Clinical Approach to the Returning Traveler

Kris Paolino, MD
Chief, Clinical Trials Center
Walter Reed Army Institute of Research

Infectious Diseases Staff Physician

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UNCLASSIFIED

- Thank You to:
  - COL Stephen Thomas
  - CAPT (Ret) Philip Coyne

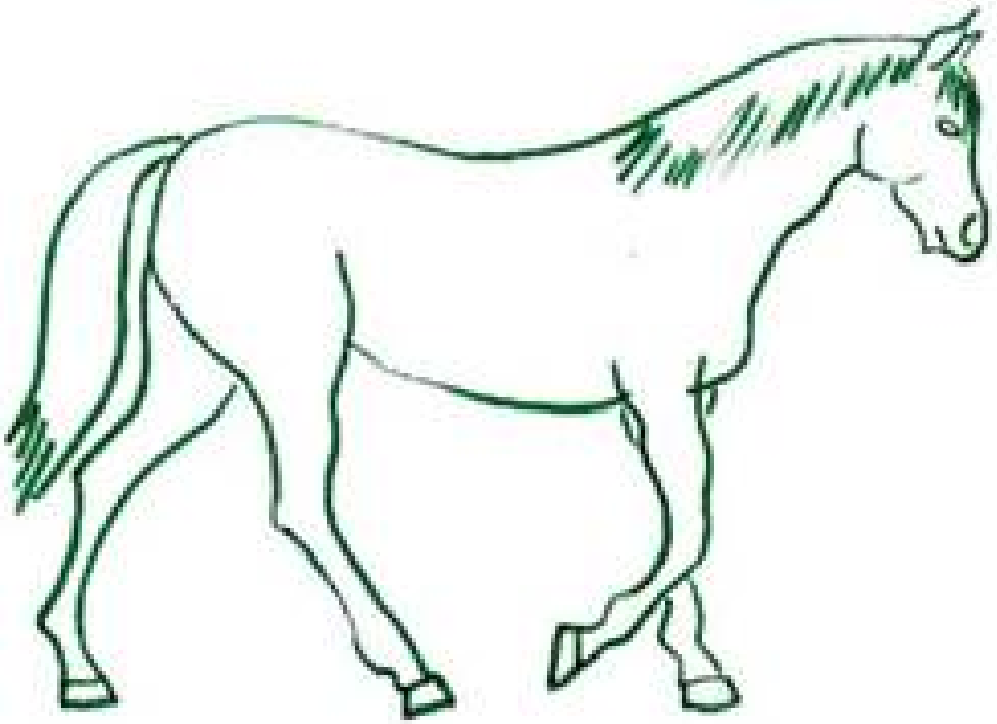
Outline

- BLUF
- Soliciting a detailed medical history
- Infectious diseases of returning travelers
- Geographic disease distribution
- Infectious Disease Emergencies
- Medical history informing diagnosis

BLUF: Caring for the ID Patient

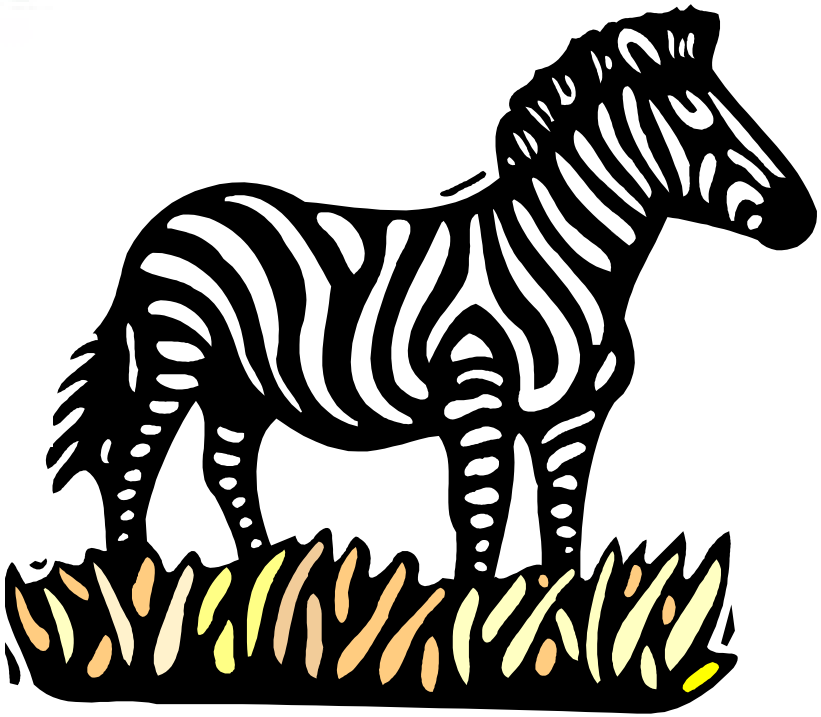
- A comprehensive, in-depth medical history is your best diagnostic tool
- Geographic and ID threat situational awareness
- Know your ID emergencies
- Know what you don’t know, seek assistance when needed

Common Things are Common



Usually this…

Not this…



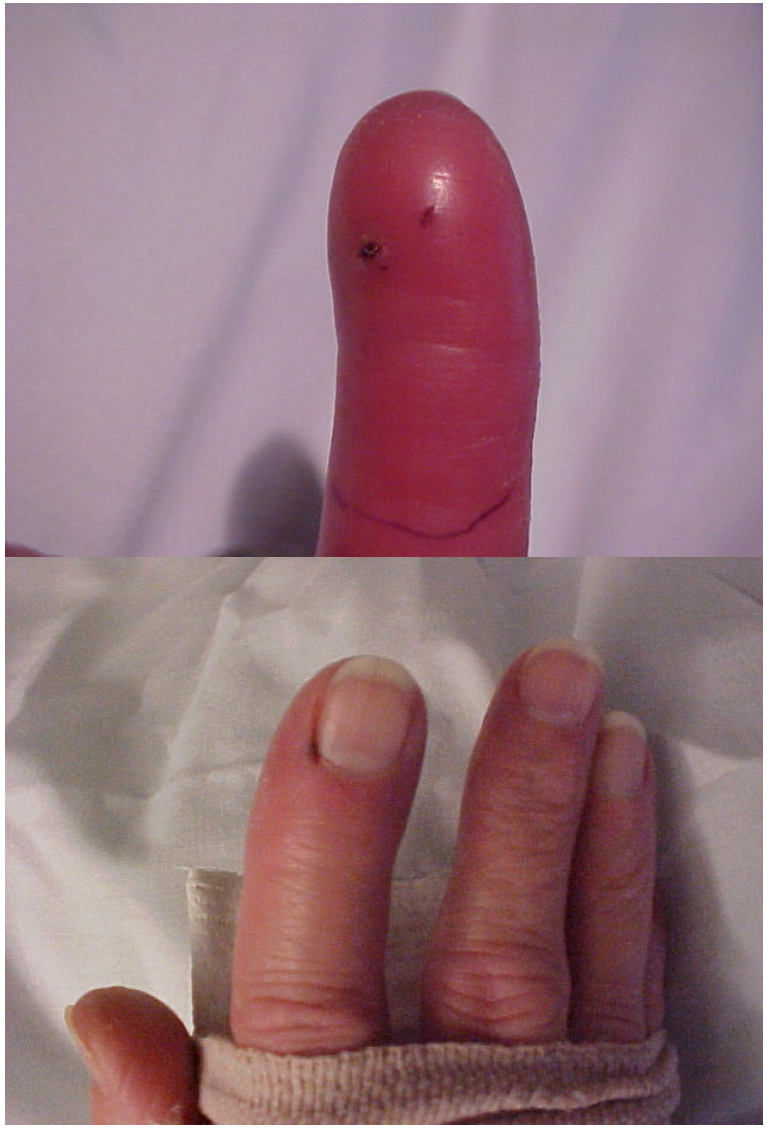
Soliciting a Detailed Medical History

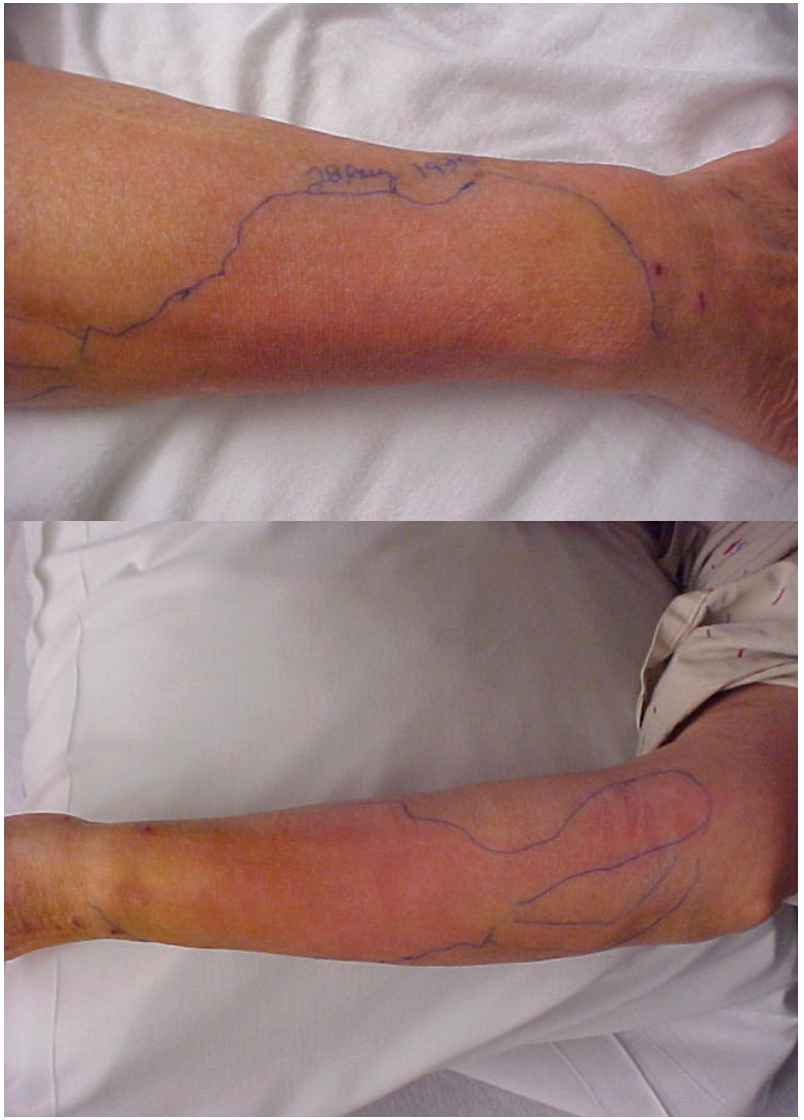
Chief Complaint

- Localizing
  - Focal lesion (cellulitis)
  - Bite (arthropod, animal, human)
  - Post-traumatic (altercation, vegetation)
  - Anatomical (CNS, GU, GI, etc.)

- Generalized and systemic
  - Fever, chills, rigors
  - Muscle and / or joint pain
  - Fatigue

Cat bites causing skin /soft tissue infections

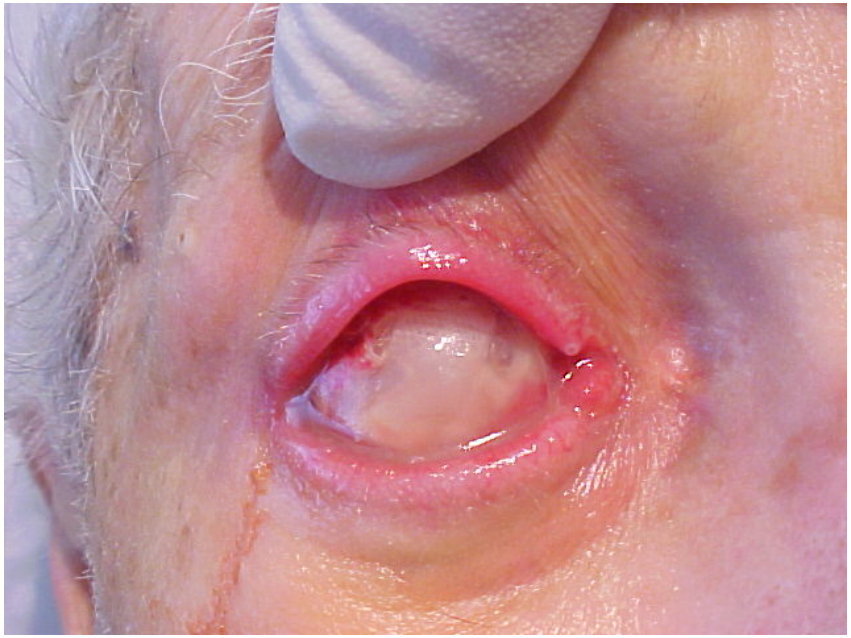




History of Present Illness

- Key information
  - Detailed chronology of illness
    - Patient was well until…DATE…when…X…happened
    - Appearance / disappearance of signs / symptoms
      - Non-specific illnesses may declare themselves
    - Identify patterns if they exist
      - Example: patterns of fever (every 3 days)
  - Incorporate important medical background of patient
    - Age (impacts presentation, fever curves, etc.)
    - Immunodeficient (HIV, medications, malignancy)

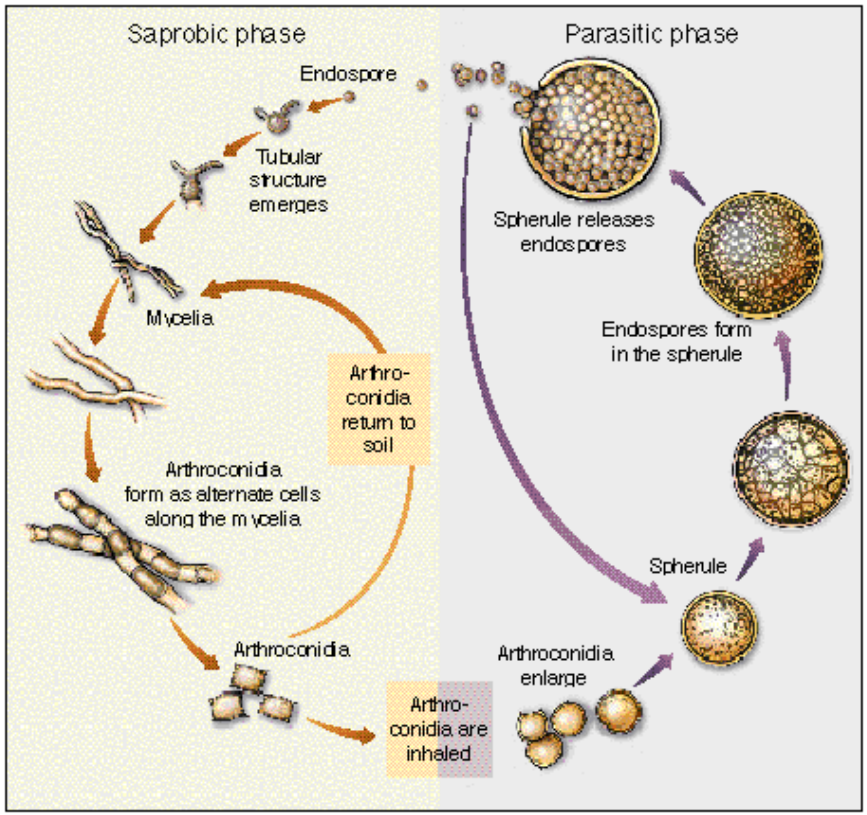
Elderly WM with eye infection, antibiotic history revealed poor Pseudomonas coverage, infection progressed, patient lost eye.



History of Present Illness

- Key information
  - Incorporate activities / exposures
    - Animals, arthropods, people, vegetation
    - Urban, rural environment exposure
    - Indoor or outdoor activities
  - Incorporate relevant active (recent) medications
    - Prophylaxis, immunomodulators, OTC medications
  - Incorporate relevant associated travel history

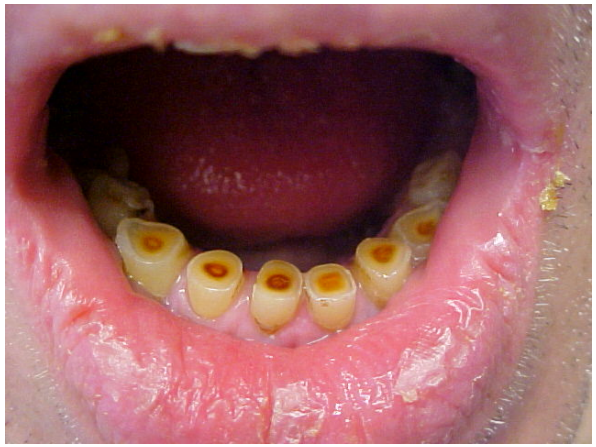
AAF with sarcoid on steroids, travels to Arizona, develops bone pain and skin nodules, MRI of knee joint demonstrates *Coccidoidomycosis* lesion



Review of Systems

- Pertinent positives and negatives
  - Specifically mention if no fever
  - CNS: evidence of meningitis, encephalitis, any neuro
  - Respiratory: tracheobronchitis, pneumonia
  - Oropharynx: pharyngitis, bleeding gums, dentition
  - GI: diarrhea with blood, mucus, rice water appearance
  - GU: discharge, dysuria, abnormal menses
  - Skin: rash, location, itching, character
  - Extremities: localized pain, joint versus bone pain

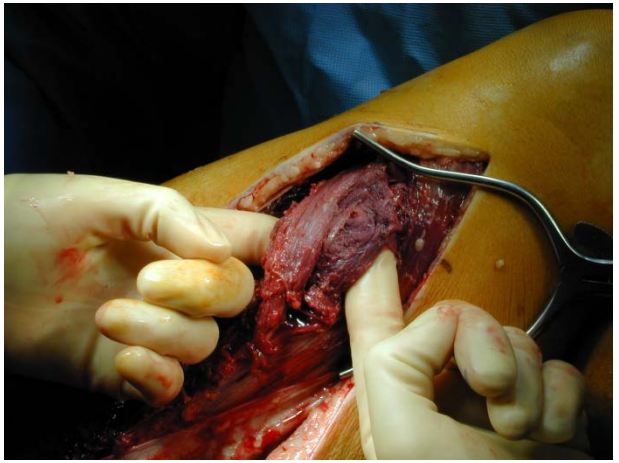
Elderly WM presents with fever, cough, chest pain, SHx reveals chronic tobacco use, ROS reveals poor dentition, CT scan below, diagnosis lung abscess

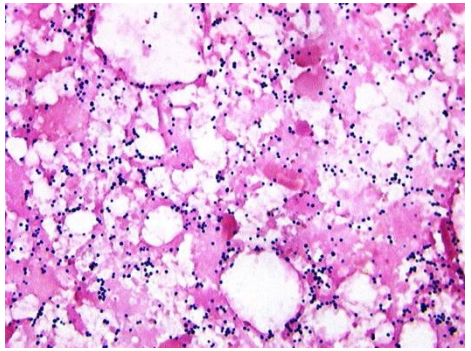


Past Medical/Surgical History

- Drill down on relevant pre-existing medical conditions
  - Immunosuppressive conditions
- Drill down on chronic or re-occurring conditions
  - Examples: frequent respiratory infections, meningitis
- Presence or absence of organs
  - Appendix, gallbladder, spleen, thymus
- Previous surgical interventions
  - Heart surgery (valve)
  - Implant of any hardware or foreign material
- Known lab / radiologic abnormalities
  - Examples: lung nodule/Ca++, heart block, etc.

Latino male with chest pain, receives cardiac cath., few days later develops thigh pain, rash, MS changes, fever, N&V, MRI shown, goes to OR, diagnosis *Staphlococcus aureus* necrotizing fasciitis and Toxic Shock Syndrome



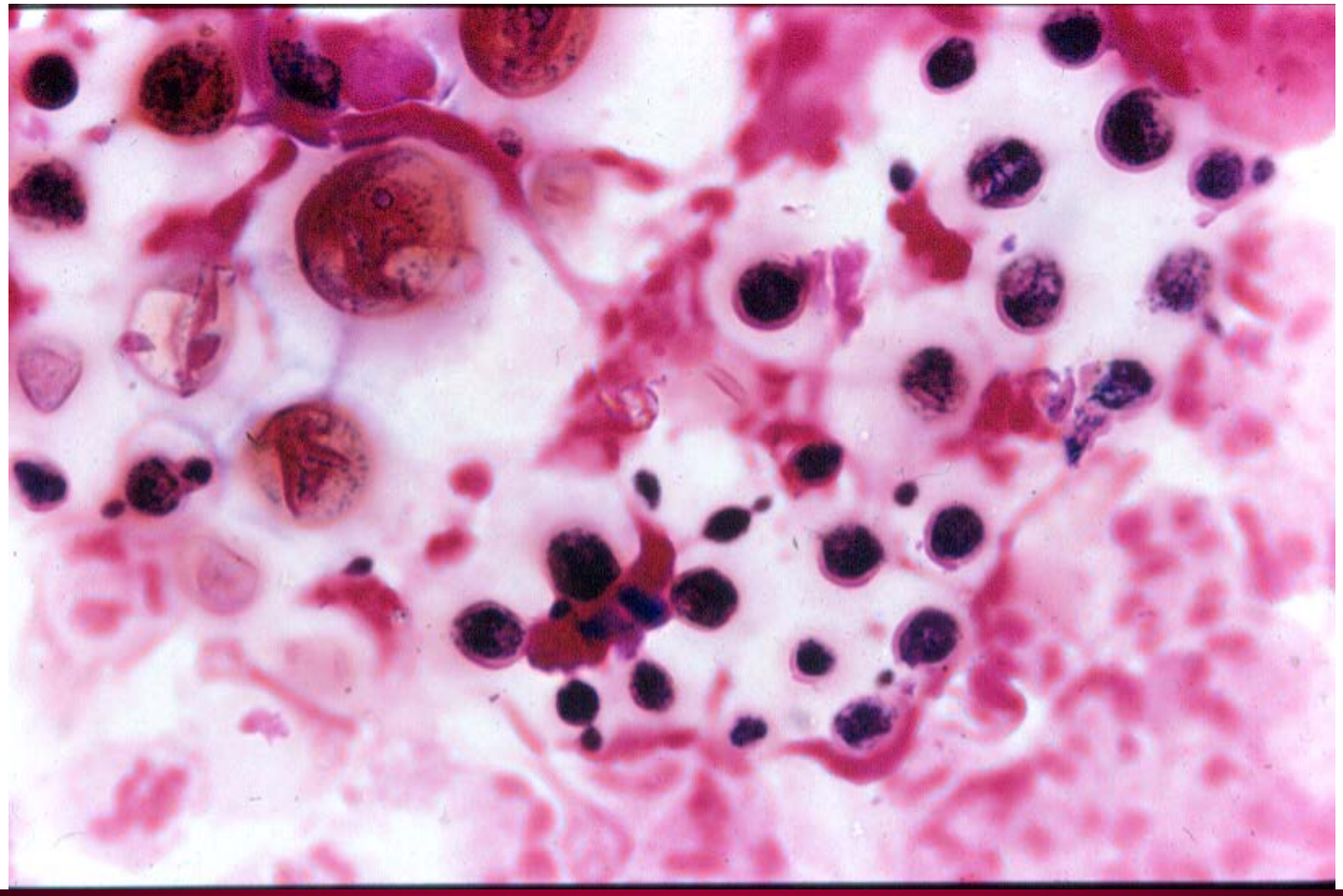


Medications / Immunizations

- Rx and OTC (previous antibiotics)
- Immunosuppressives
  - Examples – prednisone, DMARDS
- Anti-pyretics (ASA, NSAIDS, acetaminophen)
  - Manipulate fever curve
- Prophylaxis (detailed account)
  - Test understanding (especially malaria prophylaxis)
- Anything which could impact absorption or metabolism of chronic or prophylactic medications impacting their performance.

- All routine and travel specific vaccinations!

AAM with sarcoid, treated with steroids, headache and visual disturbance, CSF Gram's strain demonstrates *Cryptococcus neoformans*



22 year old USMC E-3

- **29 Aug Presents to sick call on ship with one day of fevers and diarrhea**
  - Watery stools, no blood or abdominal pain
  - Temp 101.4, 130/92, p 72 exam normal; dx with VGE, given tylenol and SIQ 24 h
  - Notes indicate he *"recently ate sugar cane"* but nothing else…

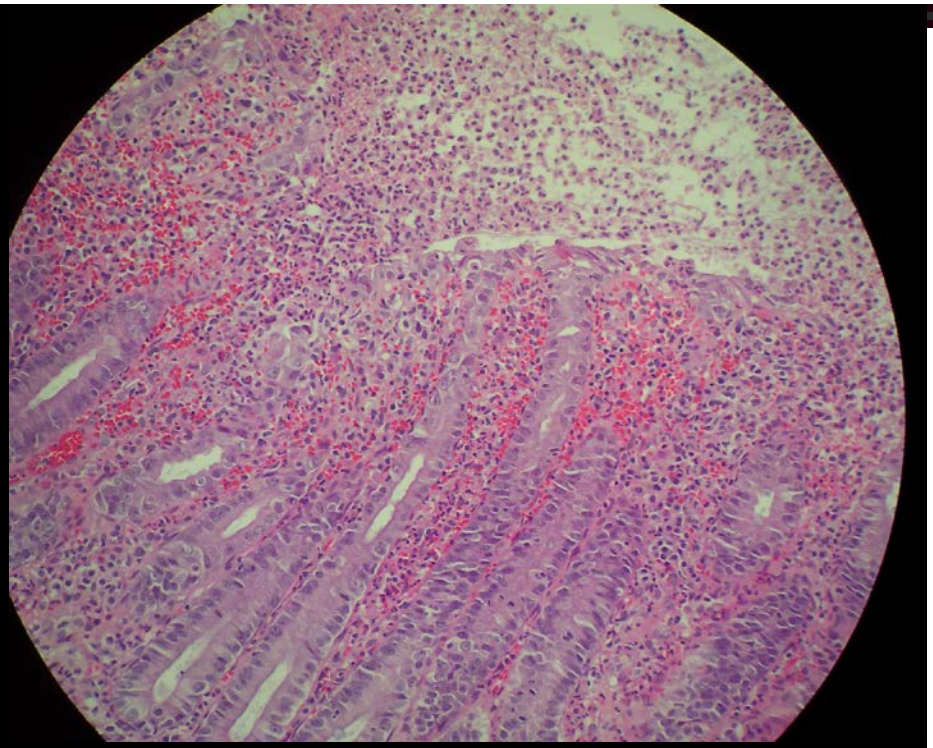
- **01 Sep "*feels better*", afebrile**

- **02 Sep Diarrhea returns, vomiting, "*feels light headed*"**
  - Temp 104.1, pulse 120-130, tilt positive.
  - Dx with *"viral syndrome",* given IV fluid and started on **ciprofloxacin**

- **04 Sep *"unable to keep down fluids"***
  - Afebrile, **BP 94/63, p 109**
  - No assessment in chart, never seen by physician
  - Trimethobenzamide IM, *"return if symptoms worsen"*

- **05 Sep falls out of his rack and hits head while trying to get to the bathroom**
  - Temp 102.2 P 111, 90/39
  - Admitted to ship's medical hold for *"diarrhea/dehydration"*
  - WBC 11.8, HGB 10.1 **Platelets 42**, ALT 114, creat 1.4
  - Doxycycline added to ciprofloxacin for unclear reasons

Multiple other Marines start presenting with diarrhea and fevers




02/18/1983
020Y
M
BETHCR02
SE:1
IM:1
09/10/2003
09/10/2003
BETHCR02
NNMC
09/10/2003
portable AP Horiz
kV:
LgM=2.39

01 Aug

15 Aug

Liberia

30 Aug

15 Sep

Washington Post, September 2003

Warehouse that Housed Marines at Roberts International Airport, Liberia, during August 2003 peacekeeping deployment

- **07 Sep Patients arrives at NNMC with Cerebral malaria**
  - 17% parasitemia with *Plasmodium falciparum*
  - Intubated for 9 days, requires 3 pressor support
  - Death imminent board, gets CRBSI with *Acinetobacter*

- JAMA 1967;199:141
Vietnam - US Soldiers with Malaria
Diarrhea in 38%

- JAMA 1994;272:398
Somalia - US Marines with Malaria
Diarrhea in 38%

- Am J Trop Med Hyg 2010; 83(2): 258
Liberia - US Marines with Malaria
Diarrhea in 62%

Marines deploy to Liberia, 44 contract malaria despite prophylaxis and PPMs

Am. J. Trop. Med. Hyg., 83(2), 2010, pp. 258–265
doi:10.4269/ajtmh.2010.09-0774

An Outbreak of *Plasmodium falciparum* Malaria in U.S. Marines Deployed to Liberia

Timothy J. Whitman,* Philip E. Coyne, Alan J. Magill, David L. Blazes, Michael D. Green, Wilbur K. Milhous, Timothy H. Burgess, Daniel Freilich, Sybil A. Tasker, Ramzy G. Azar, Timothy P. Endy, Christopher D. Clagett, Gregory A. Deye, G. Dennis Shanks, and Gregory J. Martin*

Infectious Diseases Department, National Naval Medical Center, Bethesda, Maryland; Walter Reed Army Institute of Research, Silver Spring, Maryland; Infectious Diseases Clinical Research Program, Uniformed Services University, Bethesda, Maryland; Division of Parasitic Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia; College of Public Health, University of South Florida, Tampa, Florida; Naval Medical Research Center, Silver Spring, Maryland; Infectious Diseases Division, Department of Medicine, State University of New York, Upstate Medical University, Syracuse, New York; U.S. Navy Environmental and Preventive Medicine Unit Seven, Naples, Italy; Australian Army Malaria Institute, Gallipoli Barracks, Australia

Abstract. In 2003, 44 U.S. Marines were evacuated from Liberia with either confirmed or presumed *Plasmodium falciparum* malaria. An outbreak investigation showed that only 19 (45%) used insect repellent, 5 (12%) used permethrin-treated clothing, and none used bed netting. Adherence with weekly mefloquine (MQ) was reported by 23 (55%). However, only 4 (10%) had serum MQ levels high enough to correlate with protection (> 794 ng/mL), and 9 (22%) had evidence of steady-state kinetics (MQ carboxy metabolite/MQ > 3.79). Tablets collected from Marines met USP identity and dissolution specifications for MQ. Testing failed to identify *P. falciparum* isolates with MQ resistance. This outbreak resulted from under use of personal protective measures and inadequate adherence with chemophrophylaxis. It is essential that all international travelers make malaria prevention measures a priority, especially when embarking to regions of the world with high transmission intensity such as west Africa.

What malaria chemoprophylaxis did they take?

- Issued mefloquine (MQ)
- Adherence with weekly dosing: 53%
  - Only 10% had serum MQ levels high enough for protection

- Trop Med Parasitol. 1993 Sep;44(3):257-65
- **US Marines randomized double-blind clinical trial**
  - **250 mg MQ salt weekly (n = 157)**
  - **250 mg MQ daily for 3 days followed by 250 mg weekly (n = 46)**

- **Steady state MQ plasma levels were attained rapidly with the loading dose regimen in four days versus seven weeks with weekly MQ**

Take home points

- This will happen again
  - a fever in Sub-Saharan Africa is malaria until ruled out

- Appreciate geographic variations in transmission intensity
- Understand malaria chemoprophylaxis
- Malaria does more than cause fevers

- Be suspect of adherence to malaria preventive measures

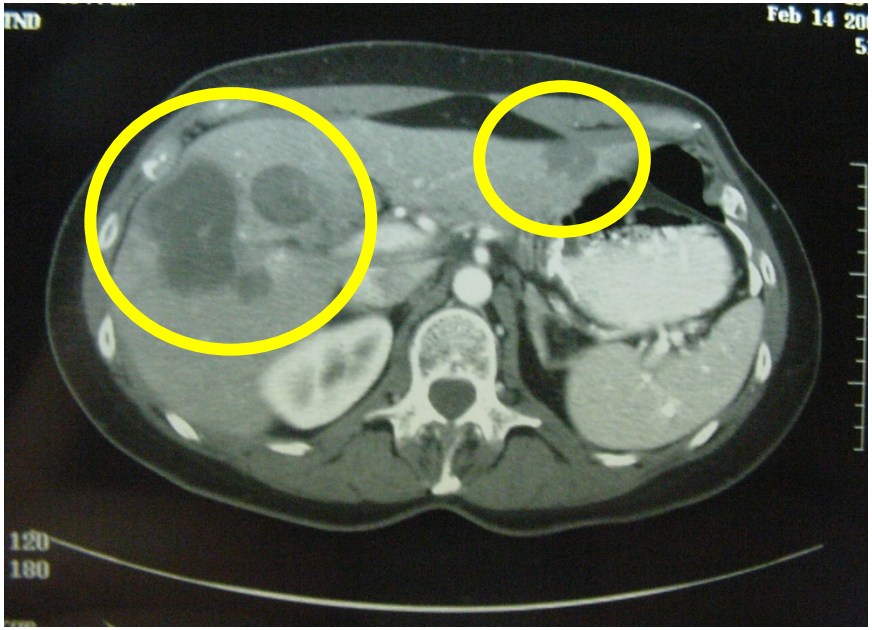
- The natural history of *P. falciparum* in non-immunes ends poorly

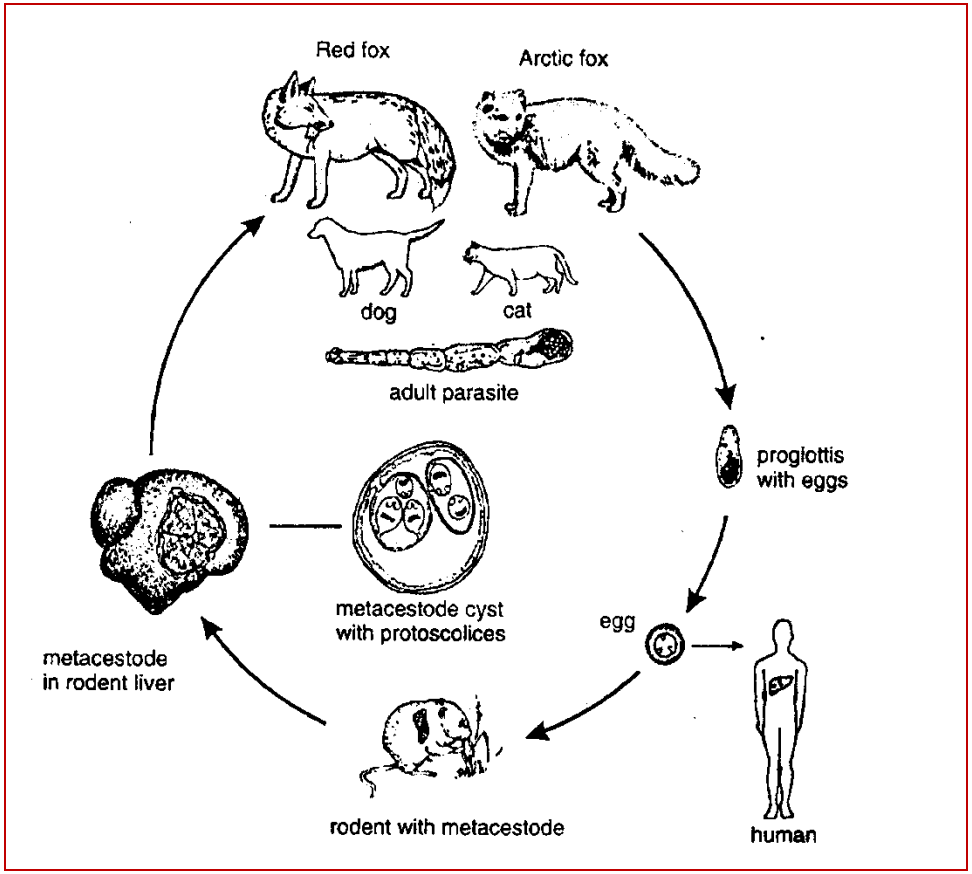
- **For future GMOs: HNs (E-2s) do not see sick call**

Social History

- Activities, hobbies, occupation (defines potential exposures)
  - Examples: hunter, gardener, fishing
- Sexual practices
  - Examples: monogamous, MSM, high risk behaviors
- Drugs and alcohol
  - Needle based drugs, potential for cirrhosis, etc.
- Tobacco
  - American or foreign
- Food
  - OCONUS (“on economy”), imported
- Pets
  - Type, acquisition history, level of interface

WF with RUQ pain, intermittent fever, expat. In Switzerland, owns dog, frequent walks in countryside, CT scan below, diagnosis *Echnococcus multilocularis*





Family History

- First degree relatives
  - Immunosuppressive conditions
  - Recurrent infections

- Individuals sharing household
  - Recent medical events (including vaccinations)
    - "Sick contacts"
  - Immunosuppressive conditions
  - Recent or current illness
    - If yes, explore diagnosis if known
    - Hospitalized?

Travel

- Where (geographic specific infections)
- When (rainy season = vectors)
- Activities during travel (urban, rural)
- Accommodations (hotel with A/C, outdoors)
- Food (hot, cold, water, hotel, street, etc.)
- Precautions (any PPM?)

Infectious Diseases of Returning Travelers

Infectious Disease Emergencies in Returning Travelers

Special Reference to Malaria, Dengue Fever, and Chikungunya

Table 2
Incubation periods for diseases

Incubation Period	Diseases
<7 Days	Common: malaria, traveler's diarrhea, dengue, enteric fever, respiratory tract infection Others: rickettsioses, leptospirosis, meningitis, yellow fever, arbovirus, meningococcal
7–21 Days	Common: malaria, enteric fever Others: rickettsioses, viral hepatitis, leptospirosis, HIV, Q fever, brucellosis, African trypanosomiasis
>21 Days	Common: malaria, enteric fever Others: tuberculosis, hepatitis B virus, bacterial endocarditis, HIV, Q fever, brucellosis, amebic liver disease, melioidosis

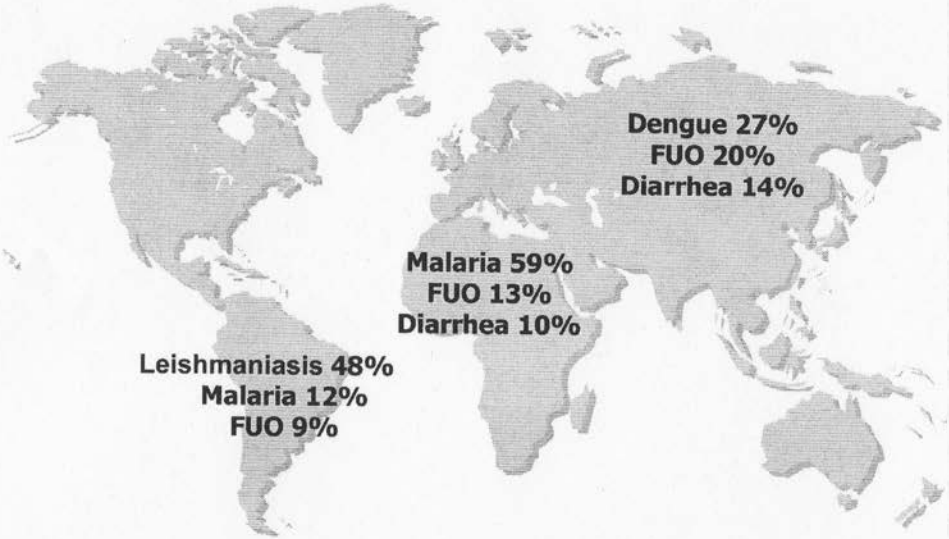


Figure 1 Diseases and destinations: the three most common diagnoses in each continent visited. FUO = fever of ur

Table 1 Distribution of Main Diagnoses Leading to Post-travel Hospitalization*

	No. of Patients (% of Total Cases)	
Disease	*Febrile*	*Nonfebrile*
Malaria	54 (26)	None
Unidentified febrile diseases	34 (16)	None
Dengue fever	27 (13)	None
Diarrheal diseases	14 (7)	10 (4)
Leishmaniasis	None	18 (9)
Miscellaneous febrile infections	12 (6)†	None
Skin diseases	7 (3)‡	4 (2)§
Pneumonia	7 (3)	None
Noninfectious diseases	None	7 (3)‖
Onchocerciasis	None	5 (2)
Idiopathic eosinophilia	None	4 (2)
Hepatitis infectious	4 (2)	None
Pulmonary schistosomiasis	2 (1)	None
Amebic liver abscess	2 (1)	None

*N = 211.
†Epstein-Barr virus (3), leptospirosis (2), echinococcal abscess (1), infective endocarditis (1), viral meningitis (1), upper respiratory tract infection (1), rubella (1), cat-scratch disease (1), tonsillitis (1).
‡Infected wounds (3), cellulitis (2), erysipelas (2).
§Infected myiasis (2), nonspecific rash (1), urticaria (1).
‖Anxiety (2), dizziness (1), hemolytic anemia (1), mefloquine adverse effect (1), hematologic malignancy (1), myositis (1).

Stienlauf S et al, *Journal of Travel Medicine* 12(3): 136-41, 2005

Spectrum of Disease and Relation to Place of Exposure among Ill Returned Travelers

N ENGL J MED 354;2 WWW.NEJM.ORG JANUARY 12, 2006

Table 3. **Etiologic Diagnoses within Selected Syndrome Groups, According to Travel Region.***

Syndrome and Cause	All Regions	Caribbean	Central America	South America	Sub-Saharan Africa	South Central Asia	Southeast Asia	Other or Multiple Regions†
	number of cases per 1000 patients with syndrome							
Systemic febrile illness (n=3907)								
Specific pathogen or cause reported‡	594	459	527	446	718	522	547	454
Malaria‡	352	65	133	133	622	139	130	234
Dengue‡	104	238	123	138	7	142	315	35
Mononucleosis (due to Epstein–Barr virus or cytomegalovirus)‡	32	70	69	79	10	17	32	63
Rickettsial infection‡	31	0	0	0	56	10	16	24
Salmonella typhi or *S. paratyphi* infection‡	29	22	25	17	7	141	26	24
No specific cause reported‡	406	541	473	554	282	478	453	546
Acute diarrhea (n=3859)								
Parasitic diarrhea‡	354	283	403	368	353	453	262	323
Giardiasis‡	173	132	136	158	177	286	118	132
Amebiasis‡	120	105	155	142	138	103	74	135
Presumptive parasitic cause‡	35	9	45	52	33	55	33	13
Bacterial diarrhea‡	268	260	190	253	250	294	369	227
Campylobacter infection‡	85	46	32	90	73	87	180	57
Shigella infection	41	37	26	41	46	61	26	34
Nontyphoidal salmonella infection‡	27	27	13	14	29	12	56	30
Presumptive bacterial cause	110	132	94	106	99	136	116	95
Viral diarrhea‡§	9	23	32	5	7	4	5	7
Unspecified acute diarrhea‡	385	457	377	376	397	289	393	451

Dermatologic disorder (n=2947)								
Insect bite, with or without superinfection	187	192	235	156	194	201	179	166
Cutaneous larva migrans‡	129	299	134	122	86	64	171	68
Allergic rash or reaction	113	148	128	97	105	112	93	132
Skin abscess‡	97	34	47	50	136	144	122	105
Rash of unknown cause	66	55	74	75	66	48	49	96
Mycosis, superficial	56	45	30	36	65	64	61	77
Animal bite requiring rabies postexposure prophylaxis‡	47	3	13	25	9	90	124	4
Leishmaniasis‡	38	0	64	143	14	19	0	36
Myiasis‡	35	0	101	100	40	0	0	14
Swimmer's itch‡§	28	3	0	2	117	3	9	14
Impetigo or erysipelas§	27	31	20	9	31	45	22	34
Mite infestation (e.g., scabies)§	22	21	37	39	12	29	17	14
Nondiarrheal gastrointestinal disorder (n=1421)								
Intestinal nematode infestation‡	239	278	273	256	307	202	344	141
Strongyloidiasis, simple intestinal‡	96	124	141	102	148	45	160	37
Ascaris infestation§	52	52	30	66	60	84	18	46
Gastritis or peptic ulcer disease‡	131	258	91	168	85	101	104	156
Helicobacter pylori status unknown	76	124	51	73	60	62	74	91
Positive for *H. pylori*‡§	47	103	40	80	22	28	25	60
Acute hepatitis‡	115	62	91	102	76	214	61	144
Hemorrhoids or constipation‡	89	124	192	117	54	84	74	84

* Numbers may not total 1000 because patients may have had more than one diagnosis. The most common diagnoses are listed for each category.
† This category includes travel to West Asia, Northeast Asia, eastern Europe, Oceania, North Africa, or Antarctica (1868 travelers) or ascertainment of exposure impossible subsequent to travel to multiple developing regions (1649 travelers).
‡ $P<0.01$ for the comparison among regions.
§ This diagnosis was listed in fewer than 100 reports.

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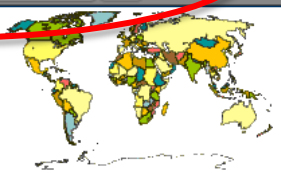
Novell GroupWise - Mailbox

GeoSentinel - Home Page

http://www.istm.org/geosentinel/main.html

www.istm.org/geosentinel

How to do print screen in Mac ... | GeoSentinel - Home Page



GeoSentinel

The Global Surveillance Network
of the ISTM and CDC

a worldwide communications & data collection
network of travel/tropical medicine clinics

GeoSentinel Home | Objectives | Surveillance Strategy | Historical Timeline | Project Staff
Current Advisory | Data Highlight | Site Directory | Network Members | Publications & Presentations

2 NEW GeoSentinel PUBLICATIONS:

"Illness in Children After International Travel: Analysis from the GeoSentinel Surveillance Network"
***Pediatrics.* Published online April 5, 2010.**
click here to download PDF (596kB) of this article

"Sex and Gender Differences in Travel-associated Disease"
***Clin Infect Dis.* 2010 Mar;50(6):826-32.**
click here to download PDF (321kB) of this article

GeoSentinel is a worldwide communication and data collection network for the surveillance of travel related morbidity. It was initiated in 1995 by the International Society of Travel Medicine (ISTM) and the Centers for Disease Control (CDC) as a network of ISTM member travel/tropical medicine clinics. GeoSentinel is based on the concept that these clinics are ideally situated to effectively detect geographic and temporal trends in morbidity among travelers, immigrants and refugees.

Current activities include:

GeoSentinel Surveillance Sites	GeoSentinel Network Members
GeoSentinel Sites participate in **surveillance and monitoring of all travel related illnesses** seen in their clinics. Aggregation of this data across the network of 49 globally dispersed medicine clinics on all continents (15 in the United States and 34 in other countries) allows linking of final diagnoses in migrating populations with similar geographic exposures. In addition to formal surveillance, GeoSentinel sites also participate in enhanced surveillance and networking with public health partners.	GeoSentinel Network Members are ISTM provider clinics that **informally provide leads and contacts** when they encounter any patient having a pre-defined alarming diagnosis or unusual event. Network Members also participate in brief e-mail queries for enhanced surveillance and response in potential outbreak situations. This program allows large numbers of individual members in many countries to be rapidly linked together to share clinical observations and facilitates direct interaction with health authorities.
Information on becoming a GeoSentinel Site	Information on becoming a GeoSentinel Network Member
GeoSentinel Data Entry (Sites Only) (Password Required)	GeoSentinel Network Members Only

http://www.istm.org/geosentinel/documents/Pediatrics_2010.pdf

Table 1. Characteristics of returned ill travelers with and without fever (6957 patients with fever among 24,920 ill returned travelers).

Characteristic	No. (%) of ill returned travelers with fever	No. of ill returned travelers without fever	Regional multiple logistic regression models in which variable is included as a significant[a] predictor
Age, years			
<20	429 (31)	962	NS
20–64[b]	6230 (28)	16,152	...
≥65	244 (24)	761	NS
Sex			
Male[b]	3995 (32)	8682	...
Female	2891 (24)	8967	A, B, C, D
Reason for travel			
Tourism[b]	3802 (26)	10,782	...
Business	1036 (29)	2477	...
Research/education	283 (27)	785	...
Missionary/volunteer	384 (18)	1734	B, C
Visiting friends and relatives	1431 (40)	2109	A, C, D
Duration of travel, days			
≤30	4134 (31)	8994	A, C, D
≥31[b]	2597 (23)	8572	...
Interval time from travel to presentation, weeks			
≤1	2789 (37)	4750	A, B, C, D
1–6	2437 (30)	5762	A, B, C, D
>6[b]	1511 (18)	7012	...
Recorded pretravel encounter			
No[b]	2535 (30)	5857	...
Yes	3488 (27)	9577	A, D
Unknown	840 (27)	2309	A, D
Total	6957 (28)	17,963	...

NOTE. A, variable was significant in sub-Saharan Africa regression; B, variable was significant in Southeast Asia regression; C, variable was significant in Latin American regression; D, variable was significant in south-central Asia regression; NS, variable was not significant in any multiple logistic regression.

[a] Two-sided $P < .05$ determined using the Wald test is considered to be statistically significant.

[b] Reference group in multivariate logistic regressions.

Infectious Disease Emergencies in Returning Travelers

Special Reference to Malaria, Dengue Fever, and Chikungunya

Med Clin N Am 96 (2012) 1225–1255

Table 1
Top 5 illnesses in returning travelers

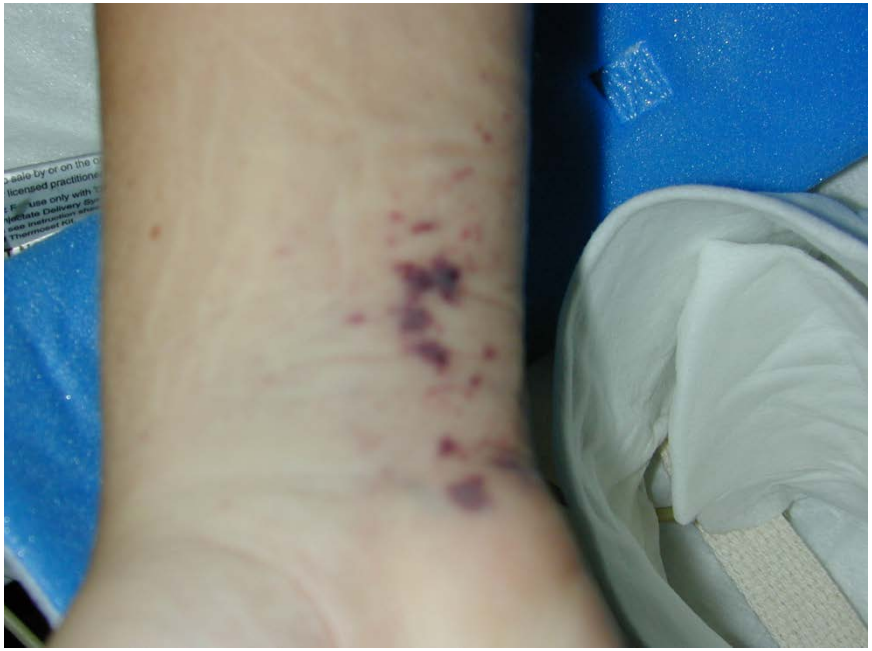
Diagnosis	%
1. Systemic illnesses	35
Malaria	21
Malaria due to *P falciparum*	14
Malaria due to *P vivax*	6
Malaria due to other species	2
Dengue	6
Salmonella enterica serovar Typhi or Paratyphi infection	2
Rickettsia	2
2. Acute diarrhea	15
3. Respiratory illness	14
4. Genitourinary diseases	4
5. Gastrointestinal illnesses (other than diarrhea)	4

Infectious Disease Emergencies

Infectious Disease Emergencies

- Acute bacterial meningitis
- Meningococcemia
- Cranial subdural empyema
- Necrotizing soft tissue infections
- Toxic shock syndrome
- Neutropenic fever
- Sepsis in patients with splenectomy (actual/functional)
- Plasmodium falciparum malaria
- Cholera
- Rocky Mountain Spotted Fever
- Babesiosis

College student not feeling well with fever, develops MS changes, hypotension, respiratory failure, the rash below, diagnosis meningococcemia.



Medical History Informing Diagnosis

"It has been said that a good history – listening to the patient – allows a diagnosis 90% of the time. *Nowhere is a complete and accurate history more important than when approaching a febrile traveler*."

- Schwartz MD. Fever in the returning traveler, part one: a methodological approach to initial evaluation. *Wilderness and Environmental Medicine* 14; 24-32, 2003.

Assumptions about your practice

- Travel history: you'll know this well since you are deploying with your unit
- Vaccination history: you'll know this well since your unit will generally be UTD
- ***Activity based risks:*** more of an unknown
  - Food intake/ingestions (crayfish, snails, slugs)❖
  - Animal contact (rabies, tularemia, lepto)
- Vector exposure and use of PPMs
- Freshwater exposure
- Barefoot exposure
- Sexual exposure
- Adherence to antimalarial chemoprophylaxis

Achitina fulica,
the giant African land snail

Vaginulus plebeius,
the intermediate host of
Angiostrongylus costaricensis

ORIGINAL ARTICLE

The NEW ENGLAND JOURNAL of MEDICINE

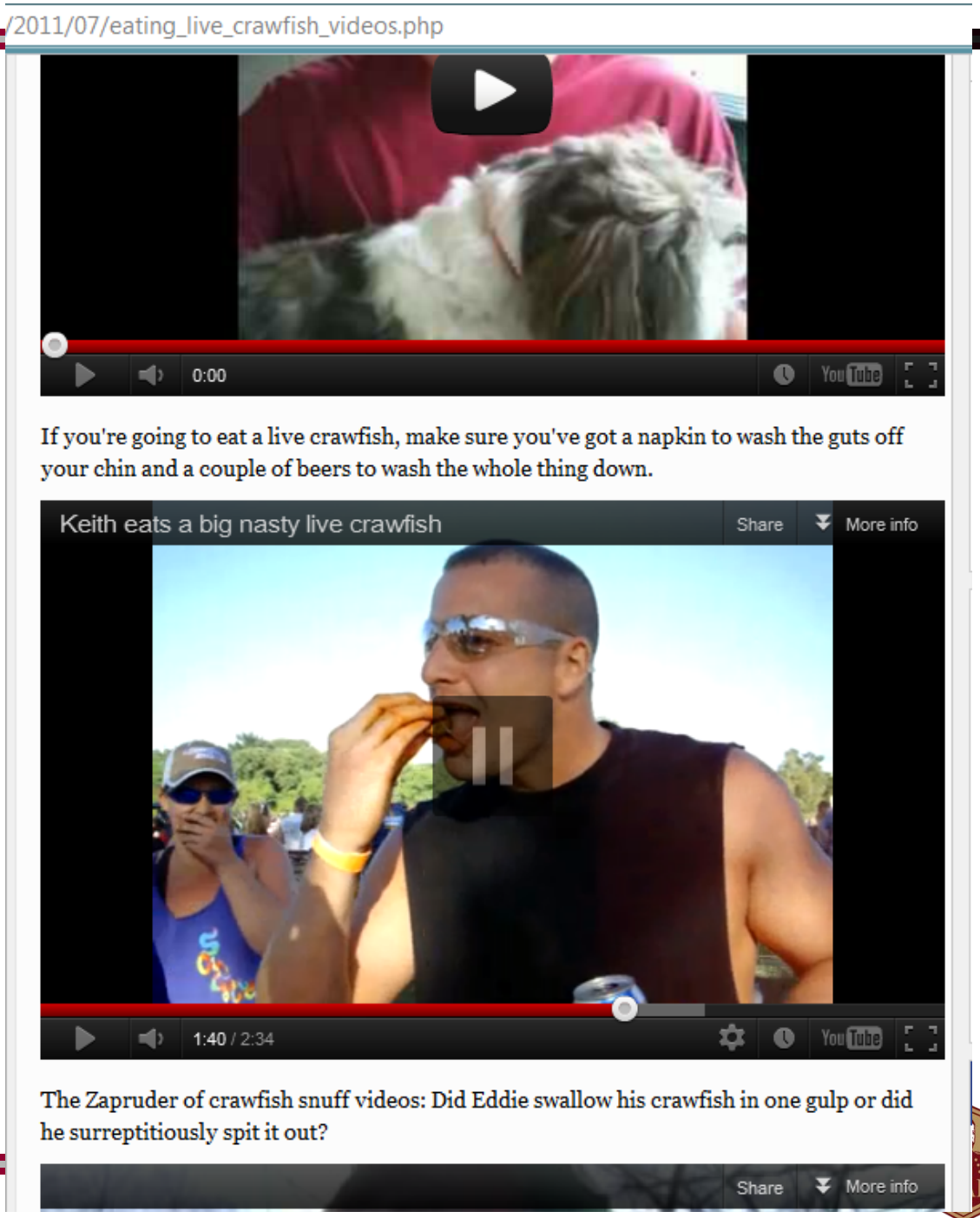
An Outbreak of Eosinophilic Meningitis Caused by *Angiostrongylus cantonensis* in Travelers Returning from the Caribbean

Trevor J. Slom, M.D., Margaret M. Cortese, M.D., Susan I. Gerber, M.D., Roderick C. Jones, M.P.H., Timothy H. Holtz, M.D., M.P.H., Adriana S. Lopez, M.H.S., Carlos H. Zambrano, M.D., Robert L. Sufit, M.D., Yuwaporn Sakolvaree, M.Sc., Wanpen Chaicumpa, Ph.D., Barbara L. Herwaldt, M.D., M.P.H., and Stuart Johnson, M.D., D.T.M.&H.

N Engl J Med 2002; 346 (9): 668-75, Feb 28

Generalizations about crawfish eating videos:

- Almost exclusively males
- Almost exclusively involve alcohol consumption
- Frequently on a dare



The importance of taking a careful history

Inbox (584) - philip.coyne@ | Inbox - Web Email Access | Raw crawdad danger | Digi

outlook.wustl.edu/2010/dec/crawdads

Washington University in St. Louis School of Medicine MAGAZINE

Outlook DEC 2010

CONTENTS

Crayfish boiled, baked or fried may taste fine.

cRAWDADS

But eaten raw, they carry a dangerous parasite.

BY CAROLINE ARBANAS

A medical mystery began one summer's day on a Missouri waterway when someone ate something that most Americans would never think of putting in their mouths — that is, not unless it had first been sauteed, baked, boiled or fried.

Before this illness was diagnosed at Washington University School of Medicine, only seven such cases had ever been reported in North America, where a parasite, *Paragonimus kellicotti*, is common in crayfish.

Division of Infectious Diseases

Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report

Missouri Department of Health and Senior Services

ScienceDaily®
Your source for the latest research news

Science News

Dangerous Lung Worms Found in People Who Eat Raw Crayfish

ScienceDaily (May 26, 2010) — If you're headed to a freshwater stream this summer and a friend dares you to eat a raw crayfish -- don't do it. You could end up in the hospital with a severe parasitic infection.

Eating raw crayfish can result in a severe parasitic infection. (Credit: Robert Boston)

Physicians at Washington University School of Medicine in St. Louis have diagnosed a rare parasitic infection in six people who had consumed raw crayfish from streams and rivers in Missouri. The cases occurred over the past three years, but three have been diagnosed since last September; the latest in April. Before these six, only seven such cases had ever been reported in North America, where the parasite, *Paragonimus kellicotti*, is common in crayfish.

"The infection, called paragonimiasis, is very rare, so it's extremely unusual to see this many cases in one medical center in a relatively short period of time," says Washington University infectious diseases specialist Gary Weil, MD, professor of medicine and of molecular microbiology, who treated some of the patients. "We are almost certain there are other people out there with the infection who haven't been diagnosed. That's why we want to get the word out."

Paragonimiasis causes fever, cough, chest pain, shortness of breath and extreme fatigue. The infection is generally not fatal, and it is easily treated if properly diagnosed. But the illness is so unusual that most doctors are not aware of it. Most of the patients had received multiple treatments for pneumonia and

See Also:

Health & Medicine
- Today's Healthcare
- Diseases and Conditions
- Infectious Diseases

Plants & Animals
- Pests and Parasites
- Bacteria
- Microbiology

Reference
- Salmonella infection
- Tularemia
- Upper respiratory tract infection
- Candidiasis

Related Stories

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Icecap Melting Rate Lower Than Expected

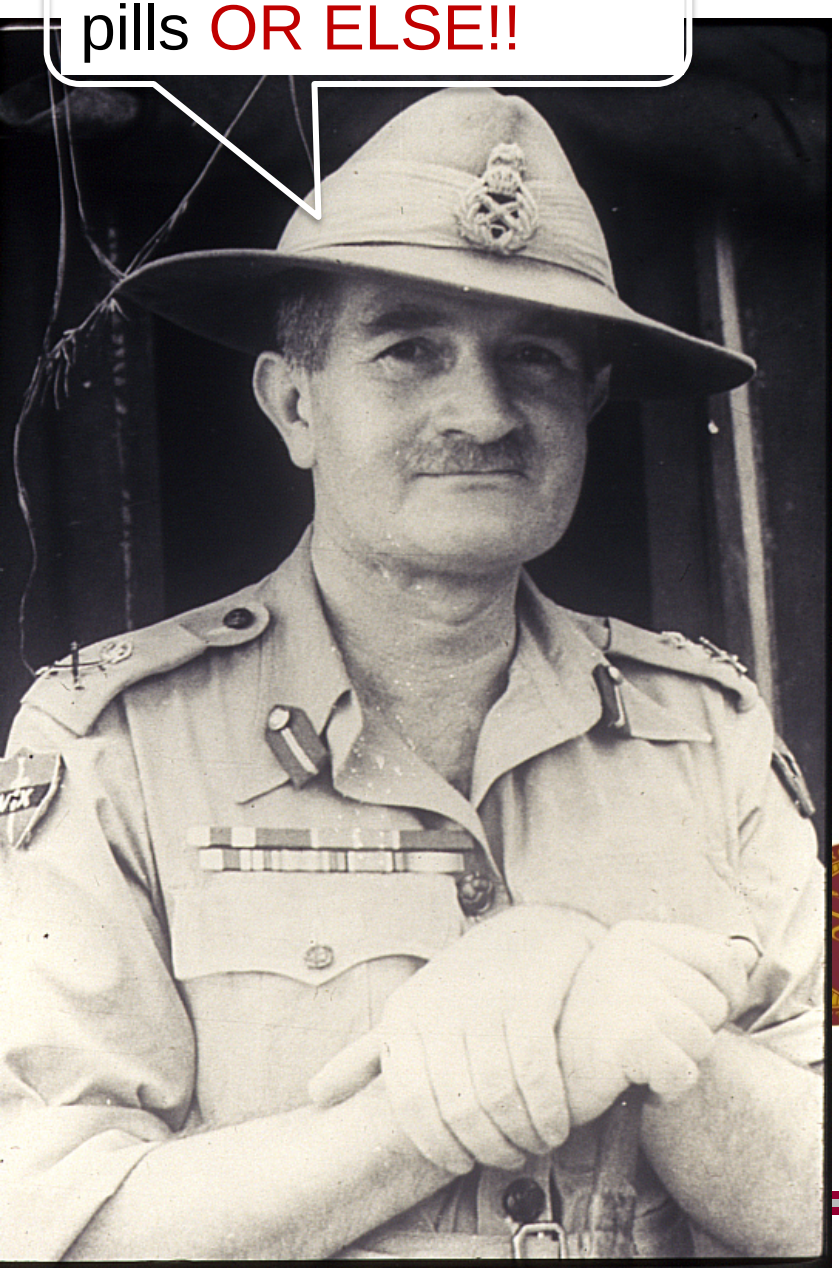
Science Video News

Mindless Eating
A food psychologist has found that people overeat unconsciously, due to numerous factors. Studies show that larger plates result in larger servings..

Breaking News

... from NewsDaily.com

Take your malaria pills OR ELSE!!



“MORE THAN HALF THE BATTLE AGAINST DISEASE IS FOUGHT NOT BY DOCTORS, BUT BY REGIMENTAL OFFICERS”

GENERAL WILLIAM SLIM
Burma Theatre, WW2

QUININE PARADE IN GREECE

Slide courtesy of Dr. Steven Craig

FROM: MACPHERSON, *MEDICAL SERVICES HYGIENE*, V2, 1924

Infections in Returning Travelers

DAVID O. FREEDMAN

Mandell et al. PPID 7th ed.

TABLE 330-1 Constellations of Exposures and Clinical Presentations Suggestive of Particular Diagnoses in Returned Travelers*

Exposure Scenario	*Distinctive Findings*	*Diagnosis*
Any exposure in any area with documented malaria transmission	Fever with or without any other finding	Malaria
Most tropical countries	Fever and altered mental status	Malaria, meningococcal meningitis, rabies, West Nile virus
Budget travel to India, Nepal, Pakistan, or Bangladesh	Insidious-onset, high, unremitting fever, toxic patient, paucity of physical findings	Enteric fever due to *Salmonella typhi* or *Salmonella paratyphi*
Freshwater recreational exposure in Africa	Fever, eosinophilia, hepatomegaly, negative malaria smear	Acute schistosomiasis (Katayama fever)
Bitten by *Aedes aegypti* in Central America, Southeast Asia, or the South Pacific	Fever, headache, myalgia, diffuse macular rash, mild to moderate thrombocytopenia	Dengue
Bitten by *A. aegypti or Aedes albopictus* in India, Malaysia, Singapore, or an island in the Indian Ocean	Fever, headache, myalgia, diffuse macular rash, arthralgia, tenosynovitis often followed by chronic polyarthritis after the fever resolves	Chikungunya fever
Hunting or visiting game reserves in southern Africa	Fever, eschar, diffuse petechial rash	African tick typhus due to *Rickettsia africae*
Travel to Southeast Asia	Fever, eschar, diffuse petechial rash	Scrub typhus due to *Orientia tsutsugamushi*
Hiking, biking, swimming, rafting with exposure to fresh surface water	Fever, myalgia, conjunctival suffusion, mild to severe jaundice, variable rash	Leptospirosis
Summertime cruise to Alaska, elderly traveler	Influenza-like illness	Influenza A or B
Outdoor exposure anywhere in the Americas	Large, single furuncular lesion anywhere on body, with sense of movement inside	Myiasis due to *Dermatobia hominis* (botfly)
Clothing washed or dried out of doors in Africa	Multiple furuncular lesions around clothing contact points with skin	Myiasis due to *Cordylobia anthropophaga* (tumbu fly)
New sexual partner during travel	Fever, rash, mononucleosis-like illness	Acute human immunodeficiency virus infection
Travel to any developing country	Coryza, conjunctivitis, Koplik spots, rash	Measles
Longer visit to humid areas of Africa, the Americas or Southeast Asia	Asymptomatic eosinophilia or with periodic cough or wheezing	Strongyloidiasis
Sandfly bite in either New or Old World tropical area	Painless skin ulcer with clean, moist base in exposed area	Cutaneous leishmaniasis

Resort hotel in southern Europe, ± exposure to whirlpool spas	Pneumonia	Legionnaires' disease
Explored a cave in the Americas	Fever, cough, retrosternal chest pain, hilar adenopathy	Histoplasmosis
Ingestion of unpasteurized goat cheese	Chronic fever, fatigue	*Brucella melitensis*
Long trip to West/Central Africa	Afebrile, intensely pruritic, evanescent truncal maculopapular rash	Onchocerciasis
Long trip to West/Central Africa	Migratory localized angioedema or swellings over large joints, eosinophilia	Loiasis
Safari to game parks of East Africa	Fever, nongenital chancre, fine macular rash	East African trypanosomiasis
Travel to Australia	Fever, fatigue, polyarthritis	Ross River virus
Farming areas of India and Southeast Asia	Fever, altered mental status, paralysis	Japanese encephalitis
Forested areas of central and eastern Europe and across Russia	Fever, altered mental status, paralysis	Tick-borne encephalitis
Rodent exposure in West Africa	Fever, sore throat, jaundice, hemorrhagic manifestations	Lassa fever
Ingestion of sushi, ceviche, or raw freshwater fish	Migratory nodules in truncal areas with overlying erythema or mild hemorrhage	Gnathostomiasis
Returning Hajj pilgrim or family contact	Fever, meningitis	Meningococcal meningitis
Ingestion of snails, fish, or shellfish in Asia	Eosinophilic meningitis	Angiostrongyliasis, gnathostomiasis
Summertime exposure to rodent droppings in Scandinavia	Fever with decreased renal function	Puumala virus
Ingestion of undercooked meat of any animal in any country	Fever, facial edema, myositis, increased creatine phosphokinase, massive eosinophilia, normal erythrocyte sedimentation rate	Trichinosis
Unvaccinated, returning from sub-Saharan Africa or forested areas of Amazonia	Fever, jaundice, proteinuria, hemorrhage	Yellow fever
Exposure to farm animals	Pneumonia, mild hepatitis	Q fever
Possible tick exposure almost anywhere	Fever, headache, rash, conjunctival injection, hepatosplenomegaly	Tick-borne relapsing fever
Poor hygienic conditions with possible body louse exposure in Ethiopia or Sudan	Fever, headache, rash, conjunctival injection, hepatosplenomegaly	Louse-borne relapsing fever

*The table includes illnesses of travelers (listed first) as well as less common diseases with presentations that should suggest the possibility of the appropriate diagnosis. Many diseases have a spectrum of presentation and the table describes the most common presentations of these diseases. Many diseases have a spectrum of geographic origins and the table describes the most common exposures seen in daily practice.

Common clinical findings and associated infections

Fever + rash➔ rickettsioses, typhus, Dengue, mening/GC, acute HIV

Fever + chancre (or 'tache noir') ➔ATBF, Trypanosomiasis

Fever + abdominal pain ➔Typhoid, amoebic dysentery/abscess

Fever + myalgias/arthralgias ➔Dengue, Chickungunya

Fever + hemorrhage ➔ VHF (YF, Dengue), mening, leptospirosis

Fever + jaundice➔ Yellow Fever, leptospirosis

Fever + eos➔ Katayama syndrome, Trichinellosis, other worms

Fever + meningeal signs➔ bacterial meningitis, Angiostrongylus

Fever NOS + normal or low WBC➔ malaria, visceral leish, Dengue, rickettsiae, Chikungunya, VHF

Fever + tender lymphadenopathy ➔ *Yersinia pestis* (Plague)

Fever persisting > 2 weeks➔ see table

Fever with delayed onset (> 6 weeks after return)➔ P. malariae,P. vivax, TB, visceral leish,

Initial studies for diagnosis in returned travelers with unexplained fever

- Thick and thin smears for malaria (supplement with RDTs)
- Complete blood count with differential and platelet estimate
- Liver function
- Blood cultures
- Urinalysis
- Chest X-rays

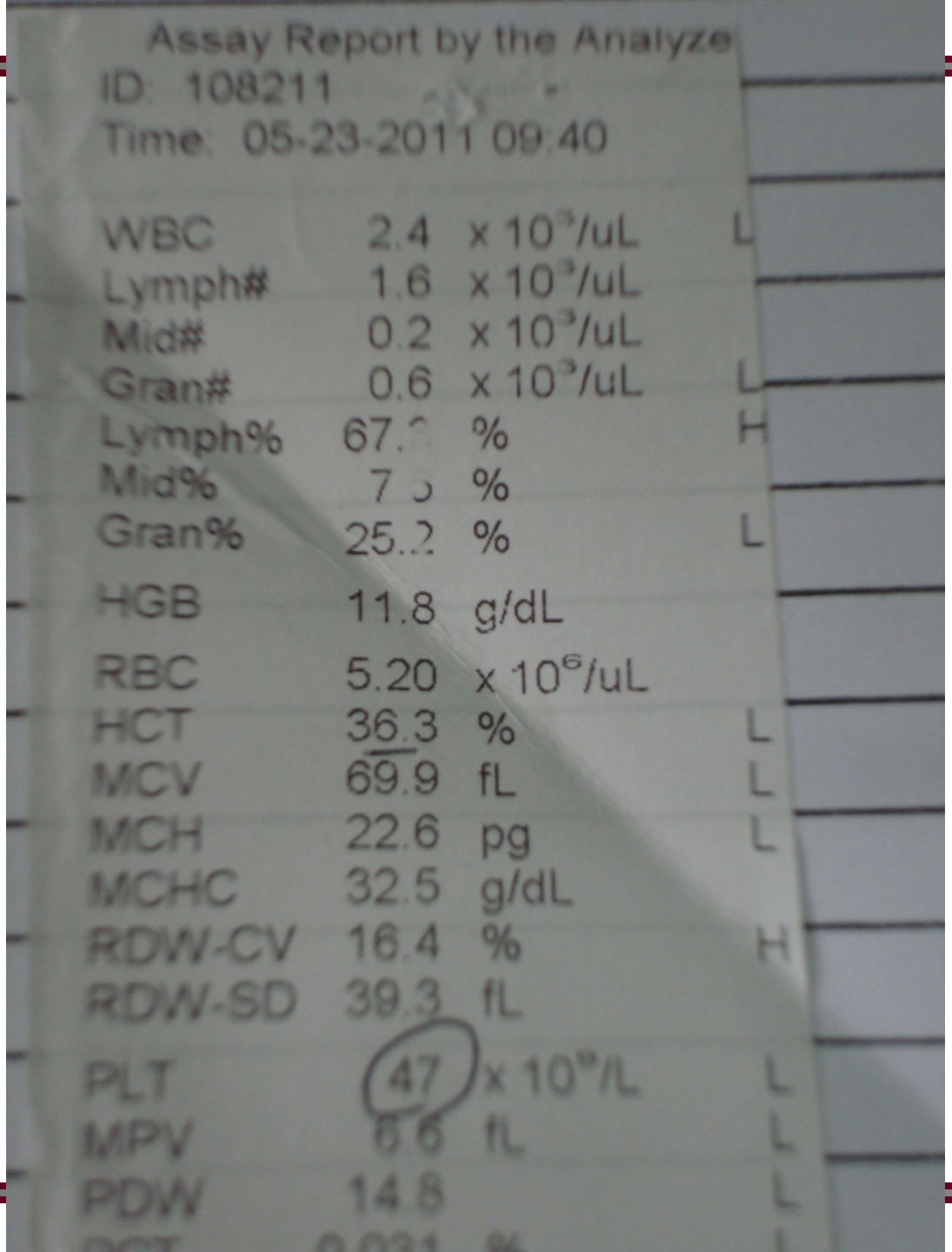
- Additional tests will depend on specific findings and exposures

Wilson ME. Fever in returned travelers. *CDC Health Information for International Travel, 2010*

Geographic Disease Distribution

CONUS / OCONUS

38 yo Thai female with fever, retro-orbital eye pain, diffuse severe myalgias



Assay Report by the Analyze

ID: 108211

Time: 05-23-2011 09:40

WBC	2.4	x 10^3/uL	L
Lymph#	1.6	x 10^3/uL	
Mid#	0.2	x 10^3/uL	
Gran#	0.6	x 10^3/uL	L
Lymph%	67.[illegible]	%	H
Mid%	7.[illegible]	%	
Gran%	25.2	%	L
HGB	11.8	g/dL	
RBC	5.20	x 10^6/uL	
HCT	36.3	%	L
MCV	69.9	fL	L
MCH	22.6	pg	L
MCHC	32.5	g/dL	
RDW-CV	16.4	%	H
RDW-SD	39.3	fL	
PLT	47	x 10^9/L	L
MPV	6.6	fL	L
PDW	14.8		L

An Analysis of Fevers of Unknown Origin in American Soldiers in Vietnam

JOHN J. DELLER, JR., LT. COL., MC, USA, and PHILIP K. RUSSELL, MAJ., MC, USA
Long Binh, South Vietnam

A NUMBER OF FEBRILE DISEASES endemic in Vietnam are characterized by the sudden onset of high fever, chills, and headache. Although the classical varieties of the arborvirus diseases, scrub typhus and malaria, as well as a number of other tropical febrile illnesses, have been well described (1–7), the differential diagnosis of these tropical diseases remains a real challenge.

In an attempt to define these "fevers of unknown origin," 110 patients presenting in this fashion in whom a more precise diagnosis could not be made within 24 hr of admission to the 93rd Evacuation Hospital, Long Binh, South Vietnam, were studied. Serologic, virologic, and bacteriologic methods were used to confirm the diagnosis in all cases.

MATERIALS AND METHODS

All patients admitted to the medical service from April 1, 1966, to August 1, 1966, with fever (over 101 F), chills (frank chills or chilliness), headache (of any degree), a negative malaria smear, and in whom a specific diagnosis could not be made were admitted to the study.

Patients were evaluated according to a standard clinical protocol that recorded epidemiologic data, a narrative history, and specific symptom, physical examination, and laboratory checklists that were monitored daily for the first 7 days of hospitalization.

Received December 30, 1966; accepted for publication February 6, 1967.

From the 93rd Evacuation Hospital, Long Binh, South Vietnam.

Requests for reprints should be addressed to Lt. Col. John J. Deller, Jr., MC, USA, Department of Medicine, Letterman General Hospital, San Francisco, Calif. 94129.

Clinical feature	Dengue	Chikungunya	Scrub Typhus	Malaria
Epidemiology				
Camp, urban	+++	+++	--	--
Jungle	--	--	+++	+++
Fever, degrees F				
< 104	+++	+++	+	--
> 104	--	--	++	+++
Arthralgias	--	+++	--	--
Tender adenopathy	++ (early)	+++	+++ (later)	--
Tender liver/spleen	--	--	++	+++
Rash	+	++	++	--
Petechiae/tourniquet test positive	+	--	--	--
WBC, /mm^3				
< 5,000	++	++	--	--
> 5,000	+	+	+++	+++
SGOT > 50 units	--	--	--	+++

Deller JJ and Russell PK. *Ann Intern Med* 66: 1129-43, 1967

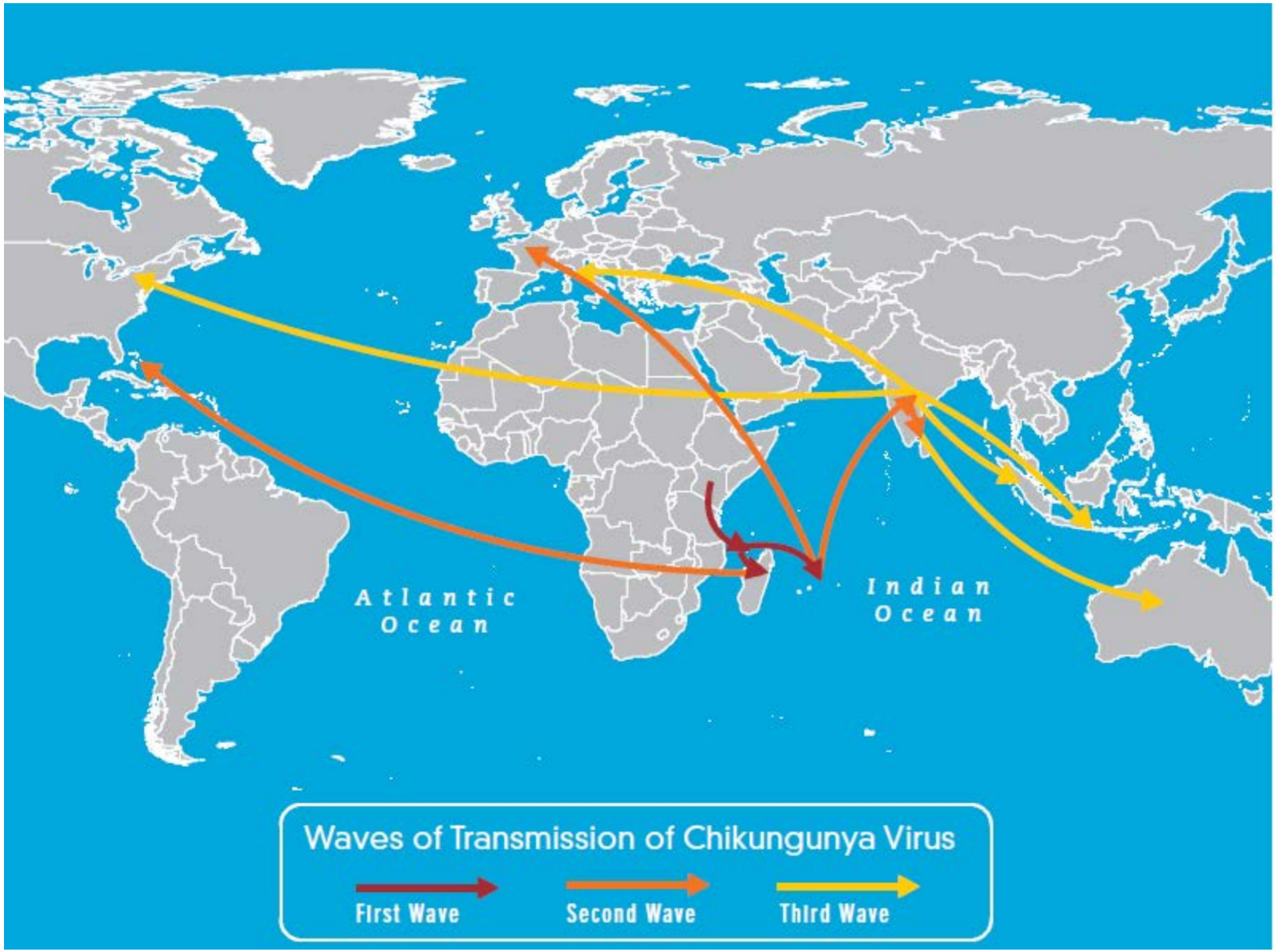
Dengue


Senegal
Cape Verde
The Gambia
Guinea-Bissau
Guinea
Sierra Leone
Liberia
Côte d'Ivoire
Ghana
Mauritania
Mali
Burkina Faso
Niger
Nigeria
Cameroon
Equatorial Guinea
Gabon
Republic of the Congo
Algeria
Libya
Egypt
Chad
Central African Republic
Sudan
Eritrea
Djibouti
Ethiopia
Somalia
Uganda
Dem. Rep. of the Congo
Kenya
Rwanda
Burundi
Tanzania
Malawi
Angola
Zambia
Zimbabwe
Namibia
Botswana
South Africa
Mozambique
Comoros
Madagascar
Mauritius
Saudi Arabia
UAE
Oman
Yemen
Afghanistan
Pakistan
India
Nepal
Bhutan
China
Bangladesh
Burma
Laos
Thailand
Vietnam
Cambodia
Sri Lanka
Taiwan
Hong Kong SAR (China)
Philippines
Brunei
Malaysia
Singapore
Indonesia
Timor-Leste
Palau
Papua New Guinea
Solomon Islands
Australia
Pacific Ocean
Indian Ocean
Atlantic Ocean
Cape Verde
Santa Luzia
Sal
Boa Vista
Fogo
Brava
Maio
Santiago
Dengue Risk Areas
Areas with No Known Dengue Risk

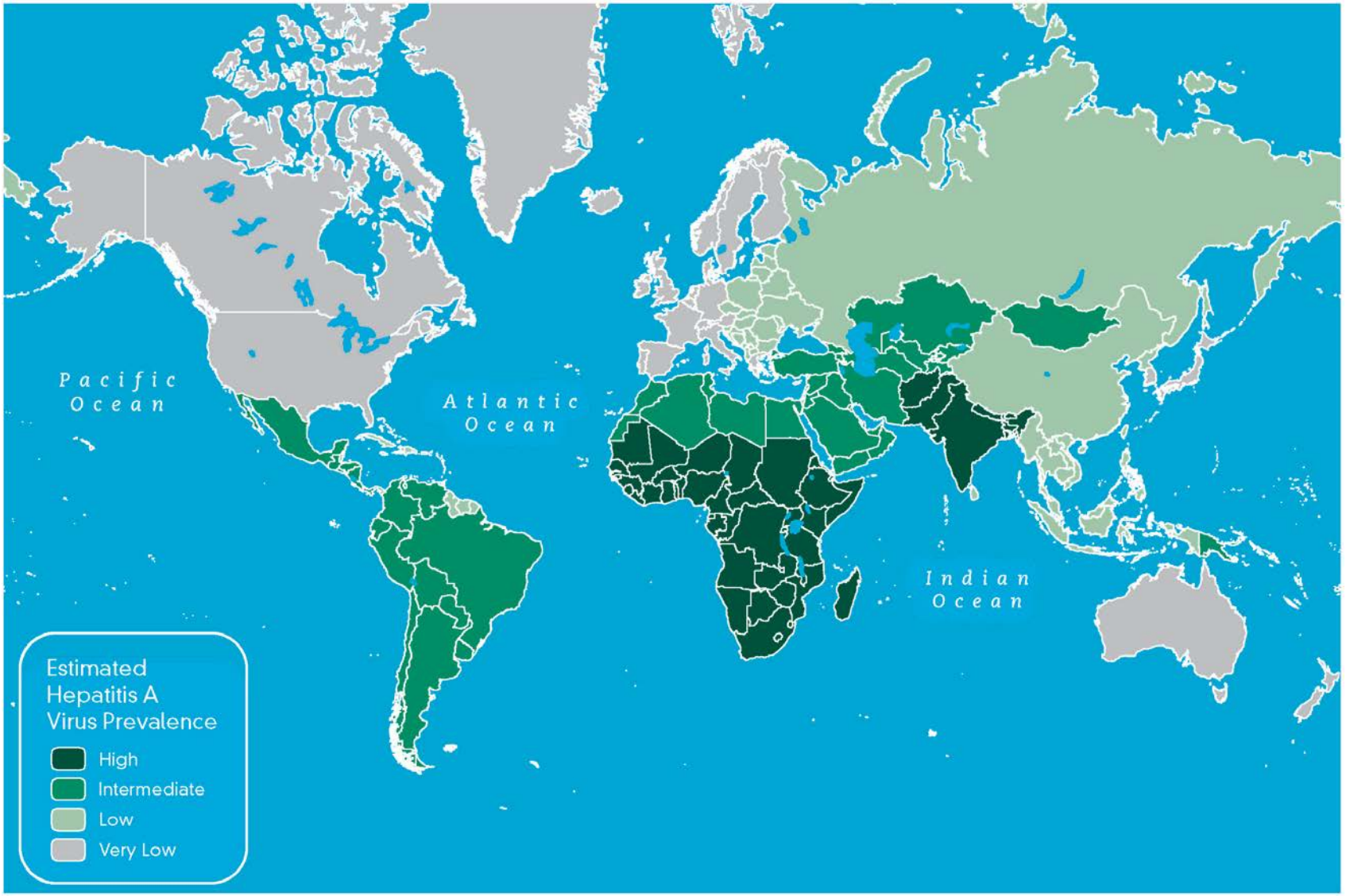
Dengue


United States
Bermuda
The Bahamas
Dominican Republic
Atlantic Ocean
Cuba
Jamaica
Haiti
Mexico
Belize
Honduras
Nicaragua
Aruba
Guatemala
El Salvador
Costa Rica
Panama
Guyana
Venezuela
Suriname
French Guiana
Colombia
Galápagos Islands (Ecuador)
Ecuador
Peru
Brazil
Bolivia
Pacific Ocean
Paraguay
Chile
Argentina
Uruguay
British Virgin Islands
Puerto Rico
Anguilla
Netherlands Antilles
Antigua and Barbuda
Virgin Islands
St. Kitts and Nevis
Montserrat
Guadeloupe
Dominica
Martinique
St. Lucia
St. Vincent and the Grenadines
Barbados
Grenada
Trinidad and Tobago
Venezuela
Dengue Risk Areas
Areas with No Known Dengue Risk

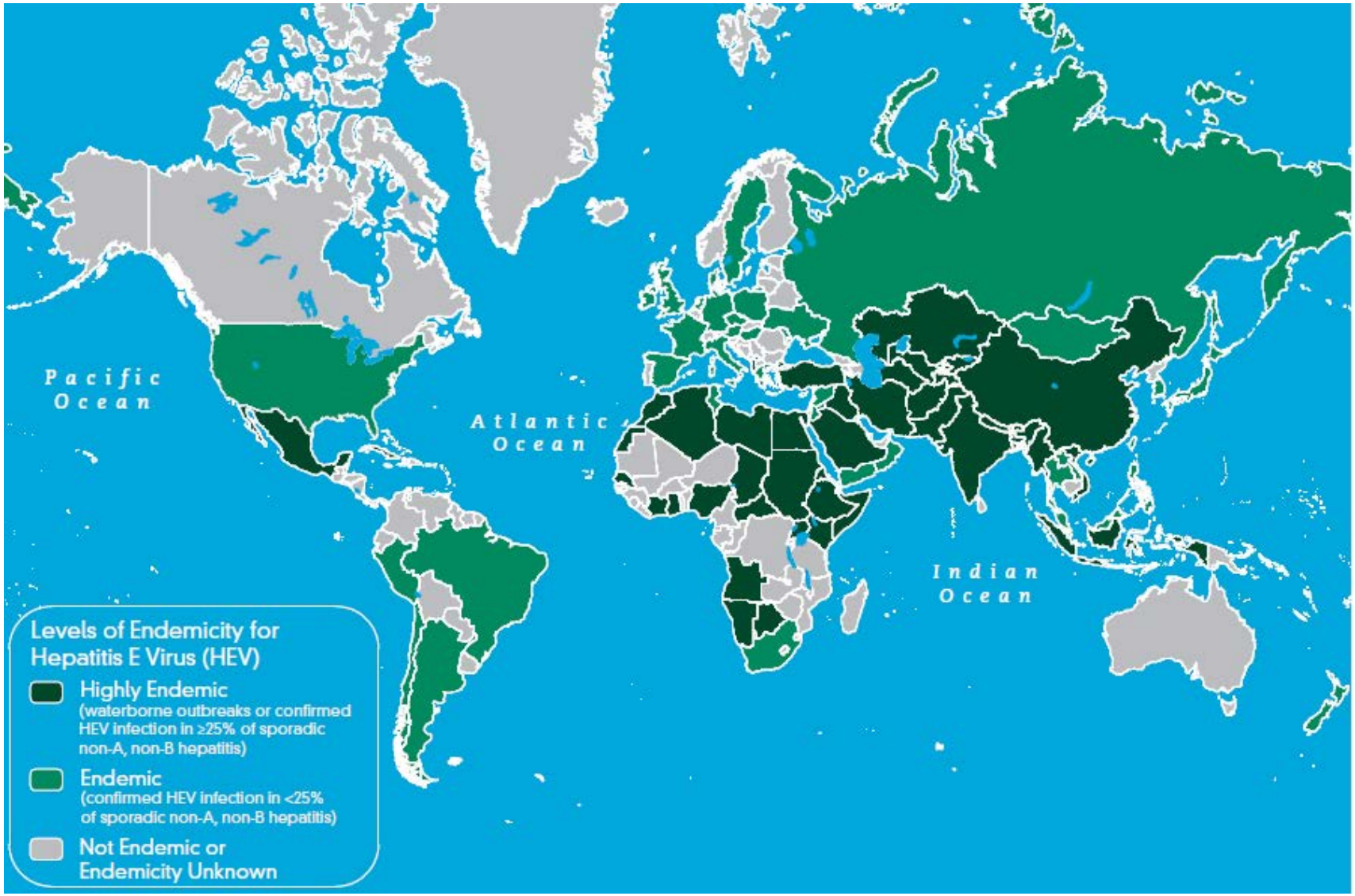
Chikungunya



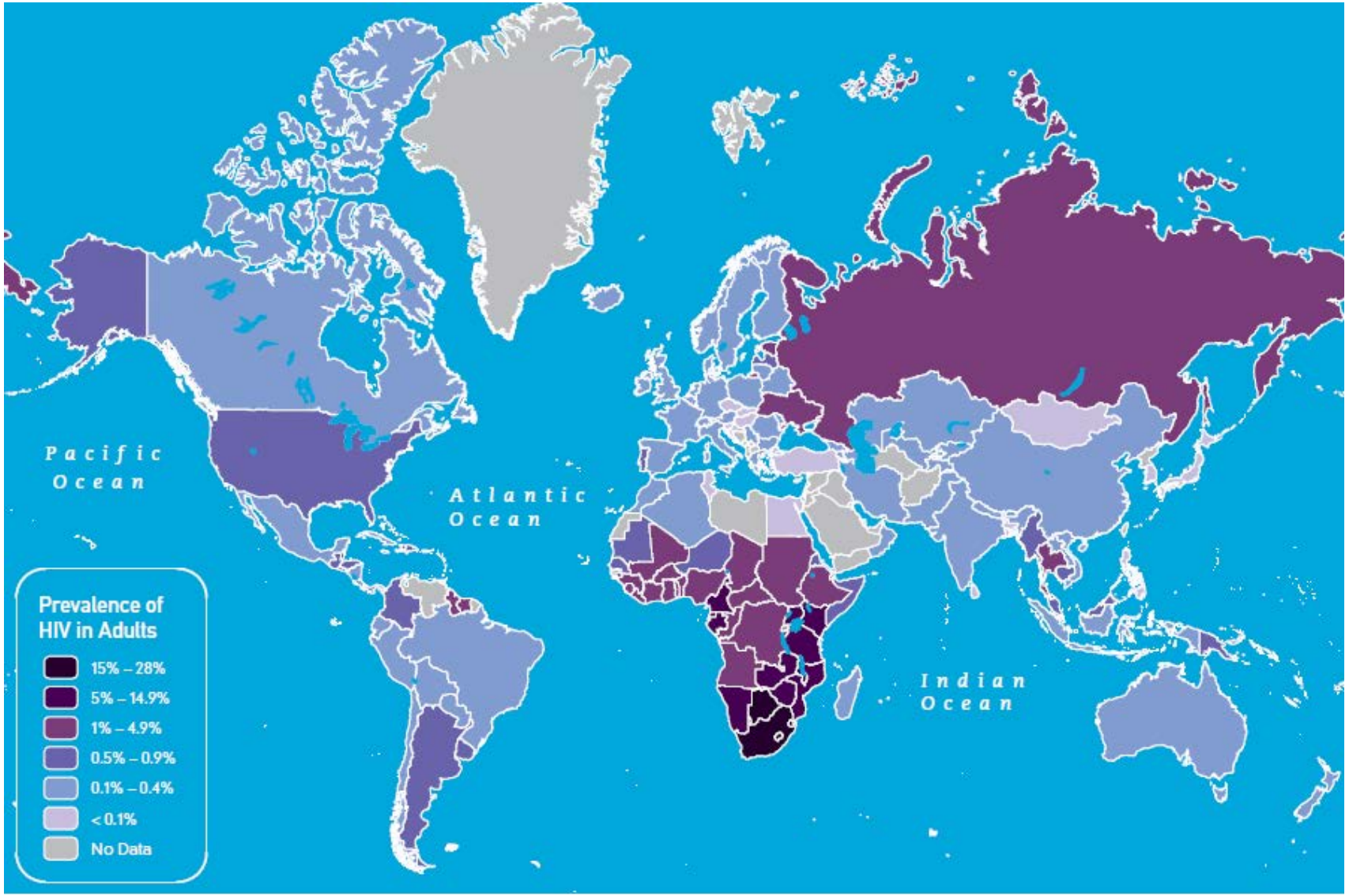
Hepatitis A


Pacific Ocean
Atlantic Ocean
Indian Ocean
Estimated Hepatitis A Virus Prevalence
High
Intermediate
Low
Very Low

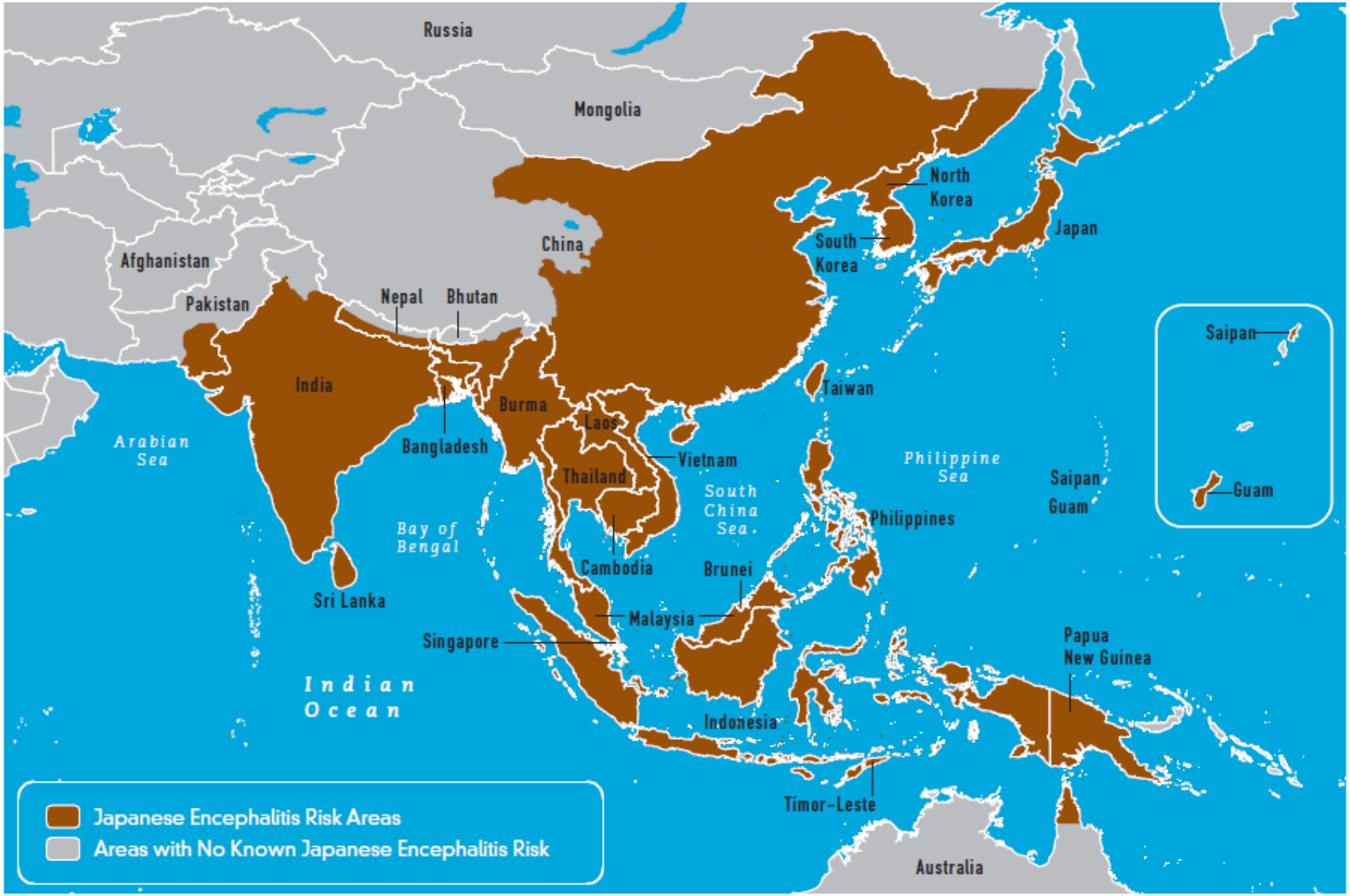
Hepatitis E


Pacific Ocean
Atlantic Ocean
Indian Ocean
Levels of Endemicity for Hepatitis E Virus (HEV)
Highly Endemic
(waterborne outbreaks or confirmed HEV infection in ≥25% of sporadic non-A, non-B hepatitis)
Endemic
(confirmed HEV infection in <25% of sporadic non-A, non-B hepatitis)
Not Endemic or Endemicity Unknown

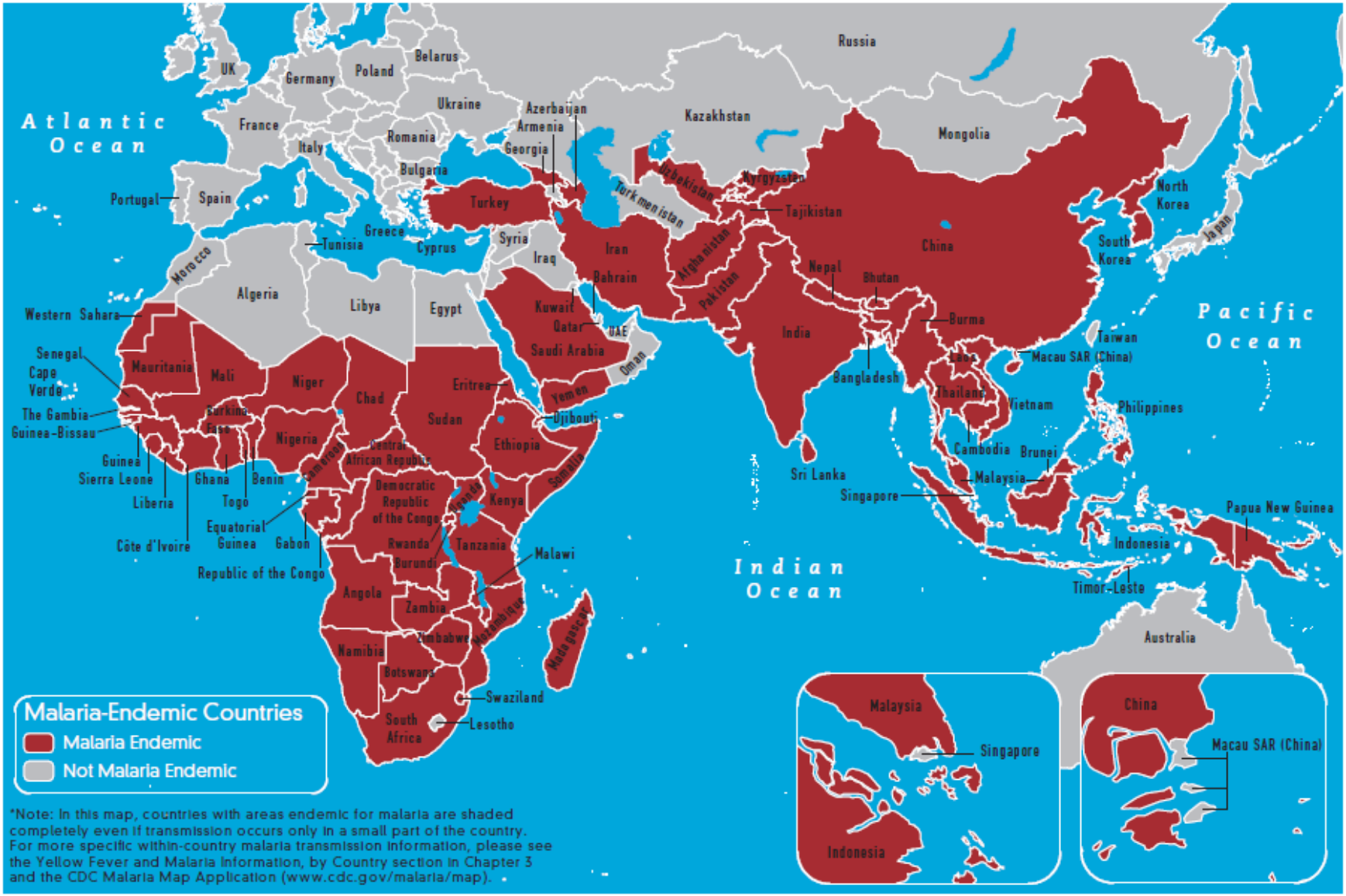
HIV


Pacific Ocean
Atlantic Ocean
Indian Ocean
Prevalence of HIV in Adults
15% – 28%
5% – 14.9%
1% – 4.9%
0.5% – 0.9%
0.1% – 0.4%
< 0.1%
No Data

Japanese Encephalitis

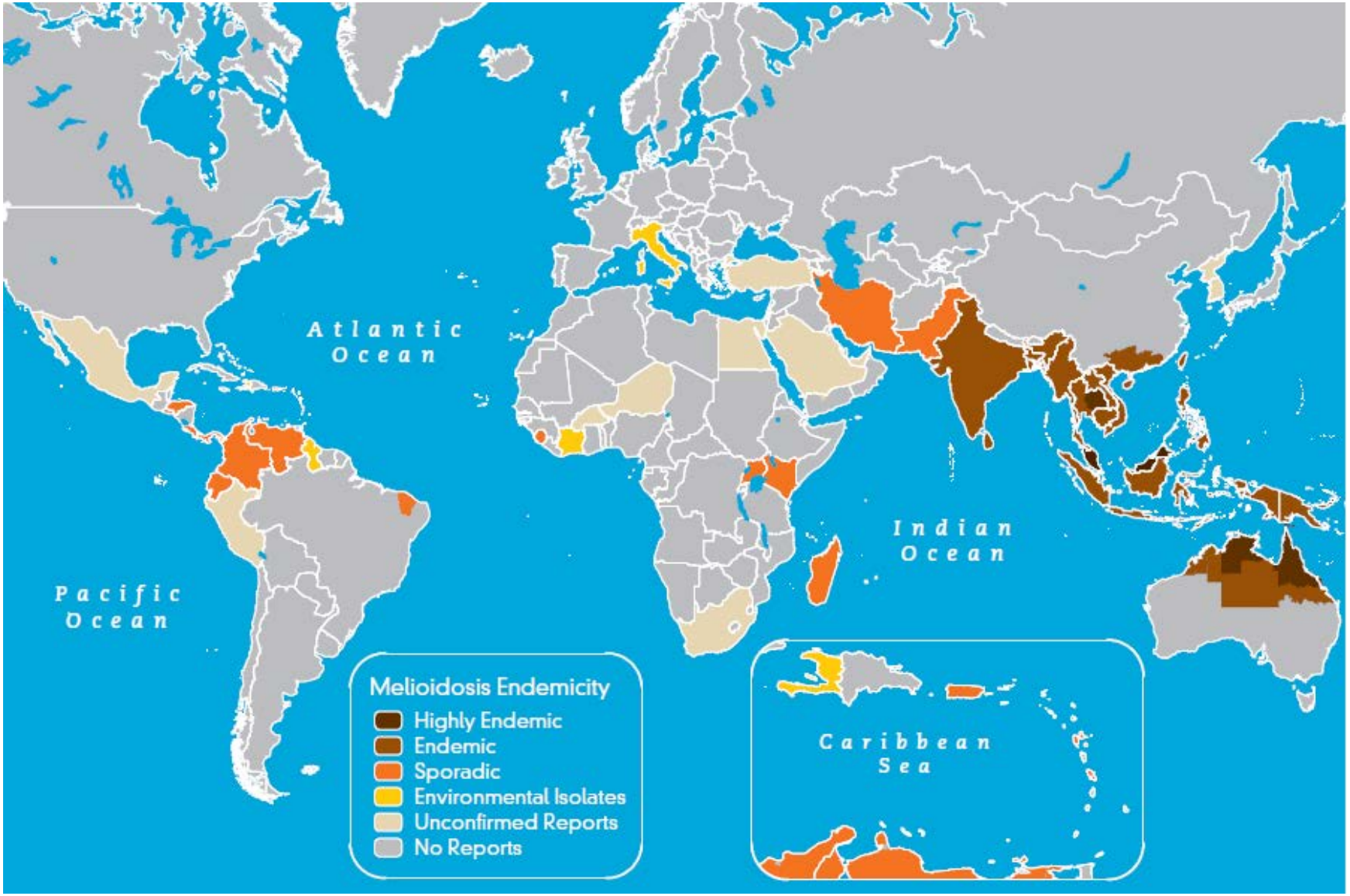


Malaria


Atlantic Ocean
Pacific Ocean
Indian Ocean
Russia
UK
Germany
Poland
Belarus
Ukraine
France
Italy
Romania
Azerbaijan
Armenia
Georgia
Kazakhstan
Mongolia
Bulgaria
Turkey
Uzbekistan
Kyrgyzstan
Tajikistan
Turkmenistan
North Korea
South Korea
Japan
China
Portugal
Spain
Tunisia
Greece
Cyprus
Syria
Iraq
Iran
Afghanistan
Pakistan
Nepal
Bhutan
Morocco
Algeria
Libya
Egypt
Bahrain
Kuwait
Qatar
UAE
Saudi Arabia
Oman
India
Burma
Western Sahara
Senegal
Cape Verde
The Gambia
Guinea-Bissau
Guinea
Sierra Leone
Liberia
Côte d'Ivoire
Ghana
Togo
Benin
Burkina Faso
Nigeria
Mauritania
Mali
Niger
Chad
Sudan
Eritrea
Yemen
Djibouti
Ethiopia
Cameroon
Central African Republic
Equatorial Guinea
Gabon
Republic of the Congo
Democratic Republic of the Congo
Uganda
Kenya
Somalia
Rwanda
Burundi
Tanzania
Malawi
Angola
Zambia
Zimbabwe
Mozambique
Madagascar
Namibia
Botswana
Swaziland
South Africa
Lesotho
Bangladesh
Sri Lanka
Taiwan
Macau SAR (China)
Laos
Thailand
Vietnam
Philippines
Cambodia
Brunei
Malaysia
Singapore
Indonesia
Timor-Leste
Papua New Guinea
Australia
Malaysia
Singapore
Indonesia
China
Macau SAR (China)
Malaria-Endemic Countries
Malaria Endemic
Not Malaria Endemic
*Note: In this map, countries with areas endemic for malaria are shaded completely even if transmission occurs only in a small part of the country. For more specific within-country malaria transmission information, please see the Yellow Fever and Malaria Information, by Country section in Chapter 3 and the CDC Malaria Map Application (www.cdc.gov/malaria/map).

Malaria / Mefloquine Resistant

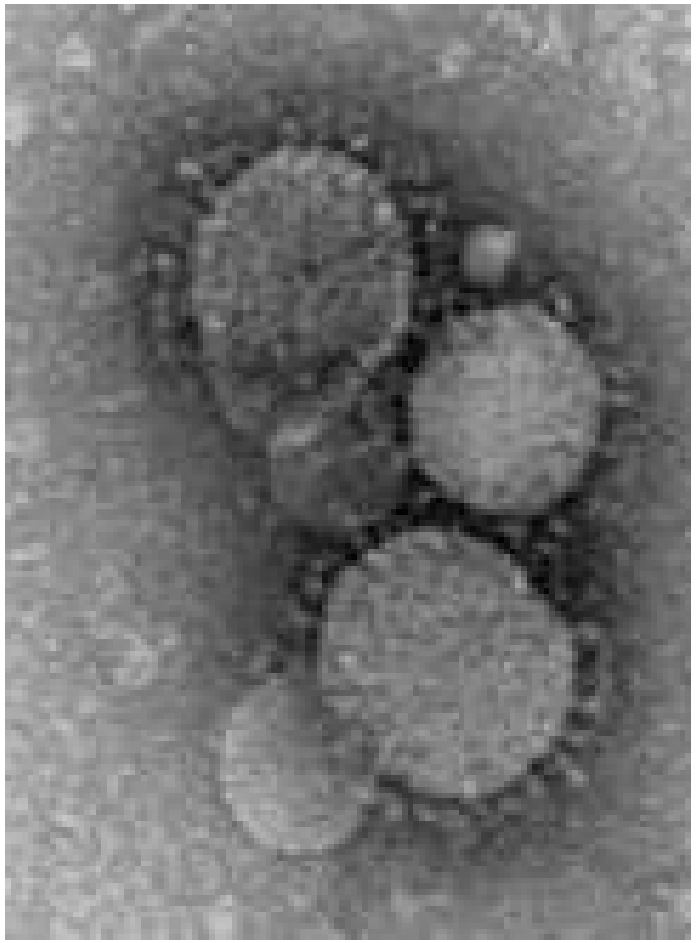
Melioidosis



Meningitis


Mediterranean Sea
Tunisia
Morocco
Algeria
Libya
Egypt
Lebanon
Syria
Iraq
Iran
Israel
Jordan
Saudi Arabia
Red Sea
Yemen
Western Sahara
Mauritania
Cape Verde
Senegal
Mali
Niger
Chad
Eritrea
Djibouti
The Gambia
Guinea-Bissau
Guinea
Burkina Faso
Benin
Nigeria
Sudan
Ethiopia
Sierra Leone
Liberia
Côte d'Ivoire
Ghana
Togo
Central African Republic
Cameroon
Somalia
Equatorial Guinea
São Tomé and Principe
Gabon
Democratic Republic of the Congo
Uganda
Kenya
Rwanda
Burundi
Republic of the Congo
Tanzania
Atlantic Ocean
Indian Ocean
Angola
Mozambique
Zambia
Malawi
Meningitis Belt

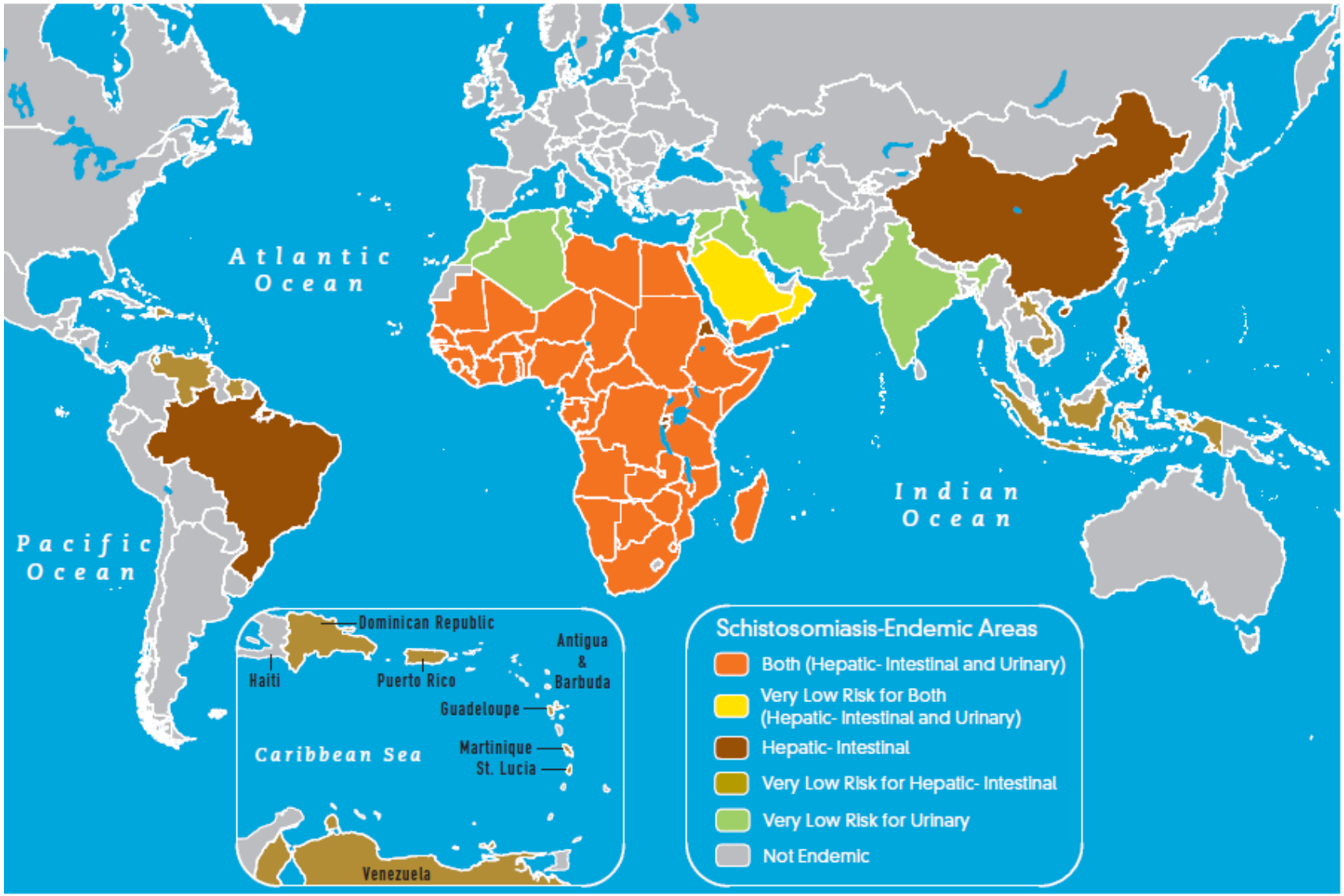
Middle East Respiratory Syndrome-Coronavirus



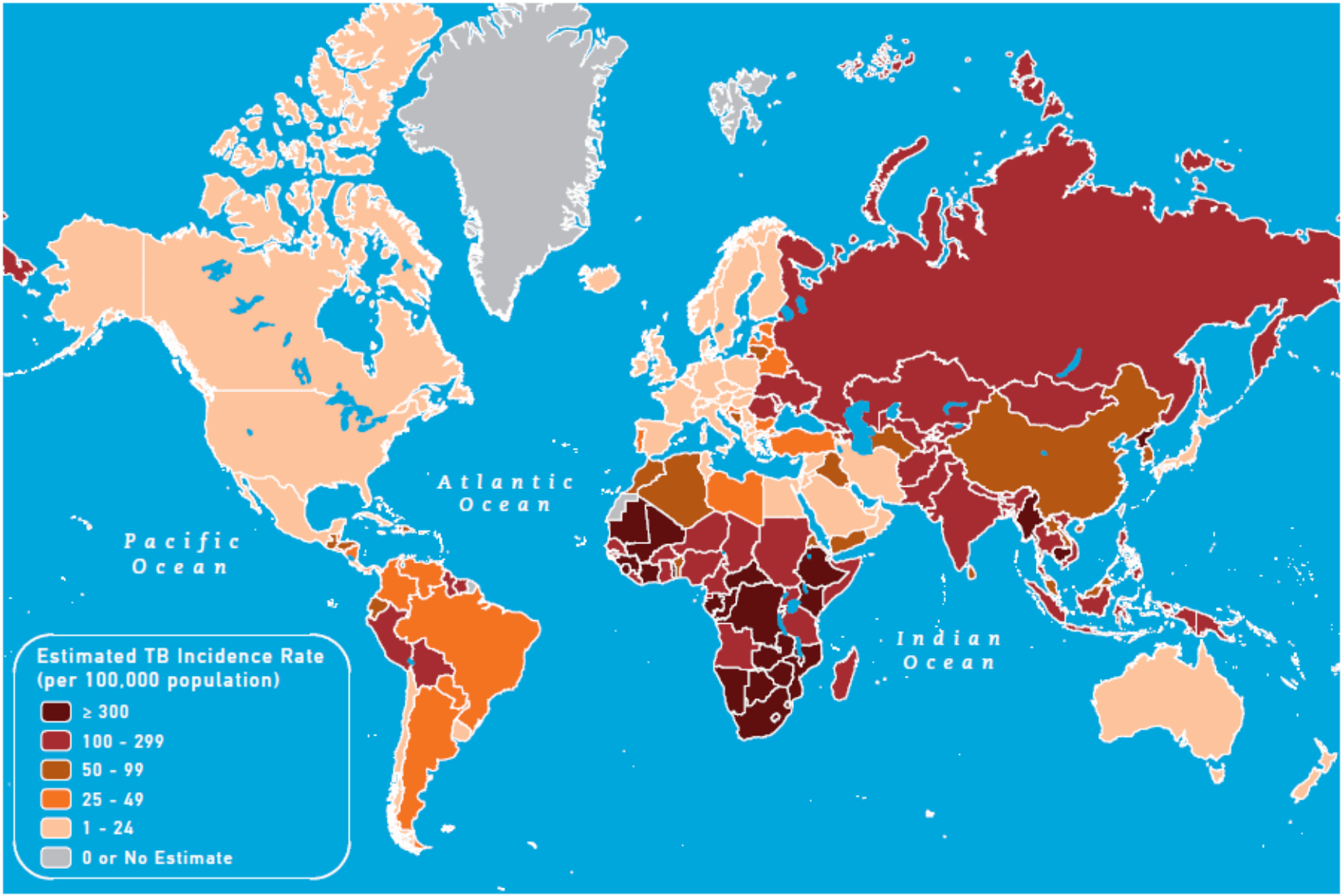
APRIL 2012 – 27 JUN 14

- Cases and deaths
  - 820 lab confirmed cases
  - 286 deaths (35%)
- Countries in or near Arabian Peninsula
  - Saudi Arabia, United Arab Emirates (UAE), Qatar, Oman, Jordan, Kuwait, Yemen, Lebanon, Iran
- **Travel associated cases**
  - United Kingdom (UK), France, Tunisia, Italy, Malaysia, Philippines, Greece, Egypt, United States of America (USA), Netherlands, Algeria

Schistosomiasis



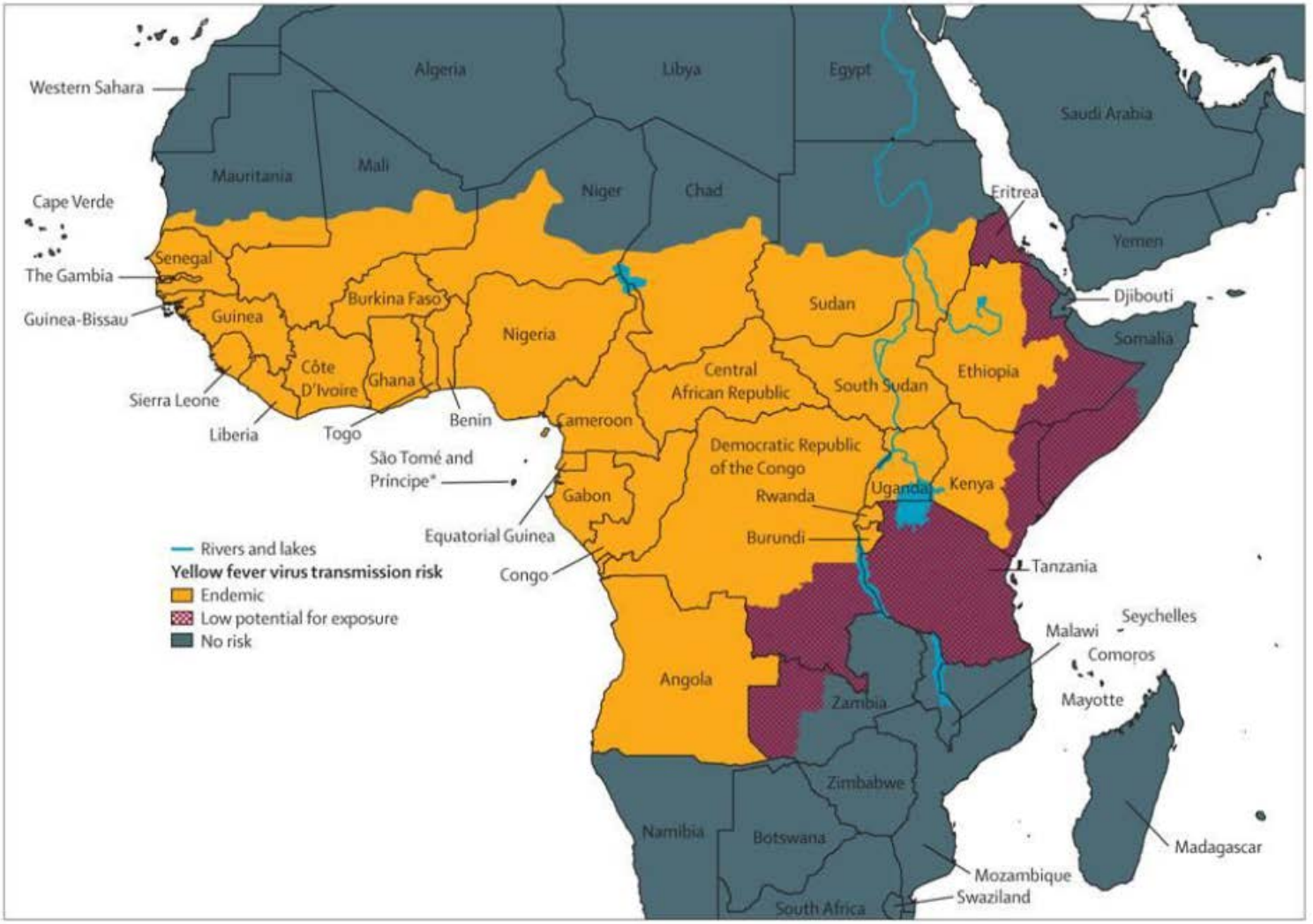
Tuberculosis



Yellow Fever

Map is from the following publication: Jentes ES. Poumerol G, Gershman MD, et al. The revised global yellow fever risk map and recommendations for vaccination, 2010: consensus of the Informal WHO Working Group on Geographic Risk for Yellow Fever. Lancet Infect Dis. 2011;11:622-32.

Yellow Fever



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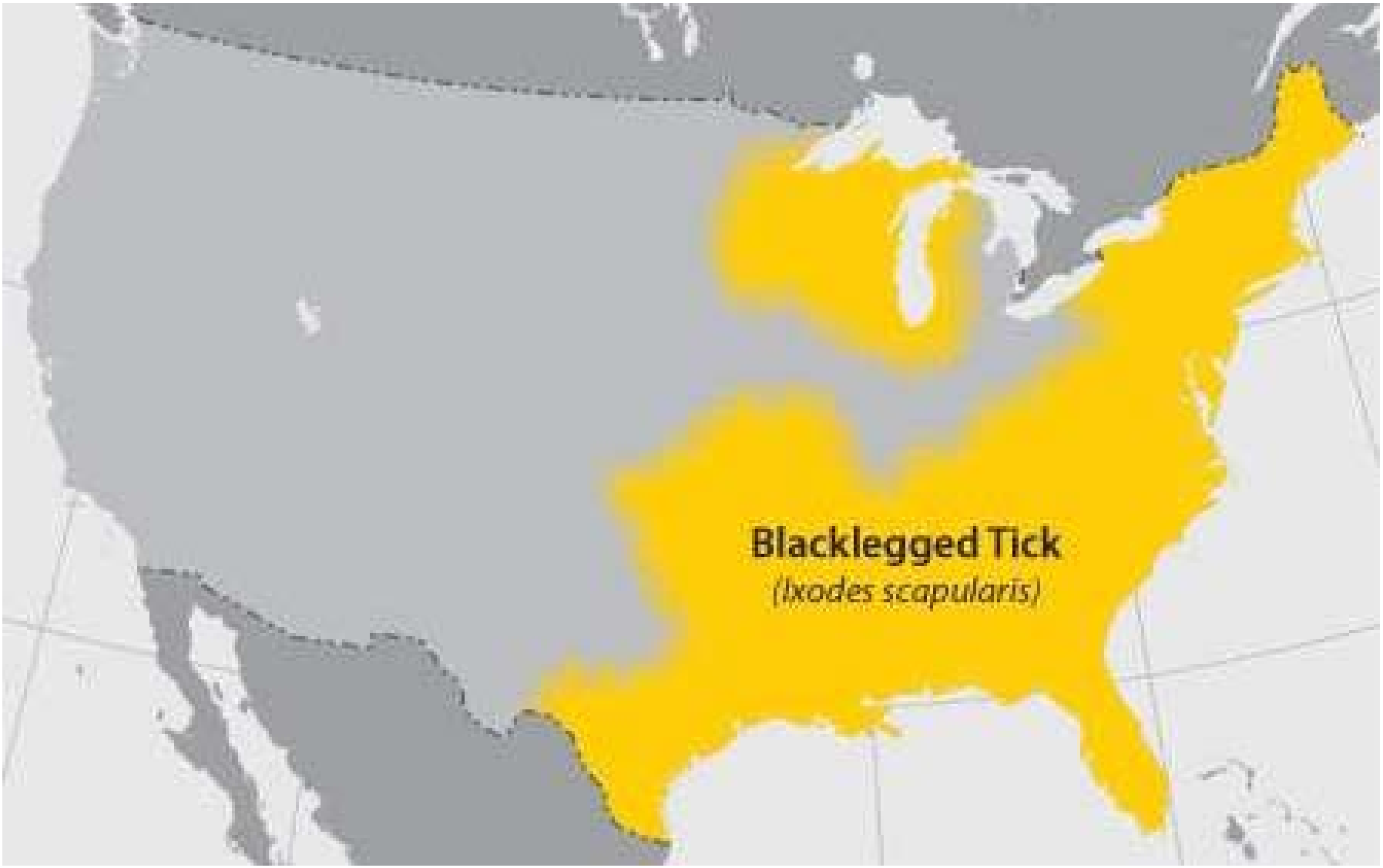
Rock Mountain Spotted Fever / Tularemia

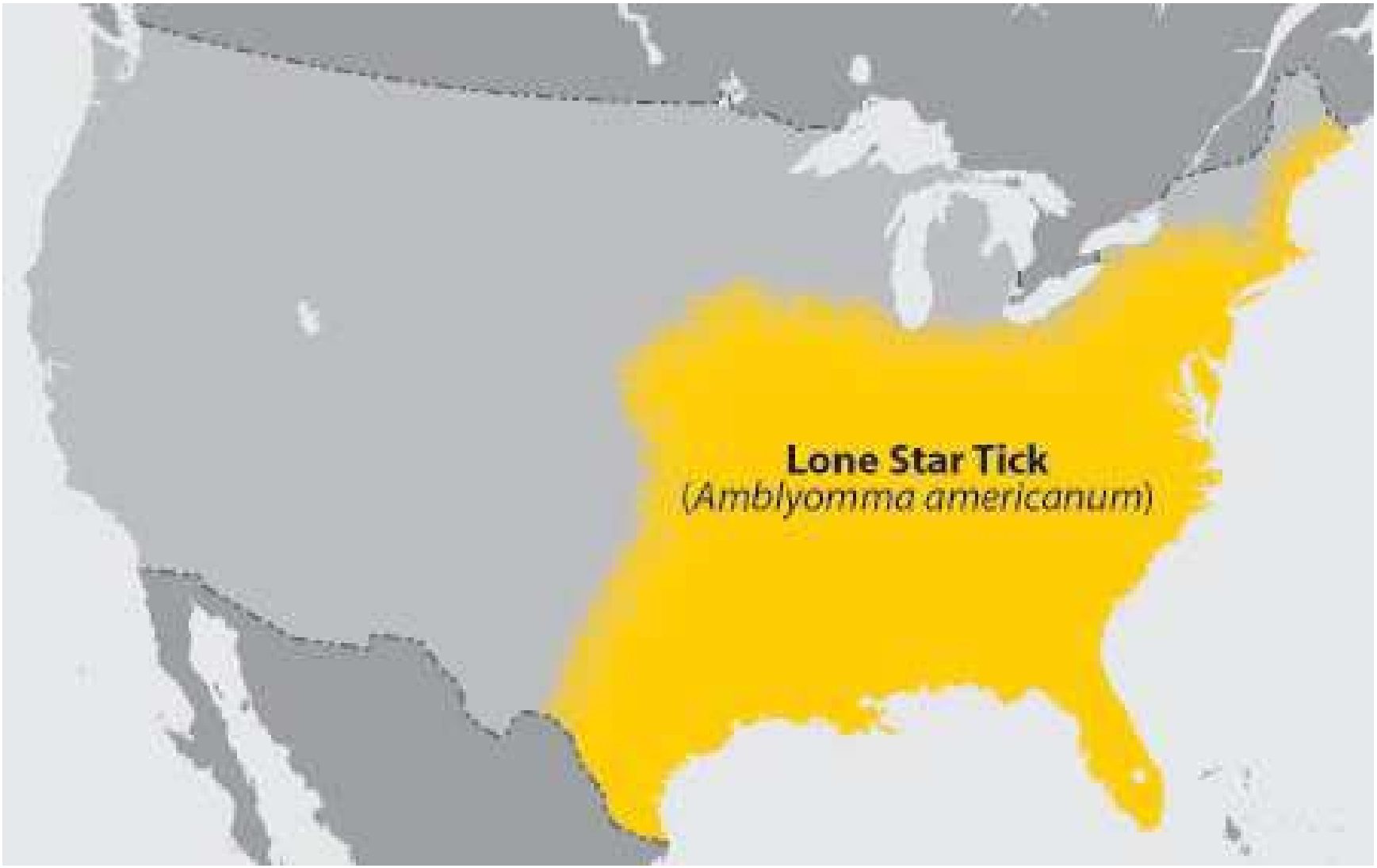
Anaplasmosis / Babesiosis / Lyme Disease



Rock Mountain Spotted Fever

Rickettsia parki rickettsiosis

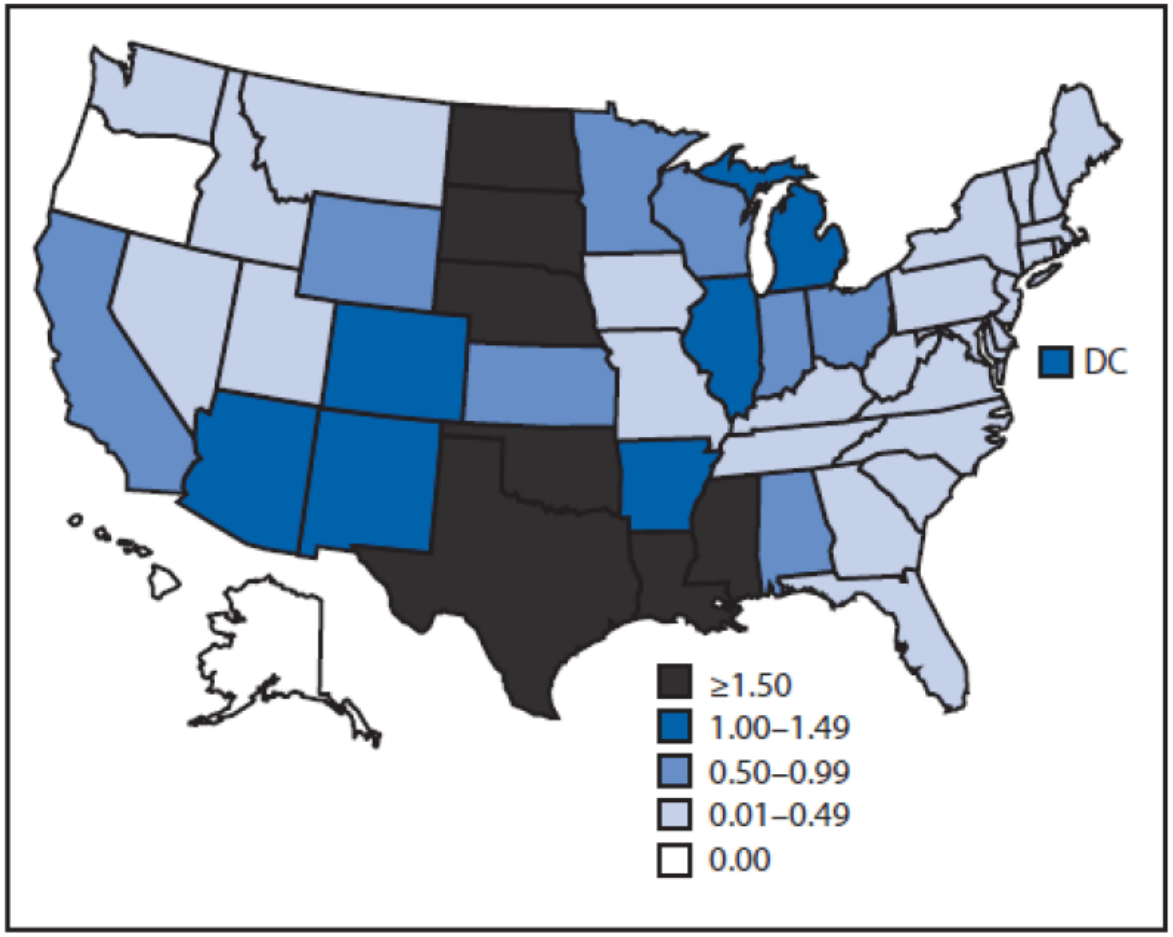
Ehrlichiosis / STARI / Tularemia



Rock Mountain Spotted Fever / Tularemia

Anaplasmosis / Lyme Disease

West Nile Virus



* Per 100,000 population, based on July 1, 2012 U.S. Census population estimates.

Alternate Text: The figure above shows the rate of reported cases of West Nile virus (WNV) neuroinvasive disease, by state, in the United States during 2012. States with the highest incidence rates included South Dakota, North Dakota, Mississippi, Louisiana, and Texas. Four states reported over half of the WNV neuroinvasive disease cases: Texas, California, Illinois, and Louisiana.

Key websites

- www.cdc.gov/travel/page/yellowbook-2012-home.htm = The Yellow Book
- www.cdc.gov/dpdx = Parasitic Diseases diagnosis
- www.istm.org/geosentinel/main.html
- www.promedmail.org = Searchable outbreak info
- https://www.intelink.gov/ncmi/index.php = AFMIC/NCMI
- www.tropnet.net = European Network on Imported Infectious Disease Surveillance

Additional websites

- www.fallingrain.com elevation and rainfall data
- www.healthmap.org outbreak information
- www.lib.utexas.edu/maps *outstanding* map collection!
- http://www.cdc.gov/vaccines/pubs/pinkbook/ default.htm
  the ‘Pink Book’ on vaccines

Take home point number one:

ALWAYS include malaria in the differential of fever in a returnee from a tropical locale

Keep in Mind that…

- Initial symptoms of life-threatening and self-limited infections can be ***identical***.
- **Malaria** is the most common cause of acute undifferentiated fever after travel to sub-Saharan Africa and to some other tropical areas.
- Patients with **malaria** may be afebrile at the time of evaluation but typically give a history of chills.
- **Malaria, especially *falciparum*, <u>can progress rapidly</u>.** Diagnostic studies should be done promptly and **treatment instituted *immediately*** if malaria is diagnosed.
- A history of taking malaria chemoprophylaxis **<u>does not</u> exclude the possibility of malaria**.
- Patients with **malaria** can have prominent **respiratory** (including adult respiratory distress syndrome), **GI**, or **central nervous system** findings.

Wilson ME. Fever in returned travelers. *CDC Health Information for International Travel, 2010 .* Page 288

Also Keep in Mind that…

- Viral hemorrhagic fevers are important to identify but are **rare** in travelers; bacterial infections, such as

  - **leptospirosis**
  - **meningococcemia** and
  - **rickettsial** infections

  can also cause fever and hemorrhage and should be always be considered because of the need to institute prompt, specific treatment.

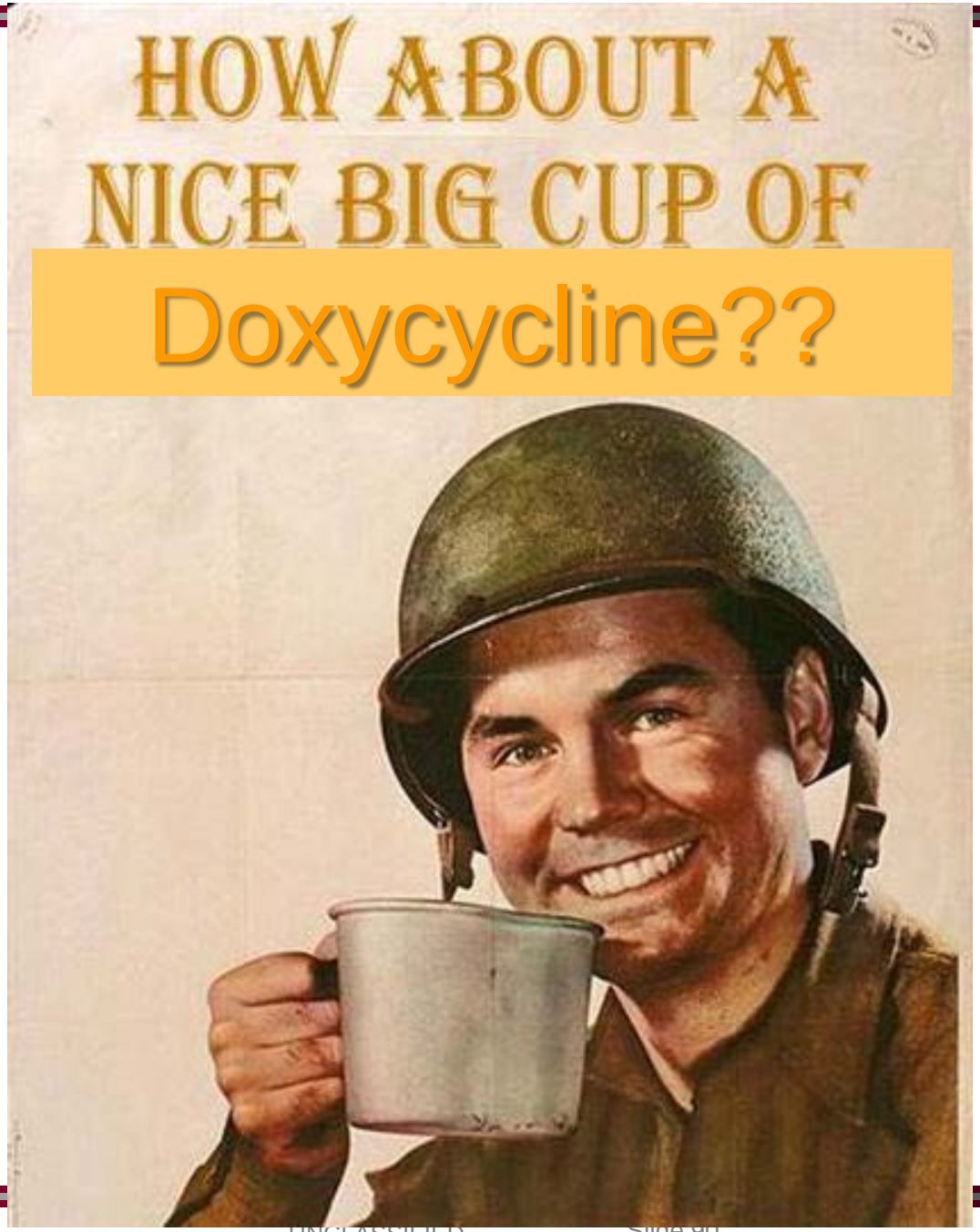
- **Sexually transmitted infections**, including acute HIV, can cause acute febrile infections.

- Consider infection control, public health implications and requirements for reportable diseases.

- Fever in returned travelers is often caused by **common, cosmopolitan infections**, such as pneumonia, influenza, or pyelonephritis. ***Common things occur commonly.***

Take home point number two:

Consider empiric doxycycline



References

1. Schwartz MD. Fever in the returning traveler, part one: a methodological approach to initial evaluation. *Wilderness and Environmental Medicine* 14; 24-32, 2003.
2. Schwartz MD. Fever in the returning traveler, part two: a methodological approach to initial evaluation. *Wilderness and Environmental Medicine* 14; 120-130, 2003.
3. Freedman DO, et al. Spectrum of disease and relation to place of exposure among ill returned travelers. *New England Journal of Medicine* 354: 119-30, 2006.
4. Wilson ME, et al. Fever in returned travelers: results from the GeoSentinel Surveillance Network. *Clinical Infectious Diseases* 44 (15 June): 1560-68, 2007.
5. McLellan SLF. Evaluation of fever in the returned traveler. *Primary Care and Clinical Office Practice* 29: 947-69, 2002.
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Any questions??