Vector borne diseases

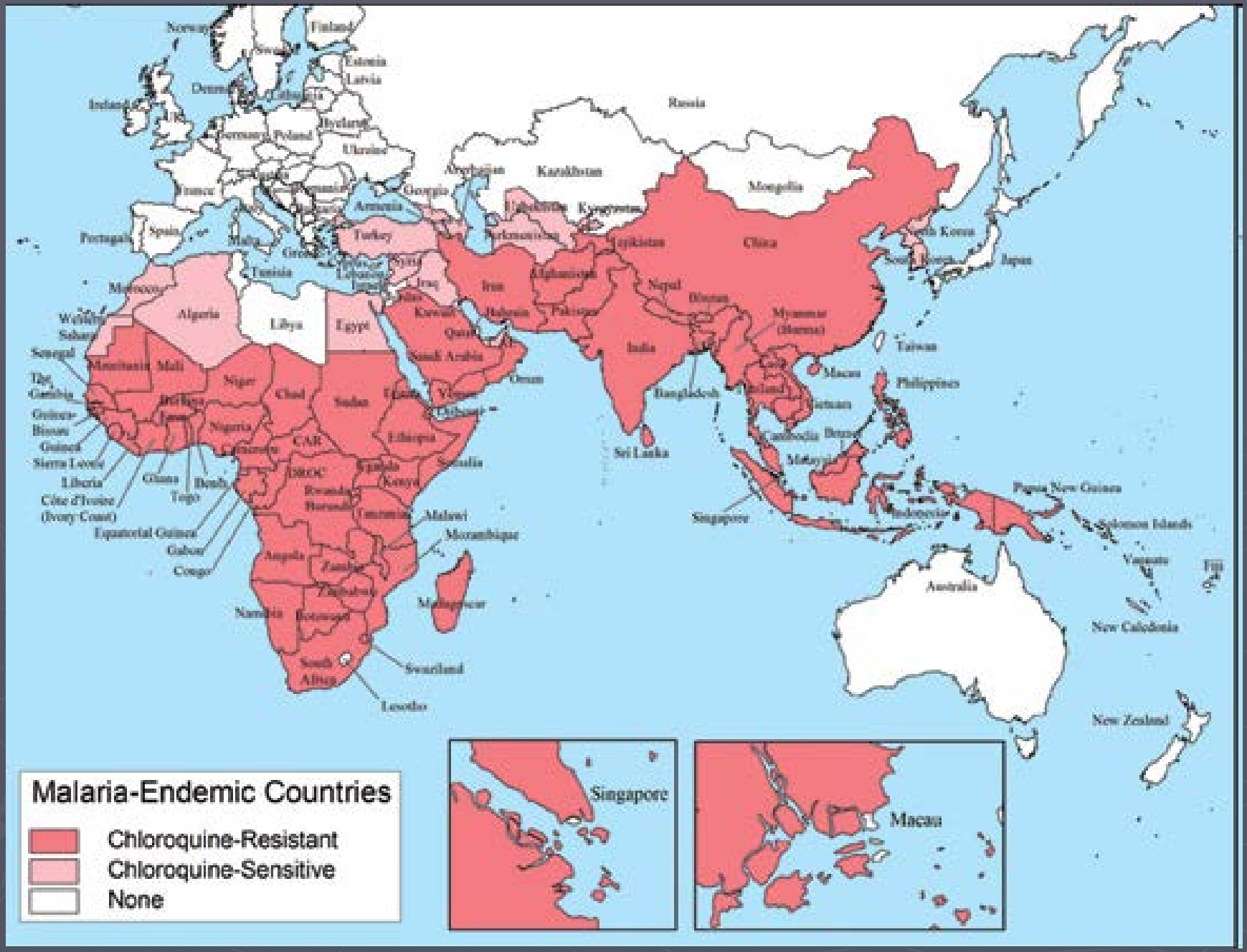
Malaria 1.

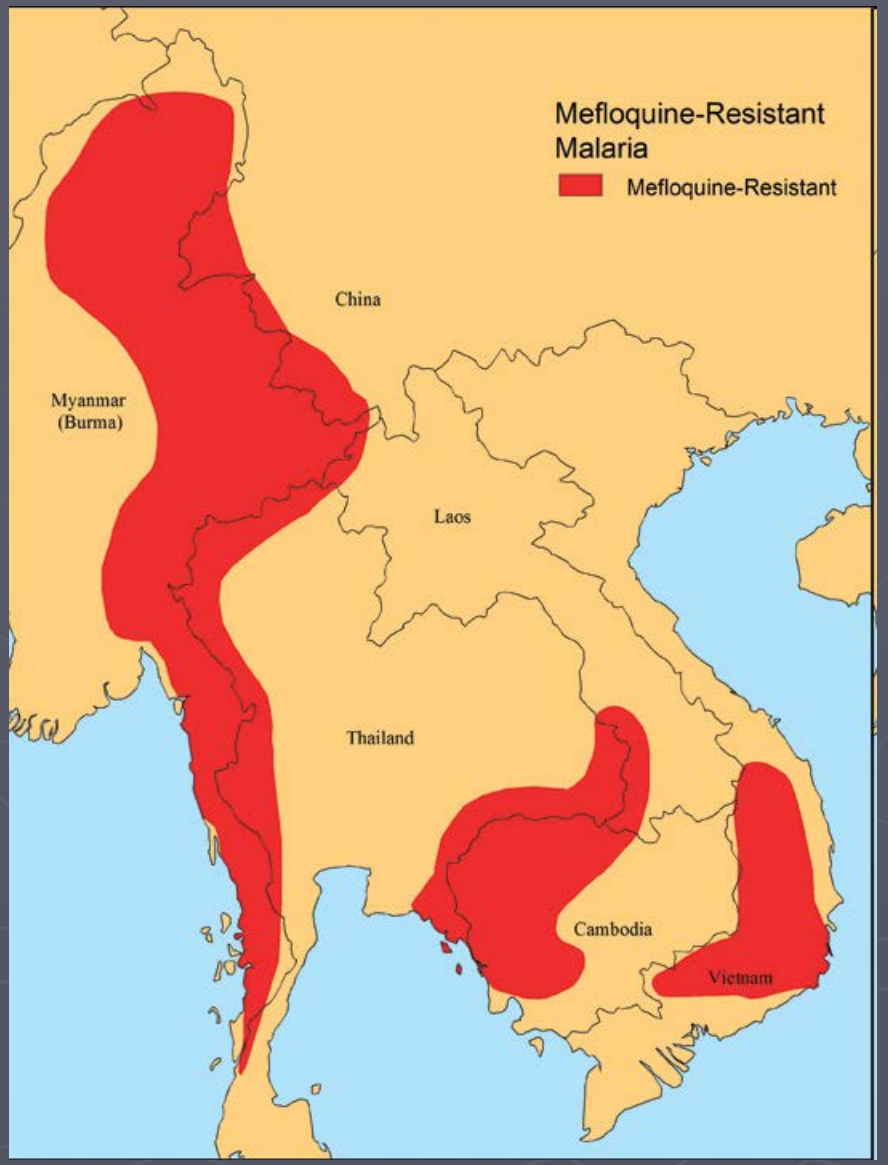
- Malaria in humans is caused by one of five protozoan species of the genus *Plasmodium: P. falciparum, P. vivax, P. ovale*, or *P. malariae*. *P. knowlesi*
- All species are transmitted by the bite of an infected female *Anopheles* mosquito.
- Occasionally, transmission occurs by blood transfusion, organ transplantation, needle-sharing, or congenitally from mother to fetus.
- Although malaria can be a fatal disease, illness and death from malaria are largely preventable.

Malaria 2.

- Malaria is a major international public health problem, causing 350-500 million infections worldwide and approximately 1 million deaths annually
- Malaria transmission occurs in large areas of Central and South America, the island of Hispaniola (the Dominican Republic and Haiti), Africa, Asia (including South Asia, Southeast Asia, and the Middle East), Eastern Europe, and the South Pacific


United States
Mexico
Cuba
Dominican Republic
Belize
Honduras
Haiti
Guatemala
El Salvador
Nicaragua
Costa Rica
Panama
Guyana
Suriname
French Guiana
Venezuela
Colombia
Ecuador
Peru
Brazil
Bolivia
Paraguay
Chile
Argentina
Uruguay
Falkland Islands
Malaria-Endemic Countries
Chloroquine-Resistant
Chloroquine-Sensitive
None


Malaria-Endemic Countries
Chloroquine-Resistant
Chloroquine-Sensitive
None
Singapore
Macau
Russia
China
India
Australia
Indonesia
Papua New Guinea
New Zealand
Japan
Mongolia
Kazakhstan
Iran
Pakistan
Afghanistan
Nepal
Bhutan
Myanmar (Burma)
Bangladesh
Sri Lanka
Thailand
Philippines
Taiwan
Malaysia
Cambodia
Vietnam
Laos
Solomon Islands
Vanuatu
Fiji
New Caledonia
Turkey
Iraq
Saudi Arabia
Oman
Yemen
Egypt
Libya
Algeria
Tunisia
Morocco
Western Sahara
Mauritania
Mali
Niger
Chad
Sudan
Nigeria
Senegal
The Gambia
Guinea-Bissau
Guinea
Sierra Leone
Liberia
Côte d'Ivoire (Ivory Coast)
Ghana
Togo
Benin
Burkina Faso
Equatorial Guinea
Gabon
Congo
CAR
DRCC
Uganda
Kenya
Rwanda
Burundi
Ethiopia
Somalia
Eritrea
Djibouti
Angola
Zambia
Zimbabwe
Namibia
Botswana
South Africa
Lesotho
Swaziland
Malawi
Mozambique
Madagascar
Comoros
Kyrgyzstan
Tajikistan
Turkmenistan
Armenia
Georgia
Azerbaijan
Ukraine
Belarus
Poland
Germany
Denmark
Sweden
Norway
Finland
Estonia
Latvia
Ireland
Portugal
Spain
Malta
Greece
Lebanon
Jordan
Kuwait
Qatar
Bahrain
United Arab Emirates
Macau
Singapore


Mefloquine-Resistant Malaria
Mefloquine-Resistant
China
Myanmar (Burma)
Laos
Thailand
Cambodia
Vietnam

Malaria 3.

- Estimating the risk for infection for various types of travelers is difficult.
- Risk can differ substantially even for persons who travel or reside temporarily in the same general areas within a country.
- For example, travelers staying in air-conditioned hotels may be at lower risk than backpackers or adventure travelers.
- Similarly, long-term residents living in screened and air-conditioned housing are less likely to be exposed than are persons living without such amenities, such as Peace Corps volunteers.
- Travelers should also be reminded that even if one has had malaria before, one can get it again and so preventive measures are still necessary.
- All travelers going to malaria endemic countries, even for short periods of time such as cruise ship passengers, may be at risk for becoming infected with malaria.

Malaria 4.

- Persons who have been in a malaria risk area, either during daytime or nighttime hours, are not allowed to donate blood in the United States for a period of time after returning from the malarious area.
- Persons who are residents of nonmalarious countries are not allowed to donate blood for 1 year after they have returned from a malarious area.
- Persons who are residents of malarious countries are not allowed to donate blood for 3 years after leaving a malarious area.
- Persons who have had malaria are not allowed to donate blood for 3 years after treatment for malaria

Malaria 5.

- Malaria is characterized by fever and influenza-like symptoms, including chills, headache, myalgias, and malaise; these symptoms can occur at intervals.
- Malaria may be associated with anemia and jaundice, and *P. falciparum* infections can cause seizures, mental confusion, kidney failure, coma, and death.
- Malaria symptoms can develop as early as 7 days after initial exposure in a malaria-endemic area and as late as several months after departure from a malarious area, after chemoprophylaxis has been terminated.

Malaria 6.

- **Prevention**
  - No vaccine is currently available.
  - All travelers to malaria-endemic areas should be advised that taking an appropriate drug regimen and using antimosquito measures will help prevent malaria.
  - Travelers should be informed that no method can protect completely against the risk for contracting malaria.

Malaria 7.

- **PERSONAL PROTECTION MEASURES**
  - Because of the nocturnal feeding habits of *Anopheles* mosquitoes, malaria transmission occurs primarily between dusk and dawn.
  - Travelers should be advised to take protective measures to reduce contact with mosquitoes, especially during these hours.
  - Such measures include remaining in well-screened areas, using mosquito bed nets (preferably insecticide-treated nets), and wearing clothes that cover most of the body.
  - Additionally, travelers should be advised to purchase insect repellent for use on exposed skin.
  - The most effective repellent against a wide range of vectors is DEET (N, N-diethylmetatoluamide), an ingredient in many commercially available insect repellents.

Malaria 8.

- **CHEMOPROPHYLAXIS**
  - Chemoprophylaxis is the strategy that uses medications before, during, and after the exposure period to prevent the disease caused by malaria parasites.
  - The aim of prophylaxis is to prevent or suppress symptoms caused by blood-stage parasites. In addition, presumptive anti-relapse therapy (also known as terminal prophylaxis) uses medications towards the end of the exposure period (or immediately thereafter) to prevent relapses or delayed-onset clinical presentations of malaria caused by hypnozoites (dormant liver stages) of *P. vivax* or *P. ovale*.

Malaria 9.

- **CHEMOPROPHYLAXIS**
  - Chemoprophylaxis is the strategy that uses medications before, during, and after the exposure period to prevent the disease caused by malaria parasites.
  - The aim of prophylaxis is to prevent or suppress symptoms caused by blood-stage parasites.
  - In addition, presumptive anti-relapse therapy (also known as terminal prophylaxis) uses medications towards the end of the exposure period (or immediately thereafter) to prevent relapses or delayed-onset clinical presentations of malaria caused by hypnozoites (dormant liver stages) of *P. vivax* or *P. ovale*.

Malaria 10.

- In choosing an appropriate chemoprophylactic regimen before travel, the traveler and the health-care provider should consider several factors.
- The travel itinerary should be reviewed in detail and compared with the information on areas of risk in a given country to determine whether the traveler will actually be at risk for acquiring malaria.
- If malaria transmission risk is determined to be present for that itinerary, the next step is to determine whether significant anti-malarial drug resistance has been reported in that location.
- Resistance to antimalarial drugs has developed in many regions of the world.
- Health-care providers should consult the latest information on resistance patterns before prescribing prophylaxis for their patients.

Malaria 11.

- The resistance of *P. falciparum* to chloroquine has been confirmed in all areas with *P. falciparum* malaria except the Dominican Republic, Haiti, Central America west of the Panama Canal, Egypt, and some countries in the Middle East.
- In addition, resistance to sulfadoxine-pyrimethamine (e.g., Fansidar) is widespread in the Amazon River Basin area of South America, much of Southeast Asia, other parts of Asia, and, increasingly, in large parts of Africa.
- Resistance to mefloquine has been confirmed on the borders of Thailand with Burma (Myanmar) and Cambodia, in the western provinces of Cambodia, in the eastern states of Burma (Myanmar) and recently on the border between Burma and China, in Laos along the borders of Laos and Burma, the adjacent parts of the Thailand Cambodia border, as well as in southern Vietnam.

Malaria 12.

- Malaria chemoprophylaxis with mefloquine or chloroquine should begin 1-2 weeks before travel to malarious areas; prophylaxis with doxycycline, atovaquone/proguanil, or primaquine can begin 1-2 days before travel.
- Beginning the drug before travel allows the antimalarial agent to be in the blood before the traveler is exposed to malaria parasites.
- Chemoprophylaxis can be started earlier if there are particular concerns about tolerating one of the medications.
- Starting the medication 3-4 weeks in advance allows potential adverse events to occur before travel.
- If unacceptable side effects develop, there would be time to change the medication before the traveler's departure.

Malaria 13.

- The drugs used for antimalarial chemoprophylaxis are generally well tolerated. However, side effects can occur.
- Minor side effects usually do not require stopping the drug. Travelers who have serious side effects should see a health-care provider.
- The health-care provider should establish whether the traveler has previously experienced an allergic or other reaction to one of the antimalarial drugs of choice.
- In addition, the health-care provider should determine whether medical care will be readily accessible during travel should the traveler develop intolerance to the drug being used and need to change to a different agent.

Malaria 14.

- **General Recommendations for Prophylaxis**
  - Chemoprophylaxis should continue during travel in the malarious areas and after leaving the malarious areas (4 weeks after travel for chloroquine, mefloquine, and doxycycline, and 7 days after travel for atovaquone/proguanil and primaquine).
  - In comparison with drugs with short half-lives, which are taken daily, drugs with longer half-lives, which are taken weekly, offer the advantage of a wider margin of error if the traveler is late with a dose.
  - For example, if a traveler is 1-2 days late with a weekly drug, prophylactic blood levels can remain adequate; if the traveler is 1-2 days late with a daily drug, protective blood levels are less likely to be maintained.

Malaria 15.

- **Travel to Areas without Chloroquine-Resistant *P. falciparum***
  - For travel to areas of risk where chloroquine-resistant *P. falciparum* has NOT been reported, once-a-week use of chloroquine alone is recommended for prophylaxis.
  - Persons who experience uncomfortable side effects after taking chloroquine may tolerate the drug better by taking it with meals.
  - As an alternative, the related compound hydroxychloroquine sulfate may be better tolerated.
  - Travelers unable to take chloroquine or hydroxychloroquine should take atovaquone/proguanil, doxycycline, or mefloquine; these antimalarial drugs are also effective against chloroquine-sensitive parasites

Malaria 16.

- **Travel to Areas with Chloroquine-Resistant *P. falciparum***
  - For travel to areas of risk where chloroquine-resistant *P. falciparum* exists, three efficacious options are available, listed in alphabetical order below. In addition, there are recommendations for the use of primaquine for prophylaxis in special situations.
  - **Atovaquone/proguanil (Malarone):** Atovaquone/proguanil is a fixed combination of the two drugs, atovaquone and proguanil. Atovaquone/proguanil prophylaxis should begin 1-2 days before travel to malarious areas and should be taken daily, at the same time each day, while in the malarious areas and daily for 7 days after leaving the area.

Malaria 17.

- **Doxycycline (many brand names and generic):**
  - Doxycycline prophylaxis should begin 1-2 days before travel to malarious areas. It should be continued once a day, at the same time each day, during travel in malarious areas and daily for 4 weeks after the traveler leaves such areas.
  - Insufficient data exist on the antimalarial prophylactic efficacy of related compounds such as minocycline (commonly prescribed for the treatment of acne).
  - Persons on a long-term regimen of minocycline who are in need of malaria prophylaxis should stop taking minocycline 1-2 days before travel and start doxycycline instead.
  - The minocycline can be restarted after the full course of doxycycline is completed.

Malaria 18.

- **Mefloquine (Lariam and generics):** Mefloquine prophylaxis should begin 1-2 weeks before travel to malarious areas. It should be continued once a week, on the same day of the week, during travel in malarious areas and for 4 weeks after a traveler leaves such areas.

Malaria 19.

- **Prevention of relapses of *P. vivax* and *P. ovale*: Presumptive anti-relapse therapy (terminal prophylaxis) with primaquine**
  - *P. vivax* and *P. ovale* parasites can persist in the liver and cause relapses for as long as 4 years or more after departure from the malarious areas.
  - Travelers to malarious areas should be alerted to this risk and, if they have malaria symptoms after leaving a malarious area, they should be advised to report their travel history and the possibility of malaria to a physician as soon as possible.

Malaria 20.

- Presumptive anti-relapse therapy with primaquine decreases the risk of relapses by acting against the liver stages of *P. vivax* or *P. ovale*.
- Primaquine presumptive anti-relapse therapy is administered for 14 days after the traveler has left a malarious area.
- When chloroquine, doxycycline, or mefloquine is used for prophylaxis, primaquine is usually taken during the last 2 weeks of post-exposure prophylaxis, but may be taken immediately after those medications are completed.
- When atovaquone/proguanil is used for prophylaxis, primaquine may be taken either during the final 7 days of atovaquone/ proguanil and then for an additional 7 days, or for 14 days after atovaquone/proguanil is completed.
- Note that the recommended daily dose of primaquine for terminal prophylaxis has been increased from 15 mg to 30 mg (base) for adults and from 0.3 mg/kg to 0.6 mg/kg (base) for children.

Malaria 21.

- Because most malarious areas of the world (except Haiti and the Dominican Republic) have at least one species of relapsing malaria, travelers to these areas have some risk for acquiring either *P. vivax* or *P. ovale*, although the actual risk for an individual traveler is difficult to define.
- Presumptive anti-relapse therapy with primaquine for prevention of relapses is generally indicated only for persons who have had prolonged exposure in malaria-endemic areas (e.g., missionaries and Peace Corps volunteers).
- Most persons can tolerate this regimen of primaquine (30 mg/day for adults) if it is taken with food; the main exception is for persons who are deficient in G6PD.

Malaria 22.

- **Infants, Children, and Adolescents Traveling to Areas without Chloroquine-Resistant *P. falciparum*:**
  - Chloroquine is the drug of choice for children traveling to areas without chloroquine-resistant *P. falciparum.*
- ***Infants, Children, and Adolescents Traveling to Areas with Chloroquine-Resistant P. falciparum:***
  - *Mefloquine is an option for use in infants and children of all ages and weights who are traveling to areas with chloroquine-resistant P. falciparum.*
  - *Doxycycline may be used for children who are at least 8 years of age.*
  - *For atovaquone/proguanil, treatment efficacy, safety, and pharmacokinetic data in children who weigh 5-11 kg have recently been extrapolated, allowing for prophylaxis doses in these children.*
  - *Providers should note that this prophylactic dosing for children weighing less than 11 kg constitutes off-label use in the United States.*
  - *Atovaquone/proguanil may now be used for prophylaxis for infants and children weighing at least 5 kg (11lbs). Atovaquone/proguanil is available in pediatric tablet form; dosage is based on weight.*

Malaria 23.

- **Chemoprophylaxis during Pregnancy**
  - Malaria infection in pregnant women can be more severe than in nonpregnant women.
  - Malaria can increase the risk for adverse pregnancy outcomes, including prematurity, abortion, and stillbirth.
  - For these reasons and because no chemoprophylactic regimen is completely effective, women who are pregnant or likely to become pregnant should be advised to avoid travel to areas with malaria transmission if possible.
  - If travel to a malarious area cannot be deferred, use of an effective chemoprophylaxis regimen is essential.

Malaria 24.

- **Travel during Pregnancy to Areas without Chloroquine-Resistant *P. falciparum*:**
  - Pregnant women traveling to areas where chloroquine-resistant *P. falciparum* has not been reported may take chloroquine prophylaxis.
  - Chloroquine has not been found to have any harmful effects on the fetus when used in the recommended doses for malaria prophylaxis; therefore, pregnancy is not a contraindication for malaria prophylaxis with chloroquine phosphate or hydroxychloroquine sulfate.

Malaria 25.

- **Travel during Pregnancy to Areas with Chloroquine-Resistant *P. falciparum*:**
  - Mefloquine is currently the only medication recommended for malaria chemoprophylaxis during pregnancy.
  - A review of mefloquine use in pregnancy from clinical trials and reports of inadvertent use of mefloquine during pregnancy suggest that its use at prophylactic doses during the second and third trimesters of pregnancy is not associated with adverse fetal or pregnancy outcomes.
  - More limited data suggest it is also safe to use during the first trimester.

Malaria 26.

- Because of insufficient data regarding the use during pregnancy, atovaquone/proguanil is not currently recommended for the prevention of malaria in pregnant women.
- Doxycycline is contraindicated for malaria prophylaxis during pregnancy because of the risk of adverse effects of tetracycline, a related drug, on the fetus, which include discoloration and dysplasia of the teeth and inhibition of bone growth.
- Primaquine should not be used during pregnancy because the drug may be passed transplacentally to a glucose-6-phosphate dehydrogenase (G6PD)-deficient fetus and cause hemolytic anemia in utero.

Malaria 27.

- **Antimalarial Drugs during Breastfeeding**
  - Data are available for some antimalarial agents on the amount of drug excreted in breast milk of lactating women.
  - Very small amounts of chloroquine and mefloquine are excreted in the breast milk of lactating women.

Malaria 28.

- Although there are very limited data about the use of doxycycline in lactating women, most experts consider the theoretical possibility of adverse events to be remote.
- No information is available on the amount of primaquine that enters human breast milk; the mother and infant should be tested for G6PD deficiency before primaquine is given to a woman who is breastfeeding.
- It is not known whether atovaquone is excreted in human milk.
- Proguanil is excreted in human milk in small quantities.
- Based on experience with other antimalarial drugs, the quantity of drug transferred in breast milk is likely insufficient to provide adequate protection against malaria for the infant.

Malaria 29.

- Because data are not yet available on the safety of atovaquone/proguanil prophylaxis in infants weighing less than 5 kg (11 lbs), CDC does not currently recommend it for the prevention of malaria in women breastfeeding infants weighing less than 5 kg.
- Atovaquone/ proguanil may be used for the treatment of malaria by women breastfeeding infants weighing more than 5 kg.
- However, it can be used for treatment of women who are breastfeeding infants of any weight when the potential benefit outweighs the potential risk to the infant, e.g., treating a breastfeeding woman who has acquired *P. falciparum* malaria in an area of multidrug-resistant strains and who cannot tolerate other treatment options.

Malaria 30.

- **Adverse Reactions and Contraindications**
- Following is a summary of the frequent or serious side effects of recommended antimalarial drugs. In addition, physicians should review the prescribing information in standard pharmaceutical reference texts and in the manufacturers' package inserts.
- **Atovaquone/Proguanil**
  - The most common adverse effects reported in persons using atovaquone/proguanil for prophylaxis or treatment are abdominal pain, nausea, vomiting, and headache.
  - Atovaquone/proguanil should not be used for prophylaxis in children weighing less than 5 kg, pregnant women, or patients with severe renal impairment (creatinine clearance <30 mL/min).

Malaria 31.

- **Chloroquine and Hydroxychloroquine Sulfate**
  - Reported side effects include gastrointestinal disturbance, headache, dizziness, blurred vision, insomnia, and pruritus, but generally these effects do not require that the drug be discontinued.
  - High doses of chloroquine, such as those used to treat rheumatoid arthritis, have been associated with retinopathy; this serious side effect appears to be extremely unlikely when chloroquine is used for routine weekly malaria prophylaxis.
  - Chloroquine and related compounds have been reported to exacerbate psoriasis.

Malaria 31.

- **Doxycycline**
  - Doxycycline can cause photosensitivity, usually manifested as an exaggerated sunburn reaction.
  - The risk of such a reaction can be minimized by avoiding prolonged, direct exposure to the sun and by using sunscreens that absorb long-wave UVA radiation.
  - In addition, doxycycline use is associated with an increased frequency of Candida vaginitis.
  - Gastrointestinal side effects (nausea or vomiting) may be minimized by taking the drug with a meal.
  - To reduce the risk of esophagitis, travelers should be advised not to take doxycycline before going to bed.
  - Doxycycline is contraindicated in persons with an allergy to tetracyclines, during pregnancy, and in infants and children younger than 8 years of age.
  - Vaccination with the oral typhoid vaccine Ty21a should be delayed for at least 24 hours after taking a dose of doxycycline.

Malaria 32.

- **Mefloquine**
  - Mefloquine (Lariam) has been associated with rare serious adverse reactions (e.g., psychoses or seizures) at prophylactic doses; these reactions are more frequent with the higher doses used for treatment.
  - Other side effects that have occurred in chemoprophylaxis studies include gastrointestinal disturbance, headache, insomnia, abnormal dreams, visual disturbances, depression, anxiety disorder, and dizziness.
  - Other more severe neuropsychiatric disorders occasionally reported during postmarketing surveillance include sensory and motor neuropathies (including paresthesia, tremor, and ataxia), agitation or restlessness, mood changes, panic attacks, forgetfulness, confusion, hallucinations, aggression, paranoia, and encephalopathy.
  - On occasion, psychiatric symptoms have been reported to continue long after mefloquine has been stopped.

Malaria 33.

- **Primaquine**
  - The most common adverse event in G6PD-normal persons is gastrointestinal upset if primaquine is taken on an empty stomach—this problem is minimized or eliminated if primaquine is taken with food.
  - In G6PD-deficient persons, primaquine can cause hemolysis that can be fatal.
  - **Before primaquine is used, G6PD deficiency MUST be ruled out by appropriate laboratory testing.**

Malaria 34.

- **SELF-TREATMENT**
  - CDC recommends the use of malaria prophylaxis for travel to malarious areas.
  - However, travelers who elect not to take prophylaxis, who do not choose an optimal drug regimen (e.g., chloroquine in an area with chloroquine-resistant *P. falciparum*), or who require a less–than-optimal drug regimen are at greater risk for acquiring malaria and needing prompt treatment.
  - Travelers who are taking effective prophylaxis but who will be in very remote areas may decide, in consultation with their healthcare provider, to take along a dose of antimalarial medication for self-treatment.
  - Travelers should be advised to take their presumptive self-treatment promptly if they have fever, chills, or other influenza-like illness and if professional medical care is not available within 24 hours.
  - **Travelers should be advised that this self-treatment of a possible malarial infection is only a temporary measure and that prompt medical evaluation is imperative**.

Malaria 35.

Drug	Usage	Adult dose
Atovaquon/ proguanil (Malarone)	Prophylaxis in areas with chloroquin resistant or mefloquin resistant P. falciparum	Adult tablets contain 250 mg atovaquon and 100 mg proguanil hydrochlorid. 1 adult tabl orally daily
Chloroquin phosphate (Aralen and generic)	Prophylaxis only in areas with chloroquin sensitive P. falciparum	300 mg base (500 mg salt) orally once/week
Doxycyclin (Many brand names and generic)	Prophylaxis in areas with chloroquin resistant or mefloquin resistant P. falciparum	100 mg orally, daily
Hydroxychloroquin e sulphate (Plaquenil)	An alternative to chloroquine for prophylaxis only in areas with chloroquin- sensitive p. Falciparum	310 mg base (400 mg salt) orally
Mefloquin (Lariam and generic)	Prophylaxis in areas with chloroquin resistant P. falciparum	228 mg base (250 mg salt) orally once/week
Primaquin	Used for presumptive anti-relapse therapy (terminal prophylaxis) to decrease the risk of relapses of P. vivax and P. ovale	30 mg base (52,6 mg salt) orally, once/day for 14 days after departures from malarious area

BODY WEIGHT (kg)	ATOVAQUONE/PROGUANIL TOTAL DAILY DOSE (mg)	DOSAGE REGIMEN
5-8	31.25 / 12.5	1⁄2 pediatric tablet daily
>8-10	46.88 / 18.75	3/4 pediatric tablet daily
>10-20	62.5 / 25	1 pediatric tablet daily
>20-30	125 / 50	2 pediatric tablets daily
>30-40	187.5 / 75	3 pediatric tablets daily
>40	250 / 100	1 adult tablet daily

DRUG	ADULT DOSE	PEDIATRIC DOSE	COMMENTS
Atovaquone/proguanil (Malarone). Self-treatment drug to be used if professional medical care is not available within 24 hours. Medical care should be sought immediately after treatment.	4 tablets (each dose contains 1,000 mg atovaquone and 400 mg proguanil) orally as a single daily dose for 3 consecutive days.	Daily dose to be taken for 3 consecutive days: 5-8 kg: 2 pediatric tablets 9-10 kg: 3 pediatric tablets 11-20 kg: 1 adult tablet 21-30 kg: 2 adult tablets 31-40 kg: 3 adult tablets >41 kg: 4 adult tablets	Contraindicated in persons with severe renal impairment (creatinine clearance <30 mL/min). Not recommended for self-treatment in persons on atovaquone/ proguanil prophylaxis. Not currently recommended for children <5 kg, pregnant women, and women breastfeeding infants weighing <5 kg

Yellow fever 1.

- **Description**
  - Yellow fever is a viral disease that is transmitted to humans through the bite of infected mosquitoes. Illness ranges in severity from an influenza-like syndrome to severe hepatitis and hemorrhagic fever.
  - Yellow fever virus (YFV) is maintained in nature by mosquito-borne transmission between nonhuman primates.
  - Transmission by mosquitoes from one human to another occurs during epidemics of “urban yellow fever.”

Yellow fever 2.

- **Occurrence**
  - The disease occurs only in sub-Saharan Africa and tropical South America where it is endemic and intermittently epidemic
  - Areas considered endemic for yellow fever have evidence of yellow fever transmission to humans and/or its potential, due to the presence of both a competent vector and YFV in nonhuman primates.
  - In Africa, where most cases are reported, a variety of mosquitoes transmit the virus.
  - The case-fatality rate of yellow fever in Africa is highly variable but approximates 20%.
  - Infants and children are at greatest risk of severe disease.
  - In South America, yellow fever occurs most frequently in young men who are exposed through their work to mosquito vectors in forested or transitional areas of Bolivia, Brazil, Colombia, Ecuador, Venezuela, Guyana, French Guiana, and Peru.

Yellow fever 3.

- **Risk for Travelers**
  - A traveler's risk of acquiring yellow fever is determined by various factors, including immunization status, location of travel, season, duration of exposure, occupational and recreational activities while traveling, and the local rate of virus transmission at the time of travel.
  - Although reported cases of human disease are the principal indicator of disease risk, case reports may be absent because of a high level of immunity in the population, or because cases are not detected by local surveillance systems.
  - Only a small proportion of yellow fever cases is recognized and officially reported because the involved areas are often remote and lack specific diagnostic capabilities.

Yellow fever 4.

- During interepidemic periods, low-level transmission may not be detected by public health surveillance.
- Such interepidemic conditions may last years or even decades in certain countries or regions.
- This “epidemiologic silence” does not equate to absence of risk and should not lead to travel without the protection provided by vaccination.
- Surveys in rural West Africa during “silent” periods have estimated an annual incidence of yellow fever of 1.1-2.4 cases per 1,000 persons and 0.2-0.5 deaths per 1,000 persons.
- YFV transmission in rural West Africa is seasonal, with elevated risk during the 2-4 months that the rainy season ends and the dry season begins (usually July-October); therefore, the annual incidence reflects incidence during a transmission season of 2-4 months.

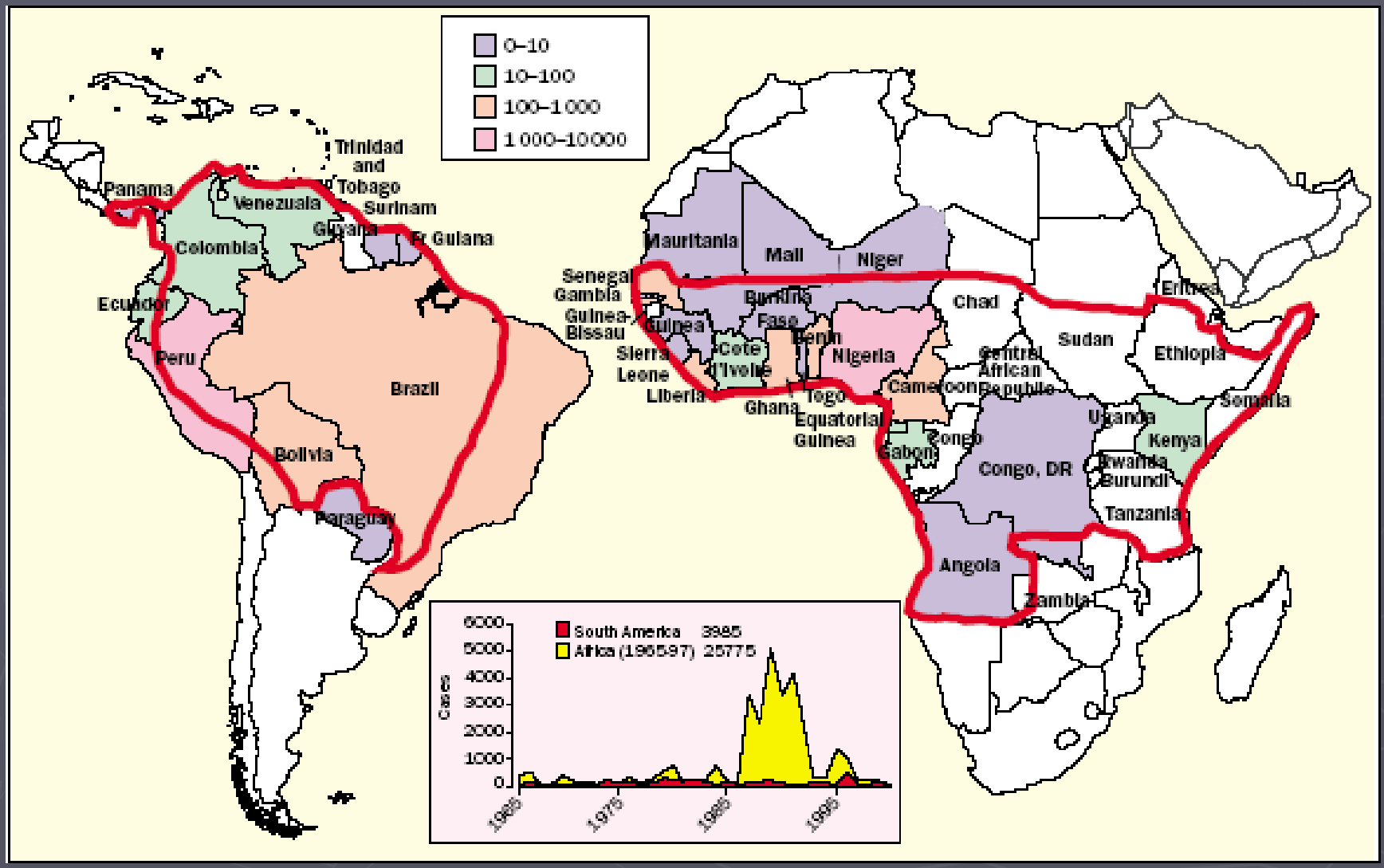
Yellow fever 5.

- The incidence of yellow fever in South America is lower than that in Africa because the mosquitoes that transmit the virus between monkeys in the forest canopy do not often come in contact with humans and because immunity in the indigenous human population is high.
- Urban epidemic transmission has not occurred in South America for many years, although the risk of introduction of the virus into towns and cities is ever present.
- For travelers, the risks of illness and death due to yellow fever are probably 10 times greater in rural West Africa than in South America; the risk varies greatly according to specific location and season.
- In West Africa, virus transmission is highest during the late rainy and early dry seasons (July-October). In Brazil, the risk of infection is highest during the rainy season (January-March)

Yellow fever 6.

- The risk of acquiring yellow fever is difficult to predict because of variations in ecologic determinants of virus transmission.
- As a rough guideline, the risks of illness and death due to yellow fever in an unvaccinated traveler in endemic areas in West Africa during the highest risk season from July to October have been estimated at 100 per 100,000 and 20 per 100,000 per month, respectively; for a 2-week stay, the estimated risks of illness and death were 50 per 100,000 and 10 per 100,000, respectively (2).
- The risks of illness and death in South America are probably 10 times lower (5 per 100,000 and 1 per 100,000, respectively for a 2-week trip)

The distribution of YF



The disease 2.

- The clinical disease varies from non-specific, abortive illness to fatal haemorrhagic fever.
- The incubation period after the bite of an infected mosquito is 3–6 days.
- Disease onset is typically abrupt, with fever, chills, malaise, headache, lower back pain, generalised myalgia, nausea, and dizziness.
- On physical examination the patient is febrile and appears acutely ill, with congestion of the conjunctivae and face and a relative bradycardia with respect to the height of fever (Faget's sign).

The disease 3.

- Virus is present in blood at titres up to 10^5–10^6 infectious particles/mL, and the patient may thus serve as a source of infection for mosquitoes.
- The average fever is 39o C and lasts 3·3 days.
- Young children may experience febrile convulsions.
- Laboratory abnormalities include leukopenia (1·5–2·5 x 10^9/L) with a relative neutropenia.
- Between 48 and 72 h after onset and before the appearance of jaundice, serum transaminase levels may rise.

The disease 4.

- This so-called “period of infection” lasts several days and may be followed by a “period of remission”, with the disappearance of fever and symptoms lasting up to 24 h.
- During the period of remission, virus is cleared by antibodies and the cellular immune response.
- The blood may contain non-infectious immune complexes detectable by immunoassays or PCR.
- Patients with abortive infections may recover at this stage, without further signs or symptoms.

Prevention

- **PERSONAL PROTECTION MEASURES**
  - Travelers to areas with yellow fever transmission should take precautions against exposure to mosquitoes.
  - Staying in air-conditioned or well-screened quarters and wearing long-sleeved shirts and long pants will help prevent mosquito bites. Insect repellents containing DEET or picaridin should be used on exposed skin and reapplied as directed on the label. Permethrin-containing repellents should be applied to clothing.
- **VACCINE**
  - Yellow fever is preventable by a relatively safe, effective vaccine. For all eligible persons, a single injection of 0.5 mL of reconstituted vaccine should be administered subcutaneously.

Acute phase


YELLOW FEVER
Santa Cruz, Bolivia

Dengue fever 1.

- **Description**
  - Dengue fever and dengue hemorrhagic fever (DHF) are viral diseases transmitted by *Aedes* mosquitoes, usually *Aedes aegypti*.
  - The four dengue viruses (DEN-1 through DEN-4) are immunologically related, but do not provide cross-protective immunity against each other.

Aedes aegypti

Dengue 2

- **Occurrence**
  - Dengue, a disease found in most tropical and subtropical areas of the world, has become the most common arboviral disease of humans.
  - More than 2.5 billion persons now live in areas where dengue infections can be locally acquired.
  - Reported attack rates for disease during epidemics range from 1 per hundred to 1 per thousand of the population.
  - However, because persons with milder illness may not seek medical attention and subsequently be reported, the actual number of infections in a population may be 5 to 10 times greater than the number reported.

Dengue 3

- Epidemics caused by all four virus serotypes have become progressively more frequent and larger in the past 25 years. As of 2005, dengue fever is endemic in most tropical countries of the South Pacific, Asia, the Caribbean, the Americas, and Africa.
- Additionally, most tropical urban centers in these regions have multiple dengue virus serotypes co-circulating (hyperendemicity), which is associated with increased dengue transmission and the appearance of DHF.
- Future dengue incidence in specific locales cannot be predicted accurately, but a high level of dengue transmission is anticipated in all tropical areas of the world for the indefinite future.
- The incidence of the severe disease, DHF, has increased dramatically in Southeast Asia, the South Pacific, and the American tropics in the past 25 years, with major epidemics occurring in many countries every 3-5 years.

Dengue 4

- **Risk for Travelers**
  - The principal mosquito vector, *Ae. aegypti*, is most frequently found in or near human habitations and prefers to feed on humans during the daytime.
  - It has two peak periods of biting activity: in the morning for several hours after daybreak and in the late afternoon for several hours before dark.
  - Nevertheless, the mosquito may feed at any time during the day, especially indoors, in shady areas, or when it is overcast.
  - Mosquito breeding sites include artificial water containers such as discarded tires, uncovered water storage barrels, buckets, flower vases or pots, cans, and cisterns.

Dengue 5.

- Current data suggest that co-circulation of all four dengue strains in the same geographic region, virus genotype, and host factors such as immune status (i.e., having had a previous dengue infection), age, and genetic background are the most important risk factors for developing DHF.
- In Asia, where a high proportion of the population has experienced a dengue infection early in life, DHF is observed most commonly in infants and children younger than 15 years of age who are experiencing a second dengue infection.
- In the Americas and the Pacific, where primary infection at a young age is less common, DHF is typically observed in older children and adults.
- Therefore, international travelers from nonendemic areas (such as the United States) are generally at low risk for DHF.

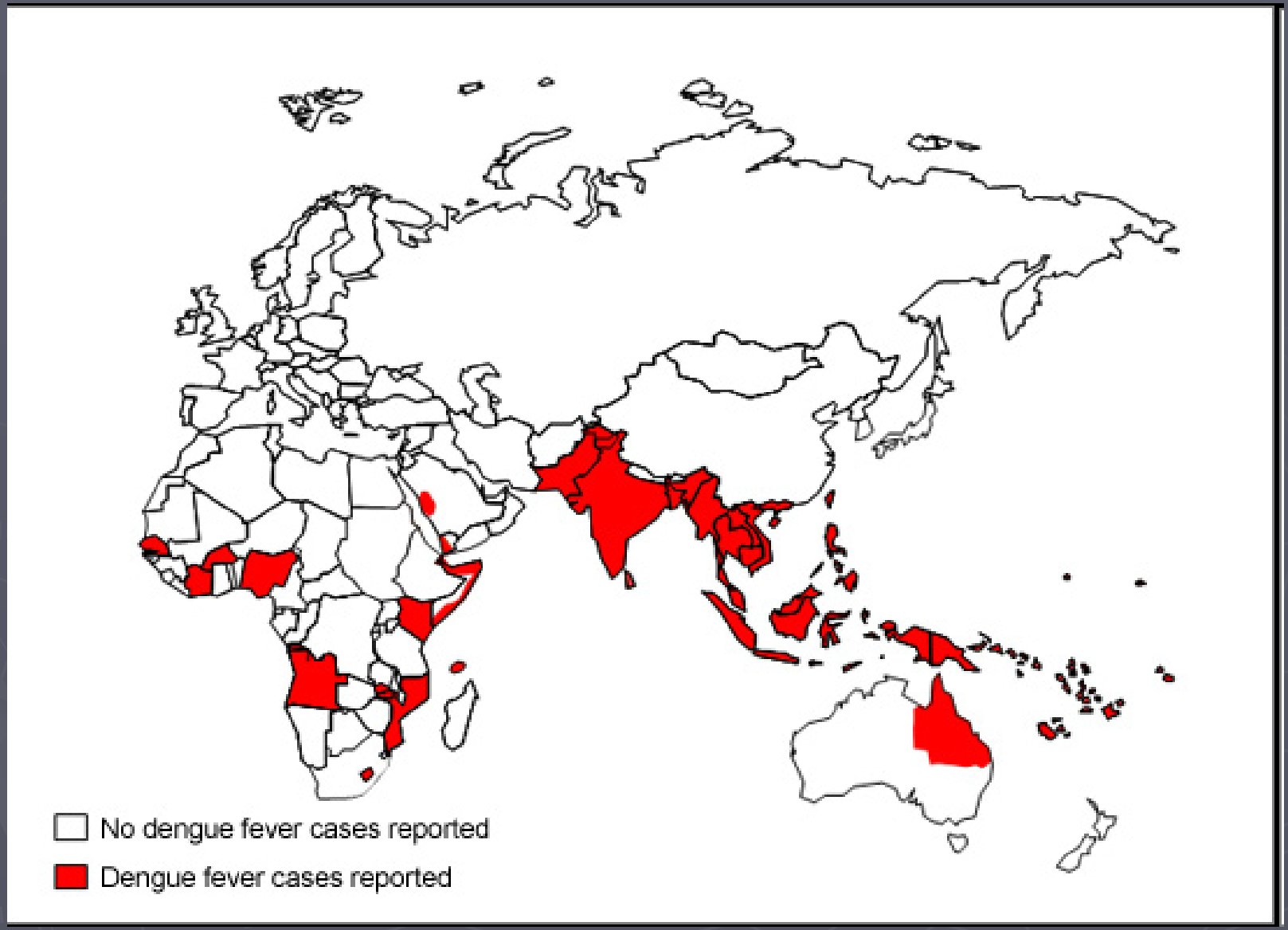
Dengue 6.

- **Clinical Presentation**
  - Dengue fever is characterized by sudden onset after an incubation period of 3-14 days (most commonly 4-7 days) of high fevers, severe frontal headache, and joint and muscle pain.
  - Many patients have nausea, vomiting, and a maculopapular rash, which appears 3-5 days after onset of fever and can spread from the torso to the arms, legs, and face.
  - The disease is usually self-limited, although convalescence can be prolonged.
  - Most patients report a nonspecific viral syndrome or a flu-like illness.
  - Asymptomatic infections are also common.
  - Although these patients do not experience symptoms at the time of the acute infection, the immunity that results increases the risk for DHF during a subsequent infection.
  - Approximately 1% of patients with dengue infection progress to DHF.

Dengue 7.

- As the patient's fever resolves, usually 3-5 days following the onset of fever, patients may develop leaky capillaries, which allow serum proteins and fluid to accumulate in the pleural and abdominal cavities.
- Thrombocytopenia and hemorrhagic manifestations, which can range from microscopic hematuria or increased menstrual flow to hemetemesis, are part of the syndrome.
- Neutropenia, elevated liver enzymes, and disseminated intravascular coagulation are also common.
- The case-fatality ratio for DHF averages about 5% worldwide, but can be kept below 1% with proper clinical management.
- Dengue shock syndrome is the progression of DHF to a hypotensive state.
- Despite the name, the progression of DHF to DSS is primarily due to capillary leakage rather the hemorrhaging A


No dengue fever cases reported
Dengue fever cases reported


No dengue fever cases reported
Dengue fever cases reported

Grade 2 erythema on hand impression in an adult patient with short-duration fever admitted to Colombo North Teaching Hospital, Sri Lanka during February—June 2004.