Responder Health Advisory
Haiti Earthquake

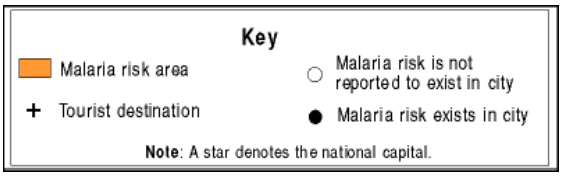
Malaria Information for Haiti[1]

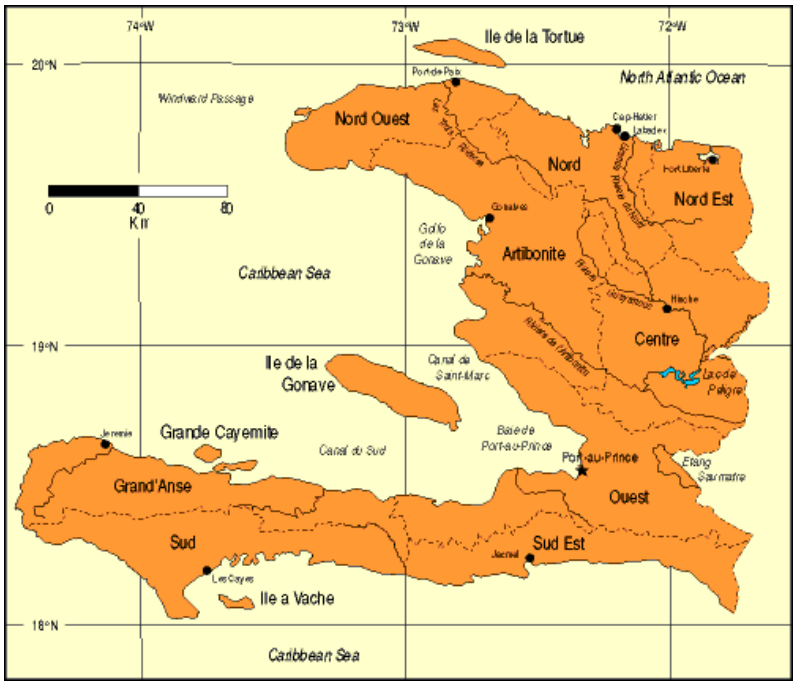
This is General Health Information about Malaria and Medications
If you have been given medication, follow the guidance of the health care provider

MALARIA MAPS

- Risk areas: Risk (exclusively *P. falciparum*) exists throughout the year in the whole country including urban areas. Risk is greatest in coastal areas, especially along southern and northern coastal areas.

- Protective measures: The medicine chloroquine protects against malaria in this area. The best drug for you depends on your itinerary and on a number of personal factors that should be discussed between you and your health care provider.

- 



[1] Adapted from information from Shoreline Medical and International Travel Medical Society

MALARIA

- Chloroquine is the drug of choice in chloroquine-sensitive areas.
- Travelers unable to take chloroquine should take atovaquone/proguanil, **doxycycline,** mefloquine, or primaquine (in certain circumstances), as these drugs are also effective against chloroquine-sensitive *P. falciparum.*
- Mefloquine, if tolerated, is preferable for long-term travelers due to lower cost and better compliance with a once-a-week regimen.
- Carefully consult the text below for detailed information on the advantages and disadvantages of each of these drugs for different kinds of travelers or itineraries.
- Chloroquine, mefloquine, doxycycline, and atovaquone/proguanil, when used as directed prevent primary attacks of all species of malaria and all clinical disease as long as these medications are continued. However, if parasites of one of the relapsing species of malaria (*P. vivax* or *P. ovale*) have entered the liver due to exposure during travel, late relapses may still occur after return home, as these drugs (with the exception of primaquine) are not effective against dormant forms (hypnozoites) in the liver. (*See discussion on Relapsing Malaria.*)

DISEASE INFORMATION

General Description

Malaria is caused by a parasite that lives within red blood cells and is transmitted by the bite of *Anopheles* mosquitoes found in almost all countries in the tropics and subtropics. Transmission usually occurs between dusk and dawn because the *Anopheles* mosquitoes feed at night. Occasionally malaria is transmitted through blood transfusion, congenitally from mother to fetus, or through contaminated needles and syringes.

Four mosquitoes species cause malaria: *P. falciparum* (the most serious, potentially lethal form), *P. vivax*, *P. ovale*, and *P. malariae*. Malaria occurs in at least 103 countries, including those in Africa, Central and South America, the Indian subcontinent, Southeast Asia, the Middle East, and islands of the South Pacific. Risk depends on the traveler's itinerary, length of the trip, season, location within a country (e.g., urban vs. rural), and where the traveler will spend the evening and nighttime hours. Most of the world's malaria occurs in sub-Saharan Africa, and risk to the traveler is considerably higher there than anywhere else.

No vaccine is available or imminent. Malaria usually (but not always) can be prevented by the use of antimalarial drugs and personal protection measures against mosquito bites each time a traveler is exposed to malaria.

Relapsing Malaria

Two species of mosquitoes, *P. vivax* and *P. ovale,* can cause clinical relapse of disease, even in the setting of adequate chemoprophylaxis (when you are taking mediation to prevent disease). Relapse can occur weeks or months (and, rarely, up to years) after initial infection with *P. vivax* or *P. ovale,* whether initially symptomatic or not, because these 2 species form dormant stages in the liver, which are *not* targeted by routine medication such as chloroquine, mefloquine, doxycycline, and atovaquone/proguanil.

A relapse can occur even if the person harboring liver stages of *P. vivax* or *P. ovale* had no symptoms of malaria during or after his or her initial infection, since the initial episode, due to parasites in the bloodstream (not the liver), would have been completely suppressed by the chloroquine, mefloquine, doxycycline, or

atovaquone/proguanil in the bloodstream at the time. Many people do not know that they were infected with *P. vivax* or *P. ovale* until a relapse occurs, long after initial exposure.

Primaquine is the only available drug that acts in the liver on the dormant stage of *P. vivax* and *P. ovale* and is thus used in conjunction with or following another anti-malarial agent to eradicate liver stages.

Epidemiology and Risk

The estimated risk of acquiring malaria varies markedly even within the same country, depending on the intensity of transmission in both urban and rural areas, as well as the itinerary, season, duration, and type of travel. For example, short-term travelers living in urban centers and staying in air-conditioned hotels will be at much lower risk than long-stay, adventurous travelers living in rural areas. As a general rule, malaria is transmitted in urban areas *in addition to* rural areas in sub-Saharan Africa and the Indian sub-continent. In most other parts of the world, malaria transmission occurs only in rural areas.

For persons not using drugs to prevent malaria, the relative risk of malaria in the high-risk areas of sub-Saharan Africa is on the order of 350 cases per 100,000 travelers, compared to 5 per 100,000 travelers to East and Southeast Asia, and 1 per 100,000 travelers to Central America. Represented another way, risk of malaria in travelers to sub-Saharan Africa can range from 1:30 (1 out of every 30 persons) to 1:280 per month of stay without chemoprophylaxis.

On the Indian subcontinent, risk of malaria acquisition is estimated to be > 1:1000 among those not using preventive drugs. High risk exists on some Pacific Islands such as Papua New Guinea, the Solomon Islands, and Vanuatu, but these are uncommon travel destinations. **Transmission in other areas of the world is generally much less intense,** and most of the higher-risk regions within these areas are outside of usual resort destinations or travel itineraries.

Persons who plan to make a blood donation after a trip to a malarious area should be advised to check with their blood center about its particular donor deferral criteria. Overall, U.S. Red Cross guidelines recommend deferral for 3 years for individuals who have lived in a malarious area or for anyone who has been treated for documented malaria. Visitors to malarious areas are generally deferred for 1 year after last exposure.

Symptoms

Malaria is characterized by fever and "flu-like" symptoms (chills, sweats, myalgia, and headache) that may be episodic but very often have an irregular pattern in travelers. Vomiting, diarrhea, abdominal cramping, and cough also may occur, and the disease may be associated with anemia, thrombocytopenia, and jaundice.

Malaria caused by *P. falciparum* usually occurs about 10 to 12 days after infection, is potentially life-threatening, and is considered a medical emergency. Without prompt treatment, parasitized red blood cells can sequester in end-organ capillaries leading to cerebral malaria, renal failure, pulmonary edema, shock, and death.

Symptoms caused by the other 3 malaria species may appear from 14 days to many months after infection, but infection with these species does not lead to end-organ damage and they are rarely fatal.

Travelers should be educated about malaria symptoms and informed that:

- No malaria chemoprophylactic regimen is 100% effective.
- Symptoms may be mild and may mimic influenza, gastroenteritis, or other common infections; malaria should be suspected for any fever that develops during or after travel to a risk area.

- Early treatment is usually effective, and delay of appropriate therapy can have serious or even fatal consequences; therefore, if symptoms of malaria occur, prompt medical attention must be sought.
- The physician should be informed of the recent travel history, and blood films should be requested; in the event of a negative film, 2 additional tests should be carried out 12 to 24 hours apart.

PREVENTION OF MALARIA

Prevention of malaria and its complications in travelers typically involves a strategy of personal protective measures, chemoprophylaxis (drugs), and prompt medical evaluation of fever or flu-like illness, or standby emergency treatment where medical evaluation is unavailable.

Personal protective measures constitute behavioral strategies which minimize the risk of mosquito bites and include the following:

- **restriction of outdoor activities between dusk and dawn**
- **screened-in accommodations**
- **light-colored, long-sleeved shirts and pants**
- **topical application of effective insect repellants to skin and clothing**
- **use of insecticide-impregnated bed nets, tents, clothing, sleeping bags, etc.**
- **mosquito-proofing of living quarters by spraying insecticide and eliminating standing water**

Topical mosquito repellants recommended by the CDC include N, N-diethyl-m-toluamide (DEET; Off!, Cutter, Sawyer, Ultrathon), picaridin (Cutter Advanced, Skin so Soft Bug Guard Plus), oil of lemon eucalyptus or PMD (Repel), and IR3535 (Skin so Soft Bug Guard Plus Expedition). Of the mosquito repellants, DEET has the longest history of use and best supportive evidence. DEET is available in formulations of 5- 40% and 100%, and when applied topically will repel mosquitoes, ticks, fleas, chiggers, and gnats. A long-acting 25-33% DEET formulation developed by the U.S. Armed Forces, Ultrathon, confers protection for 6-12 hours. Concentrations of up to 50% DEET are thought to be safe in children > 2 months of age.

Picaridin, long available in Europe and Australia, is sold in the US as a 5% and 7% spray or 10% and 15% aerosol (Cutter Advanced Sport) formulations, which are thought to be inadequate for prolonged protection. The higher concentrations available in Europe, however, confer protection against mosquito bites for 8 hours, and a 19.2% formulation available in Australia conferred protection against bites of different species of mosquitoes for 1-5 hours.

Permethrin liquid or spray can be used on clothing, mosquito nets, tents, and sleeping bags for protection against mosquito bites. Immersing tents or nets in permethrin liquid confers protection for at least 6 months. One to five percent (1-5%) permethrin-based creams are also available but are primarily used in the treatment and prevention of scabies rather than as mosquito repellants. However, these formulations may be useful for areas of skin that may become exposed (i.e., ankles, wrists, neck).

CHEMOPROPHYLAXIS (PREVENTIVE DRUGS)

Indications

Responders should review the areas they are traveling to and be aware of high risk areas within Haiti and follow guidance provided for taking medication, restricting outdoor activity door dusk and dawn, sleeping with insecticide-impregnated bed nets or tents, and using insect repellants. Because *Anopheles* mosquitoes bite from dusk to dawn, antimalarial drugs are only recommended for travelers who will have exposure during those hours in malaria risk areas. Additional factors should be considered, including whether the traveler has

previously experienced an allergic or other reaction to the antimalarial drug of choice and whether medical care will be readily accessible during travel.

Malaria chemoprophylaxis should begin 1 day before travel to malarious areas **when taking** atovaquone/proguanil, **doxycycline,** or primaquine, and should begin 1 week before travel when taking chloroquine. For mefloquine, medication should begin 2-3 weeks prior to travel. This is necessary to build up adequate blood levels of mefloquine and allows any potential side effects to be evaluated and treated by the traveler's health care provider prior to departure and an alternative drug to be prescribed and purchased. In calculating malaria regimens, it is important to note that the first day in a malarious area may not correspond to the first day in the destination country, as many itineraries may begin in an urban or non-malarious part of a country which is only partly malarious.

Adults who grew up in malarious areas generally believe themselves to be immune for life against malaria and do not think they need prophylaxis when they return home to visit friends and relatives. Immunity to malaria disappears within 6 months of the last exposure to malaria and chemoprophylaxis is indicated in these individuals in a way that does not differ from first-time travelers to the region.

As a rule, **malaria chemoprophylaxis should be continued for as long as exposure occurs**, even for many years if necessary. Except for chloroquine, no definitive data exists on the absolute safety of very long-term use of anti-malarial drugs (*see "Chemoprophylaxis in Special Populations*"). Nevertheless, there is no reason to believe there to be any theoretical or real safety concerns.

Conversely, even a short exposure of a day or two in a risk area is enough to warrant a **full course of chemoprophylaxis.** Atovaquone/proguanil and primaquine need to be taken for 7 days after last possible exposure, and chloroquine, mefloquine, and **doxycycline for 4 weeks after last possible exposure.**