INFECTIOUS DISEASES & GLOBAL WORKFORCE HEALTH:
AN OVERVIEW OF ZIKA VIRUS DISEASE

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Chief Medical Officer & Senior Vice President
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“That's the world out there, little green apples and ... infectious disease.”

*Don DeLillo, The Angel Esmeralda*
Non-communicable diseases have overtaken infectious diseases as the world’s leading cause of mortality ... a “seismic shift” that calls for sweeping changes in the very mindset of public health.

Margaret Chan, Director-General of the World Health Organization

http://www.who.int/mediacentre/factsheets/fs310/en/
GLOBAL DEATHS FROM INFECTIONS

<table>
<thead>
<tr>
<th>Disease</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory Infections</td>
<td>3.9</td>
</tr>
<tr>
<td>Malaria</td>
<td>1.3 - 3.0</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>2.5</td>
</tr>
<tr>
<td>Diarrheal Diseases</td>
<td>1.8</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>1.7</td>
</tr>
<tr>
<td>Neglected Tropical Diseases</td>
<td>0.5</td>
</tr>
</tbody>
</table>

http://www.smartglobalhealth.org/issues/entry/infectious-diseases
Several global disease outbreaks have been driven by emerging and re-emerging infections

Sands P et al. NEJM 2016;374:1281 -1287
## RISK MITIGATION CLASSIFICATION

### Vaccine Preventable Diseases (e.g.)
- Rabies
- Meningococcal disease
- Japanese encephalitis
- Typhoid
- Hepatitis B
- Yellow fever

### Non-vaccine preventable diseases (e.g.)
- Respiratory infections
- Malaria
- HIV
- Diarrheal diseases
- **Re-emerging diseases (e.g. Zika virus)**
WHAT IS ZIKA VIRUS?

- Identified in 1947
- Isolated from the blood of a rhesus monkey in Zika Forest, Uganda
- Flavivirus (Flaviviridae family)
- Other Flaviviridae viruses include:
  » Dengue
  » Japanese encephalitis
  » West Nile fever
  » Yellow Fever
ZIKA VIRUS INFECTIONS IN HUMANS: GEOGRAPHIC DISTRIBUTION

Peterson et al. NEJM 2016. DOI: 10.1056/NEJMra1602113
ZIKA CASES: AMERICAS 2015 - 2016

Cumulative Zika suspected and confirmed cases reported by countries and territories in the Americas, 2015-2016

Updated as of 14 April 2016

14th April, 2016
207,312 Suspected
6560 Confirmed
10 Deaths


Travel associated

- Florida: 82 (23%)
- New York: 54 (15%)
- Texas: 27 (8%)
- TOTAL (states & territories): 358 (100%)

Locally acquired

- Puerto Rico: 445 (94%)
- American Samoa: 14 (3%)
- US Virgin Islands: 12 (3%)
- TOTAL (states & territories): 471 (100%)

No confirmed locally acquired cases in US states
Mosquito transmission between humans occurs through the bite of an infected Aedes mosquito (Aedes aegypti and albopictus)

- Aggressive daytime biters
- Bites may be imperceptible
- Breed in standing / stagnant water

Petersen et al. NEJM 2016. DOI: 10.1056/NEJMra1602113
ZIKA VIRUS: NON-MOSQUITO TRANSMISSION

• Mother to fetus
• Mother to newborn
• Sexual contact
• Saliva
• Blood transfusion
• Organ donation
• Other potential routes
  » Breast milk
  » Lab specimens
ZIKA VIRUS: SYMPTOMS

Common symptoms
• Itchy Skin rash (90%)
• Short term and low grade fever (65%)
• Joint and muscle aches (50 – 60%)
• Conjunctivitis (55%)
• Headache (45%)
• Edema (20%)
• Vomiting (10%)

Less common symptoms
• Hematospermia (blood in sperm)
• Hearing impairment
• Subcutaneous bleeding

✔ Incubation period unknown (likely < 1 week)
✔ Symptoms last < 1 week
✔ Only 20% experience acute symptoms
✔ Mild illness
✔ Patients may not seek care
✔ Deaths are rare
COMPLICATIONS OF ZIKA VIRUS DISEASE

Adverse fetal outcomes
• Premature births
• Fetal death
• Congenital syndrome
  » Microcephaly
  » Associated brain abnormalities
  » Fetal / infant eye abnormalities

Neurological
• Guillain-Barre syndrome
• Acute disseminated encephalomyelitis
• Meningoencephalitis
• Acute myelitis
WHAT IS MICROCEPHALY?

- Microcephaly is defined as a small head size for gestational age and sex (<3rd percentile).
- It is indicative of an underlying problem with brain growth and may occur in combination with other major birth defects.
- There are many genetic and environmental causes (including Zika).
- May be associated with:
  - Problems with movement & balance
  - Developmental delay
  - Intellectual disability
  - Feeding problems
  - Seizures
  - Hearing loss
  - Vision problems

CDC National Center on Birth Defects and Developmental Disability
### Zika-Related Microcephaly Cases

<table>
<thead>
<tr>
<th>Countries</th>
<th># Confirmed cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>1113</td>
</tr>
<tr>
<td>Colombia</td>
<td>7</td>
</tr>
<tr>
<td>Martinique</td>
<td>3</td>
</tr>
<tr>
<td>Panama</td>
<td>3</td>
</tr>
<tr>
<td>USA</td>
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</tr>
</tbody>
</table>

> 7000 suspected cases were reported from October 2015 - April 2016

Peterson et al. NEJM 2016. DOI: 10.1056/NEJMra1602113
ZIKA: NEUROLOGICAL SYNDROMES AND GUILLAIN BARRE SYNDROME IN COLOMBIA

DIAGNOSIS

• Serum, cerebrospinal fluid or amniotic fluid
  » Triplex reverse transcriptase-polymerase chain reaction (rRT-PCR)
  » Zika MAC-ELISA testing (for IgM antibodies)
• Globally and nationally, Zika virus is a **notifiable** condition
• Healthcare providers should report suspected Zika cases to their state, local, or territorial health department & follow screening and testing regulations in their jurisdiction
• FDA has issued an **Emergency Use Authorization (EUA)** to qualified labs.

TREATMENT

• There is no vaccine to prevent or medicine to treat Zika virus.
• Focus is symptom relief
• Prevent dehydration – liberal fluid intake
• Acetaminophen or Paracetamol to reduce fever and pain.
• Do not take aspirin and other non-steroidal anti-inflammatory drugs (NSAIDS) until dengue can be ruled out to reduce the risk of bleeding

Consult with a healthcare provider.
May need to exclude other diagnoses.
PREVENTION: MOSQUITO TRANSMISSION

Protect yourself against mosquito bites:

• **Use EPA-registered insect repellents.** Travelers should purchase insect repellent spray prior to their trip as these may not be readily available in the destination location.

• **Cover exposed skin** by wearing long sleeved tops and long pants.

• **Use air conditioning or window and door screens** when indoors

• **Use mosquito nets**

• **Avoid the outdoors** especially during the mosquitoes' peak feeding time (dawn, dusk and early evening).

• **Sleep under a mosquito bed net** to protect yourself from mosquito bites.

• **Eliminate mosquito breeding sites** (e.g. stagnant water pools, flower pots, tires or buckets).

• **Treat your clothing and gear with Permethrin** or buy pre-treated items.
PREVENTION: SEXUAL TRANSMISSION

• All patients with Zika virus infection and their sexual partners (particularly pregnant women) should receive counselling about the potential risks of sexual transmission of Zika virus, contraceptive measures and safer sexual practices.

• Sexual partners of pregnant women, living in or returning from areas where local transmission of Zika virus is known to occur, should use safer sexual practices or abstinence from sexual activity for the duration of the pregnancy.

• Men and women living in areas where local transmission of Zika virus is known to occur should consider adopting safer sexual practices or abstaining from sexual activity.

• Men and women returning from areas with local transmission of Zika virus should adopt safer sexual practices or consider abstinence for at least four weeks after return.

PREVENTION: BLOOD SUPPLY TRANSMISSION

• National Blood banks have implemented controls, screening and increased oversight to facilitate self-deferral and exclusion of donors at risk

• In the US, the FDA recommends donors defer for 4 weeks if they are at risk for Zika virus infection for any of the following reasons:
  
  » A history of Zika virus infection
  
  » Travel to the United States from an area with active Zika virus transmission and symptoms suggestive of Zika within 2 week of travels
  
  » Sexual contact with a man who has been diagnosed with Zika virus infection
  
  » Sexual contact with a man who traveled to or lived in an area with active Zika virus transmission in the 3 months before the sexual contact
  
  » Living in or traveling to an area with active Zika virus transmission

Routine vaccines, including influenza vaccine, should be updated. Consult health care provider for destination-specific vaccine requirements.

The following travel-related vaccines warrant consideration:

- **Typhoid** *(may not provide full protection)*.
- **Hepatitis A and B** *(risk for employees travelling to endemic locations may be higher than for residents)*.
- **Meningococcal disease** *(quadrivalent vaccine should be considered for those at risk)*.
- **Japanese encephalitis** vaccine *(for employees who plan to reside in endemic areas or who plan to visit ≥1 month during the virus transmission season)*
- **Rabies pre-exposure immunoprophylaxis** *(for employees spending a prolonged time in endemic countries, especially in areas where rabies immune globulin is not available)*
- **Yellow fever** vaccine *(for employees who will be travelling to an endemic area or a country with a vaccine requirement)*

• **Malaria:** Chemoprophylaxis compliance, mosquito bite prevention

• **Diarrheal diseases:** educate on rehydration, empiric treatment and when to seek care.

• **Tuberculosis:** baseline tuberculin test or interferon-γ release assay

• **Dengue:** mosquito bite prevention

• **HIV and sexually transmitted disease:** Safe sex practices counselling; post-exposure prophylaxis in healthcare workers

• **Hepatitis E:** Strict food hygiene. Pregnant women have increased mortality

• **Strongyloides stercoralis:** Avoid walking barefoot through soil in endemic areas

• **Schistosomiasis:** Avoid swimming wading in fresh water in endemic areas

Thank you