Clinical Approach to the Returning Traveler

WRAIR- GEIS 'Operational Clinical Infectious Disease' Course

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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

• Many of the same questions you ask in PREPARATION of the traveler will be things you ask them when they return
When you hear hoof beats…. Not this...

Usually this...

Common things are common
Soliciting a Detailed Medical History
Chief Complaint

• Localizing
  – Focal lesion (cellulitis, MRSA abscess)
  – 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 **AFEBRILE**
  – CNS: evidence of meningitis, encephalitis, any neuro
  – Respiratory: tracheobronchitis, pneumonia
  – Oropharynx: pharyngitis, bleeding gums, poor 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
- Social history reveals chronic tobacco use
- ROS reveals poor dentition and occasional aspiration

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 (bacteria LIKE metal)

• Known lab / radiologic abnormalities
  – Examples: lung nodule/Ca++, heart block, etc.
Latino male with chest pain, receives cardiac cath
- Develops severe thigh pain, rash, MS changes, fever, N&V
- MRI shown goes to OR
Diagnosis: Staphlococcus aureus necrotizing fasciitis and Toxic Shock Syndrome
Diagnosis: *Staphlococcus aureus* necrotizing fasciitis and Toxic Shock Syndrome

Gram positive (PURPLE) cocci in pairs and clusters
Medications / Immunizations

• Prescribed and “Over-the-counter” meds (previous antibiotics?)
• Immunosuppressives
  – Examples – prednisone, DMARDs

• Anti-pyretics (ASA, NSAIDS, acetaminophen)
  – Manipulate fever curve

• Prophylaxis (detailed account, missed doses)
  – 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
- lumbar puncture performed
- CSF Gram’s strain demonstrates *Cryptococcus neoformans*

*Cryptococcus meningitis*
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 viral gastroenteritis, 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 bpm**, tilt positive.
  - Dx with “viral syndrome”, given IV fluid and started on ciprofloxacin
22 year old USMC E-3

- **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
22 year old USMC E-3

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Multiple other Marines start presenting with diarrhea and fevers
NOT NORMAL
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
22 year old USMC E-3

- 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%

  Liberia - US Marines with Malaria
  Diarrhea in 62%
Marines deploy to Liberia
44 contract malaria despite prophylaxis and PPMs

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

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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 chemoprophylaxis. 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 (e.g. monogamous, MSM, high risk behaviors)

• Drugs and alcohol (e.g. Needle based drugs, potential for cirrhosis, etc.)

• Tobacco use (American or foreign made cigarettes?)

• Food (OCONUS (“on economy”), imported?)

• Pets (Type, acquisition history, level of interface)
WF with RUQ pain, intermittent fevers

- Expatriate living in Switzerland
- Owns dog with frequent walks in countryside

Diagnosis: *Echinococcus 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 Personal Protective Measures?)
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

<table>
<thead>
<tr>
<th>Incubation Period</th>
<th>Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;7 Days</td>
<td>Common: malaria, traveler's diarrhea, dengue, enteric fever, respiratory tract infection</td>
</tr>
<tr>
<td></td>
<td>Others: rickettsioses, leptospirosis, meningitis, yellow fever, arbovirus, meningococcal</td>
</tr>
<tr>
<td>7-21 Days</td>
<td>Common: malaria, enteric fever</td>
</tr>
<tr>
<td></td>
<td>Others: rickettsioses, viral hepatitis, leptospirosis, HIV, Q fever, brucellosis, African trypanosomiasis</td>
</tr>
<tr>
<td>&gt;21 Days</td>
<td>Common: malaria, enteric fever</td>
</tr>
<tr>
<td></td>
<td>Others: tuberculosis, hepatitis B virus, bacterial endocarditis, HIV, Q fever, brucellosis, amebic liver disease, melioidosis</td>
</tr>
</tbody>
</table>
Figure 1 Diseases and destinations: the three most common diagnoses in each continent visited. FUO = fever of unknown origin.

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

<table>
<thead>
<tr>
<th>Disease</th>
<th>Febrile</th>
<th>Nonfebrile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria</td>
<td>54 (26)</td>
<td>None</td>
</tr>
<tr>
<td>Unidentified febrile diseases</td>
<td>34 (16)</td>
<td>None</td>
</tr>
<tr>
<td>Dengue fever</td>
<td>27 (13)</td>
<td>None</td>
</tr>
<tr>
<td>Diarrheal diseases</td>
<td>14 (7)</td>
<td>10 (4)</td>
</tr>
<tr>
<td>Leishmaniasis</td>
<td>None</td>
<td>18 (9)</td>
</tr>
<tr>
<td>Miscellaneous febrile infections</td>
<td>12 (6)</td>
<td>None</td>
</tr>
<tr>
<td>Skin diseases</td>
<td>7 (3)‡</td>
<td>4 (2)§</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>7 (3)</td>
<td>None</td>
</tr>
<tr>
<td>Noninfectious diseases</td>
<td>None</td>
<td>7 (3)¹¹</td>
</tr>
<tr>
<td>Onchocerciasis</td>
<td>None</td>
<td>5 (2)</td>
</tr>
<tr>
<td>Idiopathic eosinophilia</td>
<td>None</td>
<td>4 (2)</td>
</tr>
<tr>
<td>Hepatitis infectious</td>
<td>4 (2)</td>
<td>None</td>
</tr>
<tr>
<td>Pulmonary schistosomiasis</td>
<td>2 (1)</td>
<td>None</td>
</tr>
<tr>
<td>Amebic liver abscess</td>
<td>2 (1)</td>
<td>None</td>
</tr>
</tbody>
</table>

* 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).

¹¹Anxiety (2), dizziness (1), hemolytic anemia (1), mefloquine adverse effect (1), hematologic malignancy (1), myositis (1).
Table 3. Etiologic Diagnoses within Selected Syndrome Groups, According to Travel Region.*

<table>
<thead>
<tr>
<th>Syndrome and Cause</th>
<th>All Regions</th>
<th>Caribbean</th>
<th>Central America</th>
<th>South America</th>
<th>Sub-Saharan Africa</th>
<th>South Central Asia</th>
<th>Southeast Asia</th>
<th>other or Multiple Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systemic febrile illness</strong> (n=3907)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific pathogen or cause reported:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaria:</td>
<td>594</td>
<td>459</td>
<td>527</td>
<td>416</td>
<td>718</td>
<td>522</td>
<td>547</td>
<td>454</td>
</tr>
<tr>
<td>Dengue:</td>
<td>104</td>
<td>238</td>
<td>123</td>
<td>138</td>
<td>7</td>
<td>142</td>
<td>318</td>
<td>35</td>
</tr>
<tr>
<td>Mononucleosis (due to Epstein-Barr virus or cytomegalovirus):</td>
<td>32</td>
<td>70</td>
<td>69</td>
<td>79</td>
<td>10</td>
<td>17</td>
<td>32</td>
<td>63</td>
</tr>
<tr>
<td>Rickettsial infection:</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>56</td>
<td>10</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td><em>Salmonella typhi or</em> <em>S. paratyphi</em> infection:</td>
<td>29</td>
<td>22</td>
<td>25</td>
<td>17</td>
<td>7</td>
<td>141</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>No specific cause reported:</td>
<td>406</td>
<td>541</td>
<td>473</td>
<td>554</td>
<td>282</td>
<td>478</td>
<td>453</td>
<td>546</td>
</tr>
<tr>
<td><strong>Acute diarrhea</strong> (n=3859)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parasitic diarrhea:</td>
<td>354</td>
<td>283</td>
<td>403</td>
<td>368</td>
<td>353</td>
<td>453</td>
<td>262</td>
<td>323</td>
</tr>
<tr>
<td>Giardiasis:</td>
<td>173</td>
<td>132</td>
<td>136</td>
<td>158</td>
<td>177</td>
<td>286</td>
<td>118</td>
<td>132</td>
</tr>
<tr>
<td>Amebiasis:</td>
<td>120</td>
<td>105</td>
<td>155</td>
<td>142</td>
<td>138</td>
<td>103</td>
<td>74</td>
<td>135</td>
</tr>
<tr>
<td>Presumptive parasitic cause:</td>
<td>38</td>
<td>9</td>
<td>45</td>
<td>52</td>
<td>33</td>
<td>55</td>
<td>33</td>
<td>13</td>
</tr>
<tr>
<td>Bacterial diarrhea:</td>
<td>268</td>
<td>260</td>
<td>200</td>
<td>253</td>
<td>250</td>
<td>294</td>
<td>369</td>
<td>227</td>
</tr>
<tr>
<td>Campylobacter infection:</td>
<td>85</td>
<td>46</td>
<td>32</td>
<td>90</td>
<td>73</td>
<td>87</td>
<td>180</td>
<td>57</td>
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<tr>
<td>Shigella infection:</td>
<td>41</td>
<td>37</td>
<td>26</td>
<td>41</td>
<td>46</td>
<td>61</td>
<td>26</td>
<td>34</td>
</tr>
<tr>
<td>Nontyphoidal salmonella infection:</td>
<td>27</td>
<td>27</td>
<td>13</td>
<td>14</td>
<td>29</td>
<td>12</td>
<td>56</td>
<td>30</td>
</tr>
<tr>
<td>Presumptive bacterial cause:</td>
<td>110</td>
<td>132</td>
<td>91</td>
<td>105</td>
<td>99</td>
<td>136</td>
<td>116</td>
<td>95</td>
</tr>
<tr>
<td>Viral diarrhea:</td>
<td>9</td>
<td>23</td>
<td>32</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Unspecified acute diarrhea:</td>
<td>385</td>
<td>457</td>
<td>377</td>
<td>376</td>
<td>397</td>
<td>289</td>
<td>393</td>
<td>451</td>
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### Dermatologic disorder (n=2947)

<table>
<thead>
<tr>
<th>Condition</th>
<th>187</th>
<th>192</th>
<th>235</th>
<th>186</th>
<th>194</th>
<th>201</th>
<th>179</th>
<th>166</th>
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</thead>
<tbody>
<tr>
<td>Insect bite, with or without superinfection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cutaneous larva migrans:</td>
<td>129</td>
<td>299</td>
<td>134</td>
<td>122</td>
<td>86</td>
<td>64</td>
<td>171</td>
<td>68</td>
</tr>
<tr>
<td>Allergic rash or reaction</td>
<td>113</td>
<td>148</td>
<td>128</td>
<td>97</td>
<td>105</td>
<td>112</td>
<td>93</td>
<td>132</td>
</tr>
<tr>
<td>Skin abscess:</td>
<td>97</td>
<td>34</td>
<td>47</td>
<td>SO</td>
<td>136</td>
<td>144</td>
<td>122</td>
<td>105</td>
</tr>
<tr>
<td>Rash of unknown cause</td>
<td>66</td>
<td>SS</td>
<td>74</td>
<td>75</td>
<td>66</td>
<td>48</td>
<td>49</td>
<td>96</td>
</tr>
<tr>
<td>Mycosis, superficial</td>
<td>56</td>
<td>45</td>
<td>30</td>
<td>36</td>
<td>65</td>
<td>64</td>
<td>61</td>
<td>77</td>
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<tr>
<td>Animal bite requiring rabies postexposure prophylaxis:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Leishmaniasis:</td>
<td>38</td>
<td>0</td>
<td>64</td>
<td>143</td>
<td>14</td>
<td>19</td>
<td>0</td>
<td>36</td>
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<tr>
<td>Myiasis:</td>
<td>35</td>
<td>0</td>
<td>101</td>
<td>100</td>
<td>40</td>
<td>0</td>
<td>0</td>
<td>14</td>
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<tr>
<td>Swimmer's itch:</td>
<td>28</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>117</td>
<td>3</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Impetigo or erysipelas:</td>
<td>27</td>
<td>31</td>
<td>20</td>
<td>9</td>
<td>31</td>
<td>45</td>
<td>22</td>
<td>34</td>
</tr>
<tr>
<td>Mite infestation (e.g., scabies)</td>
<td>22</td>
<td>21</td>
<td>37</td>
<td>39</td>
<td>12</td>
<td>29</td>
<td>17</td>
<td>14</td>
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### Nondiarrheal gastrointestinal disorder (n=1421)

<table>
<thead>
<tr>
<th>Condition</th>
<th>239</th>
<th>278</th>
<th>273</th>
<th>256</th>
<th>307</th>
<th>202</th>
<th>344</th>
<th>141</th>
</tr>
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<tbody>
<tr>
<td>Intestinal nematode infestation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Strongyloidiasis, simple intestinal:</td>
<td>96</td>
<td>124</td>
<td>141</td>
<td>102</td>
<td>148</td>
<td>45</td>
<td>160</td>
<td>37</td>
</tr>
<tr>
<td>Ascaris infestation</td>
<td>52</td>
<td>52</td>
<td>30</td>
<td>66</td>
<td>60</td>
<td>84</td>
<td>18</td>
<td>46</td>
</tr>
<tr>
<td>Gastritis or peptic ulcer disease:</td>
<td>131</td>
<td>258</td>
<td>91</td>
<td>168</td>
<td>85</td>
<td>101</td>
<td>104</td>
<td>156</td>
</tr>
<tr>
<td>Helicobacter pylori status unknown</td>
<td>76</td>
<td>124</td>
<td>51</td>
<td>73</td>
<td>60</td>
<td>62</td>
<td>74</td>
<td>91</td>
</tr>
<tr>
<td>Positive for H. pylori:</td>
<td>47</td>
<td>103</td>
<td>40</td>
<td>80</td>
<td>22</td>
<td>28</td>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>Acute hepatitis:</td>
<td>115</td>
<td>62</td>
<td>91</td>
<td>102</td>
<td>76</td>
<td>214</td>
<td>61</td>
<td>144</td>
</tr>
<tr>
<td>Hemorrhoids or constipation:</td>
<td>89</td>
<td>124</td>
<td>192</td>
<td>117</td>
<td>54</td>
<td>84</td>
<td>74</td>
<td>84</td>
</tr>
</tbody>
</table>

*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.
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”
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 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.

Information on becoming a GeoSentinel Site
GeoSentinel Data Entry (Sites Only)

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

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%) of ill returned travelers with fever</th>
<th>No. of ill returned travelers without fever</th>
<th>Regional multiple logistic regression models in which variable is included as a significant predictor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>429 (31)</td>
<td>962</td>
<td>NS</td>
</tr>
<tr>
<td>20–64</td>
<td>6230 (28)</td>
<td>16,152</td>
<td>...</td>
</tr>
<tr>
<td>≥65</td>
<td>2444 (24)</td>
<td>761</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3995 (32)</td>
<td>8682</td>
<td>...</td>
</tr>
<tr>
<td>Female</td>
<td>2891 (24)</td>
<td>8967</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td><strong>Reason for travel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tourism</td>
<td>3802 (26)</td>
<td>10,782</td>
<td>...</td>
</tr>
<tr>
<td>Business</td>
<td>1036 (29)</td>
<td>2477</td>
<td>...</td>
</tr>
<tr>
<td>Research/education</td>
<td>283 (27)</td>
<td>785</td>
<td>...</td>
</tr>
<tr>
<td>Missionary/volunteer</td>
<td>384 (18)</td>
<td>1734</td>
<td>B, C</td>
</tr>
<tr>
<td>Visiting friends and relatives</td>
<td>1431 (40)</td>
<td>2109</td>
<td>A, C, D</td>
</tr>
<tr>
<td><strong>Duration of travel, days</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤30</td>
<td>4134 (31)</td>
<td>8994</td>
<td>A, C, D</td>
</tr>
<tr>
<td>≥31</td>
<td>2597 (23)</td>
<td>8572</td>
<td>...</td>
</tr>
<tr>
<td><strong>Interval time from travel to presentation, weeks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤1</td>
<td>2789 (37)</td>
<td>4750</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>1–6</td>
<td>2437 (30)</td>
<td>5762</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>&gt;6</td>
<td>1511 (18)</td>
<td>7012</td>
<td>...</td>
</tr>
<tr>
<td><strong>Recorded pretravel encounter</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>2535 (30)</td>
<td>5857</td>
<td>...</td>
</tr>
<tr>
<td>Yes</td>
<td>3488 (27)</td>
<td>9577</td>
<td>A, D</td>
</tr>
<tr>
<td>Unknown</td>
<td>840 (27)</td>
<td>2309</td>
<td>A, D</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6957 (28)</td>
<td>17,963</td>
<td>...</td>
</tr>
</tbody>
</table>

**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
# Infectious Disease Emergencies in Returning Travelers

Special Reference to Malaria, Dengue Fever, and Chikungunya


## Table 1
Top 5 illnesses in returning travelers

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Systemic illnesses</td>
<td>35</td>
</tr>
<tr>
<td>2. Acute diarrhea</td>
<td>15</td>
</tr>
<tr>
<td>3. Respiratory illness</td>
<td>14</td>
</tr>
<tr>
<td>4. Genitourinary diseases</td>
<td>4</td>
</tr>
<tr>
<td>5. Gastrointestinal illnesses (other than diarrhea)</td>
<td>4</td>
</tr>
</tbody>
</table>
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
- Viral hemorrhagic fevers
Traveler returning from Saudi Arabia after pilgrimage to the Hajj, not feeling well with fever

- Develops MS changes, hypotension, and respiratory failure -
- Rash as shown 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.*”

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
Vaginulus plebeius, the intermediate host of Angiostrongylus costaricensis

Achitina fulica, the giant African land snail
An Outbreak of Eosinophilic Meningitis Caused by *Angiostrongylus cantonensis* in Travelers Returning from the Caribbean


*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

If you're going to eat a live crawfish, make sure you've got a napkin to wash the guts off your chin and a couple of beers to wash the whole thing down.

Keith eats a big nasty live crawfish

The Zapruder of crawfish snuff videos: Did Eddie swallow his crawfish in one gulp or did he surreptitiously spit it out?
The importance of taking a careful history

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.
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.

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.

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

Related Stories

Paragonimiasis causes fever, cough, chest pain, shortness of breath and extreme fatigue. The infection is generally not fatal, and it is usually 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
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
### TABLE 330-1
**Constellations of Exposures and Clinical Presentations Suggestive of Particular Diagnoses in Returned Travelers**

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

Resort hotel in southern Europe, ± exposure to whirlpool spas
Exploded a cave in the Americas
Ingestion of unpasteurized goat cheese
Long trip to West/Central Africa
Long trip to West/Central Africa
Safari to game parks of East Africa
Travel to Australia
Farming areas of India and Southeast Asia
Forested areas of central and eastern Europe and across Russia
Rodent exposure in West Africa
Ingestion of sushi, ceviche, or raw freshwater fish
Returning Hajj pilgrim or family contact
Ingestion of snails, fish, or shellfish in Asia
Summertime exposure to rodent droppings in Scandinavia
Ingestion of undercooked meat of any animal in any country
Unvaccinated, returning from sub-Saharan Africa or forested areas of Amawnia
Exposure to farm animals
Possible tick exposure almost anywhere
Poor hygienic conditions with possible body louse exposure in Ethiopia or Sudan

Pneumonia
Fever, cough, retrosternal chest pain, hilar adenopathy
Chronic fever, fatigue
Afebrile, intensely pruritic, evanescent truncal maculopapular rash
Migratory localized angioedema or swellings over large joints, eosinophilia
Fever, nongenital chancre, fine macular rash
Fever, fatigue, polyarthritis
Fever, altered mental status, paralysis
Fever, altered mental status, paralysis
Fever, sore throat, jaundice, hemorrhagic manifestations
Migratory nodules in truncal areas with overlying erythema or mild hemorrhage
Fever, meningitis
Eosinophilic meningitis
Fever with decreased renal function
Fever, facial edema, myositis, increased creatine phosphokinase, massive eosinophilia, normal erythrocyte sedimentation rate
Fever, jaundice, proteinuria, hemorrhage
Pneumonia, mild hepatitis
Fever, headache, rash, conjunctival injection, hepatosplenomegaly
Fever, headache, rash, conjunctival injection, hepatosplenomegaly
Legionnaires' disease
Histoplasmosis
Brucella melitensis
Onchocerciasis
Loiasis
East African trypanosomiasis
Ross River virus
Japanese encephalitis
Tick-borne encephalitis
Lassa fever
Gnathostomiasis
Meningococcal meningitis
Angiostrongyliasis, gnathostomiasis
Puun lala virus
Trichinosis
Yellow fever
Q fever
Tick-borne relapsing fever
Louse-borne relapsing fever
Fever + Rash + Headache + Low platelets (<100k)

Rickettsial diseases (i.e. Typhus and Spotted Fevers)
- especially if tick exposure and you see an eschar
- empiric doxycycline is key

Meningococcal Disease
- no vaccine for “B”
- does not always result in meningitis, as it can present as septic shock
- need to think about close contacts and post-exposure prophylaxis

Early hemorrhagic fevers
- present with flu-like symptoms early
- they don’t all cause bleeding

Dengue Fever
- urban settings can create outbreaks
- severe bone pain (“break bone fever”)
- can result in hemorrhagic disease
- focus on fluid balance in patient
- if more joint pain think Chikungunya

Sexually Transmitted Diseases
- Acute HIV, Syphilis, and even disseminated gonococcal disease
- Stress importance of honesty with history
Fever + Eschar returning from Sub-Saharan Africa

African Tick Bite Fever
- Doxycycline will result in rapid symptom resolution

African Trypanosomiasis
- Known as “Sleeping Sickness”
- East African strain more rapid and severe
- Spread by Tsetse fly
- Bite leaves a chancre that may look like an eschar
- Treatments are complicated and toxic
Fever + Hemorrhage

Viral Hemorrhagic Fevers
- Start with flulike syndrome with rapid progression
- Not all cases have hemorrhagic signs
- Current Ebola outbreak known for cholera-like diarrhea
- Ribavirin has some efficacy against Lassa fever, some hantaviruses and Crimean Congo Hemorrhagic Fever
- Early supportive care is key
- In majority of cases, risk to the provider is HIGH

Leptospirosis
- Often associated with water exposure to skin
- Not likely if taking doxycycline for malaria prophylaxis

Meningococcemia
- Remember, this bacteria isn’t just meningitis
- Severe sepsis, and possibility of loss of limbs
Fever + Eosinophilia

Schistosomiasis
- Exposure to fresh water (look for snail shells)
- Acute infection (Katayama fever) occurs within weeks of infection
- May have extremely high eosinophil counts
- Praziquantel is the drug of choice

Trichinosis
- Parasite caused by eating undercooked pork or game meats
- Early symptoms may be c/w traveler’s diarrhea
- Later symptoms include muscle pain, edema, and weakness

Other intestinal worms that have a tissue migration stage can also result in high eosinophil counts.

Malaria does **NOT** typically result in raised eosinophil levels
Other common clinical findings and associated infections

Fever + abdominal pain ➔ Typhoid, amoebic dysentery/abscess

Fever + myalgias/arthralgias ➔ Dengue/Chikungunya

Fever + jaundice ➔ Yellow Fever, Leptospirosis, Hepatitis A or E

Fever + meningeal signs ➔ Bacterial meningitis, Angiostrongylus Fever

NOS + normal or low WBC ➔ Malaria, Visceral Leishmaniasis, Dengue, Rickettsiae, Chikungunya, VHF

Fever + tender lymphadenopathy ➔ Yersinia pestis (Plague)

Fever with delayed onset (> 6 weeks after return) ➔ P. malariae, P. vivax, Tuberculosis, Visceral Leishmaniasis,
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 (standard chemistry)
- 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
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 arbovirus 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.

The patients were observed for a minimum of 14 days. They were confined to bed until temperature was below 100°F and were judged clinically well enough to obtain valid temperature rises above 105°F, alcohol sedation were used. If a diagnosis was made, appropriate therapy was prescribed, however, the patient was discharged.

Laboratory Methods
Clinical laboratory procedures included complete blood count, erythrocyte sedimentation rates (Waaler), and glutamic-oxaloacetic transaminase (SGOT) levels.

Blood cultures were collected on the first day of admission and on the 3rd and 5th days of hospitalization. Blood cultures were collected on the 3rd and 5th days of hospitalization. Blood cultures were collected on the 3rd and 5th days of hospitalization. Blood cultures were collected on the 3rd and 5th days of hospitalization.

Clinical features included fever, white blood cell count, SGOT, and rash.

Epidemiology

<table>
<thead>
<tr>
<th>Epidemiology</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camp, urban</td>
<td>+++</td>
<td>+++</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Jungle</td>
<td>--</td>
<td>--</td>
<td>+++</td>
<td>+++</td>
</tr>
</tbody>
</table>

Fever, degrees F

<table>
<thead>
<tr>
<th>Fever, degrees F</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 104</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td>--</td>
</tr>
<tr>
<td>&gt; 104</td>
<td>--</td>
<td>--</td>
<td>++</td>
<td>+++</td>
</tr>
</tbody>
</table>

Arthralgias

<table>
<thead>
<tr>
<th>Arthralgias</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>+++</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Tender adenopathy

<table>
<thead>
<tr>
<th>Tender adenopathy</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>++ (early)</td>
<td>+++</td>
<td>+++</td>
<td>+++ (later)</td>
<td>--</td>
</tr>
</tbody>
</table>

Tender liver/spleen

<table>
<thead>
<tr>
<th>Tender liver/spleen</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>--</td>
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</tbody>
</table>

Rash

<table>
<thead>
<tr>
<th>Rash</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
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</tbody>
</table>

Petechiae/tourniquet test positive

<table>
<thead>
<tr>
<th>Petechiae/tourniquet test positive</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
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<td>+++</td>
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</tbody>
</table>

WBC, /mm³

<table>
<thead>
<tr>
<th>WBC, /mm³</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5,000</td>
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<tr>
<td>&gt; 5,000</td>
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<td>+++</td>
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</tbody>
</table>

SGOT > 50 units

<table>
<thead>
<tr>
<th>SGOT &gt; 50 units</th>
<th>Dengue</th>
<th>Chikungunya</th>
<th>Scrub Typhus</th>
<th>Malaria</th>
</tr>
</thead>
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</tbody>
</table>

Chikungunya

Waves of Transmission of Chikungunya Virus

First Wave  Second Wave  Third Wave
Dengue
Hepatitis E

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

Map showing the global distribution of Hepatitis E endemicity.
Tuberculosis
Malaria

*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).
48 yo man with recent travel to Southeast Asia, presenting with left lower lobe pneumonia, back pain and perirectal

- Blood cultures and abscess grew a gram negative bacilli identified as a *Pseudomonas* species
- Patient was discharged on a 3 week course of levofloxacin
- Patient returns in 11 days with severe back pain, left sided pleuritic chest pain, and acute bilateral leg paralysis
- Found to have an epidural abscess tracking from T6-T10
- Lab personnel handling the specimens required serologic evaluation for exposure
Melioidosis (Burkholderia pseudomallei)
Meningococcal Meningitis
Middle East Respiratory Syndrome Coronavirus

APRIL 2012 – 6 AUG 2015

• Cases and deaths
  – 1384 lab confirmed cases
  – 495 deaths (36%)

• Countries in or near Arabian Peninsula
  – Saudi Arabia, United Arab Emirates (UAE), Qatar, Oman, Jordan, Kuwait, Yemen, Lebanon, Iran

• Travel associated cases have occurred as well as spread to Korea where 186 cases spread from 20 May to 21 July 2015
Yellow Fever

Yellow Fever

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*, can progress rapidly. Diagnostic studies should be done promptly and treatment instituted immediately if malaria is diagnosed.

- A history of taking malaria chemoprophylaxis does not 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


