bay, See Note 8 on previous page
3 Cape Province - areas adjacent Molopo and lower Orange Rivers:2-5
4 Transvaal east north and western low altitude areas:X
5 Namibia
6 See Spain
7 Comprising the Northern Region (former Seguia el Hamra) and the Southern Region (former Rio de Oro)
8 Above 600 m. marked reduction of risk
9 Sfax Governorate
10 Gabes Governorate
11 Entebbe, Fort Portal, Jinja, Kampala, Mbale: 0
12 Egypt
13 Djibo, Oudalan, cercles:6-12
14 Acajutla, la Libertad, la Union, Usulatan, Dep.: X
15 Alta Verapaz, Izabal, Dep.:1-12

(Table continued on next page

TABLE (continued)

Country	For Countries Where Malaria Risk Exists: Malaria Risk	Areas Without Risk	For All Areas Not Shown in Col. 3: Months with Risk	Altitude below which risk exists (meters):	Risk in Urban Areas
Col. 1	2	3	4	5	6
Honduras	X	X	1-12[1]	1,000	0
Mexico	X	X	1-12[2]	1,500	0
Nicaragua	X	0	1-12	1,000	0
Panama[3]	X	X	1-12	1,000[4]	0[5]
Canal Zone -	0				
AMERICA, SOUTH					
Argentina	X	X	9-5	2,000	0
Bolivia	X	X	1-12	2,000	0
Brazil	X	X	1-12	900	0[6]
Brit. Antarctic Terr.[7]	0				
Chile	0				
Colombia	X	X	-	1,500[8]	0
Ecuador	X	X	1-12[9]	1,500[10]	0[11]
Falkland Is. (Malvinas)	0				
French Guiana	X	X	1-3[12]	-	X
Guyana	X	X	1-12	+	0
Paraguay	X	X	9-5[13]	+	X
Peru	X	X	1-12[14]	1,500	0
Surinam	X	X	1-12	+	X[15]

1 Copan, Intibuca, la Paz, Lempira, Olancho, Dep.:5-12
2 Higher risk during 6-11 in -: Campeche, Chiapas, Colima, Guerrero, Jalisco, Michoacan, Morelos, Nayarit, Oaxaca, Puebla, Quintana Roo, Sinaloa, Sonora, Tabasco, Veracruz, Yucatan
3 Excl. Canal Zone, shown separately hereunder
4 Colon, Darien, Panama. Prov.: +
5 Occasionally possible
6 Amazonas, Maranhao, Para, S. - ; Terr. Federales: X
7 Comprising the South Orkney Is., South Shetland Is. and Graham Land (former dependencies of Falkland Is. (Malvinas) south of 60° latitude) and the sector of Antarctic Continent between longitudes 20° W and 80° W
8 Boyaca, Norte de Santander, Santander, Dep.; Caqueta, Meta, Intendencias; Putumayo, Comisaria: 1,000 m
9 Canar, Loja, Prov.:12-7
10 Concerning Pichincha Prov. only
11 Concerning only the urban centres of - : Guayaquil (Guayas Prov.); Manta, Portoviejao (Manabi Prov.); Macas (Morona Prov.)
12 Main season with risk
13 Amambay, Cordillera, Itapua, Dep.: risk very low, and in small parts only
14 Piura Dep.:12-7
15 Albina, Moengo (Marowijne D.), Nickerie, Wageningen (Nickerie D.): 0

(Table continued next page)

TABLE (continued)

Country	Malaria Risk	For Countries Where Malaria Risk Exists: Areas Without Risk	For All Areas Not Shown in Col. 3: Months with Risk	Altitude below which risk exists (meters):	Risk in Urban Areas
Col. 1	2	3	4	5	6
Uruguay	0				
Venezuela	X	X	1-12	600	0[1]
ASIA					
Afghanistan	X	-	-	-	-
Bahrain	X	-	-	-	-
Bangladesh	X	-	-	-	-
Bhutan	X	-	-	-	-
Brunei	0				
Burma	X	X	4-11	900	0[2]
Ceylon[3]					
China	-	-	-	-	-
Cyprus	0				
Hong Kong[4]	X	X	-	-	-
India[5]	X	X	3-10	1,600	X
Indonesia[6]	X	X	1-12	1,200	X[7]
West Irian[8]	X	0	1-12	1,200	X
Iran	X	X	1-12[9]	1,500	0[10]
Iraq	X	-	-	-	-
Israel	0				
Japan[11]	0				
Jordon	X	X	-	-	0
Khmer Rep.	X	X	1-12[12]	+	X[13]
Korea -					
Dem. People's Rep. of Korea	X	-	-	-	-
Rep. of Korea	X	X	5-10	+	0
Kuwait	0				
Laos	X	X	-	-	-
Lebanon	0				

1 Practically no risk
2 Generally no risk in most urban areas
3 Sri Lanka
4 Hong Kong I., Kowloon and the New (leased) Territories
5 Incl. Andaman, Nicobar, Laccadive, Minicoy and Aminidivi Is.; excl. Sikkim shown separately; also incl. Jammu and Kashmir, the final status of which has not yet been determined
6 Excl. West Irian, shown separately hereunder
7 Outskirts only
8 Western part of island of New Guinea
9 Baluchestan, Fars (excl. Abadeh, Shiraz):1-2; Kerman (excl. Kerman, Sharestan), Kermanshah, Lorestan:12-3
10 Baluchestan, Khuzestan (excl. Abadan, Ahwaz), Lorestan, Oman and Fars Coastal Oman:X
11 Comprising Hokkaido, Honshu, Kyushu, Shikoku, the Amami Isl., and The Tokara Arch.
12 Kg. Som, Kep-Bokor, Municipality:11-5
13 Kirivong Town (Takeo Prov.):0

(Table continued next page)

TABLE (continued)

Country	For Countries Where Malaria Risk Exists: Malaria Risk	Areas Without Risk	For All Areas Not Shown in Col. 3: Months with Risk	Altitude below which Risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
Macao[1]	0				
Malaysia					
East Malaysia					
Sabah	X	X	1-12	1,700	0
Sarawak	X	0	1-12	+	0
West Malaysia	X	X	1-12	1,700	0[2]
Maldives	X	X	1-12	+	0[3]
Mongolia	0				
Muscat and Oman[4]					
Nepal	X	X	6-11[5] 1-12[6]	1,200	X
Oman[7]	X	-	-	-	-
Pakistan[8]	X	0	3-10[9]	2,000	X
Palestine[10]					
Gaza Strip[11]	X	-	-	-	-
Philippines	X	X	1-12	600	0[12]
Portuguese Timor	X	0	1-12	+	X
Qatar	X	-	-	-	-
Ryukyu Is.[13]	0				
Saudi Arabia	X	X	1-12	-	X[14]
Sikkim	X	-	-	-	-
Singapore	X	X	1-12	+	0
Sri Lanka[15]	X	X	1-12	800	X
Syrian Arab Rep.	X	X	5-10	600	0

1 Comprising Macao City and islands of Taipa and Coloane
2 Small towns near foothills:X
3 There are no urban agglomerations in the malarious areas except the capital city.
4 Oman
5 In cultivated areas (below 250 m.) and hill valleys (750-1,200 m.):6-11.
6 250-750 m.
7 Formerly Muscat and Oman
8 Excl. Jammu and Kashmir, the final status of which has not yet been determined
9 North-West-Frontier Prov., hilly areas of Baluchistan and Punjab Prov. - North - West-Frontier Prov.,:6-9
10 Former mandated territory administered by the United Kingdom until Armistice of 1949
11 Comprising that part of Palestine under Egyptian administration from the Armistice of 1949 until June 1967, when it was occupied by Israeli military forces
12 Practically no risk
13 Comprising those islands of the Ryukyu group south of 28° N, except the Amami Is.
14 Jeddah, Mecca, Medina, Qatif:0
15 Formerly Ceylon

(Table continued next page)

TABLE (continued)

Country	For Countries Where Malaria Risk Exists		For All Areas Not Shown in Col. 3		
	Malaria Risk	Areas Without Risk	Months with Risk	Altitude below which Risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
Thailand	X	X	1-12	+	0[1]
Trucial Oman[2]					
Turkey	X	X	7-10[3]	1,000	0
United Arab Emirates[4]	X	-	-	-	-
Vietnam					
Dem. Rep. of Vietnam	X	-	-	-	-
Rep. of Vietnam	X	X	5-12[5]	-	0[6]
Yemen	X	X	9-2	1,400	X
Yemen, Democratic	X	-	-	-	-
EUROPE					
Risk Only in Countries Noted Below					
Greece	X	X	6-11	+	0
OCEANIA					
Risk Only in Countries Noted Below					
British Solomon Is.[7]	X	0	1-12	400	X
New Guinea[8]					
New Hebrides	X	0	1-12	+	X[9]
Papua New Guinea[10]	X	0	1-12	-	X
UNION OF SOVIET SOCIALIST REPUBLICS					
Union of Soviet Socialist Rep.	X	-	-	-	-
Byelorussian Soviet Socialist Rep.	0				
Ukrainian Soviet Socialist Rep.	0				

1 In Bangkok and in most urban areas
2 United Arab Emirates
3 Siirt, Prov.:7-9; Hakkari Prov.:8-10
4 Comprising 6 sheikhdoms of Abu Dhabi, Dubai, Sharjah, Ajman, Umal Qaiwayn and Fujairah
5 Binh-Long, Darlac, Kon-Tum, Lam-Dong, Phu-Bon, Phuoc-Long, Pleiku, Quang-Duc, Tuyen-Duc:1-12
6 Practically no risk
7 Comprising the Solomon Is. group (except Bougainville and Buka which are included with New Guinea below), Ontong Java, Rennell and Santa Cruz Is.
8 Papua New Guinea
9 Southern Division:0
10 New name for the Territory of Papua under Australian administration and for New Guinea, UN Trust Territory administered by Australia, adopted by UN General Assembly Resoluation A/Res/286 (XXVI) on 20 December 1971

Areas of Countries Free of Malaria

Algeria - Oran Wilaya (= Dep.), Saida Wilaya; Frenda Daira (= Arrond.), Aflou Daira, (Tairet Wilaya); Ain Oussera Daira, Bou-Saada Daira, Djelfa Daira, (Titteri Wilaya); Mascara Daira, Mostaganem Daira, Tighennif Daira, (Mostaganem Wilaya).

Argentina - Most of the Country, malaria risk exists only in - Oran, San Martin Dep. (Salta Prov.); Ledesma, San Pedro, Santa Barbara, Dep. (Jujuy Prov.).

Bolivia - la Paz, Cochabamba, Santa Crux, Oruro, Potosi, Sucre, Tarija, Trinidad, Dep.

Botswana - Ghanzi, Kgalagadi, Kweneng, Ngamiland,[1] Ngwaketse, Ngwato,[2] Tuli Block,[2] D.

Brazil - Alagoas, Distrito Federal, Guanabara, Paraiba, Pernambuco, Rio Grand do Norte, Rio Grande do Sul, Rio de Janeiro, Sergipe, States - Partially - Bahia, Ceara, Espirito Santo, Minas Gerais, Parana, Santa Catarina, Sao Paulo, States

Burma - Rangoon Division

Colombia - Bogota, Cundinamarca, Huila, Tolima, Dep., San Andres Is.

Costa Rica - Ciudad San Jose (San Jose Prov.); Penas Blancas, Pasoc Canoas (Carretera Interamericana)

Dominican Rep. - Most of the country, malaria risk exists only in - : Dajabon, Oma de Cabrera, Municipios (Dajabon Prov.); Pepillo Salcedo Mun. (Monte Cristi Prov.); Pedernales Mun. (Pedernales Prov.); Elias Pina, Hondo Valle, Banica, Pedro Santana, Mun. (Estrelleta Prov.)

Ecuador - Azuay, Bolivar, Carchi, Chimborazo, Cotopaxi, Imbabura, Tungurahua, Arch. de Colon (Galapagos Is.), Zamora-Chinchipe, Prov.

French Guiana - Cayenne City

Greece - Practically the whole country; extremely limited risk exists only in - : Alexandria (Hematheia - Imathia, Dep.); Propouliou (Lesbos Dep.)

Guatemala - Chimaltenango, el Progreso, Guatemala, Jalapa, Sacatepequez, Solola, Totonicapan, Dep.

Guyana - East Berbice, West Berbice, East Demerara, West Demerara, Essequebo Is., Essequebo, Circles

Haiti - Sud-Ouest Dep.; part of - : Artibonite, Centre, Nord, Sud, Dep.

Honduras - Ocotopeque Dep.

Hong Kong - Hong Kong I, Kowloon, New Kowloon

India - Andhra Pradesh S.: Anantapur, Chittoor, Cuddappah, E. Godavari, W. Godavari, Hyderabad, Karimganj, Khammam, Krishna, Kurnool, Mahbubnaga, Medak, Nalgonda, Nellore, Nizamabad, Warangal, D.
Bilhar S.: Bhagalpur, Champaran, Darbhanga, Gaya, Monghyr, Muzaffarpur, Palamau, Patna, Purnea, Saharsa, Santal Parganas, Saran, Shahdol, D.
Chandigarh Union Terr.: Chandigarh D.
Coalfields: Dhanbad D.
Delhi, Terr.: Part of - : Delhi, Terr.
Goa Daman & Div., Terr.: Panaji D.
Haryana S.: Ambala, Jind, Karnal, D. Part of - :Gurgaon, Hissar, Rohtak, D.
Himachal Pradesh S.: Part of - : Dharamshala, Simla, D.
Jammu & Kashmir S.: Part of - : Doda, Jammu, Kathua, Punch, Udhampur, D.
Kerala S.: Alleppey, Cannanore, Ernakulam, Kottayam, Kozhikode, Palghat, Quilon, Trichur, Trivandrum, D.
Maharashtra S.: Akola, Amravati, Kilhapur, Ratnagiri, Wardha, D.
Part of - : Ahmednagar, Aurangabad, Bhandara, Bhir, Buldhana, Nagpur, Nasik, Osmanabad, Parbhani, Poona, Sangli, Satara, Sholapur, Yeotmal, D.
Mysore S.: Bangalore, Chikmagalur, Chitradurga, Coorg, Hassan, N. Kanara, S. Kanara, Kolar, Mandya, Tumkur, D.
Part of - : Belgaum, Bellary, Bijapur, Dharwar, Gulbarga, Mysore, Shimoga, D.

1 West of 22° E and south of 19° S
2 South of 23° S

Areas of Countries Free of Malaria

India - (cont.) Orissa S.: Part of - : Balasore, Cuttack, Puri, D.
Punjab S.: Amritsar, Bhatinda, Gurdaspur, Hoshiarpur, Jullundur, Kapurthala, Ludhiana, Patiala, D.
Part of - : Ferozepur, Ropar, Sangrur, D.
Rajasthan S.: Jhundjhunu, Sikar D.
Part of - : Churu, Jaipur, Nagaur, Sawai Madhopur, D.
Tamil Nadu: N. Arcot, Chingleput, Coimbatore, Kanyakumari, Nilgiris, Thanjavur, Tiruchirapalli, Tirunelveli, D.
Part of - : South Arcot, Dharmapuri, Madras Corp., Madurai, Ramanathapuram, Salem D.
Uttar Pradesh S.: Agra, Aligarh, Azamgarh, Ballia, Bara-Banki, Budaun, Bulandshahr, Chamoli, Deoria, Etah, Etawah, Faizabad, Farrukhabad, Fatehpur, Ghazipur, Hardoi, Jalaun, Jaunpur, Kanpur, Lucknow, Mainpuri, Mathura, Pratapgarh, Rae Bareli, Sitapur, Sultanpur, Unnao, Varanasi, D. Part of : Allahabad, Almora, Bahraich, Bareilly, Basti, Bijnor, Gonda, Gorakhpur, Meerut, Moradabad, Muzaffarnagar, Pauri, Rampur, Saharanpur, Shahjahanpur, D.

Indonesia - Djakarta-Raya, Surabaja, Regencies

Iran - Ostans (=Regions): Azarbaijan (East-oriental), Azarbaijan (West-occidental), Gilan, Hamadan, Istahan, Khorasan, Mazanderan; Sharestons (=Prov.): Abadan, Abadeh, Ahwaz, Kerman, Semnan, Shiraz, Yazd, Zanjan

Jordon - Whole country, with exception of Jordon Valley and Karak Lowlands where there is some risk, but normally not visited by tourists

Khmer Rep. - Kandal, Preyveng, Svay-Rieng, Takeo (excl. Kirivong D.), Prov.: Phnom-Penh Municip.

Laos - Vientiane

Libyan Arab Rep. - Whole country, except 2 small foci in the southwest of the country

Madagascar - Andramasina, Antanifotsy, Arivonimamo, Imeririna-Fovoany, Manjakandriana, Pref.: Nossi-Be, Is.

Maldives - Male I. (Cap.), Male Atoll (Kaaf)

Mexico - Aguascalientes, Baja California Norte, Baja California Sur, Chihuahua, Coahuila, Distrito Federal, Durango, Guanajuato, Hidalgo, Mexico, Nuevo Leon, Queretaro, San Luis Potosi, Tamaulipas, Tlaxcala, Zacatecas, States

Nepal - Dhaulagiri Anchal (=Prov.), Karnali Anchal

Panama - Ciudad Panama, Ciudad Colon

Paraguay - Boqueron, Central, Concepcion, Misiones, Neembucu, Olimpo, Paraguari, Presidente Hayes, Dep.

Peru - Amazonas (excl. Bagua Prov.), Ancash, Apurimac, Arequipa, Ayacucho, Cajamarca (excl. Cutervo, Jaen, S. Ignacio, Prov.), Callao, Cuzco Huancavelica, Huanuco, Ica, Junin (excl. Satipo Prov.), la Libertad, Lambayeque, Lima, Madre de Dios, Moquegua, Pasco, Piura (excl. Ayabaca, Huancabamba, Morropon, Prov.), Puno, Tacna, Tumbes, Dep.

Philippines - Greater Manila, Baguio City, Davao City, Zamboanga City; Bohol, Catanduanes, Cebu, Leyte, Masbate Negros (northern part), Panay Is. Albay, Sorsogon, Prov.: plain areas of - :Bulacan, Nueva Ecija, Pampanga, Pangasinan, Tarlac, Prov.; Luzon (west coast of northern part)

Rep. of Korea - Cheju-Do, Cholla-Namdo, Cholla-Pukto, Chungchong-Namdo, Chungchong-Pukto, Kangwon-Do, Kyongsang-Namdo, Prov.; Seoul Special City

Rep. of Vietnam - An-Giang, An-Xuyen, Ba-Xuyen, Chuong-Thien, Kien-Giang, Kien-Phong, Kien-Tuong, Phong-Dinh, Vinh-Long, Sa-Dec, Vinh-Long, Vung-Tau, Prov.

Sabah - Kota Kinabalu, Sandakan, Towns

Areas of Countries Free of Malaria

Saudi Arabia - Alhasa, Arar, Jauf, Quraiya (Qurayyat), Riyad, Tabuk, Taif, and rural parts of Jeddah, Mecca, Medina, as well as areas on the pilgrimage Road and pilgrimage areas
Singapore - City District (southern part of the island)
South Africa - Cape Prov. except areas adjacent Molopo and lower Orange Rivers; Orange Free State; Transvaal except east north and western low altitude areas; Natal except North Zululand.
Sri Lanka - Galle, Kalutara; partially - : Colombo
Sudan - Northern Prov. (northern part)
Swaziland - Most of the country[3]
Syrian Arab Rep. - Damascua, Deir-ez-Zor, Hama, al Hasakeh, Latakia, Sweida, Tartus, sub. D. (Latakia D.).
Surinam - Commewijne, Coronie, Para, Paramaribo, D.
Thailand - An Thong, Maha Sarakham, Nakhon Pathom, Nonthaburi, Pathum Thani, Phichit, Phra Nakhon, Phra Nakhon Si Ayutthaya, Samut Prakan, Samut Sakhon, Samut Songkhram, Sing Buri, Thon Buri, Prov.
Part of - : Buri Ram, Chachoengsao, Chai Nat, Chiang Mai, Chon Buri, Kalasin, Kanchanaburi, Khon Kaen, Lamphun, Lop Buri, Nakhon Nayok, Nakhon Ratchasima, Nakhon Sawan, Nakhon Si Thammarat, Narathiwat, Nong Khai, Pattani, Phetchaburi, Phitsanulok, Prachin Buri, Ratchaburi, Roi Et, Saraburi, Si Sa Ket, Songkhla, Sukothai, Suphan Buri, Surat Thani, Surin, Udon Thani, Ubon Ratchathani, Uthai Thani, Uttaradit, Prov.
Tunisia - Beja, Bizerte, Jendouba, Kairouan, Kasserine, Le Kef, Nabeul, Sousse, Tunis, Governorates
Turkey - Whole country, excl. plain of Cucurova (partially - Adana, Hatay, Icel, Prov.); Hakkari, Mardin, Siirt, Prov.
Uganda - Kigezi D. (southern part)
Venezuela - Anzoategui, Aragua, Carabobo, Cojedes, Falcon, Guarico, Lara, Miranda Monagas, Nueva Esparta, Portuguesa, Sucre, Trujillo, Yaracuy, States -; Distrito Federal, Territorio Federal Delta-Amacuro
West Malaysia - Kuala Lumpur, Cap.; Georgetown (Penang State); Malacca Municipality
Yemen - Hajja Sada, Prov.

All tourists who travel in a malarious area should use a prophylactic drug no matter how brief their visit. The drug of choice 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/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 the patient's predisposition to G-6-P-D deficiency. 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.

3 Excl. some small areas near the border. Most of the notified cases are of non-local origin

X. ADDENDUM II

The 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 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 (90-95%). 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 (Figure 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 (Figure 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 (Figure 8).

7. The blood film should be kept horizontal and protected from dust and insects while the thick film dries (minimum of 6 hrs. at room temperature).*

8. Lable the slide in the upper part of the thin film with the date and the name or initials of the patient as illustrated (Figure 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

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

Fig. 7

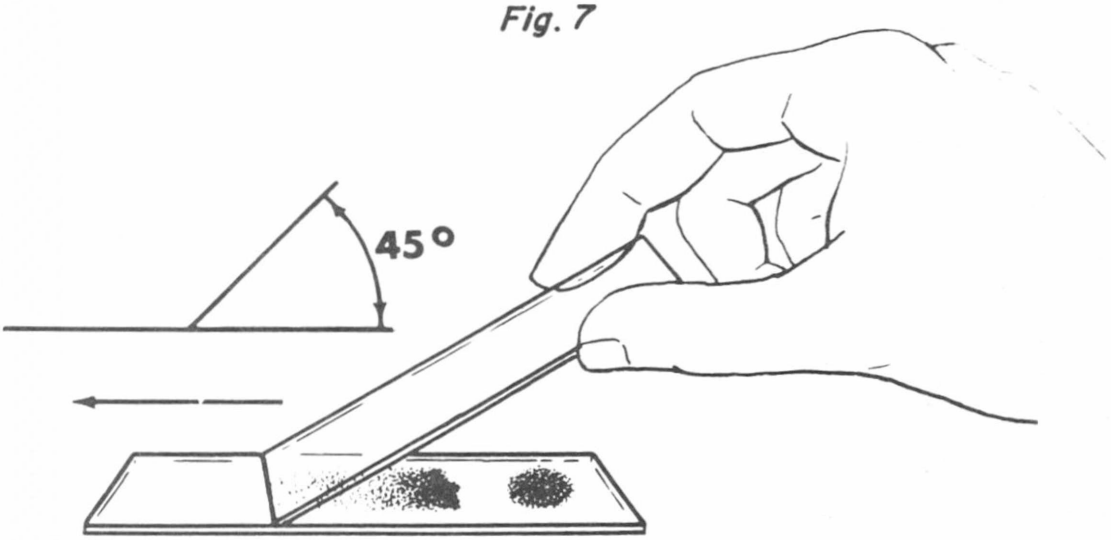
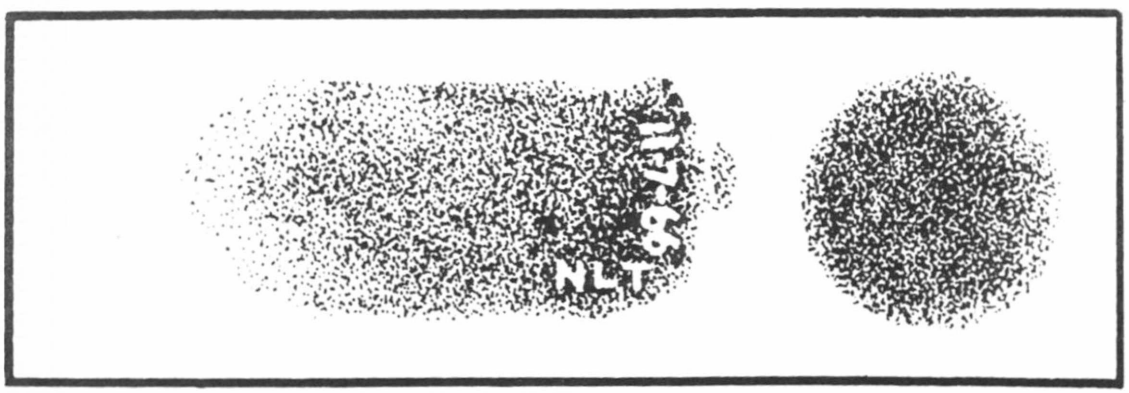


Fig. 8



STATE EPIDEMIOLOGISTS

Key to all disease surveillance activities are those in each State who serve the function 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 major contributions to the evolution of this report are gratefully acknowledged.

Alabama . . . . . Frederick S. Wolf, M.D.
Alaska . . . . . Donald K. Freedman, M.D.
Arizona . . . . . Loren Anderson, M.D.
Arkansas . . . . . Andrew G. Dean, M.D., Acting
California . . . . . James Chin, M.D.
Colorado . . . . . Thomas M. Vernon, Jr., M.D.
Connecticut . . . . . James C. Hart, M.D.
Delaware . . . . . Ernest S. Tierkel, V.M.D.
District of Columbia . . . . . John R. Pate, M.D.
Florida . . . . . Chester L. Nayfield, M.D.
Georgia . . . . . John E. McCroan, Ph.D.
Hawaii . . . . . Ned Wiebenga, M.D.
Idaho . . . . . John A. Mather, M.D.
Illinois . . . . . Byron J. Francis, M.D.
Indiana . . . . . Richard D. Telle, M.D.
Iowa . . . . . Charles A. Herron, M.D.
Kansas . . . . . Don E. Wilcox, M.D.
Kentucky . . . . . Calixto Hernandez, M.D.
Louisiana . . . . . Charles T. Caraway, D.V.M.
Maine . . . . . Peter J. Leadley, M.D.
Maryland . . . . . Kathleen H. Acree, M.D.C.M.
Massachusetts . . . . . Nicholas J. Fiumara, M.D.
Michigan . . . . . Norman S. Hayner, M.D.
Minnesota . . . . . Barry S. Levy, M.D., Acting
Mississippi . . . . . Durward L. Blakey, M.D.
Missouri . . . . . H. Denny Donnell, Jr., M.D.
Montana . . . . . Martin D. Skinner, M.D.
Nebraska . . . . . Paul A. Stoesz, M.D.
Nevada . . . . . William M. Edwards, M.D.
New Hampshire . . . . . Vladas Kaupas, M.D.
New Jersey . . . . . Ronald Altman, M.D.
New Mexico . . . . . Jonathan M. Mann, M.D.
New York State . . . . . Donald O. Lyman, M.D., Acting
New York City . . . . . John S. Marr, M.D.
North Carolina . . . . . Martin P. Hines, D.V.M.
North Dakota . . . . . Kenneth Mosser
Ohio . . . . . Thomas Halpin, M.D.
Oklahoma . . . . . Stanley Ferguson, Ph.D.
Oregon . . . . . John A. Googins, M.D.
Pennsylvania . . . . . W. D. Schrack, Jr., M.D.
Puerto Rico . . . . . Carlos T. Armstrong Ressy, M.D.
Rhode Island . . . . . Michael P. Hudgins, M.D., Acting
South Carolina . . . . . William B. Gamble, M.D.
South Dakota . . . . . Robert S. Westaby, M.D.
Tennessee . . . . . Robert H. Hutcheson, Jr., M.D.
Texas . . . . . M. S. Dickerson, M.D.
Utah . . . . . Taira Fukushima, M.D.
Vermont . . . . . John Long, D.D.S.
Virginia . . . . . Robert S. Jackson, M.D.
Washington . . . . . Thieu Nghiem, M.D.
West Virginia . . . . . William L. Cooke, M.D.
Wisconsin . . . . . H. Grant Skinner, M.D.
Wyoming . . . . . Herman S. Parish, M.D.

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

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF HEW
HEW 399

DHEW Publication No. (CDC) 76-8259