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Chemoprophylaxis of Malaria

Each year a large number of Americans travel to malarious areas of the world. In recent years there has been a resurgence of malaria in many countries where control had been temporarily achieved. Consequently, there has been a significant increase in the incidence of imported malaria in the United States. From 1970 through 1975, the number of cases of malaria in civilians reported to the Center for Disease Control (CDC) rose from 151 to 430 per year. Information submitted to CDC by health departments and private physicians indicates that many travelers to malarious areas and their physicians are unaware of the risk of acquiring this disease or of the need for malaria chemoprophylaxis. Even when travelers are properly informed and do receive prophylactic medication, they often stop taking their drugs as soon as they return home. The financial cost of such inadequate malaria chemoprophylaxis was well illustrated in a recent study of patients with malaria at a New York hospital; it showed that an illness which cost approximately $1,700 to treat in the hospital could have been prevented by taking just 5 cents' worth of prophylactic medication a week (*1*). The potential risk of inadequate antimalarial prophylaxis can be even better appreciated when it is realized that from 1970 through 1975, 12 American travelers died of malaria after returning to this country.

To understand malaria chemoprophylaxis, a basic knowledge of the life cycle of the malaria parasite is needed. Malaria is transmitted by the bite of an infected *Anopheles* mosquito. As the mosquito feeds, sporozoites are released into the blood stream of the host and enter liver cells (exoerythrocytic stage). After the parasite divides and matures, the liver cell ruptures, and the merozoites invade red blood cells (erythrocytic stage). The intraerythrocytic parasites divide again, and when the infected cell ruptures, they repeat the cycle by reinvading other red blood cells. The release of merozoites from infected erythrocytes usually coincides with the onset of chills and fever characteristic of a clinical attack of malaria. Relapses occur when those parasites which have persisted in the liver mature and are released into the blood stream initiating another series of erythrocytic cycles. Infections caused by *Plasmodium falciparum* and *P. malariae* do not relapse because, unlike other species of *Plasmodium* which infect man, their exoerythrocytic stage terminates when the erythrocytes are invaded. Thus, *P. falciparum* and *P. malariae* infections can be cured by drugs which are active against the erythrocytic forms alone. In *P. vivax* and *P. ovale*, on the other hand, therapy directed at the erythrocytic stages will cure the clinical attack but may not prevent relapses because of a persistence of the exoerythrocytic parasites.

When discussing malaria chemoprophylaxis the following terms are frequently used:

Suppression—prevention of the clinical symptoms of a malaria infection by eliminating parasites from the blood without eliminating the exoerythrocytic stages

Suppressive cure—elimination of all parasites from the body by suppressive treatment which is continued longer than the natural duration of the exoerythrocytic stages

These terms dealing with the **prevention** or **suppression** of symptomatic malaria attacks must be distinguished from terms such as "clinical cure" and "radical cure," which refer to the results of **treatment** of acute or chronic illnesses rather than prophylaxis.

Although malaria is worldwide in distribution, the risk of acquiring the disease is not uniform from country to country, or even within countries. The risk depends on local conditions such as mosquito control efforts, prevalence of disease, weather, and altitude. Areas where malaria is known to exist include parts of Mexico, Haiti, Central America, South America, Africa, the Middle East, the Indian subcontinent, Southeast Asia, Korea, Indonesia, and Oceania. The specific areas of countries in which malaria transmission occurs are listed in Table 1 (*2*) (see page 6).

All persons traveling to one or more of these areas are at risk of acquiring malaria. The traveler's itinerary should be reviewed to determine if he or she will be visiting a malarious area. If so, the traveler should be informed of the general protective measures which will help reduce exposure to mosquitoes and should receive a specific recommendation for malaria chemoprophylaxis. The choice of a drug or drugs will depend on several factors which are discussed in detail in the following sections. These include: the intensity of the traveler's exposure to malaria, whether or not the traveler is visiting an area with chloroquine-resistant malaria, whether or not the traveler has a history of drug allergy or intolerance, and whether or not she is pregnant.

Questions about malaria chemoprophylaxis may be directed to State Health Departments or to CDC: day 404-633-3311, night and weekend 404-633-2176.

GENERAL PROTECTIVE MEASURES

Because of the feeding habits of *Anopheles* mosquitos, malaria transmission takes place primarily between dusk and dawn. Therefore, travelers can reduce their risk of acquiring malaria by remaining in well-screened areas during these hours and by sleeping under mosquito netting (16 x 18 mesh). Outdoors, exposure to mosquitos can be reduced by wearing clothing that adequately covers the arms and legs and by applying mosquito repellent to exposed areas of the skin.

MALARIA CHEMOPROPHYLAXIS IN AREAS WHERE STRAINS OF *P. FALCIPARUM* ARE SENSITIVE TO CHLOROQUINE

Chloroquine phosphate is the drug of choice for the suppression of infections caused by *P. vivax, P. malariae, P. ovale,* and strains of *P. falciparum* that are sensitive to chloroquine (Table 2). The recommended adult dose is 500 mg (300 mg base) orally once a week beginning 1-2 weeks before entering a malarious area and continuing for 6 weeks after the last exposure (Table 3). Chloroquine is a safe and effective suppressive agent when taken on a regular basis. Serious adverse reactions to suppressive doses are rare, but minor side effects such as gastrointestinal disturbances, headache, dizziness, and blurred vision are occasionally seen. It may be possible to reduce the frequency and magnitude of these minor adverse reactions by taking the drug after meals. When chloroquine is used in high doses for prolonged periods of time, such as in the treatment of rheumatoid arthritis, it may cause a severe retinopathy characterized by a loss of central visual acuity, pigmentation of the macula, and retinal artery constriction. Retinopathy has never been reported with suppressive antimalarial doses of chloroquine (500 mg weekly) even when administered for as long as 26 years. Malaria chemoprophylaxis for pregnant women and for children is discussed in later sections.

Although chloroquine is well absorbed and suppressive blood levels are rapidly achieved after a single oral dose, travelers should nevertheless start this drug 1-2 weeks before entering a malarious area in order to establish a regular pattern of drug administration. This practice also allows any early adverse reactions to chloroquine that might occur to take place in this country, where they can be managed by the traveler's personal physician.

Chloroquine is active only against the erythrocytic stages of *Plasmodium* spp. Therefore, it **suppresses** the clinical symptoms of a malaria infection without **preventing** the infection. In the cases of *P. falciparum* and *P. malariae,* which have no persistent exoerythrocytic phase, chloroquine usually produces a suppressive cure when continued for 6 weeks after leaving the malarious area. Occasionally, however, delayed primary attacks caused by these 2 species can occur after 6 weeks. Travelers should be alerted to this risk, and if a fever develops after they return home, they should report their possible malaria exposure to their physician as soon as possible.

Because the exoerythrocytic stages of *P. vivax* and *P. ovale* persist in the liver, delayed initial attacks or relapses caused by these 2 species can occur as long as 4 years after chloroquine suppression is discontinued. These relapses can be prevented by the use of primaquine which is active against the exoerythrocytic stages of malaria parasites. However, in contrast to the use of primaquine to eradicate malaria parasites after a **clinical attack** (radical cure), the use of primaquine for **prophylaxis** is controversial, and it is not possible to make a recommendation which will be applicable to all travelers. The decision to administer primaquine should take into account both the intensity of the traveler's exposure to *P. vivax* and *P. ovale* and the potential risk of primaquine toxicity. For American travelers, most of whom remain in urban areas and stay on the usual tourist routes, the intensity of malaria exposure is usually low. Furthermore, adverse reactions to primaquine, such as hemolytic anemia and methemoglobinemia in glucose-6-phosphate dehydrogenase (G6PD)-deficient individuals may pose problems in some ethnic groups. G6PD deficiency occurs most commonly in blacks and persons of Mediterranean extraction. For these reasons, most authorities recommend that prophylaxis with primaquine be used **only** in travelers who are heavily exposed to mosquitoes and in those individuals in whom G6PD deficiency has been excluded by appropriate laboratory tests. When primaquine prophylaxis is used, it may be started during the last 2 weeks of, or following a course of chloroquine suppression.

TABLE 2. Indications for malaria chemoprophylaxis

Purpose	Drugs of Choice	Alternative Drugs
To prevent acquisition of malaria in areas **without** known chloroquine-resistant malaria	Chloroquine phosphate Amodiaquine Hydroxychloroquine Chloroquine sulfate	Pyrimethamine Chlorguanide[1]
To prevent acquisition of malaria in areas **with** known chloroquine-resistant strains of *P. falciparum*	Pyrimethamine-sulfadoxine[1]	Since pyrimethamine-sulfadoxine is not available in the United States and must be obtained overseas (see table 3), travelers should take weekly chloroquine or a comparable drug until pyrimethamine-sulfadoxine can be obtained (see page 4)
To prevent relapses of *P. vivax* and *P. ovale*	Primaquine[2]	

[1] Not available in the United States
[2] Not recommended for all travelers to malarious areas (see text this page)

TABLE 3. Drugs and doses for malaria chemoprophylaxis

Generic Name	Brand Names[1]	Manufacturer	Adult Dose	Pediatric Dose
Amodiaquine	Camoquin Flavoquine Basoquin	Parke-Davis	520 mg (400 mg base) once weekly and continued for 6 weeks after last exposure in a malarious area	<1 year : 65 mg (50 mg base) 1- 3 years:130 mg (100 mg base) 4- 6 years:195 mg (150 mg base) 7-10 years:260 mg (200 mg base) 11-16 years:390 mg (300 mg base)
Chlorguanide (Proguanil)	Paludrine	Ayerst, ICI Chemicals	100-200 mg daily and continued for 6 weeks after last exposure in a malarious area	2 years & under: 25-50 mg 3- 6 years: 50-75 mg 7-10 years: 100 mg
Chloroquine phosphate	Aralen Avlocloı Resochin	Winthrop ICI Chemicals FBA Pharmaceuticals	500 mg (300 mg base) weekly and continued for 6 weeks after last exposure in a malarious area	<1 year : 62 mg (37.5 mg base) 1- 3 years:125 mg (75 mg base) 4- 6 years:165 mg (100 mg base) 7-10 years:250 mg (150 mg base) 11-16 years:375 mg (225 mg base) or 5 mg/kg base
Chloroquine sulfate	Nivaquine	May & Baker	500 mg (300 mg base) weekly and continued for 6 weeks after last exposure in a malarious area	<1 year : 62 mg (37.5 mg base) 1- 3 years:125 mg (75 mg base) 4- 6 years:165 mg (100 mg base) 7-10 years:250 mg (150 mg base) 11-16 years:375 mg (225 mg base) or 5 mg/kg base
Hydroxychloroquine	Plaquenil	Winthrop	400 mg (310 mg base) weekly and continued for 6 weeks after last exposure in a malarious area	<1 year : 50 mg (37.5 mg base) 1- 3 years:100 mg (75 mg base) 4- 6 years:130 mg (100 mg base) 7-10 years:200 mg (150 mg base) 11-16 years:290 mg (225 mg base) or 5 mg/kg base
Primaquine	None	Winthrop	26.3 mg (15 mg base) daily for 14 days or 79 mg (45 mg base) once weekly for 8 weeks; start during the last 2 weeks of, or following a course of suppression with chloroquine or a comparable drug	0.3 mg/kg base/day for 14 days or 0.9 mg/kg base/day weekly for 8 weeks
Pyrimethamine	Daraprim	Burroughs-Wellcome	25 mg weekly and continued for 6 weeks after last exposure in a malarious area	2 years & under: 6.25 mg 3-10 years: 12.5 mg Over 10 years: Adult dosage
Pyrimethamine-sulfadoxine[2]	Fansidar Falcidar Antemal Methipox	Hoffmann-La Roche Hoffmann-La Roche	50 mg pyrimethamine and 1,000 mg sulfadoxine every other week and continued for 6 weeks after last exposure in a malarious area[3]	In terms of sulfadoxine: 6 to 11 months: 125 mg 1 - 3 years : 250 mg 4 - 8 years : 500 mg 9 - 14 years : 750 mg

[1] Use of trade names is for identification only and does not constitute endorsement by the Public Health Service, United States Department of Health, Education, and Welfare.
[2] Countries where pyrimethamine-sulfadoxine can be obtained: Belgium, Brazil, Burma, Cambodia, Germany, Hong Kong, Indonesia, Laos, Malaysia, Philippines, Singapore, Switzerland, Thailand, Venezuela, Viet Nam.
[3] Use of this drug for more than 6 months is discouraged until more information becomes available on its chronic toxicity.

Because the decision to administer primaquine should be made on an individual basis, the use of fixed combination chloroquine-primaquine tablets cannot be recommended routinely.

The most suitable alternatives to chloroquine are amodiaquine and hydroxychloroquine; both are 4-aminoquinolines whose activities and toxicities are similar to chloroquine. Prophylactic pyrimethamine can be used in patients who are unable to tolerate one of the 4-aminoquinolines. Chlorguanide can also be used for this indication, but it is not available in the United States. Like chloroquine, pyrimethamine and chlorguanide are active against the erythrocytic stages of malaria parasites and thus suppress the clinical symptoms of these infections. They have no significant

toxicity in prophylactic doses. The major drawback to the use of pyrimethamine and chlorguanide in malaria chemoprophylaxis is the presence of drug-resistant strains of *P. vivax* and *P. falciparum.* Such resistant strains have been reported from all areas where there has been extensive use of pyrimethamine and/or chlorguanide.

MALARIA CHEMOPROPHYLAXIS IN AREAS WHERE CHLOROQUINE-RESISTANT STRAINS OF *P. FALCIPARUM* HAVE BEEN CONFIRMED

Although strains of both *P. vivax* and *P. falciparum* resistant to several antimalarial drugs have been identified, the most important from a prophylactic and therapeutic standpoint are those strains of *P. falciparum* which are resistant to the 4-aminoquinolines (for example, chloroquine, amodiaquine).

Areas in which chloroquine-resistant strains of *P. falciparum* have been documented include parts of the following: Panama, South America, the Indian subcontinent, Southeast Asia, and New Guinea, but **not** Africa or the Middle East. Countries with chloroquine-resistant *P. falciparum* malaria are listed in Table 1. Although this table provides the most up-to-date information available from the World Health Organization (*3,4*), it has several limitations. First, only those areas in which testing for chloroquine resistance has been performed are listed, and in many cases studies have been limited to 2 or 3 locales within a country. Thus, the status of *P. falciparum* sensitivity to chloroquine in neighboring areas may be unknown. Second, many of the studies on which Table 1 is based were performed between 5 and 10 years ago. Since then, changes in the distribution and degree of chloroquine resistance may have taken place. Finally, sensitive and resistant strains of *P. falciparum* can coexist in the same or neighboring areas. For these reasons recommendations for malaria chemoprophylaxis in countries with chloroquine-resistant strains of *P. falciparum* must be individualized. Moreover, these recommendations may change from year to year as areas with chloroquine resistance change and new drugs become available. Individualized recommendations are also important because, at present, there are no drugs available in the United States which are universally acceptable for the suppression of chloroquine-resistant strains of *P. falciparum*.

The descriptions and recommendations made here are general ones. For specific recommendations about chemoprophylaxis in areas with chloroquine-resistant malaria, physicians and public health officials are urged to consult CDC.

Chloroquine alone will provide some protection against malaria in areas with chloroquine-resistant malaria, since it suppresses the clinical symptoms of *P. vivax, P. malariae*, and *P. ovale* infections and is also active against chloroquine-sensitive strains of *P. falciparum*. Other drugs, such as amodiaquine which appears to be more effective than chloroquine against resistant strains, may offer additional but not absolute protection. Probably the most effective drug for the suppression of chloroquine-resistant *P. falciparum* malaria is a fixed combination of pyrimethamine and sulfadoxine—a long-acting sulfonamide—called Fansidar.* Because the manufacturer of this drug combination has not yet sought Food and Drug Administration approval, it is not licensed and cannot be obtained in this country (*5-7*). It is available, however, in most countries with known chloroquine-resistant malaria (Table 3). If the decision is made to use pyrimethamine-sulfadoxine, travelers should start taking chloroquine 1 to 2 weeks before entering the malarious area and continue it until they obtain pyrimethamine-sulfadoxine.

The recommended regimen for pyrimethamine-sulfadoxine is 50 mg pyrimethamine and 1,000 mg sulfadoxine once every 2 weeks. This drug is active primarily against the erythrocytic stages of malaria parasites. When continued for 6 weeks after returning from a malarious area, it produces suppressive cure in most chloroquine-sensitive and chloroquine-resistant *P. falciparum* infections and is an effective suppressant for *P. malariae, P. ovale,* and strains of *P. vivax* which are sensitive to pyrimethamine. Pyrimethamine-resistant strains of *P. vivax* will not be suppressed. For this reason, some authorities have suggested adding chloroquine to a course of pyrimethamine-sulfadoxine.

As with chloroquine, pyrimethamine-sulfadoxine will not prevent delayed primary attacks or relapses due to persistent exoerythrocytic stages of *P. vivax* and *P. ovale* when suppression is discontinued. Primaquine prophylaxis may be advisable in such cases (see page 2).

Thus far, no serious adverse reactions to pyrimethamine-sulfadoxine have been reported (*5-8*), but because the combination includes a sulfonamide, it should not be given to patients with known allergy to the sulfonamides. Physicians should also be alert to the risk of other potentially serious reactions that have been associated with the use of sulfonamides. Since pyrimethamine-sulfadoxine has only been studied in prophylactic regimens of 4-6 months' duration, the long-term use of this drug is discouraged until more information becomes available on its possible chronic toxicity.

MALARIA CHEMOPROPHYLAXIS IN PREGNANT WOMEN

Pregnancy is not a contraindication for malaria chemoprophylaxis. The most suitable agent for use during pregnancy is chloroquine or 1 of the other 4-aminoquinolines, because they have not been associated with teratogenic effects when administered for malaria suppression. Neither pyrimethamine nor pyrimethamine-sulfadoxine should be used in pregnant women because of reports of congenital defects associated with the administration of pyrimethamine to animals. To avoid excessive use of drugs during pregnancy, prophylaxis with primaquine, if indicated (see page 2) should be withheld until after delivery.

MALARIA CHEMOPROPHYLAXIS IN CHILDREN

In children, chloroquine phosphate is the drug of choice for the suppression of infections caused by *P. vivax, P.*

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malariae, P. ovale, and strains of *P. falciparum* that are sensitive to chloroquine (Table 2). The drug should be taken orally once a week beginning 1-2 weeks before entering a malarious area and continuing for 6 weeks after the last exposure.

Since chloroquine is not available in liquid form in the United States and since it has an extremely bitter taste, the tablets must be crushed or scored and broken and then dissolved, preferably in chocolate syrup, for pediatric administration. Chloroquine syrup or elixir (Nivaquine) or amodiaquine (Basoquin) can be purchased outside this country and should be considered for use in children staying for prolonged periods of time in malarious areas. Since fatalities from accidental poisonings in children have been reported, containers of these drugs should be kept out of the reach of children. One of the other 4-aminoquinolines or pyrimethamine or chlorguanide is a safe and effective alternative in children who cannot tolerate chloroquine.

In malarious areas with known chloroquine-resistant strains of *P. falciparum*, pyrimethamine-sulfadoxine may be used. As in adults, long-term use of this drug is discouraged.

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TABLE 1. Information on malaria risk by country

This table has been simplified from data released by the World Health Organization so that all cities and regions listed can be found in a standard world atlas. Countries which are not listed have no malaria risk. Question marks indicate that no information on malaria risk is available. Although this is the best information available, studies on the distribution of chloroquine-resistant malaria are limited and may have been performed several years ago.

Country	Risk	Areas without risk	Risk exists during (months)	Risk exists below given altitude (meters)	Risk in urban areas	Areas with known chloroquine-resistant *P. falciparum*
AFRICA						
Afars and the Issas, French Territory of the	No					
Algeria	Yes	Most of the country except coastal area between Oran and Alger	Jun-Oct	1,200	No	None
Angola	Yes	None	All	All	Yes	None
Botswana	Yes	Southwestern quarter of country	Nov-May	All	Yes[1]	None
British Indian Ocean Territory	No					
Burundi	Yes	None	All	All	Yes	None
Cameroon, United Republic of	Yes	None	All	All	Yes	None
Cape Verde Islands	Yes	None				None
Central African Republic	Yes	None	All	All	Yes	None
Chad	Yes	None	Jul-Nov	All	Yes	None
Comoro Islands	Yes	None	All	All	Yes	None
Congo	Yes	None	All	All	Yes	None
Egypt	Yes	Most of the country, except the Nile delta, El Faiyum area, the oases, and part of southern Egypt	Jun-Oct	All	No[2]	None
Equatorial Guinea	Yes	None	All	All	Yes	None
Ethiopia	Yes	None	All	2,000	Yes	None
Gabon	Yes	None	All	1,000	Yes	None
Gambia	Yes	None	All	All	Yes	None
Ghana	Yes	None	All	All	Yes	None
Guinea	Yes	None	All	All	Yes	None
Guinea-Bissau	Yes	None	All	All	Yes	None
Ivory Coast	Yes	None	All	All	Yes	None
Kenya	Yes	None	All	2,000	Yes[3]	None
Lesotho	No					
Liberia	Yes	None	All	All	Yes	None
Libyan Arab Republic	Yes	Most of country, except southwest quarter	Feb-Aug	All	No	None
Madagascar (Malagasy Republic)	Yes	Antsirabe, Tananarive, and vicinities	Sep-Mar	1,100	Yes	None

[1] Except Gaborone and Francistown

[2] No risk except in outskirts

[3] Risk very low: Nairobi Area

TABLE 1. Information on malaria risk by country (cont'd)

Country	Risk	Areas without risk	Risk exists during (months)	Risk exists below given altitude (meters)	Risk in urban areas	Areas with known chloroquine-resistant *P. falciparum*
AFRICA (cont'd)						
Malawi	Yes	None	All	1,700	Yes	None
Mali	Yes	None	All	All	Yes	None
Mauritania	Yes	?	?	?	?	None
Mauritius	No					
Morocco	Yes	Agadir, Casablanca, Rabat-Sale, Tanger, Taza, Tetouan, Tiznit, and vicinities	May-Oct	?	No[4]	None
Mozambique	Yes	None	All	All	Yes	None
Niger	Yes	None	Jul-Nov	All	Yes	None
Nigeria	Yes	None	All	All	Yes	None
Reunion	No					
Rhodesia	Yes	?	?	?	?	None
Rwanda	Yes	None	All	All	Yes	None
St. Helena	No					
Sao Tome and Principe	Yes	?	?	?	?	None
Senegal	Yes	None	All	All	Yes	None
Seychelles	No					
Sierra Leone	Yes	None	All	All	Yes	None
Somali	Yes	None	All	All	Yes	None
South Africa	Yes	Most of country except areas bordering South-West Africa, Botswana, Rhodesia, and Mozambique	All	1,200	Yes	None
South-West Africa (Namibia)	Yes	?	?	?	?	None
Spanish Sahara	No					
Sudan	Yes	None	All	All	Yes	None
Swaziland	Yes	Most of the country except northern border areas	Dec-Mar	All	Yes	None
Tanzania, United Republic of	Yes	None	All	All	Yes	None
Togo	Yes	None	All	All	Yes	None
Tunisia	Yes	None	May-Nov	All	No	None
Uganda	Yes	None	All	1,800	Yes[5]	None
Upper Volta	Yes	None	All	All	Yes	None
Zaire	Yes	None	All	All	Yes	None
Zambia	Yes	None	Nov-May	All	Yes	None
AMERICAS						
Argentina	Yes	Most of the country except small area in northwest	Sep-May	2,000	No	None

[4] No risk except in outskirts
[5] No risk in Entebbe, Fort Portal, Jinga, Kampala, or Mbale

TABLE 1. Information on malaria risk by country (cont'd)

Country	Risk	Areas without risk	Risk exists during (months)	Risk exists below given altitude (meters)	Risk in urban areas	Areas with known chloroquine-resistant *P. falciparum*
AMERICAS (cont'd)						
Belize	Yes	None	All	500	Yes	None
Bolivia	Yes	Southwestern quarter of country	All	2,000	No	None
Brazil	Yes	Brasilia and Distrito Federal; coastal areas from Fortaleza to Salvador and from Rio de Janiero to Sao Paulo	All	900	No[6]	States in interior of country and Espirito Santo State (coastal area north of Rio de Janeiro)
Canal Zone	No					
Chile	No					
Colombia	Yes	Bogota and vicinity	All	1,500	No	Malarious areas in northern third of country; interior provinces bordering Venezuela and Brazil
Costa Rica	Yes	Mountainous center of country	All	500	No	None
Cuba	No					
Ecuador	Yes	Galapagos Islands, Guayaquil and vicinity	All	1,500	Yes	Provinces in interior of country bordering Colombia
El Salvador	Yes	None	All	1,000	No	None
Falkland Islands	No					
French Guiana	Yes	Cayenne City	All	All	Yes	None
Guatemala	Yes	Guatemala City and vicinity	Jun-Nov[7]	1,000	No	None
Guyana	Yes	Coastal areas from Georgetown to New Amsterdam; Essequibo River Delta and Islands	All	All	No	Areas bordering Brazil and Guyana
Honduras	Yes	None	All	1,000	No	None
Mexico	Yes	States of Aguascalientes, Baja California Norte, Baja California Sur, Coahuila, Distrito Federal, Guanajuato, Nuevo Leon, and Tlaxcala	All	1,800	No	None
Nicaragua	Yes	None	All	1,000	No	None
Panama (excluding Canal Zone)	Yes	Panama City and Colon City	All	700	No	All malarious areas east of Canal Zone including San Blas Islands
Paraguay	Yes	Most of country except areas bordering Brazil	Sep-May	All	Yes	None
Peru	Yes	Lima and vicinity, coastal area south of Lima	All	1,500	No	None
Saint-Pierre and Miquelon	No					

[6] Except in Amazon River region

[7] Northeastern part of country: risk during all months

TABLE 1. Information on malaria risk by country (cont'd)

Country	Risk	Areas without risk	Risk exists during (months)	Risk exists below given altitude (meters)	Risk in urban areas	Areas with known chloroquine-resistant *P. falciparum*
AMERICAS (cont'd)						
Surinam	Yes	Coastal areas around Paramaribo	All	All	Yes[8]	All malarious areas
Uruguay	No					
Venezuela	Yes	Coastal area between Caracas and Maracaibo	All	600	No	Provinces in interior of country bordering Colombia, Brazil, and Guyana
CARIBBEAN						
Dominican Republic	Yes	Most of country except areas bordering Haiti	All	500	No	None
Haiti	Yes	None	Jun-Feb	500	No[9]	None
ASIA						
Afghanistan	Yes	None	May-Nov	2,000	Yes	None
Bahrain	Yes	None	All	All	Yes	None
Bangladesh	Yes	Bogra, Dacca, Jessore, Khulna, Pabna, Rajshahi, and vicinities	All	All	Yes	Areas bordering Assam State, India, and Burma
Bhutan	Yes	None	Mar-Oct	1,600	Yes	None
Brunei	No					
Burma	Yes	Rangoon City and suburbs, Mandalay City	Apr-Nov	900	No	All malarious areas
Cambodia	Yes	?	All	All	Yes	Whole country
China	?	?	?	?	?	?
Cyprus	No					
Gaza Strip (Palestine)	Yes	None	Jun-Oct	All	Yes	None
Hong Kong	No					
India	Yes	None	Mar-Oct	1,600	Yes	Assam State
Indonesia	Yes	Djkarta and Surabaya and vicinity	All	1,200	Yes	East Kalimantan (Island of Borneo), Irian Jaya (Island of New Guinea)
Iran	Yes	Northwestern quarter of country (including Teheran and Isfahan)	Jul-Nov	1,500	No	None
Iraq	Yes	Most of the country except northern third	May-Nov	1,500	Yes	None
Israel	No					
Japan	No					
Jordan	Yes	Whole country, except Jordan River Valley	Apr-Nov	All	No	None
Korea						
Democratic People's Republic of N. Korea	No					
Republic of S. Korea	Yes	None	Jun-Sep	All	No	None
Kuwait	No					
Laos	Yes	Vientiane and vicinity	All	All	Yes	None
Lebanon	No					
Macao	No					

[8] Except coastal cities
[9] No risk except in outskirts

TABLE 1. Information on malaria risk by country (cont'd)

Country	Risk	Areas without risk	Risk exists during (months)	Risk exists below given altitude (meters)	Risk in urban areas	Areas with known chloroquine-resistant *P. falciparum*
ASIA (cont'd)						
Malaysia	Yes	None	All	1,700	No[10]	All malarious areas of the Federation of Malaya and Sabah; Sarawak-Sabah border area
Maldive Islands	Yes	Male Island	All	All	No	None
Mongolia	No					
Nepal	Yes	None	All	1,200	Yes	None
Oman	Yes	None	All	1,000	Yes	None
Pakistan	Yes	None	Mar-Oct	2,000	Yes	None
Philippines	Yes	Cebu and Leyte Islands, plains areas of Negros and Panay Islands	All	600	No	Luzon Island Basilan Island and Sulu Archipelago Mindoro Island Palawan Island
Portuguese Timor	Yes	None	All	All	Yes	None
Qatar	Yes	None	All	All	Yes	None
Saudi Arabia	Yes	Urban areas of Jeddah, Mecca, Medina, Riyad	All	?	Yes	None
Singapore	Yes	City District (southern part of the island)	All	All	No	None
Sri Lanka (Ceylon)	Yes	Colombo	All	800	Yes	None
Syrian Arab Republic	Yes	Mediterranean Coast, eastern half, and southern half of country	May-Oct	600	No	None
Thailand	Yes	Most urban areas including Bangkok and suburbs	All	All	No	All malarious areas
Turkey	Yes	Whole country except Adana and surrounding area	Jul-Oct	1,000	No	None
United Arab Emirates	Yes	None	All	All	Yes	None
Viet Nam, Democratic Republic of	Yes	None	Mar-Nov	1,000	No	All malarious areas in south; status of chloroquine resistance in north is unknown
Yemen	Yes	None	Sep-Feb	1,400	Yes	None
Yemen, Democratic	Yes	Aden and airport perimeter	All	All	Yes	None
EUROPE	No					
OCEANIA						
British Solomon Islands	Yes	None	All	400	Yes	None
New Hebrides	Yes	None	All	All	Yes	None
Papua New Guinea	Yes	None	All	2,000	Yes	None

[10] Except Sabah

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