Infectious Considerations Before During and After Medical Mission Trips

Elias B. Chahine, PharmD, FCCP, BCPS (AQ-ID)  
Associate Professor of Pharmacy Practice  
Lloyd L. Gregory School of Pharmacy  
Palm Beach Atlantic University
Goal

Upon completion of this presentation, the learner should be able to recommend appropriate options for the prevention of infections during medical mission trips.
Learning Objectives

At the conclusion of this presentation, the learner should be able to:

- Given an individual, select the appropriate vaccines to prevent diseases associated with travel to certain geographic regions.
- Identify the causative organisms associated with travelers’ diarrhea.
- Given an individual, design an appropriate regimen to prevent and to treat travelers’ diarrhea.
- Compare and contrast the available agents to prevent malaria.
- Given an individual, design an appropriate regimen to prevent malaria in short-term travelers.
- Devise strategies to prevent travelers’ diarrhea and malaria.
Outline

Vaccines
- Routine vaccines for children
- Routine vaccines for adults
- Travel vaccines

Travelers’s diarrhea
- Causative organisms
- Prevention
- Treatment

Malaria
- Prevention for short-term travelers

Vaccines

- Routine vaccines for children
- Routine vaccines for adults
- Travel vaccines
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16 yrs</th>
<th>17-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
<td>1st dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotavirus (RV)RV1 (2-dose series); RV5 (3-dose series)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTPa; &lt;7 yrs)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenza type b (Hib)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenza type b (Hib)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactivated poliovirus (IPV; &lt;18 yrs)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza (IIV)</td>
<td>Annual vaccination (IIV) 1 or 2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>See footnote 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella (VAR)</td>
<td>1st dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella (VAR)</td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A (HepA)</td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal (Hib-MenCY ≥6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≥2 mos)</td>
<td>See footnote 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap; ≥7 yrs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV)</td>
<td></td>
<td>See footnote 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal B (M)</td>
<td>See footnote 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide (PPSV23)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Range of recommended ages for all children
- Range of recommended ages for catch-up immunization
- Range of recommended ages for certain high-risk groups
- Range of recommended ages for non-high-risk groups that may receive vaccine, subject to individual clinical decision making
- No recommendation
<table>
<thead>
<tr>
<th>VACCINE ▼</th>
<th>INDICATION ▶</th>
<th>Immunocompromised status (excluding HIV infection)</th>
<th>HIV infection CD4+ count (cells/µL)</th>
<th>Kidney failure, end-stage renal disease, on hemodialysis</th>
<th>Heart disease, chronic lung disease</th>
<th>CSF leaks/cochlear implants</th>
<th>Asplenia and persistent complement deficiencies</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotavirus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenzae type b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal conjugate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactivated poliovirus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal ACWY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningococcal B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal polysaccharide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Vaccination according to the routine schedule recommended**
- **Recommended for persons with an additional risk factor for which the vaccine would be indicated**
- **Vaccination is recommended, and additional doses may be necessary based on medical condition. See footnotes.**
- **No recommendation**
- **Contraindicated**
- **Precaution for vaccination**
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>19–21 years</th>
<th>22–26 years</th>
<th>27–59 years</th>
<th>60–64 years</th>
<th>≥ 65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza¹</td>
<td></td>
<td></td>
<td>1 dose annually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Td/Tdap²</td>
<td></td>
<td></td>
<td>Substitute Tdap for Td once, then Td booster every 10 yrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMR³</td>
<td></td>
<td></td>
<td>1 or 2 doses depending on indication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAR⁴</td>
<td></td>
<td></td>
<td>2 doses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HZV⁵</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dose</td>
</tr>
<tr>
<td>HPV–Female⁶</td>
<td></td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPV–Male⁶</td>
<td></td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCV13⁷</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dose</td>
</tr>
<tr>
<td>PPSV23⁷</td>
<td></td>
<td></td>
<td>1 or 2 doses depending on indication</td>
<td></td>
<td>1 dose</td>
</tr>
<tr>
<td>HepA⁸</td>
<td></td>
<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HepB⁹</td>
<td></td>
<td></td>
<td>3 doses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MenACWY or MPSV4¹⁰</td>
<td></td>
<td></td>
<td>1 or more doses depending on indication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MenB¹⁰</td>
<td></td>
<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hib¹¹</td>
<td></td>
<td></td>
<td>1 or 3 doses depending on indication</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Recommended for adults who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection**
- **Recommended for adults with additional medical conditions or other indications**
- **No recommendation**

https://www.cdc.gov/vaccines/schedules/hcp/adult.html
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza[^1]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dose annually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Td/Tdap[^2]</td>
<td>1 dose Tdap each pregnancy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Substitute Tdap for Td once, then Td booster every 10 yrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMR[^3]</td>
<td>contraindicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 or 2 doses depending on indication</td>
<td></td>
</tr>
<tr>
<td>VAR[^4]</td>
<td>contraindicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 doses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HZY[^5]</td>
<td>contraindicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPV-Female[^6]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 doses through age 26 yrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPV-Male[^6]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 doses through age 21 yrs</td>
<td>3 doses through age 26 yrs</td>
<td></td>
</tr>
<tr>
<td>PCV13[^7]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPSV23[^7]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1, 2, or 3 doses depending on indication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HepA[^8]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HepB[^9]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 doses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MenACWY or MPSV[^10]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 or more doses depending on indication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MenB[^10]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 or 3 doses depending on vaccine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hib[^11]</td>
<td>3 doses post-HSCT recipients only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dose</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[^a]: Recommended for adults who meet the age requirement, lack documentation of vaccination, or lack evidence of past infection
[^b]: Recommended for adults with additional medical conditions or other indications
[^c]: Contraindicated
[^d]: No recommendation

https://www.cdc.gov/vaccines/schedules/hcp/adult.html
Travel Vaccines

- Cholera
- Hepatitis A
- Hepatitis B
- Japanese encephalitis
- Meningococcal
- Rabies
- Typhoid
- Yellow fever
# Travel Vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Brand</th>
<th>Standard Adult Schedule</th>
<th>Duration of Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholera</td>
<td>Vaxchora</td>
<td>Single dose</td>
<td>6 mo?</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>Havrix / Vaqta</td>
<td>0 and 6 to 18 mo</td>
<td>Lifelong</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>Engerix-B / Recombivax-HB</td>
<td>0, 1, and 6 mo</td>
<td>Lifelong</td>
</tr>
<tr>
<td>Japanese encephalitis</td>
<td>Ixiaro</td>
<td>0, 28 days</td>
<td>Single booster &gt;1 yr if ongoing risk</td>
</tr>
</tbody>
</table>
## Travel Vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Brand</th>
<th>Standard Adult Schedule</th>
<th>Duration of Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningococcal</td>
<td>Menomune</td>
<td>Single dose</td>
<td>Repeat every 5 years if ongoing risk</td>
</tr>
<tr>
<td></td>
<td>Menveo</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Menactra</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rabies</td>
<td>Imovax</td>
<td>0, 7, and 21 or 28 days</td>
<td>Routine boosters are not necessary</td>
</tr>
<tr>
<td></td>
<td>RabAvert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typhoid</td>
<td>Vivotif</td>
<td>1 cap every other day</td>
<td>Repeat every 5 years if ongoing risk</td>
</tr>
<tr>
<td></td>
<td>Typhim Vi</td>
<td>for 4 doses</td>
<td>Repeat every 2 years if ongoing risk</td>
</tr>
<tr>
<td>Yellow fever</td>
<td>YF-Vax</td>
<td>Single dose</td>
<td>Long-lasting protection</td>
</tr>
</tbody>
</table>
C.C. is a 40-year-old man who is in your travel clinic today because he is planning to go on a medical mission trip to Uganda in June.

His immunizations record indicates that he completed a 3-dose series of hepatitis B vaccine 5 years ago.

PMH: Hypertension

All: NKDA
Question

What would you recommend to C.C. for the prevention of viral hepatitis?

- A) Hepatitis A immune globulin
- B) Hepatitis A vaccine
- C) Hepatitis B immune globulin
- D) Hepatitis B vaccine
Question

Which additional travel vaccine(s) would you recommend to C.C.?

- I. Japanese encephalitis
- II. Typhoid
- III. Yellow fever

- A) I only
- B) III only
- C) I and II only
- D) II and III only
- E) I, II, and III
Travelers’ Diarrhea

- Epidemiology
- Causative organisms
- Risk factors
- Prevention
- Treatment

http://www.history.com/topics/ancient-history/the-egyptian-pyramids
Epidemiology

- Incidence between 10 and 40%

Risk Areas For Travelers' Diarrhea

Risk Level
- Low
- Intermediate
- High

https://www.travmed.com/pages/health-guide-chapter-6-travelers-diarrhea
Causative Organisms

- **Bacteria (~70%)**
  - ETEC
  - EAEC
  - Campylobacter
  - Salmonella
  - Shigella
  - Vibrio
  - Aeromonas
  - Yersinia

- **Viruses (~25%)**
  - Rotavirus
  - Norovirus
  - Enteric adenovirus

- **Parasites (~5%)**
  - Giardia
  - Cryptosporidium
Risk Factors

- Tap water and ice
- Raw vegetables
- Raw fruits
- Seafood
- Buffet-style meals
- Unpasteurized milk and dairy products
- Uncooked or undercooked food
- Alcohol consumption (> 5 drinks per day)

Risk Factors

**Conditions**
- Cancer
- HIV/AIDS
- Solid organ transplantation
- Achlorhydia
- Inflammatory bowel disease

**Medications**
- Chemotherapy agents
- Immunosuppressants
- Antacids
- Proton pump inhibitors
- Diuretics
- Digoxin
- Lithium
- Insulin
Prevention

**Antimicrobials**
- Norfloxacin 400 mg PO daily
- Ciprofloxacin 500 mg PO daily
- Rifaximin 200 mg PO daily or BID
- Bismuth subsalicylate 2 tabs or 30 mL (524 mg) PO q6h

**Non Antimicrobials**
- “Peel it, boil it, cook it, or forget it”
- Travelers’ kits
Treatment

- Supportive care

- Antibiotics

- Loperamide
  - 4 mg first dose
  - 2 mg dose after each loose stool
  - NOT to exceed 16 mg in a 24-hour period
Treatment

Antibiotic choices

– Norfloxacin 400 mg PO BID for up to 3 days
– Ciprofloxacin 500 mg PO BID for up to 3 days
– Ofloxacin 200 mg PO BID for up to 3 days
– Levofloxacin 500 mg PO daily for up to 3 days
– Azithromycin 1000 mg PO single dose
– Rifaximin 200 mg PO TID for up to 3 days
Case Presentation

A.N. is a 45-year-old woman who is leading a medical mission trip to the Dominican Republic.

During her stay in the Caribbean country, she indulged in local culinary delights. Three days later, she started complaining of fatigue and watery diarrhea that are interfering with her daily activities.

She called E.C. asking for a recommendation to treat her symptoms.
Question

What would E.C. recommend to A.N.?

- I. Oral rehydration
- II. Ciprofloxacin 500 mg PO BID for 3 days
- III. Ciprofloxacin 500 mg PO BID for 7 days

- A) I only
- B) III only
- C) I and II only
- D) II and III only
- E) I, II, and III
Malaria

- Epidemiology
- Causative organisms
- Risk factors
- Prevention
- Preemptive self treatment

http://blogs.cdc.gov/global/files/2013/08/contest7_full-3LaurenLambert-560x413.jpg
Epidemiology
Epidemiology

- Major international public health problem

- Estimated 207 million infections worldwide

- Estimated 627,000 deaths worldwide

- Increasing cases among travelers
Causative Organisms

- **Plasmodium falciparum**
  - Africa, Haiti, Dominican Republic, Amazon, New Guinea

- **Plasmodium vivax**
  - India, Pakistan, Bangladesh, Sri Lanka, Central America

- **Plasmodium ovale**
  - Africa

- **Plasmodium malariae**
  - Where the Anopheles live and thrive

- **Plasmodium knowlesi**
  - Southeast Asia
Causative Organisms
Prevention

- Use effective personal protection against mosquitoes (nets, clothes, DEET, picaridin)

- Adhere to an antimalarial regimen before, during, and after the trip

- No chemoprophylactic regimen against malaria is 100% effective
## Prevention

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Before Trip</th>
<th>During Trip</th>
<th>After Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atovaquone</td>
<td>250 mg</td>
<td>1 to 2 days</td>
<td>Daily</td>
<td>7 days</td>
</tr>
<tr>
<td>Proguanil</td>
<td>100 mg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloroquine</td>
<td>500 mg (300 mg base)</td>
<td>1 week</td>
<td>Weekly</td>
<td>4 weeks</td>
</tr>
<tr>
<td>phosphate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doxycycline</td>
<td>100 mg</td>
<td>1 to 2 days</td>
<td>Daily</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Mefloquine</td>
<td>250 mg salt (228 mg base)</td>
<td>1 to 3 weeks</td>
<td>Weekly</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Primaquine</td>
<td>52.6 mg salt (30 mg base)</td>
<td>1 to 2 days</td>
<td>Daily</td>
<td>7 days</td>
</tr>
<tr>
<td>phosphate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Prevention

<table>
<thead>
<tr>
<th>Drug</th>
<th>Children</th>
<th>Pregnancy</th>
<th>Adverse Events &amp; Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atovaquone Proguanil</td>
<td>Yes</td>
<td>No (C)</td>
<td>GI upset&lt;br&gt;Avoid in patients with severe renal impairment</td>
</tr>
<tr>
<td>Chloroquine phosphate</td>
<td>Yes</td>
<td>Yes (C)</td>
<td>Visual impairment, pruritus&lt;br&gt;Avoid in patients with psoriasis&lt;br&gt;Use only in areas with chloroquine-sensitive malaria</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>≥8 years</td>
<td>No (D)</td>
<td>Photosensitivity, GI upset</td>
</tr>
<tr>
<td>Mefloquine</td>
<td>Yes</td>
<td>Yes (B)</td>
<td>Neuropsychiatric effects, cardiac effects&lt;br&gt;Use only in areas with mefloquine-sensitive malaria</td>
</tr>
<tr>
<td>Primaquine phosphate</td>
<td>Yes</td>
<td>No (D)</td>
<td>GI upset, methemoglobinemia&lt;br&gt;Avoid in patients with G6PD deficiency</td>
</tr>
</tbody>
</table>
Blood stage: clinical symptoms

Blood vessel

Ring form

Schizont

Trophozoite

Blood-stage schizonticides

Atovaquone–proguanil
Doxycycline
Mefloquine
Chloroquine
# Presumptive Self Treatment

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Atovaquone-Proguanil (Malarone)     | 250 mg 100 mg | 4 tablets orally as a single dose daily for 3 consecutive days          | Avoid in patients with severe renal impairment  
Avoid in patients on atovaquone-proguanil prophylaxis  
Avoid in pregnant women                                                   |
| Artemether-Lumefantrine (Coartem)   | 20 mg 120 mg | 4 tablets orally followed by 4 tablets 8 hours later, then 4 tablets twice daily for 2 days | Avoid in patients on mefloquine prophylaxis  
Avoid in pregnant women                                                   |
Question

Which agent can be used as an alternative to chloroquine for prophylaxis against malaria in areas with chloroquine-sensitive malaria?

- A) Infliximab
- B) Hydroxychloroquine
- C) Leflunomide
- D) Methotrexate
Case Presentation

A family of three persons is planning a medical mission trip to Zambia.

The itinerary includes:
- 3 days in Lusaka
- 3 days in Victoria Falls
- 4 days in Mpulungu
Case Presentation

The 31-year-old husband takes no medications currently, but he recently discontinued fluoxetine, which he had taken for depression.

His 29-year-old wife, who was selected to go on the trip by a competition at her church, is healthy and 15 weeks pregnant.

Their 7-year-old child is in good health.
Question

What would you recommend for the 31-year-old husband to prevent malaria?

- A) Atovaquone-proguanil
- B) Chloroquine
- C) Doxycycline
- D) Mefloquine
Question

What would you recommend for the 29-year-old wife to prevent malaria?

- A) Atovaquone-proguanil
- B) Chloroquine
- C) Doxycyline
- D) Mefloquine
Question

What would you recommend for the 7-year-old child to prevent malaria?

- A) Atovaquone-proguanil
- B) Chloroquine
- C) Doxycycline
- D) Mefloquine
Therefore go and make disciples of all nations, baptizing them in the name of the Father and of the Son and of the Holy Spirit.

Matthew 28:19 (NIV)
Key References & Readings


Key References & Readings


Infectious Considerations Before During and After Medical Mission Trips

Elias B. Chahine, PharmD, FCCP, BCPS (AQ-ID)
Associate Professor of Pharmacy Practice
Lloyd L. Gregory School of Pharmacy
Palm Beach Atlantic University