

Travel Medicine



January 29, 2020

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Disclosures

None

Outline

Diagnosis, management, and prevention of important illnesses of travelers

- Fever
- Diarrhea
- Vaccinations
- Important infections of immigrants not to forget
- Exotic but not uncommon skin lesions

40 year old man with fever and mental status changes

- 3 week stay in Nigeria 10 days earlier
- x1 week: malaise, feverishness
- Unusual behavior at home after work
- ER next morning:
 - Temp 102° F
 - Agitated, unable to follow commands
- Hct 32, WBC 6000, platelets 110,000, creatinine 2.2

Differential diagnosis?

Fever in returned US travelers

- 9624 visits 2000-2012 (Geosentinel clinics)
- 18.2% with fever

Malaria (27.4%)

Viral syndrome (18.5%)

Dengue (12%)

Mononucleosis syndrome (8.7%)

Rickettsial disease (4.7%)

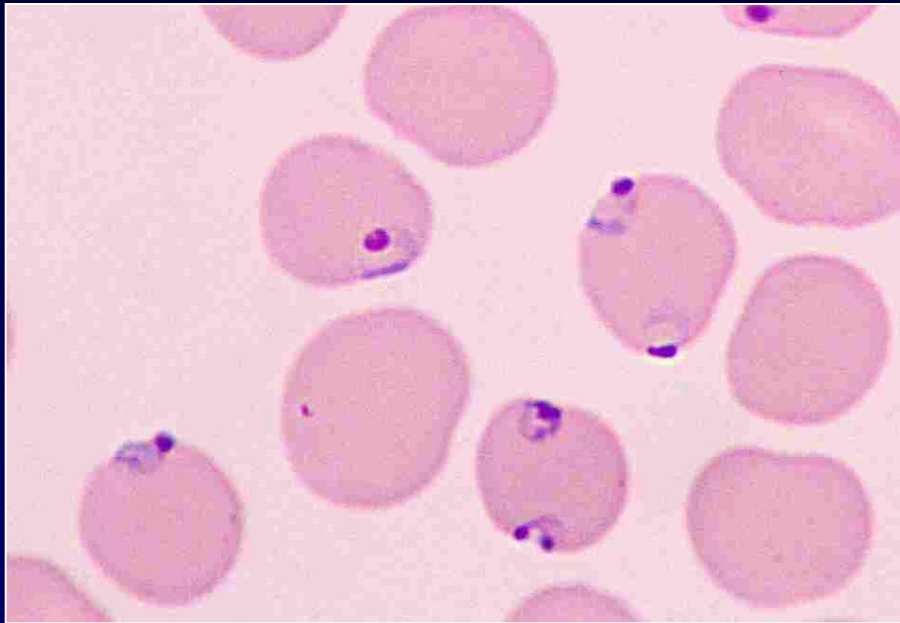
Enteric fever (6.1%)

Fam Pract 31:678, 2014

- Also; fever with diarrhea or respiratory infection, acute hepatitis, acute HIV, brucellosis, leptospirosis

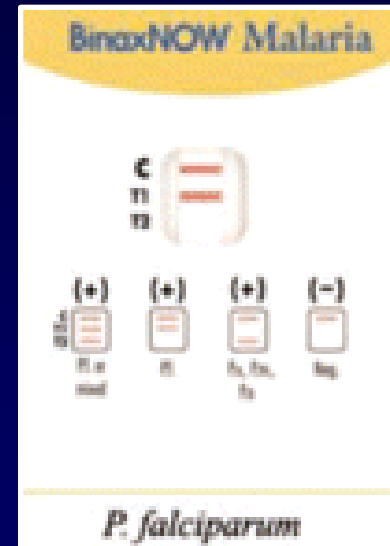
Further history:

- Immigrated from Nigeria 6 years earlier
- No antimalarial chemoprophylaxis, no pretravel vaccinations
- Visited family



Plasmodium falciparum
(5% of RBCs infected)

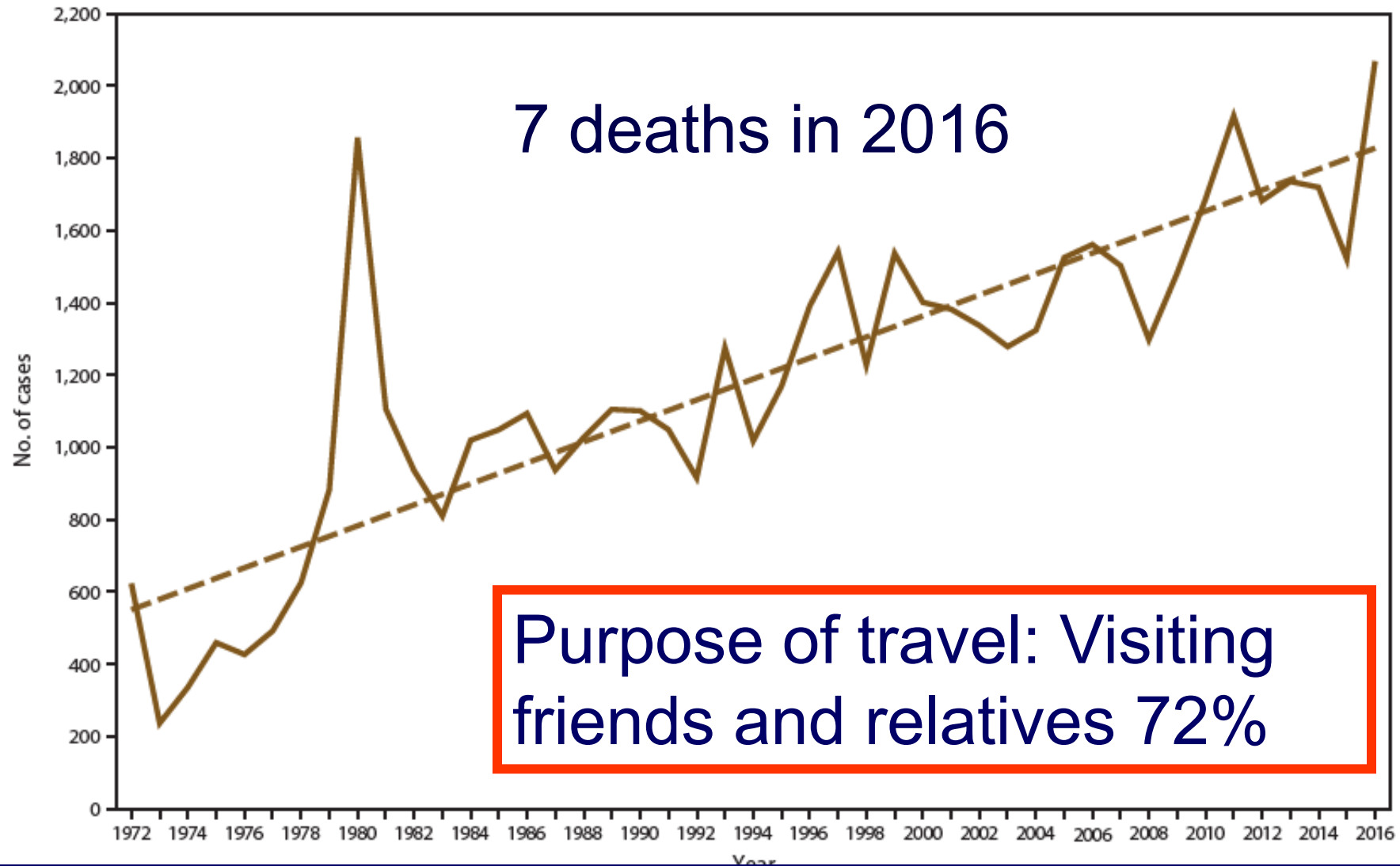
Further studies?



Rapid blood test for malaria (dipstick) was also positive

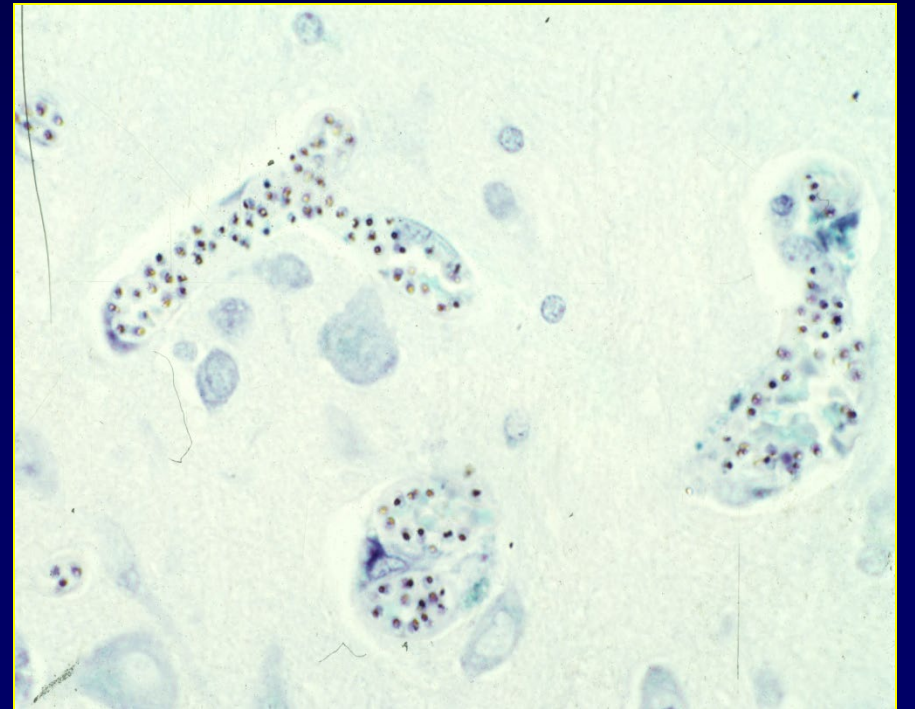
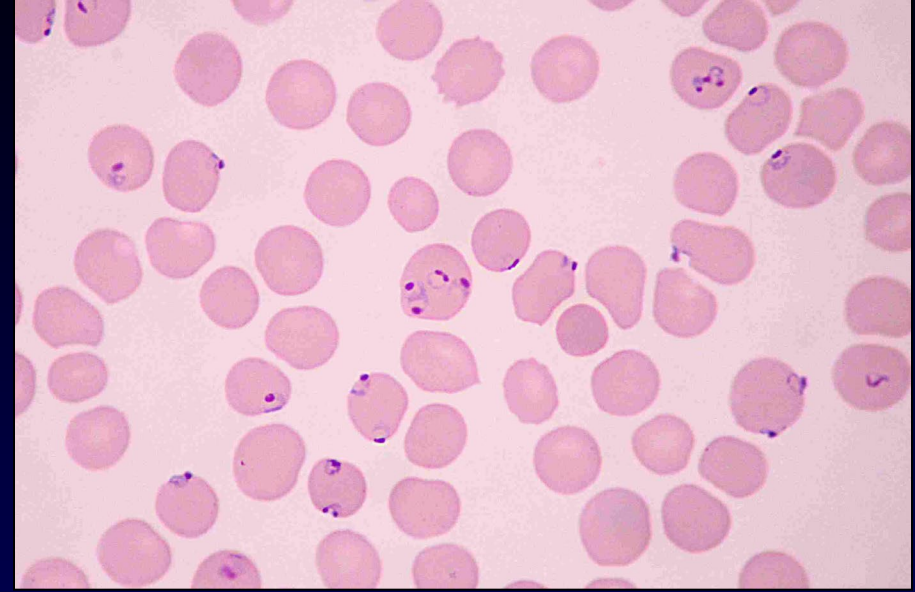
2078 reported cases of imported malaria in 2016

FIGURE 1. Number of malaria cases* among U.S. military personnel, U.S. civilians, and non-U.S. residents — United States, 1972–2016



Plasmodium falciparum: life-threatening

- High parasitemia
- Only rings on smears: infected with later to endothelium of small vessels
- Pathophysiology
 - Severe anemia
 - Blockage of blood flow
 - Systemic and local cytokine production



Plasmodium falciparum: life-threatening

- High parasitemia
- Only rings on smears:



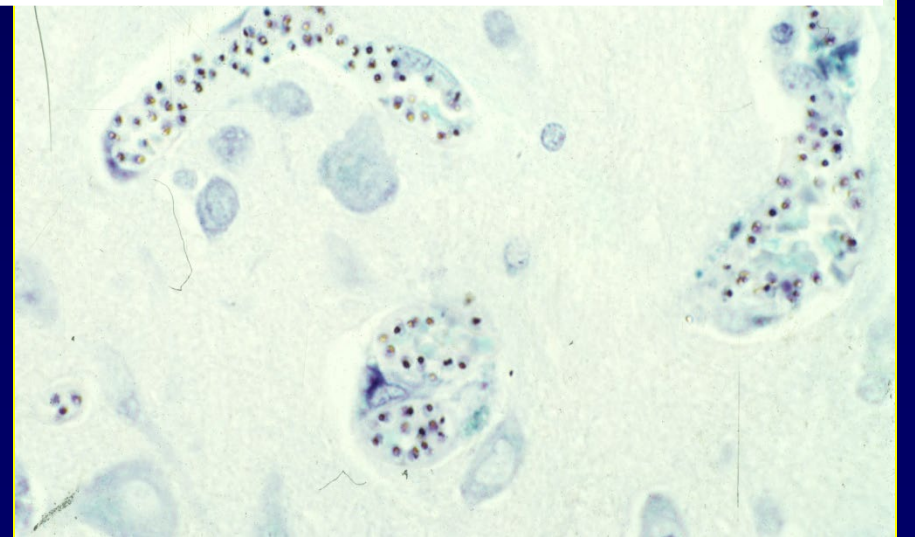
Falciparum malaria

Progresses rapidly

Life threatening (especially non-immune)

Mimics other infections

- Pa
-
- Blockage of blood flow
- Systemic and local cytokine production



Falciparum malaria: complications

- Cerebral malaria, hypoglycemia
- Pulmonary edema
- Renal failure, blackwater fever
- Jaundice, tender hepatomegaly
- Diarrhea, dysentery
- Lactic acidosis
- Severe anemia
- Placental dysfunction



Treatment? (40 y.o. man with fever)

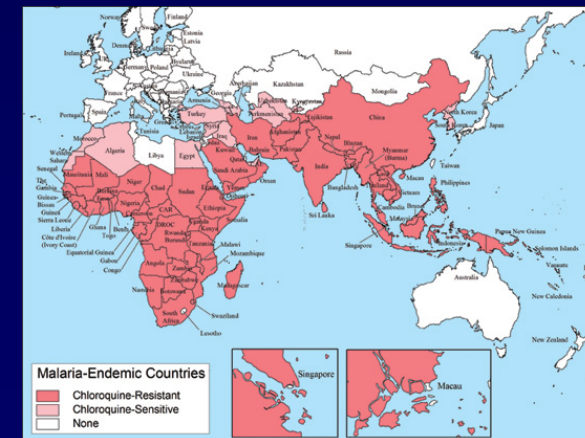
Treatment of falciparum malaria

- Oral therapy

- Artemether-lumefantrine
- Alternatives:
 - Chloroquine (sensitive strains)
 - Quinine + doxycycline or clindamycin
 - Atovaquone-proguanil

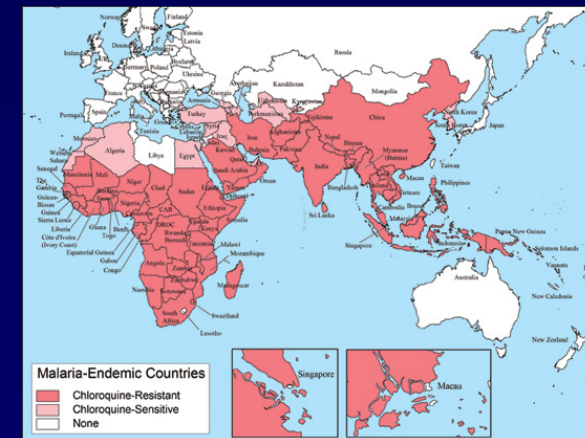
- Severe falciparum malaria

- IV artesunate (CDC)
- Alt: IV quinidine gluconate + doxycycline or clindamycin



Treatment of falciparum malaria

- Oral therapy
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40 y.o.man with fever: appropriate Rx

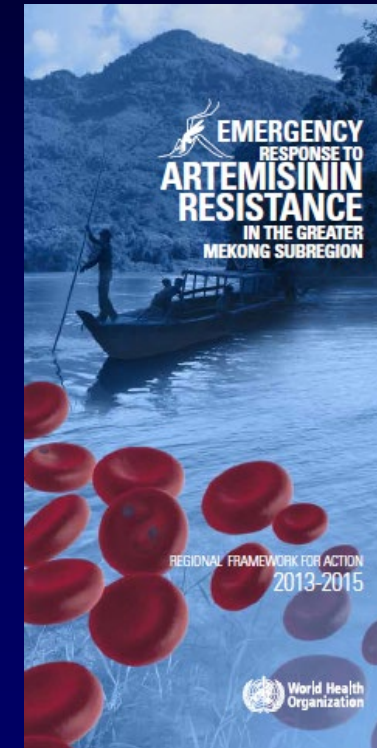
- Contact CDC for intravenous artesunate under expanded access investigational new drug (IND) protocol
- If needed: interim treatment orally or via nasogastric tube (artemether-lumefantrine, atovaquone-proguanil, quinine or mefloquine)
- Artesunate 2.4 mg/kg i.v. at 0, 12, 24; 48 hrs.
- Follow artesunate with artemether-lumefantrine, atovaquone-proguanil, doxycycline, clindamycin or mefloquine

CDC: 770-488-7788 or toll-free 855-8565-4713; 770- 488-7100 after hours)

Artemisinin combination therapy

- Artemisinins: most rapidly acting antimalarials
- Active against resistant *P. falciparum*
- Improved survival compared with quinine
- Given in combination with second (mefloquine, atovaquone-proguanil, lumefantrine, others)
- Resistance spreading in SE Asia

Drugs of choice for treatment of falciparum malaria



Treatment of falciparum malaria

- Oral therapy

- Artemether-lumefantrine

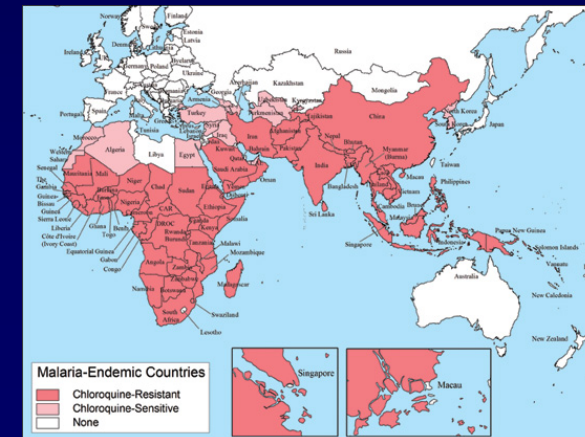
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- Chloroquine (sensitive strains)
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 - Atovaquone-proguanil

- Severe falciparum malaria

- IV artesunate (CDC)

- IV artesunate (CDC)



What prophylaxis do you recommend for 59-year-old who will spend 10 days traveling to Hanoi, Bangkok, and Singapore for business?

- Weekly chloroquine
- Daily doxycycline
- Weekly mefloquine
- Daily atovaquone-proguanil (Malarone^R)
- Tafenoquine
- None of the above

Malaria: chemoprophylaxis

- No chloroquine resistance: weekly (hydroxy-) chloroquine
- Chloroquine-resistance:
 - Doxycycline
 - Atovaquone-proguanil
 - Mefloquine (not border areas in SE Asia)
 - Tafenoquine



Note: chloroquine, doxycycline, mefloquine, atovaquone-proguanil do not prevent relapses of *P. vivax* or *ovale*

Tafenoquine for prevention of malaria

- Analog of primaquine (8-aminoquinoline)
- Approved by FDA 2018
- Active against all stages of parasite
- Once weekly dosing
- Contraindicated: pregnancy, G6PD deficient

Regimen Name	Timing	Dosage
Loading regimen	For each of the 3 days before travel to a malarious area	200 mg (2 of the 100 mg tablets) once <u>daily</u> for 3 days
Maintenance regimen	While in the malarious area	200 mg (2 of the 100 mg tablets) once <u>weekly</u> – start 7 days after the last loading regimen dose
Terminal prophylaxis regimen	In the week following exit from the malarious area	200 mg (2 of the 100 mg tablets) one-time 7 days after the last maintenance dose

MMWR
2019,68:1062

Prophylaxis: resistant *P. falciparum*

	Dose; duration <u>p</u> -travel	Adverse effects	Contra- indicated	Cost (2 weeks) (wholesale)
Doxycycline (not minocycline)	100 mg/d; + 4 wks	GI upset, photo- sensitivity, thrush	Children, pregnant mothers	\$65-240
Mefloquine (Lariam ^R)	250 mg/wk +4 wks	Neuro- psychiatric symptoms	Seizures, major psych- iatric or con- duction disord	\$85 (generic)
Atovoquone/ proguanil (Malarone ^R)	250/100 mg/d; + 7 days	Headache, abdominal pain, n/v	CrCl<30, $\pm$ pregnancy, breastfeeding	\$135
Tafenoquine	Load, then 200 mg/wk + 7d	GI upset	G6PD deficiency, pregnancy, psych dis	?

59-year-old will spend 10 days traveling to Hanoi, Bangkok, and Singapore for business

What do you recommend?

- Weekly chloroquine
- Daily doxycycline
- Weekly mefloquine
- Daily atovaquone-
(Malarone^R)
- None of the above

There is no transmission of malaria in any of these 3 cities



Mefloquine resistance

http://cdc.gov/malaria/map/

CDC Malaria Map Application

Home **Browser** Help

Search
Indian

☒ Search all populated places (~ 6 sec)

Country
[British Indian Ocean Territory, includes Diego Garcia \(UK\)](#)

Province
[Indiana, United States](#)

City
[Indianapolis, Indiana, United States](#)
[Indian Riv, Manitoba, Canada](#)
[Indianapolis, Alberta, Canada](#)
[Indian Harbour, Canada](#)
[Indian Head, Saskatchewan, Canada](#)

Alternative Color:
Choose a different color scheme:
Red yellow green

Map Legend:
Malaria everywhere
Malaria presence varies
No known malaria

You searched for province named Indiana, in the country of United States

Malaria in Province:

Province Name	Malaria in Province	Prophylaxis for this State/Province/District
Indiana	None	Not applicable

Malaria in Country:

Country Name	Malaria in Country	Drug Resistance	Malaria Type	Prophylaxis for Areas with Malaria
United States	None	Not applicable	Not applicable	Not applicable

Contact Us / Feedback

1 2 3 4 5 6 7 8 9 10

Province Name		Malaria in Province	Prophylaxis for this State/Province/District	
Hanoi		None in the Red River delta and none in the city of Hanoi.	Not applicable	

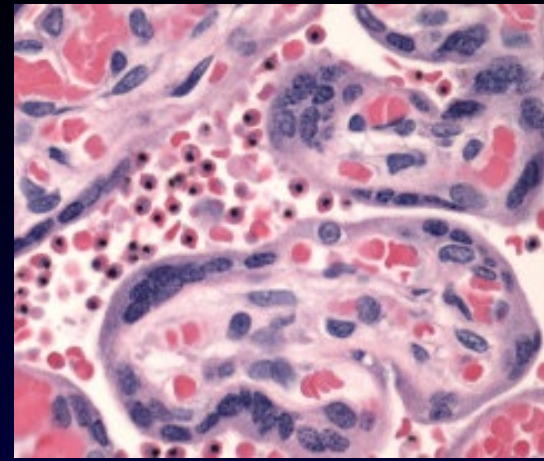
32 year old woman, 27th week of pregnancy, traveling to rural India

What do you recommend?

1. Weekly chloroquine
2. Daily doxycycline
3. Weekly mefloquine
4. Daily atovaquone-proguanil (Malarone^R)
5. None of the above

1. Weekly chloroquine
2. Daily doxycycline
3. Weekly mefloquine
4. Daily atovaquone-proguanil (Malarone^R)
5. None of the above

2nd best answer=3



Malaria Journal 2012 11:150

Malaria, especially falciparum malaria, is more serious among pregnant women than woman who are not; there is chloroquine resistance in India, and of the other drugs, only mefloquine is safe during pregnancy (Schlagenhauf P, et al. *Travel Med* Nov 2019).

23-year old woman with fever and rash 3 days after returning from vacation in Bahia, Brazil

- Abrupt onset: fever, chills, headache, myalgia, arthralgia
- Temperature 102° F, diffuse rash, lymphadenopathy
- WBC 3400 with normal platelets 120,000

Differential diagnosis?



Diagnosis?

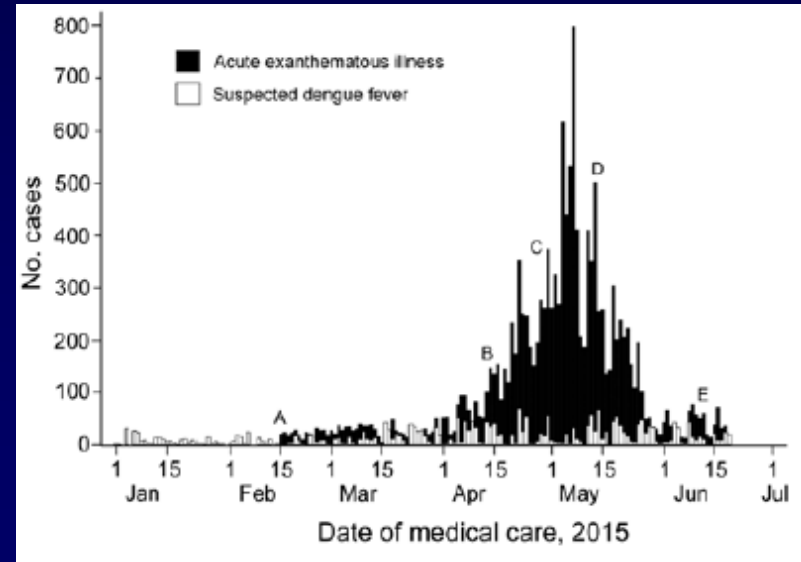
- Dengue
- Chikungunya
- Zika
- Acute HIV
- EBV
- Measles
- Rubella
- Parvovirus
- Enteroviruses
- Rickettsial infection
- Gr A streptococcus
- Syphilis
- Typhoid
- Leptospirosis
- Drug reaction
- Other

23 year old woman with fever and rash

- Clinical diagnosis: dengue
- Confirmed retrospectively with serology (IgG, IgM)
- Afebrile on 7th day; prolonged fatigue for several weeks

Outbreak of Exanthematous Illness Associated with Zika, Chikungunya, and Dengue Viruses, Salvador, Brazil

Cristiane W. Cardoso,¹ Igor A.D. Paploski,¹
Mariana Kikuti, Moreno S. Rodrigues,
Monaise M.O. Silva, Gubio S. Campos,
Silvia I. Sardi, Uriel Kitron, Mitermayer G. Reis,
Guilherme S. Ribeiro



Classic dengue

- Incubation period 1-7 days, up to 14⁺ days
- 5-7 days of fever; often biphasic
- Rash in ~50%: flushlike, later macular or morbilliform
- Serologic tests negative during first 5-7 day
 - CDC: symptoms $\leq$ 5 days: PCR
 - CDC: symptoms $>$ 5 days: IgM antibody test

Chikungunya

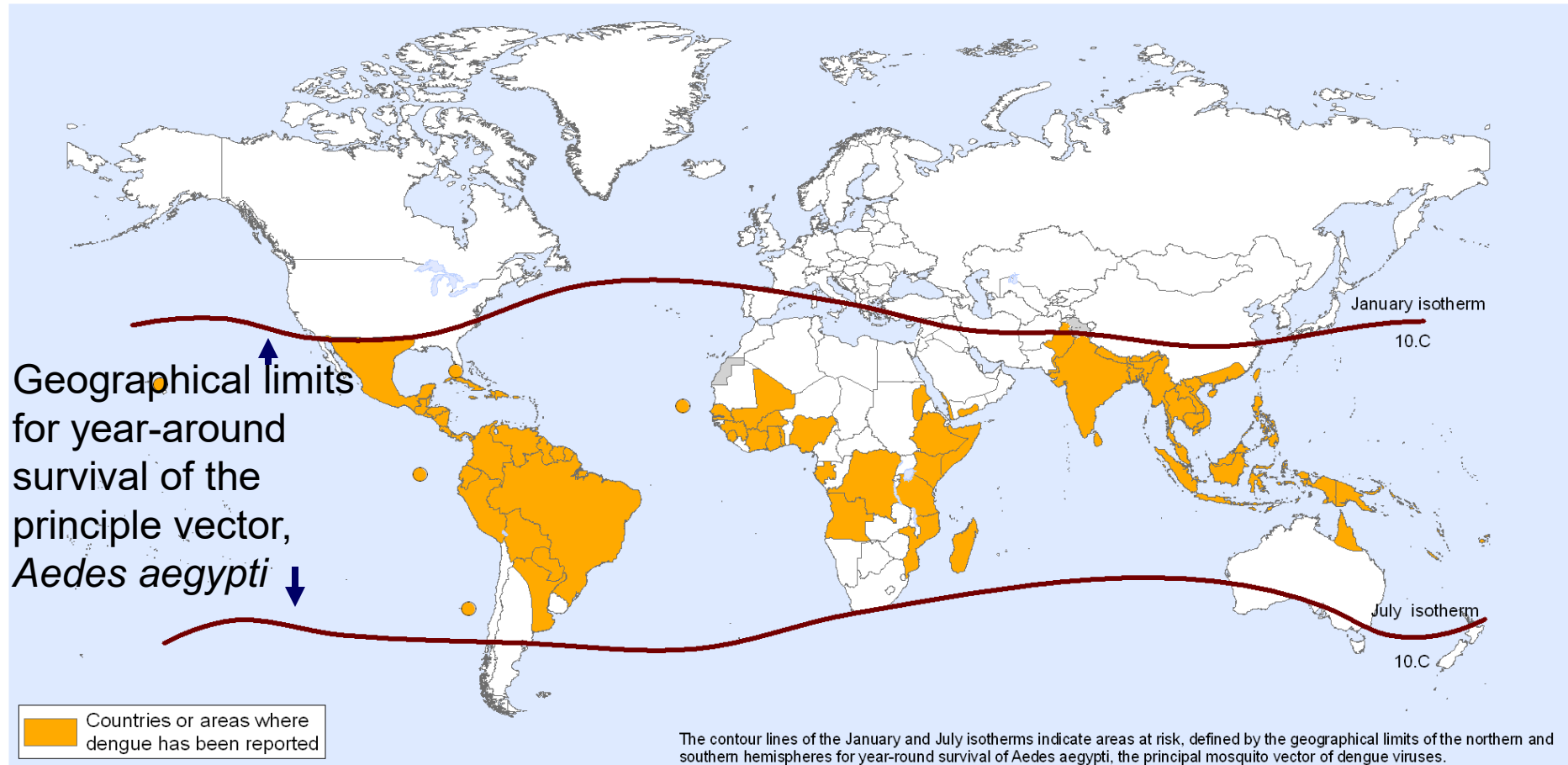
- ‘That which bends up’ in the Kimakonde language of Mozambique’
- Dengue-like illness except $\geq 1/3$ patients have incapacitating arthralgia/arthritis lasting months or years

Zika

- Like dengue + joint swelling, conjunctivitis
- Infection during pregnancy: microcephaly, fetal brain defects
- Increase in Guillain-Barre syndrome
- Sexual transmission

Clinical differentiation of dengue, zika, and chikungunya, difficult: avoid NSAIDs

Dengue 2019 (estimated 50-100 million cases/year)



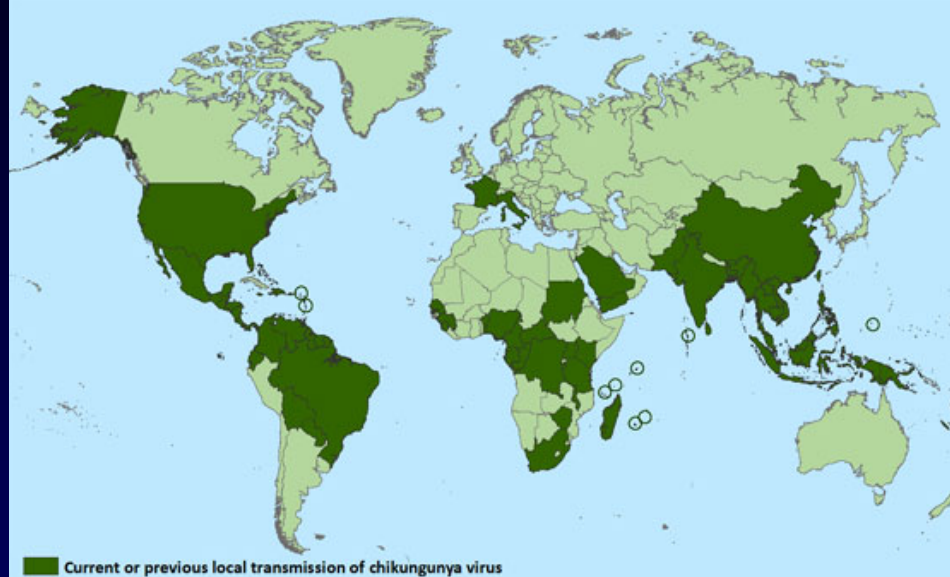
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization

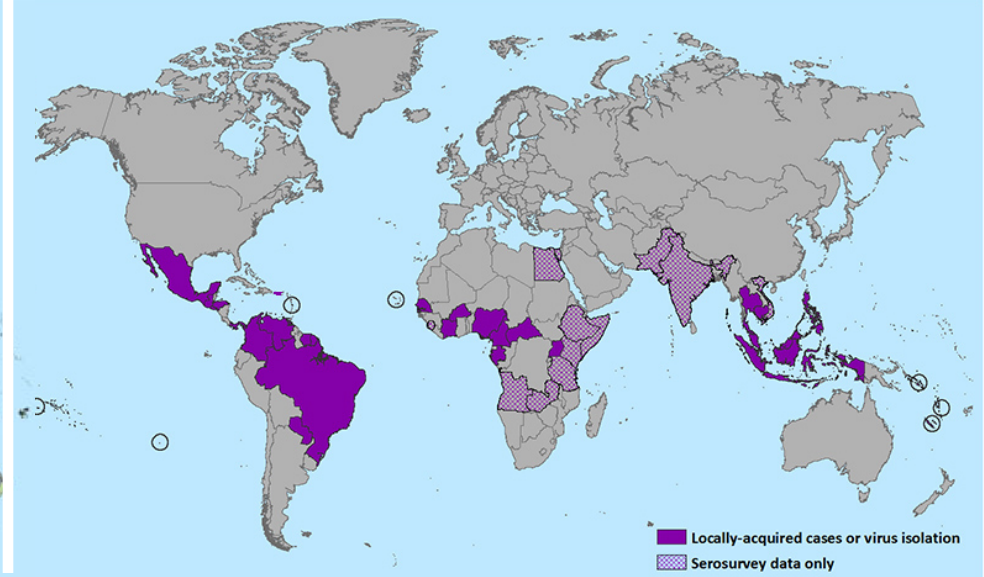


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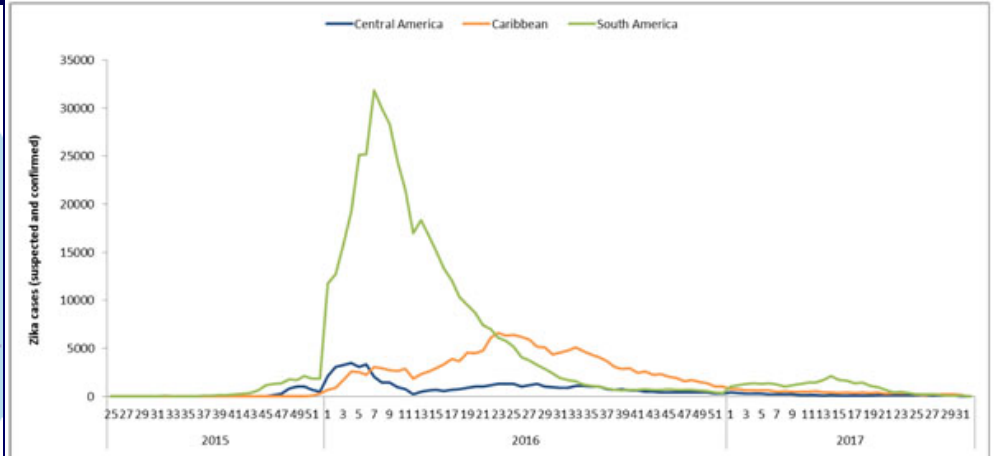
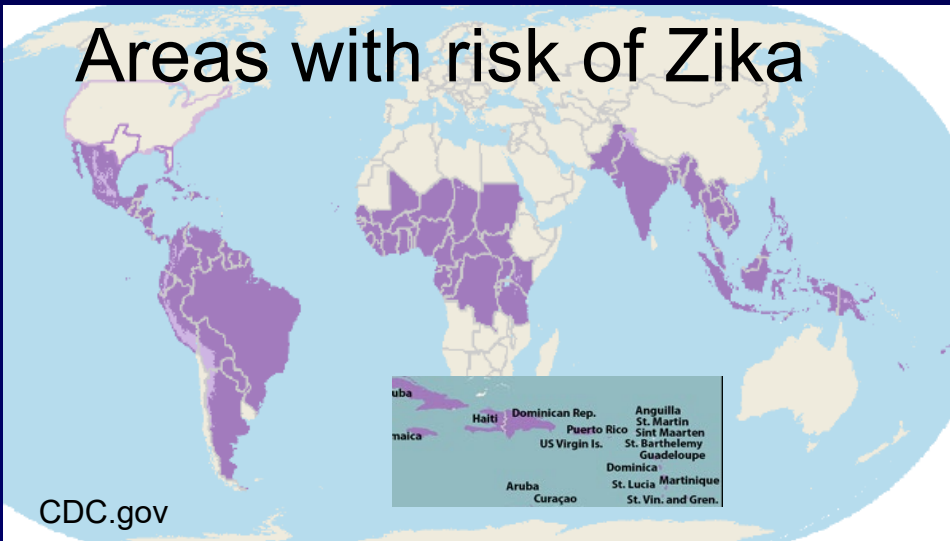
Countries and territories where chikungunya cases have been reported



Countries and territories where Zika cases have been reported

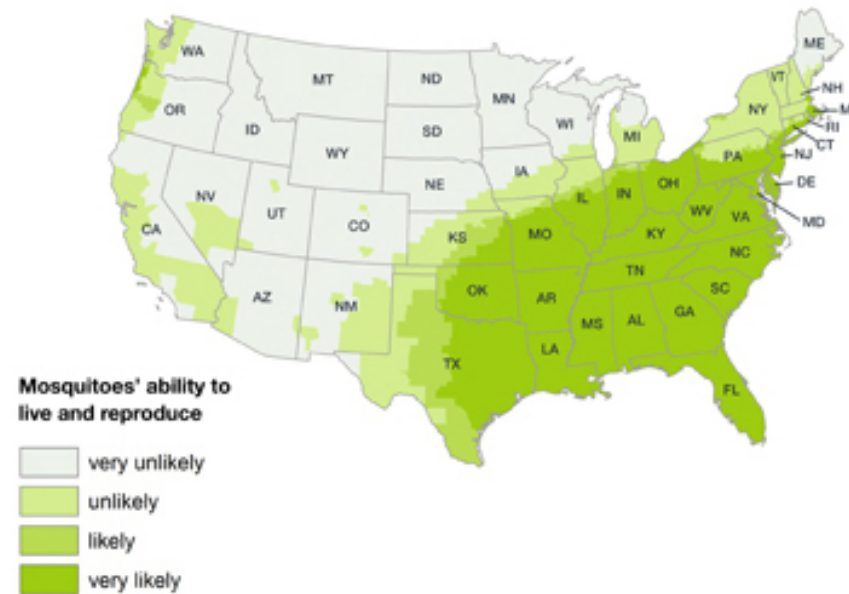
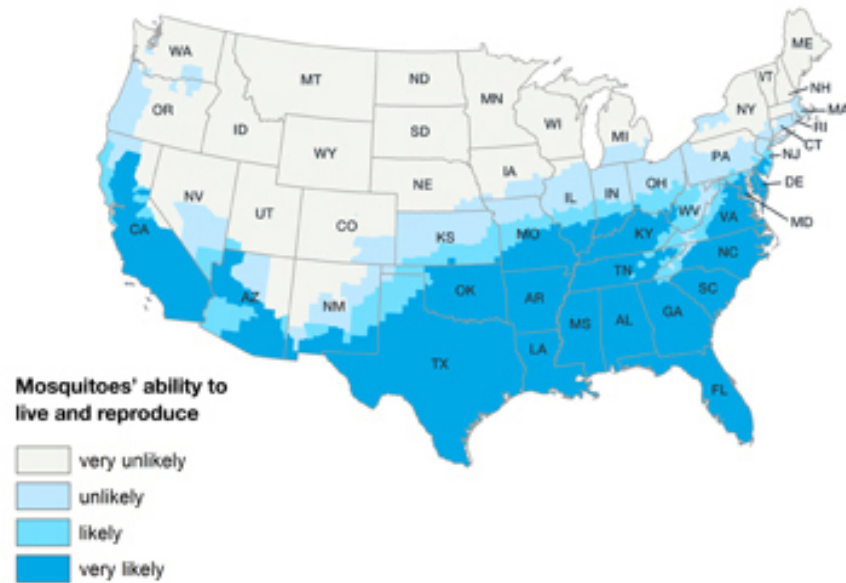


Areas with risk of Zika



Zika: Americas 2015-17 (www.paho.org)

Approximate ranges of *Aedes aegypti* and *A. albopictus* in the United States, 2017 (CDC)



Symptoms of Zika

Many people won't have symptoms or even know they are infected with the virus. The illness is usually mild with symptoms lasting for several days to a week.

Zika can also be sexually transmitted from an infected person to his or her male or female partners, so travelers should use condoms.

Pregnant?

- Do not travel to areas with Zika.
- If you must travel to these areas, talk to your doctor first.
- Strictly follow steps to prevent mosquito bites during your trip.

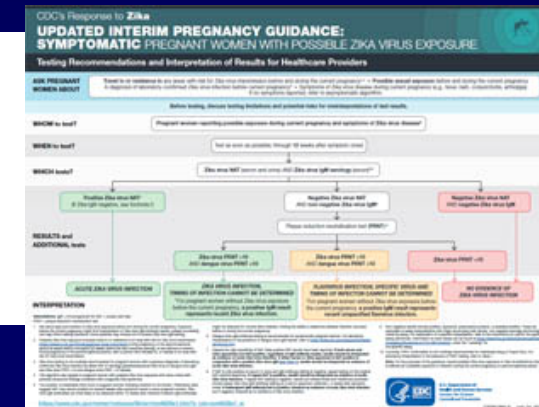


Trying to become pregnant?

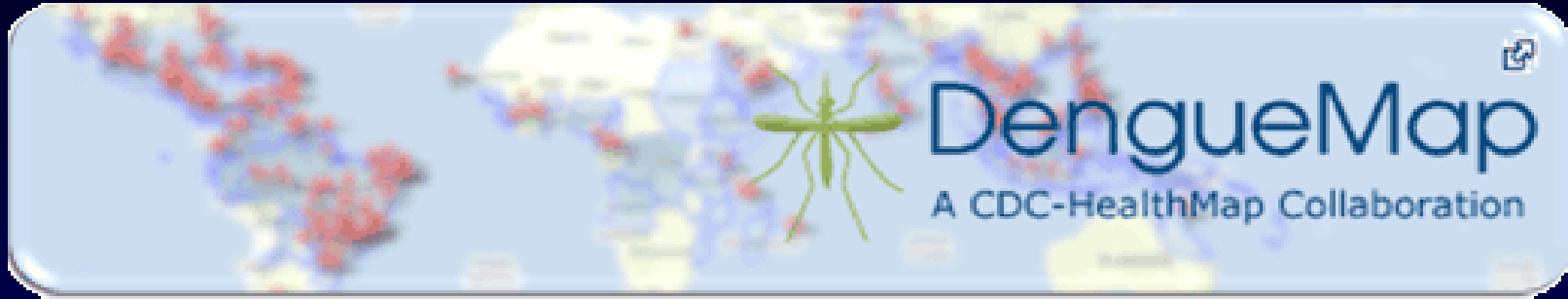
- Before you travel, talk to your doctor about your plans to become pregnant and the risk of getting Zika.
- Strictly follow steps to prevent mosquito bites during your trip.

Morbidity and Mortality Weekly Report

Update: Interim Guidance for Health Care Providers Caring for Pregnant Women with Possible Zika Virus Exposure — United States (Including U.S. Territories), July 2017



The following year, she tells you she is traveling to the Philippines. CDC's Dengue Outbreak Notice reports 1000's of cases



[CDC.gov/dengue](https://www.cdc.gov/dengue)

Endemic areas, outbreaks

The following year, she tells you she is traveling to the Philippines. CDC's Dengue Outbreak Notice reports 1000's of cases

What do you recommend?

1. Quadrivalent dengue vaccine
2. Prophylactic plecornaril
3. Protection against daytime-biting mosquitoes
4. Protection against nighttime-biting mosquitoes
5. Don't go

1. Quadrivalent dengue vaccine **
2. Prophylactic plecornaril
3. Protection against daytime-biting mosquitoes
4. Protection against nighttime-biting mosquitoes
5. Don't go * Not an option she tells you

Dengue shock syndrome/dengue hemorrhagic fever after second infection; rare in travelers

** Note: FDA approved live-attenuated quadrivalent dengue vaccine (Dengvaxia™) for persons 9-16 years of age with laboratory confirmed history of dengue)

Prevention of insect bites



- CDC: most efficacious repellents:
 - DEET (N,N-diethyl-m-toluamide)
 - Effect plateaus around 50%
 - 25%-35%: ~4-5 hr
 - Picaridin (KBR 3023): $\geq 20\%$
 - Oil of eucalyptus
- Treatment of outer clothing with permethrin
- Air-conditioning, otherwise permethrin-impregnated bed net > aerosol insecticide or coils

52 year old woman with fever and painless sore on leg

- Returned from safari in South Africa 6 days earlier
- Flu-like symptoms: headache, myalgia
- Eschar on upper thigh, inguinal lymphadenopathy



Diagnosis?

1. Cutaneous leishmaniasis
2. Cutaneous anthrax
3. MRSA
4. African tick bite fever
5. African wolf spider bite

Diagnosis?

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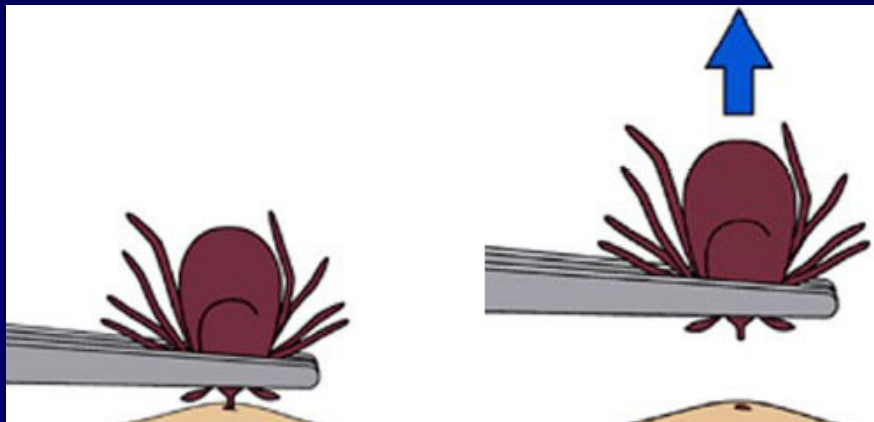
African tick-bite fever

- *Rickettsia africae*
- Transmitted by ticks (*Amblyomma*)
- Rural sub-Saharan Africa, especially Southern Africa; French West Indies
 - 4% to 5% attack rate during safari tours
 - Often in clusters
- Diagnosis confirmed by serology
- Treatment: doxycycline 100 mg/d x 7-10 days



African tick bite fever: prevention

- DEET repels the tick for only 1-2 hrs;
- Best protection: preventive clothing with permethrin
- Check for ticks
- Remove attached ticks promptly
- Weekly doxycycline prevents scrub typhus, but data not available for prevention of African tick bite fever



CDC.gov

42 year old man with diarrhea after travel to Thailand

- Chills, cramps, watery diarrhea on return flight
- Self-treated with levofloxacin
- Markedly improved after 7 days; one loose stool/day
- 24 hours after stopping levofloxacin: chills, diarrhea, crampy abdominal pain

42 year old man with diarrhea after travel to Thailand

Most likely diagnosis?

- Treatment failure
- Amebic dysentery
- *Clostridioides difficile* colitis
- Falciparum malaria

42 year old man with diarrhea after travel to Thailand

- Fecal leukocytes: few/hpf
- Stool for ova and parasites: negative
- Assay for *C. difficile* toxin: negative
- Stool culture: Campylobacter resistant to quinolones

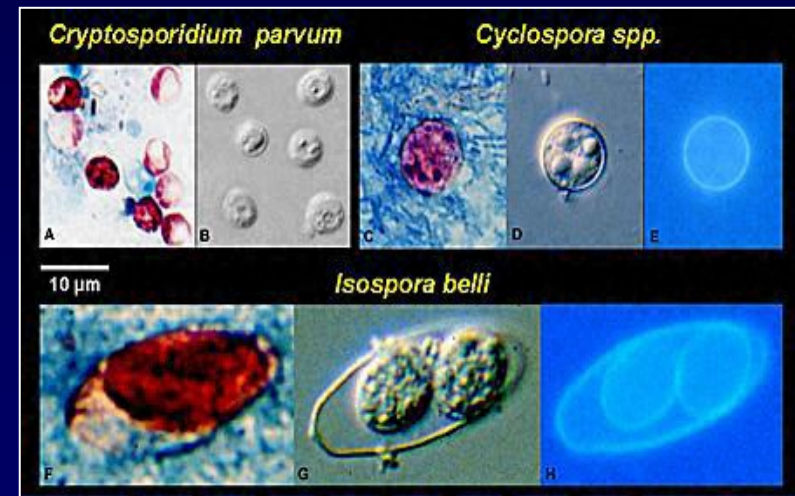
Treatment: azithromycin 1 gm po
Acute illness subsides, but 6 months later
he still has frequent loose stools, cramps

Persistent travelers' diarrhea

- Diarrhea lasting > 2-3 weeks
- Six months following bout of diarrhea, 6-18% experience chronic GI symptoms
- Three major categories:
 - Infections
 - Chronic gastrointestinal disease unmasked by enteric infection (e.g., inflammatory bowel disease, celiac sprue)
 - Post-infectious processes

Persistent travelers' diarrhea: infectious causes

- Protozoan infections most common (Giardia, Cryptosporidium, Cyclospora, Cystoisospora, *Entamoeba histolytica*)
- Helminths less common: Strongyloides, Schistosoma
- Bacteria: *C. difficile*, *coli*; tropical sprue
- Multi-pathogen molecular assays available



CDC-DPDx

Persistent travelers' diarrhea: post-infectious causes

- Post-infectious malabsorption
 - Lactase deficiency
 - Bacterial overgrowth
- Post-infectious irritable bowel syndrome

Our patient: probable irritable bowel syndrome

Diarrhea: strategies for travelers

Prevention

- Food & beverages
 - “Boil it, cook it, peel it or forget it!”
 - Easier said than done
- Hand hygiene
- Chemoprophylaxis (high risk travelers)
 - Bismuth subsalicylate (65% protection)
 - Rifaximin (70-80% protection)
 - Fluoroquinolones (effective, not recommended)
 - ETEC vaccines

Empirical treatment

- Fluids
- Loperamide 4 mg x1, then 2 mg for each loose stool up to 16 mg/day; not in dysentery)
- Bismuth subsalicylate
+/-
- Antibiotics (severe cases)
 - Azithromycin 1gm x1; 500 mg x 1 + loperamide; 500 mg x 3days
 - Nondysenteric cases
Rifaximin 200 mg TID x3 days (max); fluoro-quinolones x1 or x3d

Antimicrobials Increase Travelers' Risk of Colonization by Extended-Spectrum Betalactamase-Producing *Enterobacteriaceae*

Anu Kantele,^{1,2,3,4} Tinja Lääveri,^{1,2} Sointu Mero,⁵ Katri Vilkkman,^{2,3} Sari H. Pakkanen,³ Jukka Ollgren,⁶ Jenni Antikainen,⁵ and Juha Kirveskari⁵

¹Department of Clinical Medicine, University of Helsinki, ²Division of Infectious Diseases, Department of Medicine, Helsinki University Hospital, and ³Department of Bacteriology and Immunology, University of Helsinki, ⁴Aava Travel Clinic, Medical Centre Aava, ⁵Department of Clinical Microbiology, Helsinki University Hospital, University of Helsinki, and ⁶National Institute for Health and Welfare, Helsinki, Finland

In South Asia, 80% of travelers who received antibiotics for treatment of travelers' diarrhea became colonized with ESBL-producing bacteria

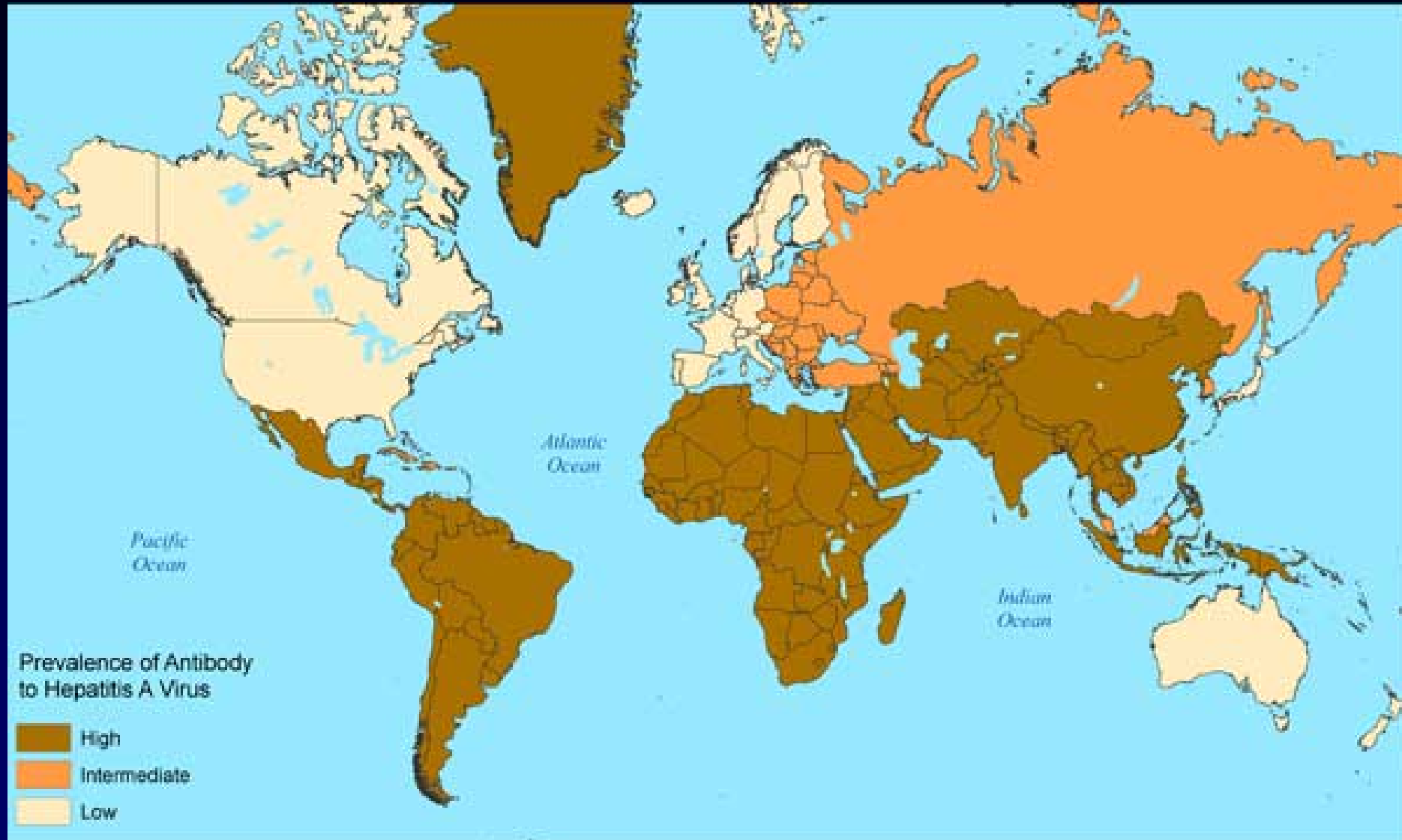
Clin Infect Dis 2015; 60:837

See also: J Travel Med Nov 28, 2019

Vaccines for travelers

- All travelers should be up-to-date: TDAP, MMR, influenza, pneumococcal, varicella, zoster, hepatitis B
- Consider:
 - Hepatitis A
 - Typhoid
 - Cholera
 - Yellow fever
 - Japanese encephalitis
 - Tickborne encephalitis
 - Rabies
 - Meningococcal
 - Inactivated polio
 - Plague
 - Dengue

Prevalence of antibodies to hepatitis A



Prevention of Hepatitis A

- Monovalent vaccines (HAVRIX, VAQTA): 2 doses, at least 6 months apart
- Bivalent vaccine (Twinrix): 3 doses (0, 1, 6 months) or 4 doses (accelerated schedule-0, 7, 21 days and 1 year)
- No additional doses recommended at present
- IgG: travel in < 2 weeks, especially in older adults, immune compromised, chronic liver disease, other medical conditions. Can be given at same time as vaccine.

Neisseria meningitidis: quadrivalent vaccine

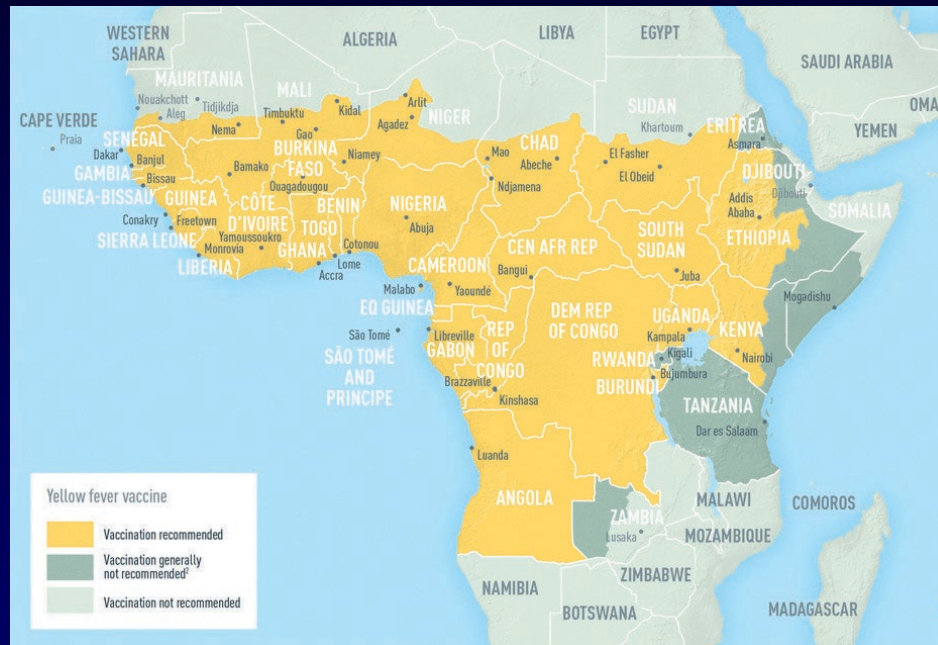


- Meningitis belt (December-June)
- Hajj and Umrah pilgrimage (required)
- Prolonged contact in endemic areas

Meningococcal vaccine

- MCV4 (conjugate vaccine not polysaccharide): all travelers)
- Group B vaccine recommended only for high risk persons (asplenia, complement deficiency/eculizumab, outbreaks, certain laboratory workers)
- Revaccinate every 5 years
- Protective antibodies in 7-10 days

Areas with Risk of Yellow Fever Virus Transmission

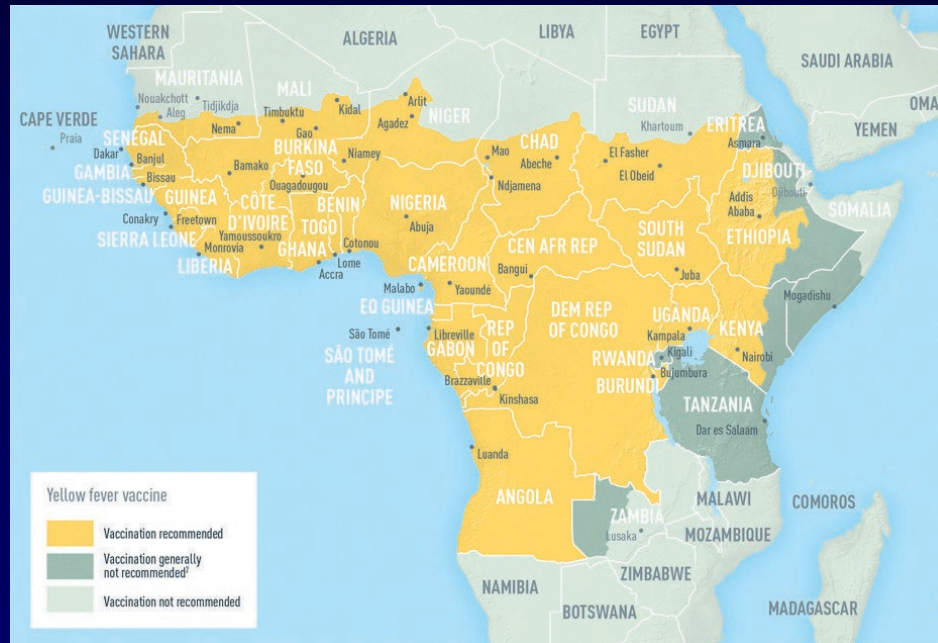


CDC.gov



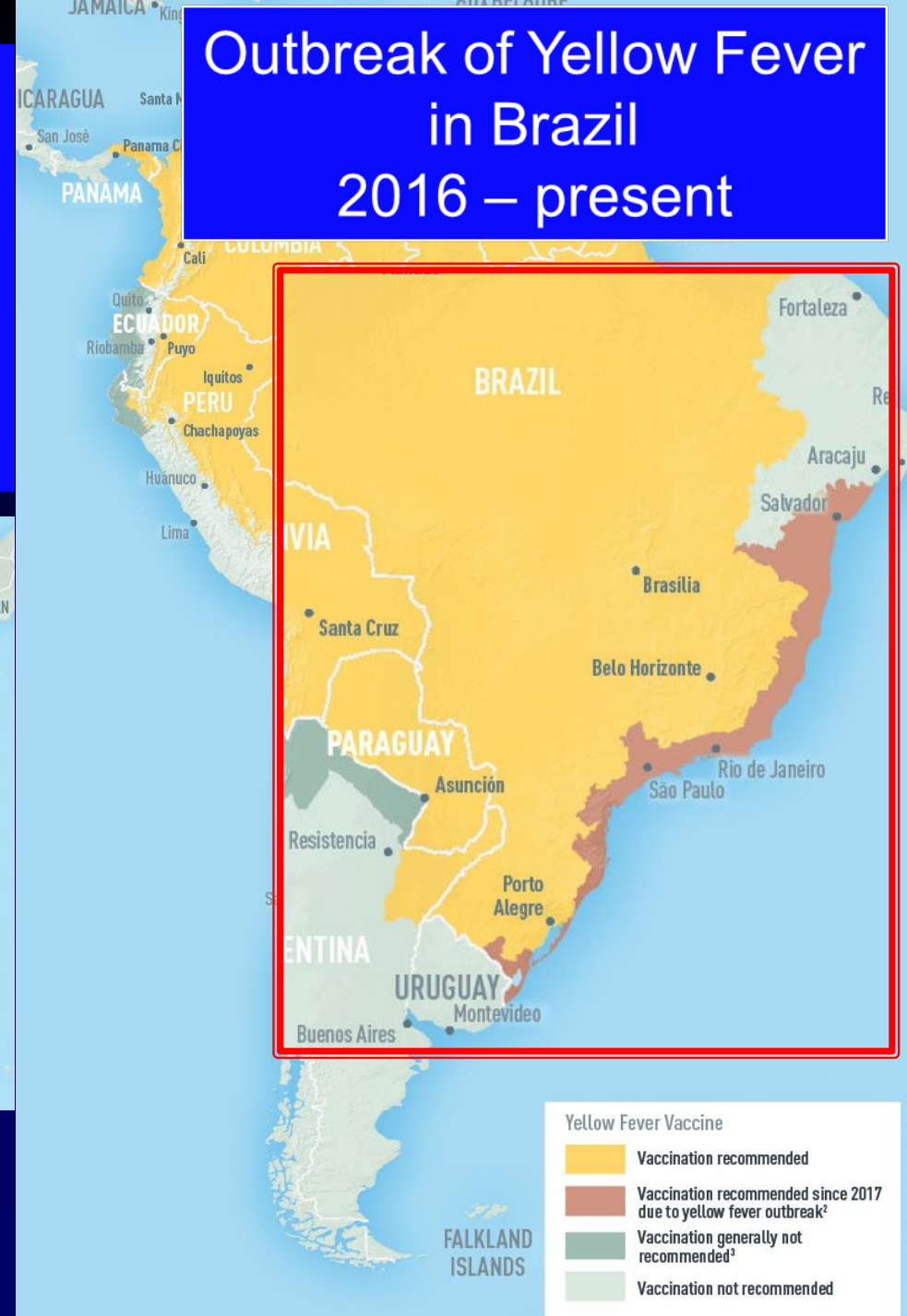
2017

Yellow Fever Vaccine
shortage mid-2017 to
2018 (9): consult CDC
([cdc.gov/travel/page/search-for-stamaril-clinics](https://www.cdc.gov/travel/page/search-for-stamaril-clinics))



CDC.gov

Outbreak of Yellow Fever
in Brazil
2016 – present



Yellow fever vaccine

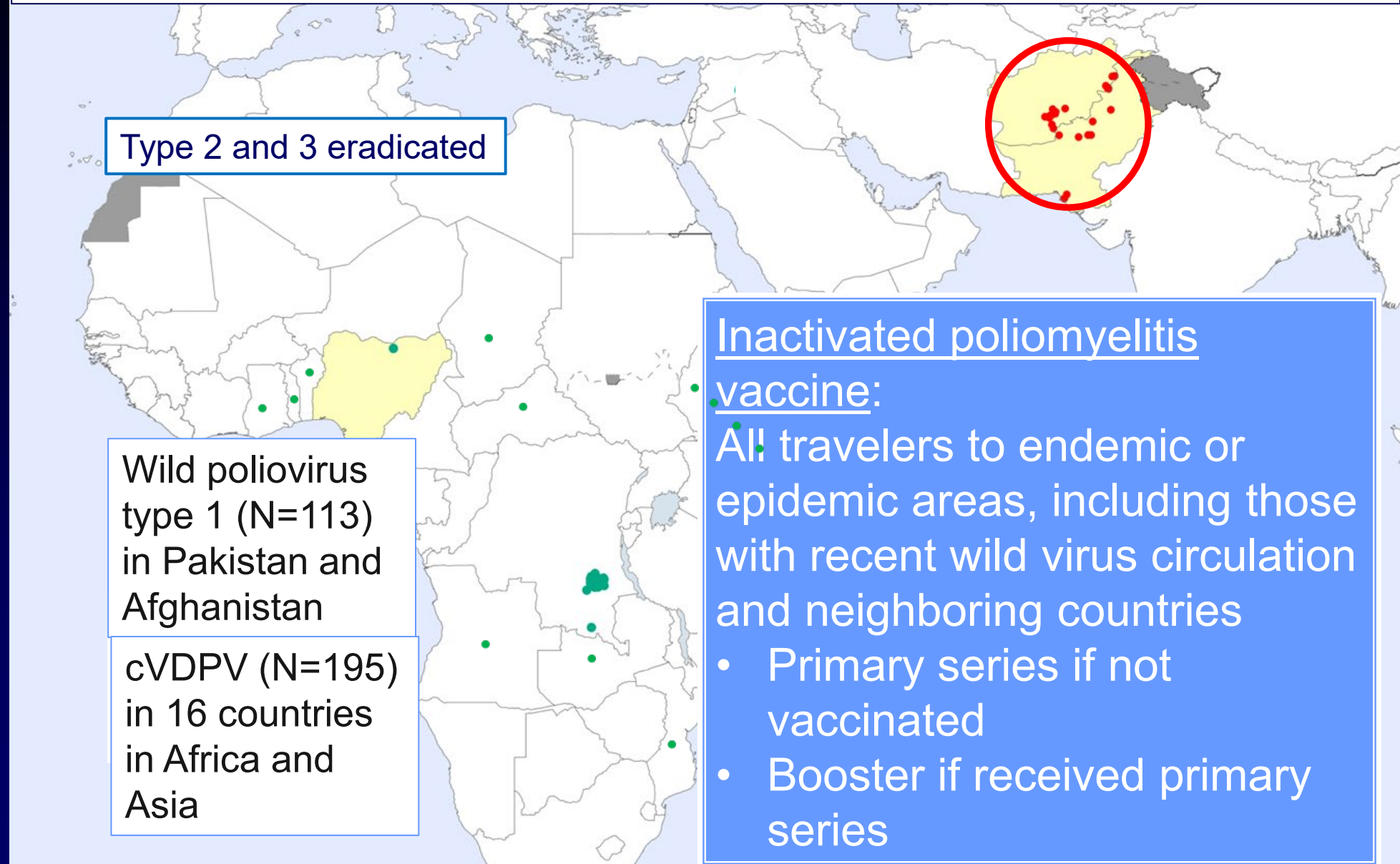
- Travel to endemic areas or requiring proof of vaccination for entry to country
- Contraindications: hypersensitivity to egg or chicken proteins, immune suppression, age under 9 months
- Precautions (weigh risks and benefits): age > 60 years, asymptomatic HIV infection, pregnancy, breastfeeding
- Vaccinate at least 10 days before travel; no need to revaccinate according to WHO but need to check each country's regulations.

Typhoid fever

- Risk in South Asia 6 to 30 times higher than East and Southeast Asia, Africa, the Caribbean, and Central and South America
- Oral live attenuated Ty21a vaccine: 1 capsule orally q 48 hrs x4; boost every 5 years
- Vi capsular polysaccharide vaccine: intramuscular injection every 2 years
- Protection: 50-80%; not paratyphoid fever

Wild poliovirus & cVDPV cases, 2019

January – December



Oral live attenuated cholera vaccine (CVD 103-HgR)

- Approved in the United States 2016
- Single oral dose administered at least 8 days before exposure; cost around \$225
- Affective against *Vibrio cholerae* 01 but not 0139 strains; protection lasts 3-6 mos.
- Cholera rarely identified in US travelers
- Currently recommended for persons traveling to areas with acute and uncontrolled outbreaks, especially for aid and refugee workers

Subclinical chronic infections of immigrants and returning long-term expatriates

Healthy, asymptomatic immigrants from endemic areas should be screened for which of the following?

- Tuberculosis
- HIV
- Hepatitis B
- Chagas' disease
- Strongyloidiasis
- Schistosomiasis
- Cysticercosis

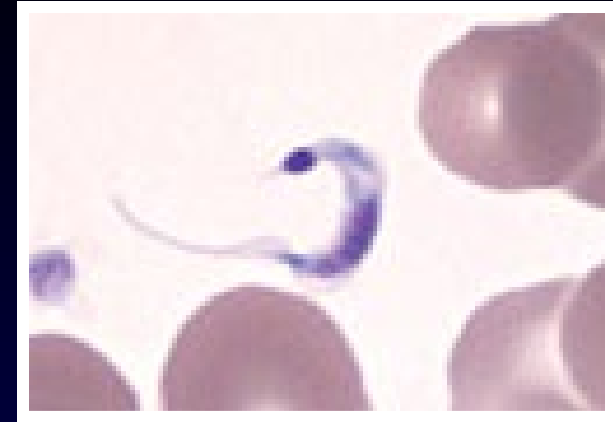
Subclinical chronic infections of immigrants and returning long-term expatriates

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Case history

27 y.o. immigrant from rural Salvador receives a letter donating blood at her local blood bank. tested positive for infection with *Trypanosoma cruzi*.



She has no symptoms. Physical examination is negative. CBC, diff, LFTs are all normal

Does she have Chagas disease?

Does she need further evaluation or treatment?

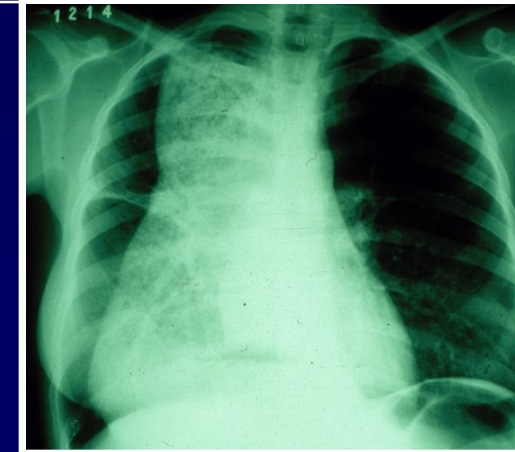
Chagas disease (American trypanosomiasis)

- ~250,000 immigrants with *T. cruzi* infection in US
- Most unaware of infection
- US blood banks screening blood donors
- Diagnosis
 - History of exposure: Latin America, not Caribbean; poor housing; history of blood transfusion; infected mother or sibling
 - Serology: 2 or more tests (IFA, ELISA, Western blot, etc.)



Chronic Chagas disease

- 70-80%: subclinical
- 20-30%: decades later
 - Chronic cardiomyopathy: CHF, arrhythmias (sudden death), heart block, thromboembolism; RBBB
 - Mega-esophagus, -colon
 - Reactivation in HIV-infected, other immune suppressed: CNS lesions mimic toxoplasmosis, acute myocarditis
- Congenital transmission
- Treatment: nifurtimox (CDC), benznidazole (FDA-approved)



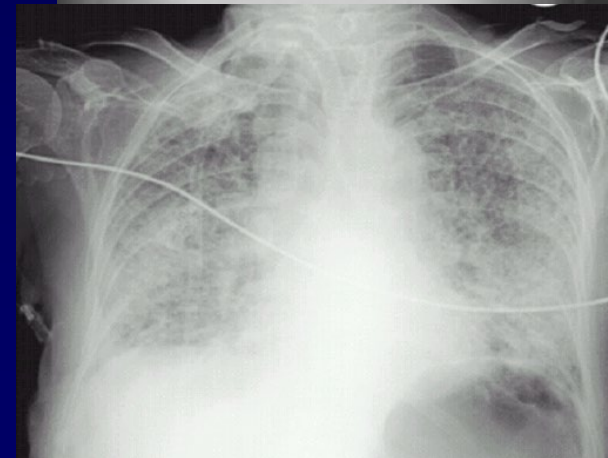
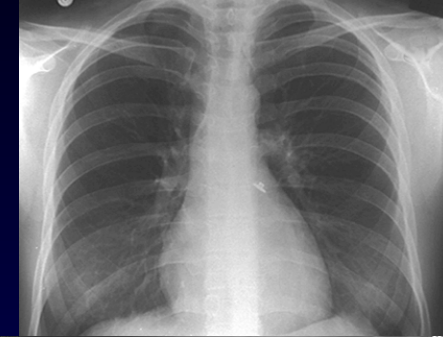
Megaesophagus

Treatment of *T. cruzi* infection

- Always offer:
 - Acute, congenital, reactivated infection in immunocompromised host
 - Persons < 18 years
 - Women of childbearing age
- Consider: other persons 18-50 years of age (without advanced cardiomyopathy)
- Not offer: advanced cardiomyopathy
- Nifurtimox: CDC, FDA IND; benznidazole, FDA approved; available from supplier (<https://www.benznidazoletablets.com/en/>)

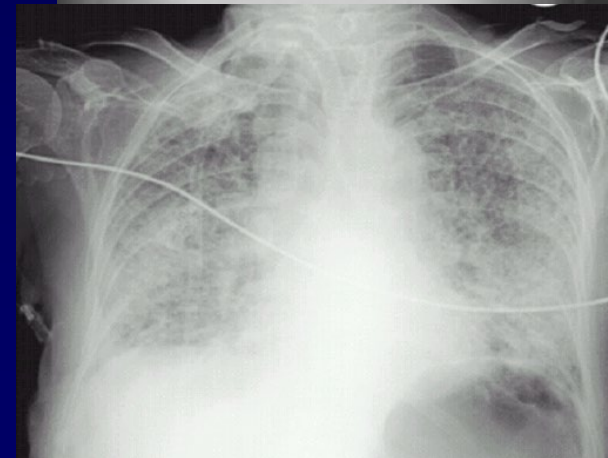
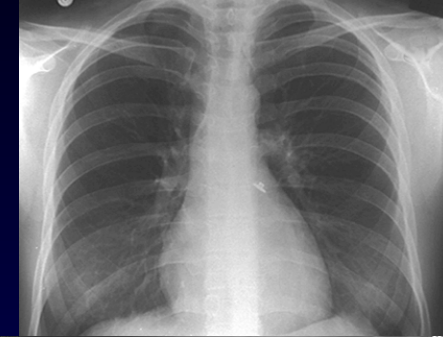
32 yr old man from Ecuador, in US x 8 yrs

- Evaluation for kidney transplant
 - Epigastric pain
 - Endoscopy: duodenitis
 - WBC 7900, 9% eosinophils
- 6 weeks after renal allograft:
 - Temp 102.5°
 - Abdominal pain
 - Diarrhea (heme +)
 - Blood cultures+ for *E. coli*
 - Broad spectrum antibiotics
 - Progressive respiratory failure



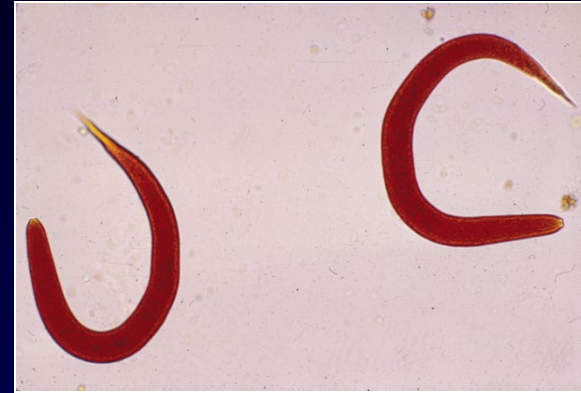
32 yr old man from Ecuador, in US x 8 yrs

- Evaluation for kidney **Diagnosis?**
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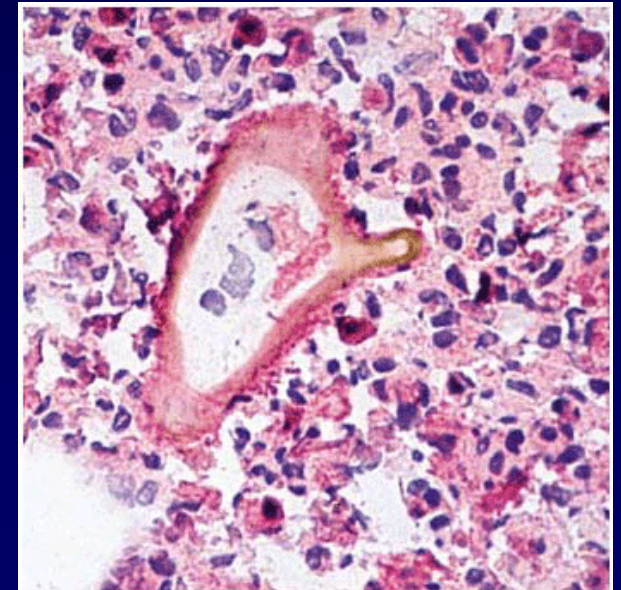
Strongyloides stercoralis

- Able to complete life cycle in host without exogenous reinfection
 - Infection life-long
 - Eosinophilia in >75%
 - Potential for life threatening hyperinfection/dissemination (corticosteroids, HTLV-1>>>HIV, malnutrition)
- Diagnosis: microscopic examination (stool, secretions, CSF), serology
- Treatment: ivermectin



25 year old woman with seizure

- Spent a semester in Ghana
- Avoided swimming in fresh water
- 4 years later: seizure
- MR of brain: suspicious for tumor
- Craniotomy
- After diagnosis made recalled walking barefoot along the side of a river one afternoon



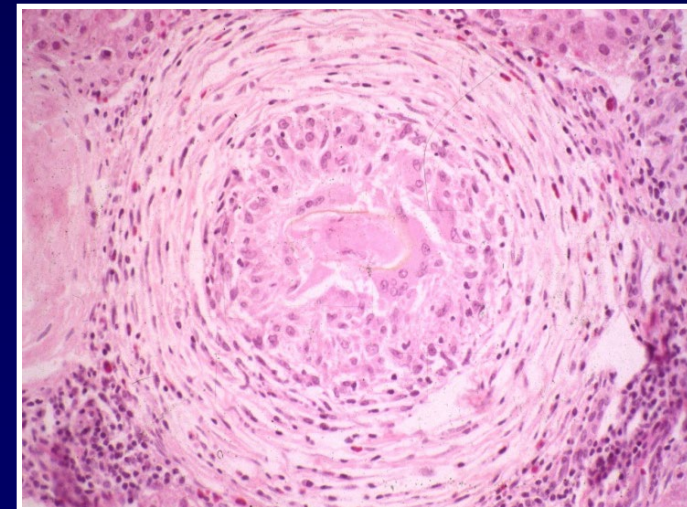
Schistosoma mansoni

Schistosomiasis

- Contact with snail-infested fresh water
- Acute infection: first exposure, fever, eosinophilia, urticaria, abdominal pain, cough
- Chronic disease: granulomatous response to eggs in tissue, fibrosis
- Multiple complications including ectopic egg deposition with disastrous complications (spinal cord, central nervous system)
- Diagnosis:
 - Eggs in stool/urine
 - Serology
- Treatment: praziquantel



Schistosoma mansoni



Skin lesions in returning travelers

- Teenager with an itchy rash
- Developed after 10-day vacation in Trinidad
- Worsened despite 7-days of amoxicillin



Diagnosis?



Cutaneous larva migrans (creeping eruption)

Cutaneous larva migrans (creeping eruption)

- Infection with dog or cat hookworms (*Ancylostoma braziliensis*, others)
- Contact of bare skin with contaminated, usually sandy, soil
- Diagnosis: clinical
- Treatment
 - ivermectin 200 mcg/kg PO QD x1-2 days
 - albendazole 400 mg PO QD x3 days

Cutaneous lesions in returning travelers

- Cutaneous larva migrans — 25 percent
- Pyoderma — 18 percent
- Arthropod-reactive dermatitis — 10 percent
- Myiasis — 9 percent
- Tungiasis — 6 percent
- Urticaria — 5 percent
- Fever and rash — 4 percent
- Cutaneous leishmaniasis — 3 percent

Healthy 47-year-old man with skin lesions

- One week earlier he left West Africa
- 5 days in five-star hotel, ate only hotel food, slept in an air-conditioned room with the windows closed
- He walked on the beach outside the hotel, swam in the chlorinated hotel pool, and lounged on wooden cots near the pool
- No history of insect bites, but sensation of bites and small red bumps on his buttocks and thighs

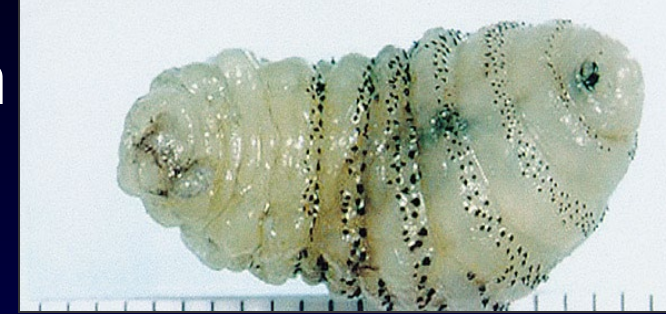


- On flight to US: numerous boils several centimeters in diameter; unable to sit because of pain
- Back in US, lesions increasing in size in front of his eyes
- In EW reports things moving inside, blowing bubbles in bath tub

Diagnosis?

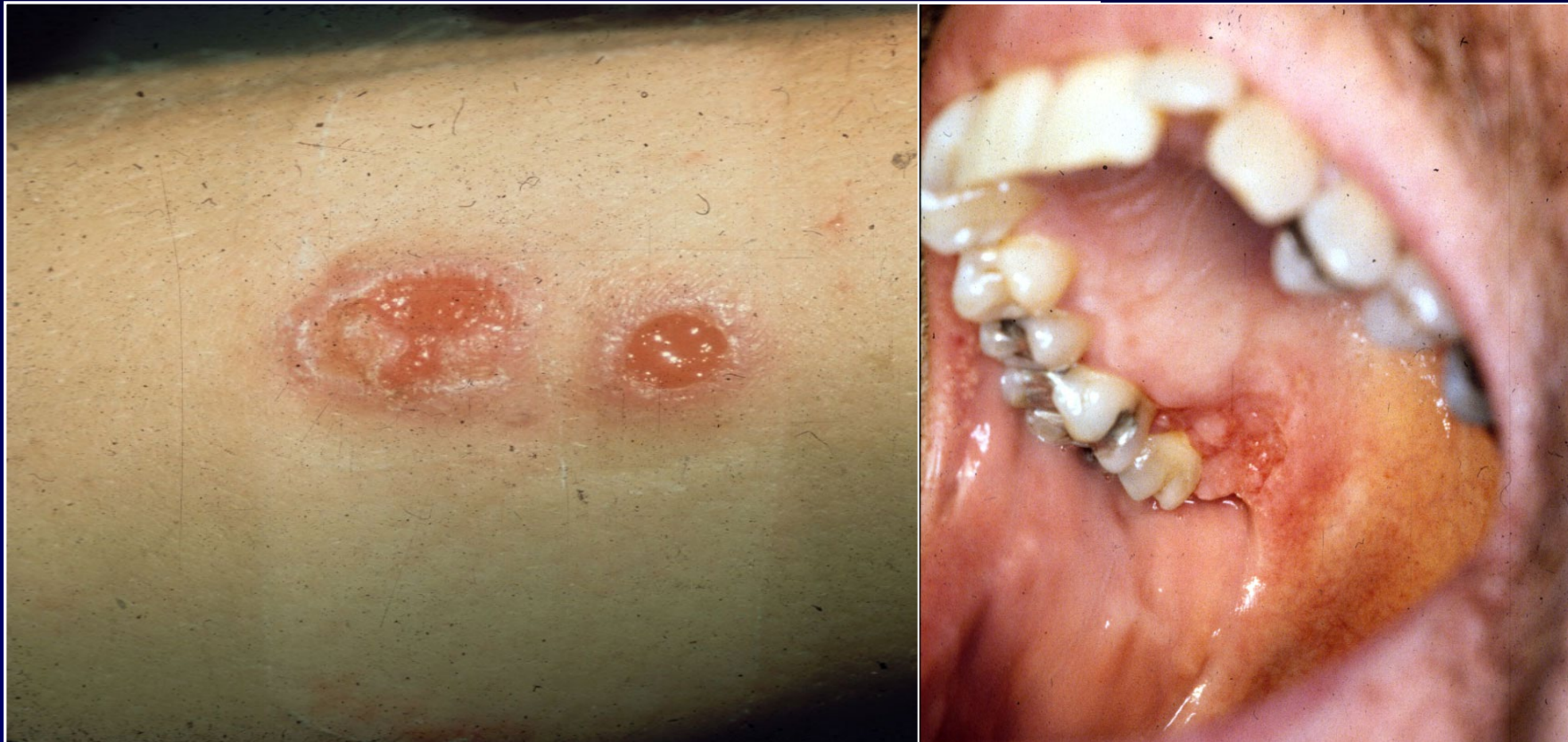
Furuncular myiasis (infestation with maggots--fly larvae)

- Tumbu fly: (*Cordylobia anthropaga*): sub-Saharan Africa
 - Eggs deposited on sandy or clothes contaminated with urine or sweat
 - Larvae hatch, penetrate skin to subcutaneous tissue where they feed and grow
 - Larval chamber becomes boil-like and inflamed
 - 10-14 days later mature larvae falls out of lesion, pupates on ground
- Human botfly (*Dermatobia hominis*): Latin America
- Treatment: extraction (squeezing, suffocation; excision)



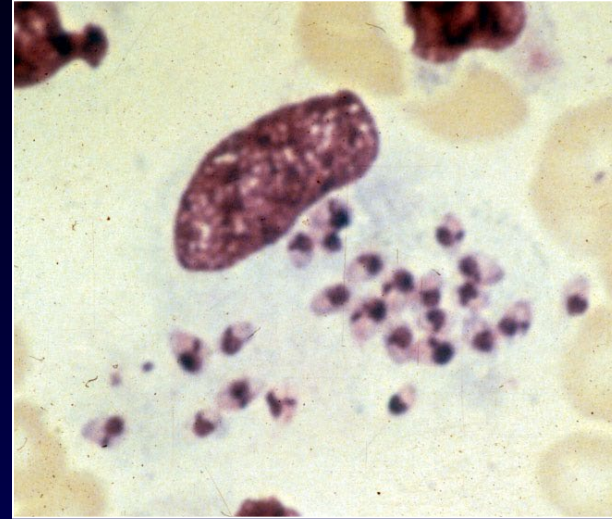
45-year old biologist worked in Peruvian forest

- Age 30 years: received 10 days of injections for painless, slowly expanding ulcers
- Lesions healed in ~2 months
- 15 years later presents with mouth ulcer



Leishmaniasis (Leishmania braziliensis)

- Diagnosis: biopsy, scrapings, aspirate for intracellular organisms
- Treatment: lipid-associated amphotericin compounds, parenteral pentavalent antimony, miltefosine
- Complication: mucosal leishmaniasis



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