ANNUAL SUMMARY 1977
Issued July 1978

CENTER FOR DISEASE CONTROL

MALARIA

SURVEILLANCE

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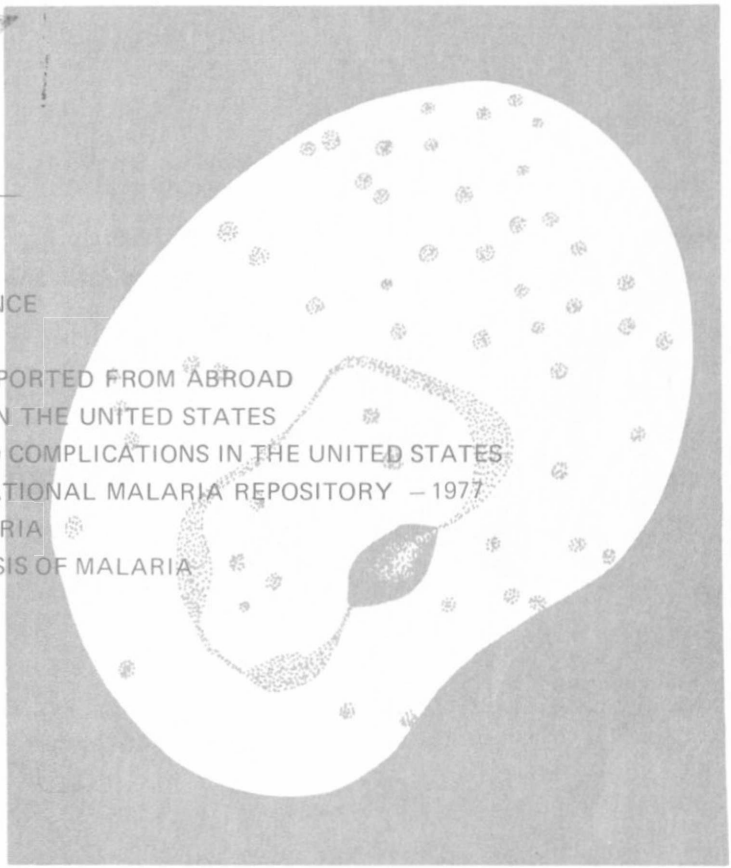

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

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:

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I. SUMMARY

In 1977, 480 cases of malaria were reported in the United States, a 15.8% increase compared with the 415 cases reported in 1976. Only 11 cases (2.3% of all cases reported in the United States) were in military personnel in 1977. As in previous years, imported Plasmodium vivax infections were more common than P. falciparum (60.8% versus 20.8%).

In 1 case infection was induced by transfusion. No cases of congenital or introduced malaria were reported. Three deaths attributed to malaria were reported in 1977, compared with 5 in 1976. All deaths occurred in civilians who acquired malaria during travel in Africa; in 2 fatal cases the patients were infected with P. falciparum, and in the third case the Plasmodium species was not identified. The P. falciparum malaria case-fatility ratio of 3% was not significantly different 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.

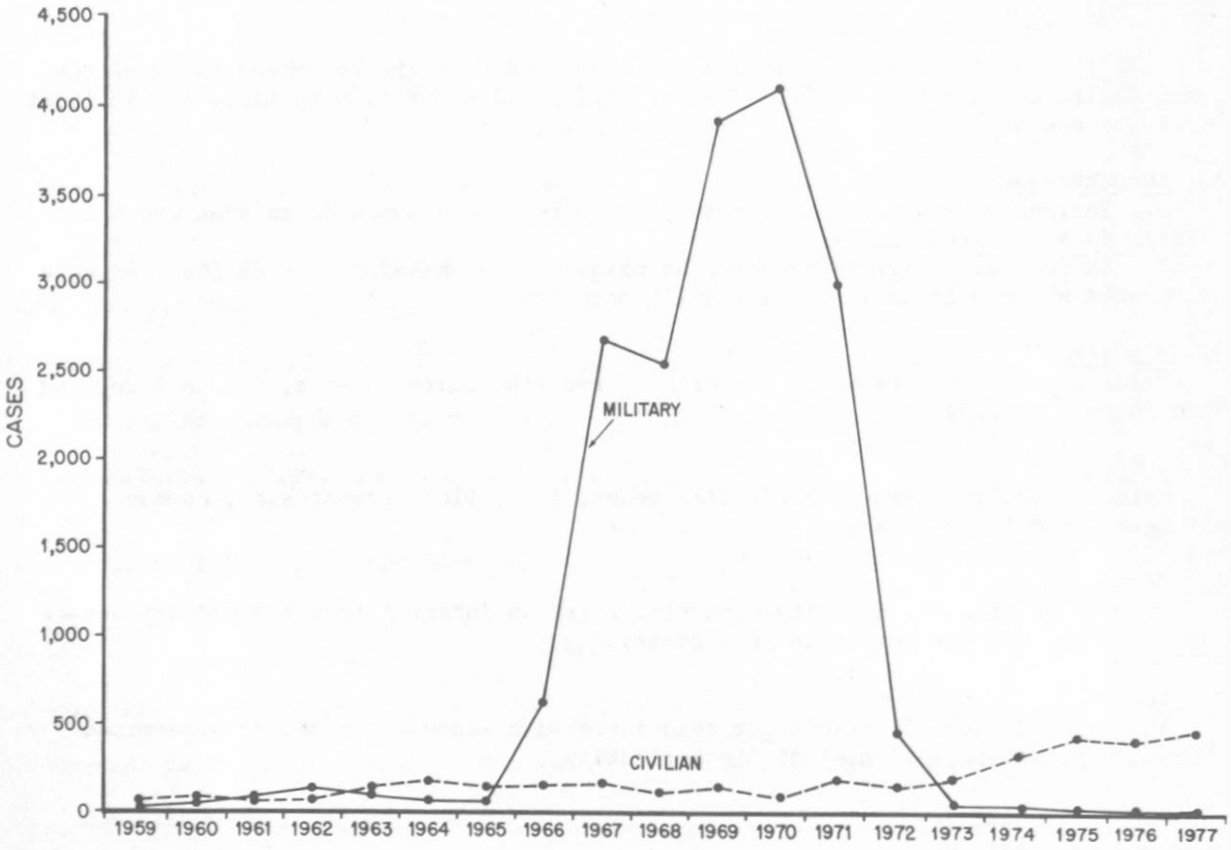
HEW Publication No. (CDC) 78-8259

III. GENERAL SURVEILLANCE

In 1977 (1977 case reports received January 1, 1977 through April 30, 1978), 480 cases* of malaria, with onset in 1977 in the United States and territories, were reported to the Parasitic Diseases Division, Center for Disease Control; this represents a 15.7% increase over the number seen in 1976 when 415 cases were reported. As in 1976 most of the reported cases were in civilians, which comprised 98% of all cases diagnosed in this country (Table 1). The number of cases that occurred in military personnel in 1977 (11) was higher than the number seen in 1976 when 5 cases were reported. The number of military cases, however, remained below the levels seen during the Vietnam War years (Fig. 1).

Figure 1

MILITARY AND CIVILIAN CASES OF MALARIA, UNITED STATES, 1959-1977



*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 person caused by a different Plasmodium species is counted as an additional case. Repeat attacks in this country caused by the same species are considered relapses, 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 health department laboratory. Doubtful cases were referred to the National Malaria Repository, CDC.

Table 1 Military and Civilian Malaria Cases, United States, 1959-1977*

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	410	415
1977***	11	466	477

*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.
***Status unknown for 3 additional cases

In only 1 of the 466 civilian cases and in none of the military cases, did patients acquire this infection in the United States. In this case P. falciparum malaria was induced by transfusion. No cases of congenital infection or introduced malaria were reported in 1977.

The ratios of cases caused by the various Plasmodium species generally showed little change in 1977 from 1976 (Table 2).

Table 2 Malaria Cases by Plasmodium Species, United States, 1977

Species	Total	Percent
P. vivax	292	60.8
P. falciparum	100	20.8
P. malariae	24	5.0
P. ovale	11	2.3
Mixed Infections	7	1.5
Undetermined	46	9.6
Total	480	100.0

The countries in which the 480 patients contracted malaria are shown in Table 3. Asia accounted for 53.8% of cases, Africa for 30.4%, Central America and the Caribbean for 8.5%, South America for 3.3%, Oceania for 3.0%, and North America for 1.0%. The number of malaria cases reported from Asia in 1977 (258 cases) represented a 13.1% increase over the number of cases from Asia reported in 1976 (195 cases). This increase reflected, primarily, a marked increase in the number of cases from India (188 cases in 1977 compared with 130 cases in 1976).

As in 1976 the largest number of cases from any single country was reported from India (188), comprising 39.2% of all reported cases in 1977. Of the imported cases a large number of patients acquired their infections in Nigeria (35), Ghana (19), Pakistan (17), New Guinea (12), Honduras (12) and Kenya (11).

Figure 2 shows the geographic distribution of the 1977 malaria cases by the state in which the patient first developed clinical symptoms of the disease.

Table 3 Malaria Cases by Distribution of Plasmodium Species and Area of Acquisition, United States, 1977*

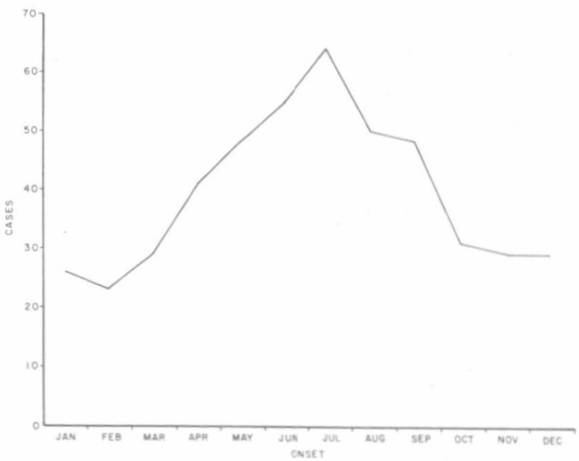
	vivax	falciparum	malariae	ovale	mixed	unknown	total
AFRICA	34	77	9	10	3	13	146
Africa, East**	4	1	0	0	0	0	5
Africa, North**	1	0	0	0	0	0	1
Africa, South**	0	4	0	0	0	0	4
Africa, West & Central**	6	12	2	1	1	2	24
Africa, Unspecified	5	7	1	2	1	2	18
Botswana (Bechuanaland)	1	0	0	0	0	0	1
Cameroon	2	2	1	1	0	0	6
Central African Republic	0	3	0	0	0	0	3
Gabon	0	0	0	1	0	0	1
Ghana	6	10	2	1	0	0	19
Ivory Coast	1	0	0	0	0	1	2
Kenya	0	7	2	0	0	2	11
Liberia	1	6	0	1	0	1	9
Niger	1	1	0	0	0	0	2
Nigeria	2	24	1	3	1	4	35
Rhodesia, North	0	0	0	0	0	1	1
Sierra Leone	1	0	0	0	0	0	1
Tanzania	2	0	0	0	0	0	2
Upper Volta	1	0	0	0	0	0	1
ASIA	211	12	8	1	3	23	258
Asia, Southeast**	2	0	0	0	0	0	2
Asia, unspecified**	4	0	1	0	0	1	6
Cambodia (Democratic Kampuchea)	3	0	0	0	0	0	3
India	160	7	6	0	2	13	188
Indonesia	6	0	0	0	1	0	7
Korea	1	0	0	0	0	0	1
Laos	4	0	0	0	0	1	5
Malaysia	3	0	0	0	0	1	4
Oman	0	1	0	0	0	0	1
Pakistan	10	1	1	1	0	4	17
Philippines	2	1	0	0	0	0	3
Saudia Arabia	1	0	0	0	0	1	2
Sri Lanka (Ceylon)	2	0	0	0	0	0	2
Thailand	1	1	0	0	0	1	3
Turkey	5	1	0	0	0	0	6
United Arab Emirates	1	0	0	0	0	0	1
Vietnam	6	0	0	0	0	1	7
CENTRAL AMERICA AND CARIBBEAN	30	6	4	0	0	1	41
Central America**	3	0	0	0	0	0	3
Belize (British Honduras)	1	0	0	0	0	0	1
El Salvador	6	0	1	0	0	0	7
Guatemala	2	0	0	0	0	0	2
Haiti	0	6	1	0	0	1	8
Honduras	11	0	1	0	0	0	12
Nicaragua	7	0	1	0	0	0	8
NORTH AMERICA	3	1	1	0	0	0	5
Mexico	3	0	1	0	0	0	4
United States	0	1	0	0	0	0	1
SOUTH AMERICA	13	2	0	0	0	1	16
South America**	1	0	0	0	0	1	2
Brazil	2	1	0	0	0	0	3
Colombia	7	1	0	0	0	0	8
Ecuador	1	0	0	0	0	0	1
Peru	1	0	0	0	0	0	1
Venezuela	1	0	0	0	0	0	1
OCEANIA	8	3	1	0	0	2	14
Oceania**	0	2	0	0	0	0	2
New Guinea	8	1	1	0	0	2	12
TOTAL	299	101	23	11	6	40	480

*Onset of illness in the united States and territories
**Country not specified

Fig. 2 GEOGRAPHIC DISTRIBUTION OF MALARIA CASES WITH ONSET IN UNITED STATES, 1977

*NO MALARIA SURVEILLANCE DATA AVAILABLE FOR TEXAS

Fig. 3 MALARIA CASES, BY MONTH OF ONSET, UNITED STATES, 1977



In 1977 as in 1976 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.

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 72% of persons with P. falciparum infection and in 34.4% of those with P. vivax infection (Table 4). Within 6 months after returning to this country, 92.7% of patients with P. falciparum malaria and 65.6% of those with P. vivax malaria developed clinical symptoms. Twelve patients (3.2%) with malaria became ill 12 months or longer after the last possible exposure to malaria abroad.

*27 malaria cases were identified by the State of Texas in 1977. Surveillance forms for 26 of these cases were not completed; they were thus not included in our malaria surveillance data analysis for 1977.

Table 4 Malaria Cases by Period Between Date of Entry Into the United States and Onset of Illness, and by Plasmodium Species, United States, 1977*

Period (in months)	Plasmodium Species									
	Vivax	(%)	Falciparum	(%)	Malariae	(%)	Ovale	(%)	All Cases	(%)
< 1	89	(34.4)	59	(72.0)	12	(60.0)	3	(27.3)	163	(43.8)
1-2	34	(13.1)	10	(12.2)	3	(15.0)	1	(9.1)	48	(12.9)
3-5	47	(18.1)	7	(8.5)	3	(15.0)	5	(45.4)	62	(16.7)
6-11	80	(30.9)	4	(4.9)	2	(10.0)	1	(9.1)	87	(23.4)
≥ 12	9	(3.5)	2	(2.4)	0	(0.0)	1	(9.1)	12	(3.2)
Total	259	(100.0)	82	(100.0)	20	(100.0)	11	(100.0)	372	(100.0)

*Cases acquired in the United States (1), cases with species undetermined (46) or mixed (7), and cases with exact entry date or onset of illness date unknown (54) are not included.

Of the 461 cases reported in 1977, and for which the status of hospitalization was known, 86.1% required hospitalization. The majority of patients were initially treated in civilian hospitals (70.9%), military hospitals (3.0%) and Public Health Service hospitals (2.0%) (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 see patients with malaria.

Table 5 Malaria Cases by Type of Initial Hospital Admission, United States, 1977*

Type of Hospital	Number of Patients	Percent
Military	14	3.0
Veterans Administration	2	0.4
Civilian	327	70.9
Public Health Service	9	2.0
Other	45	9.8
Not Hospitalized	64	13.9
Total	461	100.0

*Hospital unknown for 19 patients

IV. MILITARY MALARIA

In 1977, 11 cases of malaria in military personnel were reported. Although this represented a 120% increase over the number reported in 1976 (5 cases), the total number of military cases still remained below the levels observed during the Vietnam War years (Table 6).

V. CIVILIAN MALARIA IMPORTED FROM ABROAD

The number of imported civilian cases in 1977 continued to increase, a trend first evident in 1974. The age and sex distribution of the 466 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 49.8% of the imported civilian cases for which the 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, students or teachers made up the largest group.

Table 6 Malaria Cases in Military Personnel, by Branch of Service, United States, 1977

Branch of Service	Cases	
	Number	Percent
Air Force	5	45.4
Army	4	36.4
Navy	0	0
Marine	0	0
Unknown	2	18.2
Total	11	100.0

Table 7 Civilian Malaria Cases, by Age and Sex, United States, 1977

Age Group	Male	Female	Unknown	Total	Percent
0-09	34	23	2	59	13.1
10-19	32	12	1	45	10.0
20-29	101	57	4	162	35.8
30-39	59	26	2	87	19.2
40-49	29	7	1	37	8.2
50-59	26	7	0	33	7.3
60-69	10	10	0	20	4.4
≥ 70	6	3	0	9	2.0
Total	297	145	10	452	100.0

Table 8 Imported* Civilian Malaria Cases, by Occupation While in Malarious Area, and Nationality, United States, 1977

Occupation	U.S. Citizen	Foreign Visitor	Total	Percent
Tourist	45	5	50	10.7
Businessman	26	16	42	9.0
Government Representative	7	9	16	3.4
Missionary	25	1	26	5.6
Peace Corps	12	0	12	2.6
Seaman	5	12	17	3.6
Student or Teacher	27	47	74	15.9
Other	42	78	120	25.8
Unknown	43	66	108	23.4
Total	232	234	465	100.0

*Induced case (1) not included.

VI. MALARIA ACQUIRED IN THE UNITED STATES

In 1977, 1 case of transfusion-induced malaria was reported in the United States. In this case malaria was induced by transfusion of platelets. In addition, 2 other cases of malaria induced by transfusion which occurred in 1976, and were not previously reported, are described here. No cases of introduced malaria were reported (Fig. 4).

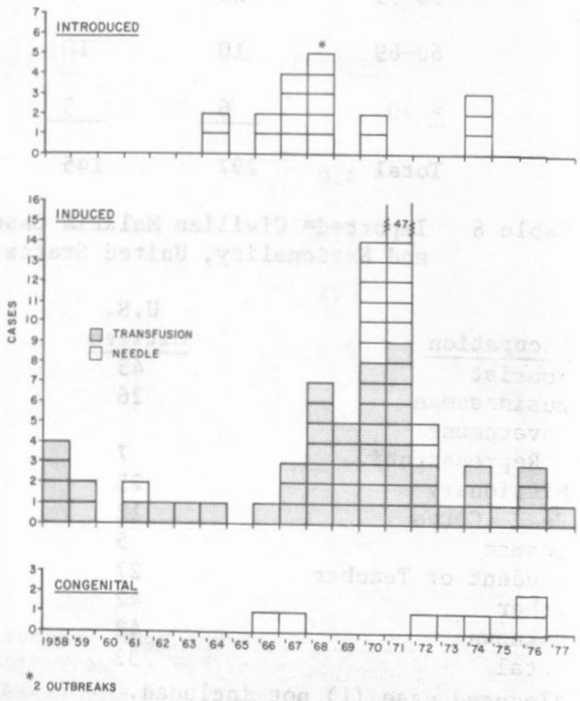
Case 1 - A case of malaria probably transmitted by a platelet transfusion occurred in July 1977 in Wisconsin. The patient was a 57-year-old woman diagnosed as having acute myelomonocytic leukemia in October 1976. During induction therapy, the patient received several antibiotics for culture-negative febrile episodes and multiple transfusions (93 units of platelets, 8 units of packed red cells, and 13 white cell concentrates). She was discharged December 21, 1976, and received outpatient consolidation and maintenance therapy.

She was re-admitted with relapse of leukemia on June 23, 1977, and reinduced. She had febrile episodes on July 7, July 13, July 24, and August 2. She received an additional 70 units of platelets and 8 units of packed red cells. On August 5, *Plasmodium falciparum* organisms were seen on a peripheral blood smear. Bacterial cultures were negative.

Meanwhile, another patient in Wisconsin, who had returned from Togo in June 1977 and donated blood on July 5, developed symptoms of *P. falciparum* malaria on July 7. After making the diagnosis, his physician learned that the patient had donated blood. The unit of blood was traced, and the packed red blood cells were retrieved. The plasma, however, had been made into a cryoprecipitate and sent to a commercial laboratory. The platelets, when traced, already had been transfused into the leukemic patient. Serum specimens were obtained from the remaining donors and were found negative for malaria antibody by IFA.

(Reported by M.D. Garfield, M.D., J. Polk, M.D., R.F. Schilling, University Hospital, University of Wisconsin, Madison; H.G. Skinner, M.D., State Epidemiologist, Wisconsin Division of Health, Madison; Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Fig. 4 MALARIA ACQUIRED IN THE UNITED STATES, 1958-1977



The following are 2 previously unreported cases of transfusion-induced malaria that occurred in 1976. These bring the total number of transfusion-induced cases in the United States up to 3 for 1976.

Case 1 - On December 22, 1976, malaria due to *P. vivax* infection was diagnosed in a 71-year-old female from St. John, Kansas. There was no history of recent travel. The patient had been hospitalized since early November 1976 for incision and drainage of an abcess on the right thigh. At that time she was found to have an iron deficiency anemia (hemoglobin = 9 gm per 100 ml). An abdominal mass had been found at the time of admission which at laparatomy was found to be a benign leiomyoma. At that time the patient was given 8 units of blood (7 units of packed red blood cells and 1 unit of whole blood) bringing the hemoglobin up to 13 gm per 100 ml. Two episodes of hemoptysis followed

by a drop of hemoglobin to 10 gm per 100 ml developed in this patient. Blood smears obtained at that time (2 to 3 weeks after having received the blood transfusions) were found positive for P. vivax. No details were available on the patient's symptoms at the time the diagnosis of malaria was made. The patient received a total of 2.5 gms of amodiaquine orally over a 3-day period, and the parasitemia cleared completely.

The 8 blood donors were interviewed and blood for malaria serology was obtained from each. Two of the 8 blood donors gave a history of travel to malarious countries, both as recently as 2 years preceding blood donation. Neither of these donors took malaria chemoprophylaxis while traveling abroad. None of the 8 donors gave a history of malaria, blood transfusion or use of illicit drugs in the past. Results of the serologic tests for malaria antibody by indirect immunofluorescence (IIFA) in all 8 blood donors are summarized in Table 9. Only 1 of the 2 donors with a history of travel to a malarious country (donor #2) showed significant malaria titers; although serum was reactive to P. vivax, titers were higher for P. falciparum and P. malariae. Donor #2 was a 26-year-old healthy black Nigerian student who had lived in the United States since 1974. He was asymptomatic, did not recall having had malaria in the past and denied donating blood previously. Elevated malaria titers were found in 3 of the remaining 6 donors, neither of which gave a history of malaria, travel to malarious countries, blood transfusion or use of illicit drugs. Thus, the positive malaria titers in the latter 3 donors remain unexplained. Although donor #2 appeared as the most likely donor to transmit malaria because of recent travel history and positive malaria titers, he cannot be clearly indicated as the source of P. vivax infection in the present case of malaria, in view of the relatively low titers to this malaria species in the donor.

Table 9 Malaria Titers (IIFA)*

Donor	P. vivax	P. falciparum	P. malariae	P. ovale
1**	1:16	1:16	Neg	N.D.+
2**	1:64	1:1024	1:256	N.D.
3	1:64	1:64	Neg	N.D.
4	Neg	1:256	Neg	N.D.
5	Neg	1:64	Neg	N.D.
6	Neg	Neg	Neg	N.D.
7	Neg	Neg	Neg	N.D.
8	Neg	Neg	Neg	N.D.
Patient	1:64	Neg	Neg	N.D.

*Significant titer is considered to be $\geq$ 1:64

**Only 2 donors with history of travel to malarious countries (none of the 8 donors gave history of malaria, blood transfusion or illicit drug use).

+N.D. = Not Done

(Reported by D. Wilcox, M.D., State Epidemiologist, Kansas State Department of Health; G. Sabin, Jr., M.D., Medical Director, Wichita Regional Red Cross Blood Center; EIS Officer, Oklahoma State Department of Health; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Case 2 - On March 10, 1976, a 35-year-old woman underwent orthopedic surgery at a hospital in San Diego, California, and received 7 units of blood during and after surgery. She did well until March 26 when fever, malaise, myalgias, and nausea developed. On March 30 she was readmitted to the hospital, delirious and with severe hemolysis. A blood smear revealed a heavy infection with P. falciparum. She was treated with intravenous quinine, oral dapsone, and pyrimethamine; she made a good recovery and was discharged 2 weeks later.

The patient was born in the U.S. and had not traveled recently outside the country except to Tijuana, Mexico. She had no history of previous malaria or drug abuse. Of the 7 units of blood she had received, 5 were from a military blood bank and 2 were from a civilian blood bank. During screening prior to blood donation, all 7 donors denied travel to malaria-endemic areas within 6 months, prior history of malaria or treatment for malaria.

Follow-up of the 7 donors revealed that 1 of the military donors, a 26-year-old recruit, had been born in Liberia, and had lived there until 1971 when he immigrated to the U.S. He returned to Liberia for a visit from April to November 1975. In June and December 1975 he was ill with fever and chills, and his illness was diagnosed as "flu". He had taken antimalarial drugs about 8 years before donating blood, but had not taken malaria chemoprophylaxis during his return visit.

Indirect immunofluorescent antibody studies on the implicated donor revealed a titer of 1:4096 to P. falciparum. The serology on the other 4 military donors and 1 civilian donor was negative, and is pending on the second civilian donor. No malaria parasites were noted on thick and thin smears of the 7 donors. The implicated donor was treated for falciparum malaria.

(Reported by R. R. Roberto, M.D., Deputy Chief, Infectious Diseases Section, State of California, Department of Health.)

VII. MALARIA DEATHS AND COMPLICATIONS IN THE UNITED STATES

A. Malaria Deaths

Three malaria deaths were reported in the United States in 1977. They were all cases of malaria imported from Africa; 2 were caused by P. falciparum infection, and in the third case the Plasmodium species was not identified.

Case 1 - On January 23, 1977, a 51-year-old man was admitted to a Baltimore hospital with a history of malaise, anorexia, and jaundice, and for the past 6 days had had recurrent chills, fever, and diaphoresis. One month before admission, he had taken part in a "camera" safari to Kenya and Tanzania. He had not taken antimalarial prophylaxis.

On admission he was alert, but jaundiced. His temperature was 99.4 F orally, his pulse was 120/minute, and his blood pressure was 100/70 mmHg. His liver was palpable, 2 cm below the right costal margin, but his spleen was not palpable. Other physical findings were within normal limits.

Laboratory data showed normal hemoglobin, hematocrit, white blood cell count, electrolyte values, chest roentgenogram, and urinalysis, but a thin blood smear revealed Plasmodium falciparum.

The patient was started on hydroxychloroquine and quinine orally, but on the second hospital day, his temperature rose to 105 F, and he became increasingly lethargic and hypotensive. His blood pressure stabilized after vigorous intravenous fluid therapy, but his hematocrit dropped from 40% (recorded on admission) to 26%. Fibrinogen and fibrin split products were reduced. He was given packed red blood cells and fresh frozen plasma. Over the next 2 days he became oliguric and developed generalized edema, and on the fourth hospital day, because of his increasing abdominal girth, he underwent abdominocentesis. This disclosed grossly bloody fluid with a hematocrit of 39%. The following day he developed pulmonary edema, requiring intubation and positive end-expiratory pressure ventilation. An exploratory laparotomy revealed 3 to 4 liters of grossly bloody peritoneal fluid and a ruptured spleen, which was removed. Peritoneal dialysis was started on the fifth hospital day. The patient's renal failure and pulmonary edema gradually began to resolve,

but on the afternoon of the eighth hospital day, his temperature rose to 102 F, his blood pressure fell to 50/30 mmHg, and he had a cardiac arrest. Despite attempts at resuscitation, he died.

No parasites were seen in blood smears taken on the day of death, but Pseudomonas aeruginosa was isolated from a blood culture. Postmortem examination revealed hemmorrhagic necrotizing pneumonia in both lungs, from which P. aeruginosa and Staphylococcus aureus were isolated, congestion of the sinusoids of the liver and capillaries of the spleen with parasitized erythrocytes and malaria pigment, hemoglobinuric nephrosis, and acute tubular necrosis.

(Reported by F. Farra, M.D., V.R. Hrehorovich, M.D., B. Kasimis, M.D., D. Sawhney,M.D., South Baltimore General Hospital; K. H. Acree, M.C.D.M., State Epidemiologist, Maryland Department of Health and Mental Hygiene; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Case 2 - On July 9, 1977, a 53-year-old male returned to the United States after a 2-week "Nature Expedition" safari in Kenya in which 19 other American tourists participated. The group was given specific advise about malaria chemoprophylaxis, but the patient did not take any medication. On arrival back in the United States the patient developed chills, fever, myalgias and weakness. He did not seek medical attention, and on July 11, 2 days after arrival in the U.S., he was found dead at home. Autopsy revealed marked pulmonary edema, congestion of the brain, spleen and pancreas, hemorrhagic kidneys, and an acute myocardial infarction. Abundant brown pigment was noted in sections of lung, liver, and spleen which was consistent with malarial pigment in its distribution and staining characteristics. Intraerythrocytic parasites consistent with Plasmodium species were seen in sections of the spleen.

(Reported by R. R. Roberto, M.D., Deputy Chief, Infectious Diseases Section, State of California Department of Health.)

Case 3 - A 72-year-old woman was first seen by a California physician on April 20, 1977, at which time she was admitted to a hospital in a comatose state. The patient had returned from Africa 10 days prior to admission, where she had spent approximately 4 weeks. She did not take any malaria chemoprophylaxis. While in Africa and approximately 4 weeks prior to admission to the hospital, the patient developed fever, weakness, and lethargy. She was cared for by a Christian Science practitioner but did not receive any medical attention until the fourth week of illness when she became bed-ridden and non-communicative. On admission to the hospital she was comatose, jaundiced, and had markedly abnormal renal and liver fuction tests. Her hematocrit was 28% and the platelets were slightly decreased. The diagnosis of malaria due to P. falciparum infection was made promptly, but the patient succumbed to her disease on the day of admission. No autopsy was performed.

(Reported by Robert Johnson, M.D., J. Reichel, P.H.N., James Chin, M.D., State Epidemiologist, California State Department of Health, Field Services Division; and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

B. Malaria Complications

Fifty-one complications of malaria, aside from death, were reported in 1977 (Table 10).

Table 10 Malaria Complications by Species, United States, 1977

	Vivax	Falciparum	Malariae	Ovale	Mixed	Undetermined	Total
Hemolysis	17	18	3	0	2	4	44
Cerebral	0	3	0	0	0	0	3
Renal	0	4	0	0	0	0	4
Total	17	25	3	0	2	4	51
Total Number of Cases Diagnosed	292	100	24	11	7	46	480

VIII. REPORT FROM THE NATIONAL MALARIA REPOSITORY - 1977

The presence of *Plasmodium* species or agreement that there were no parasites present was confirmed in blood films from 182 patients submitted to the National Malaria Repository in 1977. Two cases submitted as *P. falciparum* and *Plasmodium* species, respectively, were later found to be negative at CDC. No specimens submitted as negative were later found to be positive 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 11 and 12.

Table 11 Institutions Submitting Positive Slides for Malaria to the National Malaria Repository*, 1974-1977

	ORGIN							
	Army	Navy	VA Hosp	Air Force	Health Dept. (State, County, City)	PHS Hosp	Other Hospitals Clinics, Physicians, etc.	Cumulative
Cumulative total positive 1977	1	1	0	3	74	5	37	121
Cumulative total positive 1976	3	0	1	1	62	4	63	134
Cumulative total positive 1975	2	30	0	1	25	2	65	125

*CDC

Table 12 Species of Malaria Identified by National Malaria Repository*, 1975-1977

Species	1977	1976	1975
P. vivax	73	79	57
P. falciparum	34	43	48
P. malariae	1	4	3
P. ovale	2	4	13
Plasmodium sp.	10	4	4
Negative	61	63	96
Total examined	182	197	221
Cumulative positive	121	134	125

*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

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. (Also see Fig. 5.) Table 13 provides information on malaria risk for each country. **For detailed information on each country with a malaria risk see Table 14.**

Table 13 **Information on Malaria Risk by Country**

Country	Malaria Risk	Country	Malaria Risk
Afghanistan	Yes	Czechoslovakia	No
Albania	No	Democratic Kampuchea	Yes
Algeria	Yes	Denmark	No
American Samoa	No	Djibouti, Republic of	No
Angola	Yes	Dominica	No
Antigua	No	Dominican Republic	Yes
Argentina	Yes	East Timor	Yes
Australia	No	Ecuador	Yes
Austria	No	Egypt	Yes
Azores	No	El Salvador	Yes
Bahamas	No	Equatorial Guinea	Yes
Bahrain	Yes	Ethiopia	Yes
Bangladesh	Yes	Falkland (Malvinas) Islands	No
Barbados	No	Faroe Islands	No
Belgium	No	Fiji	No
Belize	Yes	Finland	No
Benin	Yes	France	No
Bermuda	No	French Guiana	Yes
Bolivia	Yes	French Polynesia (Tahiti)	No
Botswana	Yes	Gabon	Yes
Brazil	Yes	Gambia	Yes
Brunei	No	German Democratic Republic (East)	No
Bulgaria	No	Germany, Federal Republic of (West)	No
Burma	Yes	Ghana	Yes
Burundi	Yes	Gibraltar	No
Cameroon,United Rupublic of	Yes	Gilbert Islands	No
Canada	No	Greece	No*
Canal Zone	No	Greenland	No
Canary Islands	No	Grenada	No
Cape Verde	Yes	Guadeloupe	No
Cayman Islands	No	Guam	No
Central African Empire	Yes	Guatemala	Yes
Chad	Yes	Guernsey, Alderney and Sark	No
Chile	No	Guinea	Yes
China, People's Republic of	(Unknown)	Guinea-Bissau	Yes
China, Republic of (Taiwan)	No	Guyana	Yes
Christmas Island	No	Haiti	Yes
Colombia	Yes	Honduras	Yes
Comoros	Yes	Hong Kong	No
Congo	Yes	Hungary	No
Cook Islands	No	Iceland	No
Costa Rica	Yes	India	Yes
Cuba	No	Indonesia	Yes
Cyprus	No		

*See Table 14

Table 13 (continued) **For detailed information on each country with a malaria risk see Table 14.**

Country	Malaria Risk	Country	Malaria Risk
Iran	Yes	Norway	No
Iraq	Yes	Oman	Yes
Ireland	No	Pacific Islands, Trust Terr. (USA)	No
Isle of Man	No	Pakistan	Yes
Israel	No	Panama	Yes
Italy	No	Papua New Guinea	Yes
Ivory Coast	Yes	Paraguay	Yes
Jamaica	No	Peru	Yes
Japan	No	Philippines	Yes
Jersey	No	Pitcairn Island	No
Jordan	Yes	Poland	No
Kenya	Yes	Portugal	No
Korea, Domocratic People's Rep. of	No	Puerto Rico	No
Korea, Republic of (South)	Yes	Qatar	Yes
Kuwait	No	Reunion	No
Lao People's Democratic Rep.	Yes	Rhodesia	Yes
Lebanon	No	Romania	Yes
Lesotho	No	Rwanda	Yes
Liberia	Yes	Ryukyu Islands (Okinawa)	No
Libyan Arab Jamahiriya	Yes	Saint Helena	No
Liechtenstein	No	Saint Kitts-Nevis-Anguilla	No
Luxembourg	No	Saint Lucia	No
Macao	No	Saint Pierre and Miquelon	No
Madagascar	Yes	Saint Vincent	No
Madeira	No	Samoa	No
Malawi	Yes	Sao Tome and Principe	Yes
Malaysia	Yes	Saudi Arabia	Yes
Maldives	Yes	Senegal	Yes
Mali	Yes	Seychelles	No
Malta	No	Sierra Leone	Yes
Martinique	No	Singapore	Yes
Mauritania	Yes	Solomon Islands	Yes
Mauritius	No	Somalia	Yes
Mexico	Yes	South Africa	Yes
Monaco	No	Spain	No
Mongolia	No	Sri Lanka	Yes
Montserrat	No	Sudan	Yes
Morocco	Yes	Surinam	Yes
Mozambique	Yes	Swaziland	Yes
Namibia	Yes	Sweden	No
Nauru	No	Switzerland	No
Nepal	Yes	Syrian Arab Rep.	Yes
Netherlands	No	Tanzania, United Republic of	Yes
Netherlands Antilles	No	Thailand	Yes
New Caledonia and Dependencies	No	Togo	Yes
New Hebrides	Yes	Tonga	No
New Zealand	No	Trinidad and Tobago	No
Nicaragua	Yes	Tunisia	Yes
Niger	Yes	Turkey	Yes
Nigeria	Yes	Tuvalu	No
Niue	No	Uganda	Yes

Table 13 (continued) For detailed information on each country with a malaria risk see Table 14.

Country	Malaria Risk	Country	Malaria Risk
Union of Soviet Socialist Rep.	No*	Virgin Islands (USA)	No
United Arab Emirates	Yes	Western Sahara	No
United Kingdom	No	Wake Island	No
United States of America	No	Yemen	Yes
Upper Volta	Yes	Yemen, Democratic	Yes
Uruguay	No	Yugoslavia	No
Venezuela	Yes	Zaire	Yes
Vietnam	Yes	Zambia	Yes

*See Table 14

Table 14 Information on Malaria Risk by Country
Only Countries with Known Risk are Listed

Country or area (If a country is not listed, it is malaria free.)	Malaria risk	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 14 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	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	?	?	?	?
Morocco	Yes	Agadir, Boulmane, Casablanca, 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
Rhodesia	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[6]
South Africa	Yes	Cape Prov. (excl. Molopo and lower Orange River areas; Orange Free State;	Feb-May	1200	No
		Transvaal (excl. north, east and western low altitude areas);	All	800	Yes
		Natal (excl. North Zululand).	All	500	No
Sudan	Yes	None	All	All	Yes
Swaziland	Yes	Most of the country.[7]	Dec-Mar	All	Yes
Tanzania[8]					
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	Yes	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] Excl. northern border areas: Bordergate, Lomahasha, Mhlume, Tshaneni.
[8] V. United Rep. of Tanzania
[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 14 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	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	2000	No
Brazil	Yes	Alagoas, Ceara, Distrito Federal, Paraiba, 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 14 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	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 14 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	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 (South)	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 14 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	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
Thailand	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	Yes	None	Mar-Nov	1000	No
Yemen	Yes	Hajja, Sada, Prov.	Sep-Feb	1400	Yes
Yemen, Democratic	Yes	First Governorate (Aden and airport perimeter)	All	All	Yes

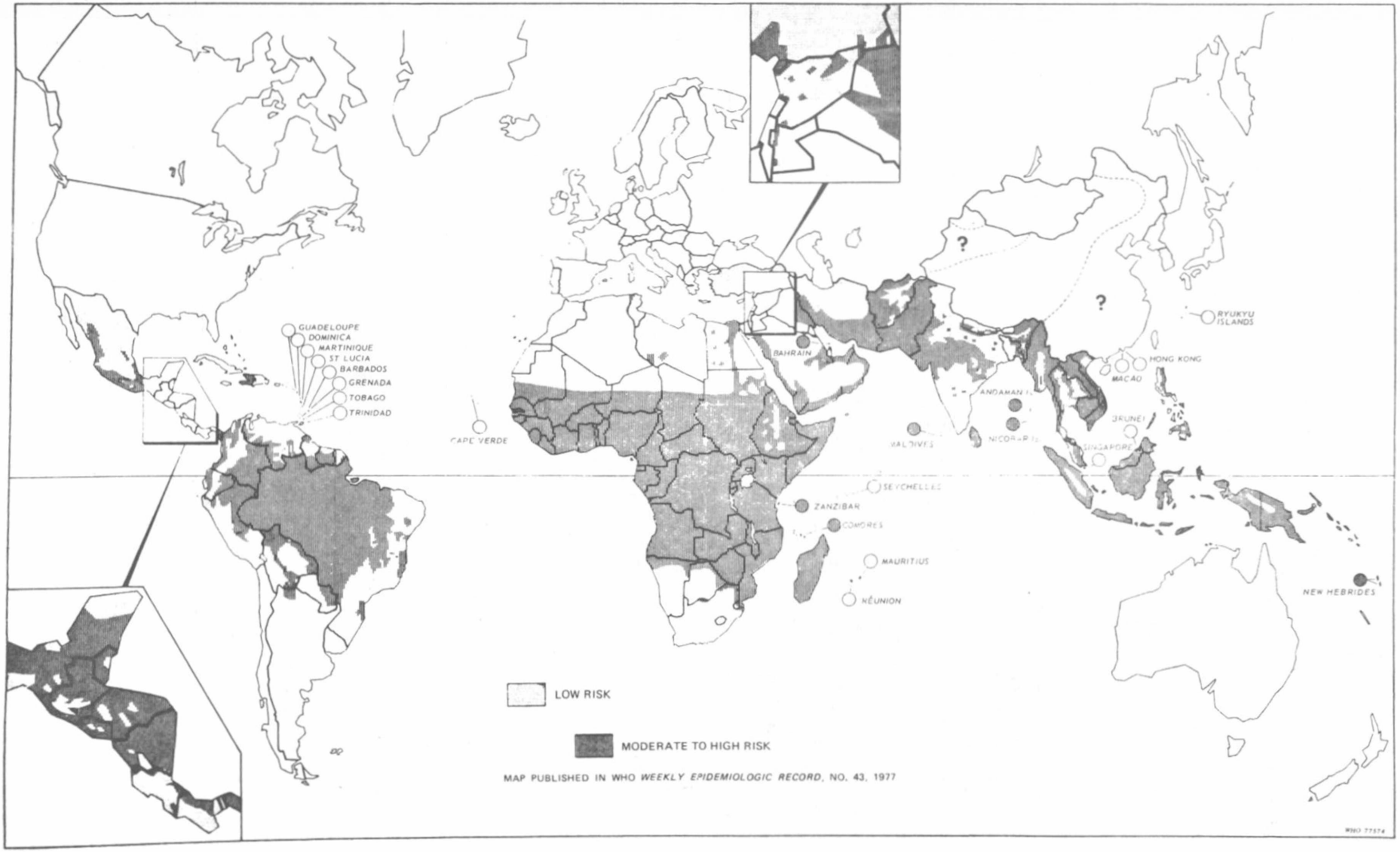
[1] In cultivated areas (below 250 m.) and in hill valleys (750-1 200 m.).
[2] 250-750 m.
[3] North-West-Frontier Prov., hilly areas of Baluchistan and Punjab Prov. Jun-Sept.
[4] Practically no risk.
[5] Except Jeddah, Mecca, Medina, Qatif.
[6] In Bangkok and in most urban areas.
[7] Hakkâri Prov.: Aug-Oct;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

Table 14 (continued)

Country or area (If a country is not listed, it is malaria free)	Malaria risk	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					
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[1]	?	?	?	?

[1] Excl. Byelorussian Soviet Socialist Rep. and Ukrainian Soviet Socialist Rep.

Fig. 5 AREAS OF RISK FOR MALARIA TRANSMISSION, DECEMBER 1976



MAP PUBLISHED IN WHO *WEEKLY EPIDEMIOLOGIC RECORD*, NO. 43, 1977

Chemoprophylaxis of Malaria:

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

There are areas of the world in which malaria due to P. falciparum is resistant to chloroquine. These areas include parts of Asia and South America and are summarized in table 14, abstracted from the World Health Organization's Weekly Epidemiological Record 52:366-370, 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 of 2 tablets on alternate weeks during and for 6 weeks after exposure to malaria, has been found to be effective in the prevention of chloroquine-resistant malaria. More information on the chemoprophylaxis of malaria may be found in the Morbidity and Mortality Weekly Report (CDC) vol 27 (Supplement): 81-90, 1978.

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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	All malarious areas except west coast	1961-73
Ecuador	Provinces in interior of country bordering Colombia	1975-76
French Guiana	Isolated reports	1975
Guyana	Brazil-Guyana border area	1969, 71
Panama	All areas east of Canal Zone	1969-75
Surinam	All malarious areas	1973-75
Venezuela	All malarious areas	1964-74
ASIA		
Bangladesh	Border areas with Assam State, India, and Burma	1970-75
Burma	All malarious areas	1969-75
Dem. Kampuchea	Whole Country	1962
India	Assam State	1973
Indonesia	East Kalimantan (Island of Borneo) Irian Jaya (Island of New Guinea)	1974 1974
Laos	Vientiane Province	1976
Malaysia		
West	All malarious areas	1963
Sabah	All malarious areas	1971-75
Papua New Guinea	Border area with Irian Barat, Indonesia	1976
Philippines	Luzon Island Basilian Island and Sulu Archipelago Mindoro Island Palawan Island	1969-76 1975 1974 1969
Thailand	All malarious areas	1961-71
Vietnam	Widespread	1962

X. MICROSCOPIC DIAGNOSIS OF MALARIA

Early diagnosis of malaria requires a high level of clinical suspicion and, in particular, the careful taking of a travel history from every patient with a fever of unknown origin. Once 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

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

Fig. 7

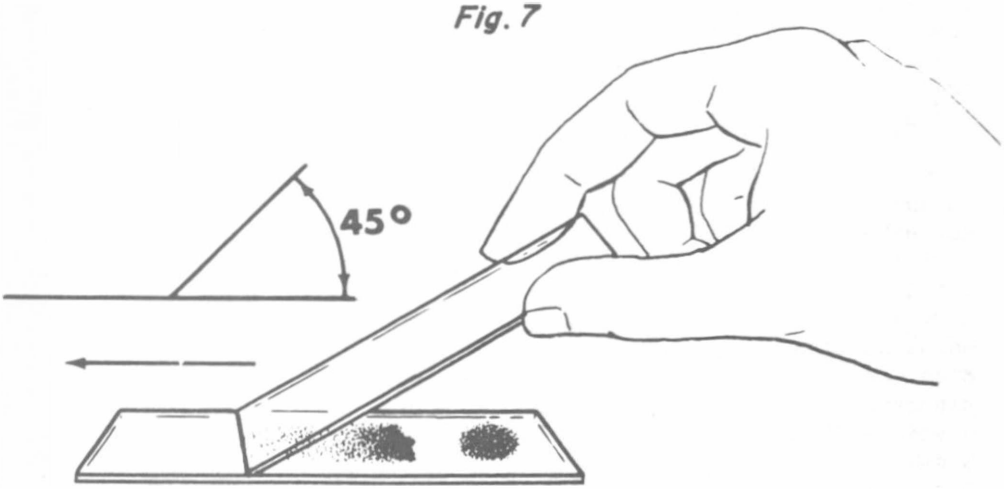
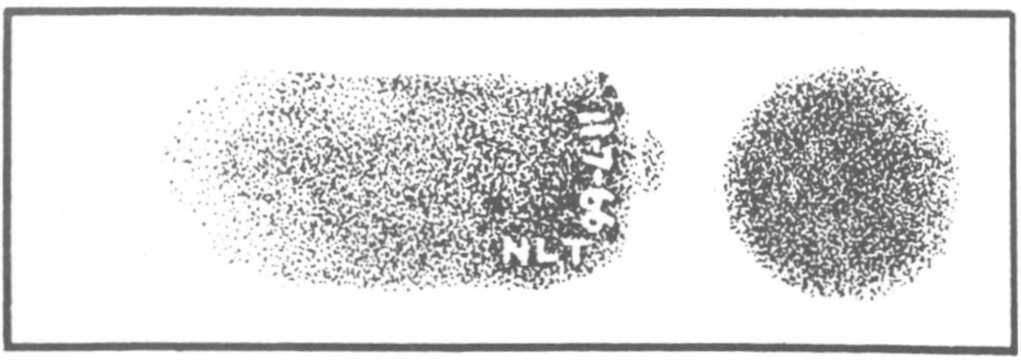


Fig. 8



STATE EPIDEMIOLOGISTS

Key to all disease surveillance activities are those in each state who serve 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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