

# Malaria Prevention, Recognition, and Treatment

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# Disclosures

- None
- “I guess I should warn you, if I turn out to be particularly clear, you’ve probably misunderstood what I’ve said” Alan Greenspan

# Why this talk?

- Malaria is a serious infection
- US residents are fully susceptible
- Malaria is preventable with chemoprophylaxis

# Prevention is the first message

- Travelers to malaria infested zones will be exposed to “armed and dangerous” mosquitoes
- Chemoprophylaxis will prevent malaria in travelers
- Factoid: 75% of US residents who got malaria did not take prophylaxis

# Recognition is the second message

- Key to recognition and diagnosis is history
- Where did the patient go in the past 3 months?
- Did the patient take malaria prophylaxis?
- Rule of thumb: Look for malaria in any febrile patient who was in malaria zone in past 3 months.

# For Today

- Overview of Malaria in US
- Geography of malaria
- Prevention
- Clinical malaria
- Treatment
- Resources



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# Overview of Malaria in USA

CDC data, 2009

- 1484 cases of malaria, 99.5% imported, 4 deaths
- *P. falciparum*, 74%; *P. vivax*, 18%; *ovale* and *malariae* 5.5%
- Place of acquisition: Africa 74%, Asia 14%, Americas 10%
  - Hot spots: West Africa, India

# Overview of Malaria

(continued)

- All ages, both genders
  - Children (<18 yrs) 89% (n79) went to Africa to VFR, 31% took chemoprophylaxis
  - 19 cases in pregnant women
- Overall 75% of malaria cases did not get prophylaxis

# Arizona Malaria Data

## 2005-2009

- 80 cases, avg 16/yr, range 19-24
- 75% in Maricopa County
- *Plasmodium* species
  - 53% *P.falcip*
  - 40% *P. vivax*
  - 7% other
- Travel history
  - 64% Africa
  - 21% Asia
  - 15% Mexico, Central America

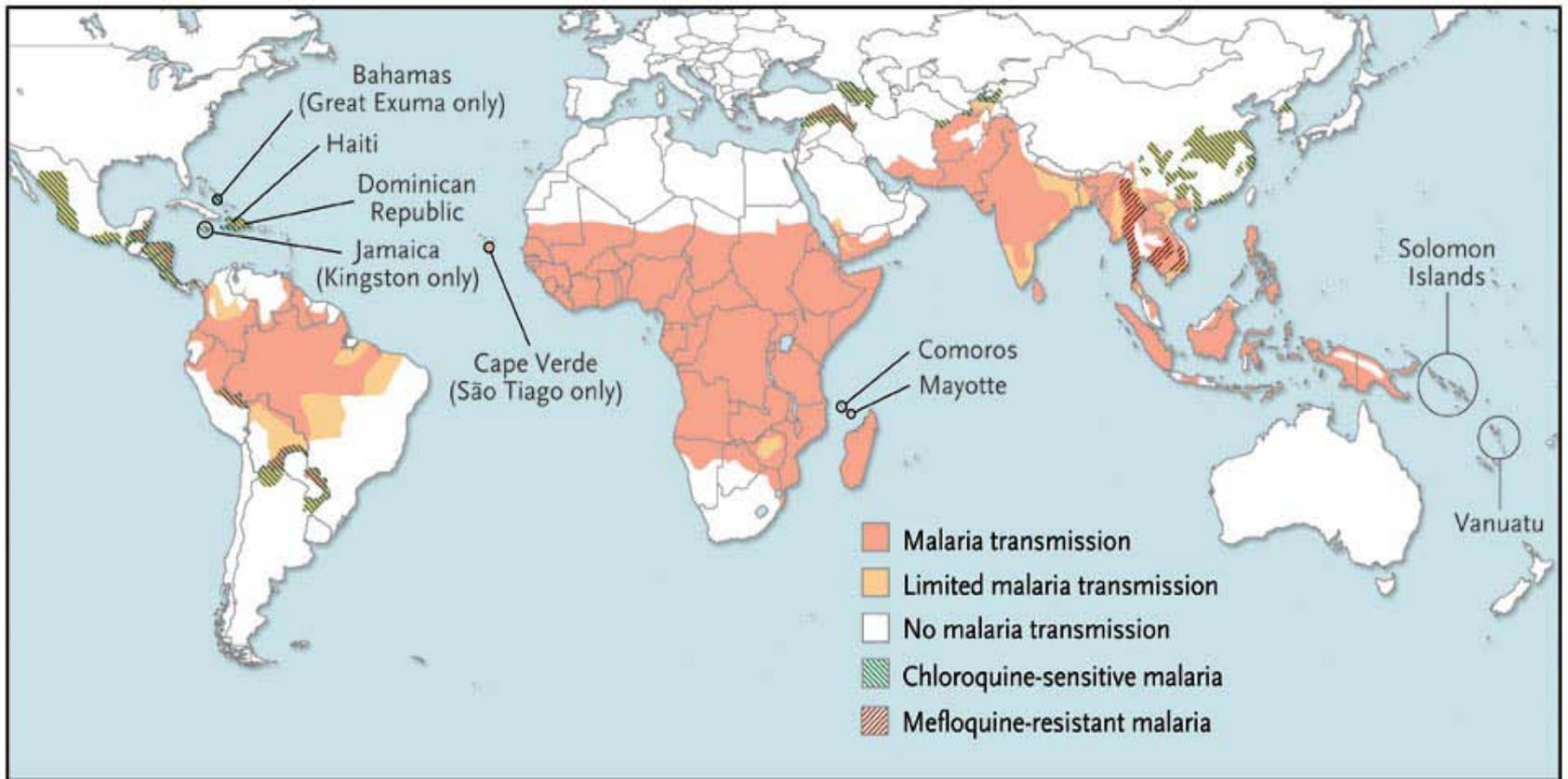
# Purpose of Travel

Malaria Surveillance-US,2009

• Visiting friends /relatives	417	63.3%
• Missionary	65	9.9
• Unknown	62	9.4
• Business	40	6.1
• Tourism	32	4.8
• Students	28	4.2

# Geography of Malaria

- Destination matters
  - Risk of acquisition: urban, high altitude, cooler temps, deserts
  - Plasmodium species: Africa, *P. falcip* predominates. Asia *P. vivax*. Haiti, *P.falcip*. Mexico, *P. vivax*
- Within a region or a country significant variation in risk.
- Get as much geo info as you can



Freedman D. N Engl J Med 2008;359:603-612

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**Table 1. Relative Risk of Malaria among Travelers, 2000 through 2002.\***

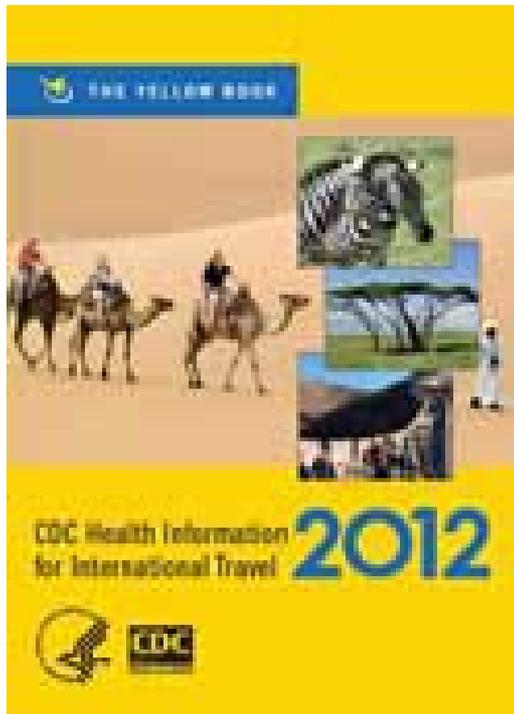
Region Visited	Relative Risk (95% CI)
Very-low-risk area†	1.0
Caribbean	3.8 (1.9–7.5)
North Africa	6.9 (3.6–13.3)
South America	8.3 (4.9–13.9)
Southeast Asia	11.5 (8.3–15.9)
Central America	37.8 (24.0–59.6)
South Asia	53.8 (37.4–77.4)
Oceania	76.7 (50.8–115.9)
Sub-Saharan Africa	207.6 (164.7–261.8)

\* Approximate relative risks were based on 1140 cases of malaria among travelers in the GeoSentinel database, with areas visited as numerators and tourist arrivals in that region (according to World Tourism Organization data) as estimates for denominators. Adapted from Leder et al.<sup>12</sup>

† Very-low-risk areas were Europe, Northeast Asia, Australia, New Zealand, North America, and the Middle East.

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# Yellow Book



- Available on line at [CDC.gov](http://CDC.gov), click on Y
- Comprehensive guide to health information on international travel
- Chapter 3 has malaria section
- Chapter 4 on select destinations

# 2012 Yellow Book

## Belize

- **Malaria**
- Malaria is found throughout Belize, except for Belize City. In Guatemala, malaria is found only in rural areas at altitudes <4,921 ft (1,500 m); therefore, the specific destination is important to know. Travelers who plan to visit only the capital and highlands do not need prophylaxis. Travelers who mention plans to scuba dive or visit Mayan ruins, though, will be at risk for malaria. Some clinicians feel that primaquine is the preferred antimalarial drug (only after G6PD testing) due to the amount of *Plasmodium vivax*, although atovaquone-proguanil, chloroquine, doxycycline, and mefloquine are alternative choices.

# CDC Malaria Site

[cdc.gov](http://cdc.gov). click on m

- Comprehensive information on malaria country by country
- Drill down maps
- Recommendations on medications for both chemoprophylaxis and treatment

# Malaria Prevention



- Pills
- Netting
- Long sleeves
- Mosquito repellent

# Risk Assessment for Travelers

## CDC web site

- Where
  - Highest risk area west Africa and Oceania
  - Specific destination information
- When
  - Malaria risk can vary by season in some areas. Risk decreases in cooler and drier months

# Risk Assessment

(continued)

- Style of Travel
  - Business, inside, urban
  - Back packer
- Who
  - Highest risk is 1<sup>st</sup> and 2<sup>nd</sup> generation immigrants retuning to country of origin. Consider themselves to be immune

# “Risk Adverse”

- “For the risk adverse traveler remember that even low risk settings, it only takes one bite from an infective *Anopheles* mosquito to transmit malaria.”
- [cdc.gov/malaria/travelers/risk](http://cdc.gov/malaria/travelers/risk)

# Medication for Chemoprophylaxis

- Areas with chloroquine-resistant *P. falcip*
  - Atovaquone-proguanil
  - Mefloquine
  - Doxycycline
- Areas with chloroquine-sensitive *P.falcip*
  - Chloroquine phosphate
- Areas with *P.vivax* and *P.ovale* +/-*P.falcip*
  - Primaquine

# Sweeping Generalities

- Prophylaxis is lot better than no prophylaxis (~95% effective for *P.falcip*)
- No prophylaxis regimen is 100% effective
- Start before you depart and continue after you return
- Pregnant women should not travel to malaria zones (CDC and WHO)
- But if they insist mefloquine is DOC

# Returning Traveler



# Clinical Malaria

- Acute febrile illness often with rigors and chills
  - Other symptoms: sweats, headaches, body aches, malaise
  - Signs: fever, perspiration, enlarged spleen/liver, mild jaundice
  - Labs: mild anemia and thrombocytopenia, increased bilirubin, and aminotransferases
- Incubation period: 7-30 days
- Differential diagnosis: influenza, bacterial infection including sepsis, diarrheal illnesses, other tropical diseases (dengue)

# Clinical Malaria

(continued)

- Uncomplicated; low level parasitemia (0.2-1% of rbc)
- Severe: usually *P. falcip.* Parasitemia is increased (2-5%)
  - Cerebral: behavior change, consciousness decreased, seizures, coma
  - Hemolysis: severe anemia, hemoglobinuria
  - Sepsis like picture
  - Hypoglycemia, acidosis

# Clinical Malaria

(continued, CDC 2009 data)

- 10% of US cases (n142) severe.
- 4 deaths, CFR 2.8%
- 86% *P. falcip*
- 80% did not take recommended prophylaxis
- Most of cases acquired in west Africa
- 35% of missionaries who got malaria had severe disease

Febrile patient with travel history to malaria zone...

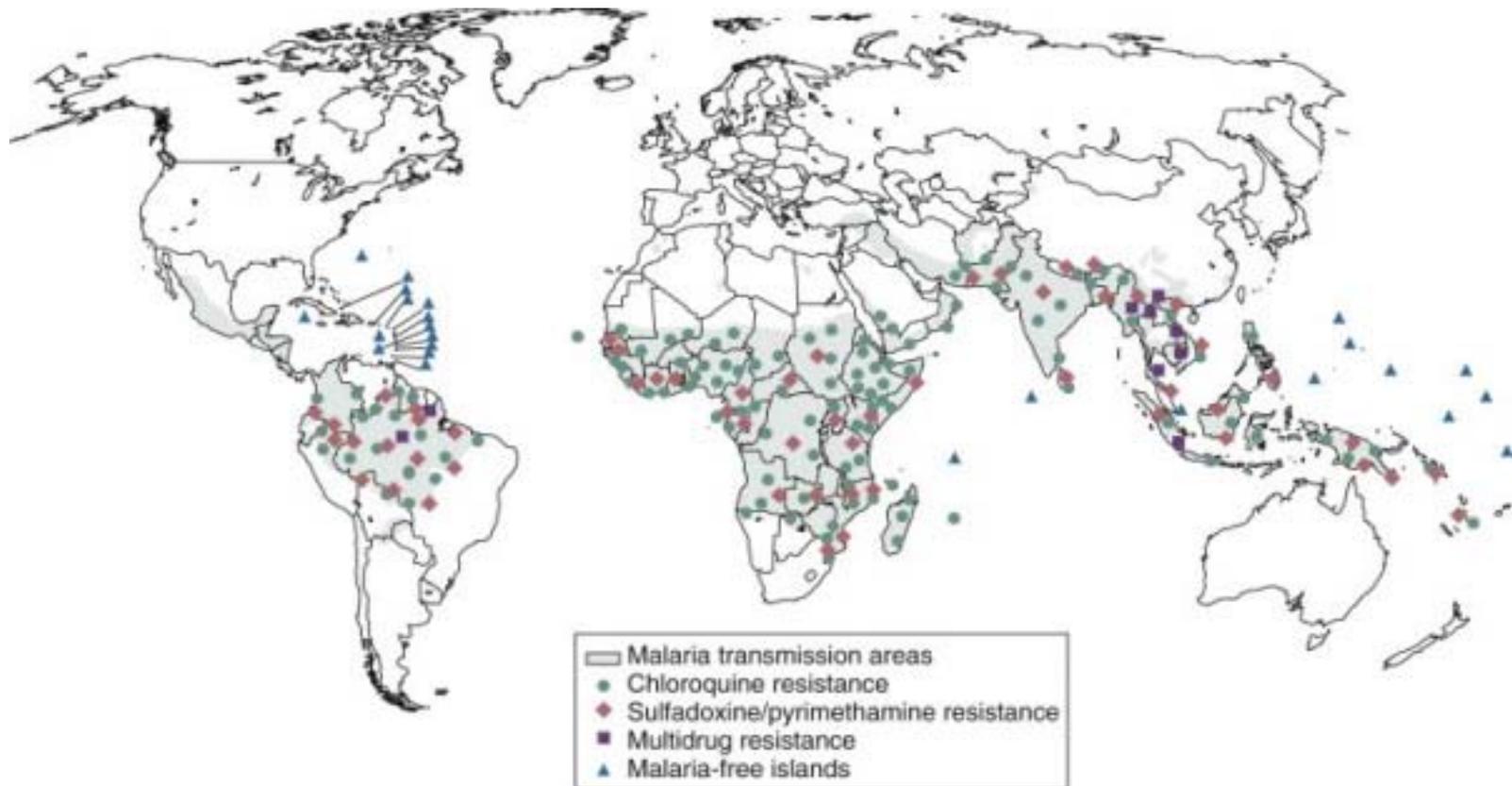
Order a peripheral smear for malaria and tell the lab what you are looking for.

95% of malaria cases  
present within 3 months  
of return

# Approach to Treatment (CDC web site)

- Infecting *Plasmodium* species
  - *P falcip* more severe than *P vivax*
- Clinical status of patient
  - Uncomplicated, oral meds suffice
  - Complicated, iv medications advised
- Drug susceptibility of parasite
  - If diagnosis of malaria made but species not certain, treat for chloroquine resistant *P. falcip*

# Drug Resistance Map



# Guidelines for Treatment of Malaria in the US

## CDC web site updated May, 2009

- Chloroquine resistant *P. falcip* or unknown
- 4 regimens, A,B, and C are equally recommended
- A: Atovaquone-proguanil (Malarone) 4 adult tabs po qd x 3 days
- B:Artemether-lumefantrine (Coartem) 3 day treatment of 6 oral doses based on weight. Initial dose, second dose 8 hrs later, then 1 dose po bid for 2 days.
- C: Quinine sulfate plus one of the following:  
Doxycycline, Tetracycline or Clindamycin. 7 day course.  
Clinda dose based on weight

# Call for help !

CDC Malaria Hotline Mon-Fri  
770-488-7788 or 855-856-4713  
After hours, holidays, week ends  
770-488-7100

# Take Home Messages

- Prevention is primary. Chemoprophylaxis works. Use it.
- Case recognition based on travel history and blood smears will lead to treatment
- You are not alone. Use CDC resources