Chikungunya Virus Disease

- Mosquito-born viral disease
- Acute onset febrile disease with severe polyarthralgias
- Often causes large outbreaks with high attack rates
- In Dec 2013, first locally-acquired cases reported in the Americas on St. Martin
  - Puerto Rico in May. Now >10,000 cases

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Reported Cases in the Americas 2013-Dec 5, 2014

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>Locally Acquired</th>
<th>Imported Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>11</td>
<td>1,900</td>
</tr>
<tr>
<td>Mexico</td>
<td>74</td>
<td>13</td>
</tr>
<tr>
<td>Central America</td>
<td>717,686</td>
<td></td>
</tr>
<tr>
<td>Caribbean</td>
<td>731,878</td>
<td></td>
</tr>
<tr>
<td>Andes</td>
<td>69,614</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>975,678</td>
<td></td>
</tr>
</tbody>
</table>

Chikungunya in the USA

- Since 2006 averaged 28 imported cases/yr
- No local outbreaks triggered
- Increase occurring in US travelers to the Caribbean
  - 243 traveler-associated cases in first half 2014
- First Chikungunya case acquired in the US reported in FL in June 2014
  - 7 months after first recognized in the Western Hemisphere
  - At least 11 more cases since then

Aedes spp. Distribution

- A. aegypti
- A. albopictus

Transmission

- Urban cycle
  - Human—Mosquito—Human—Mosquito
    - Aedes aegypti and Aedes albopictus
- Sylvatic cycle
  - Animal—Mosquito—Animal—Mosquito
    - Chimps, monkeys, baboons
    - Aedes furcifer, Aedes africanus

Other Rare Modes of Transmission

- In utero resulting in abortion
- Intrapartum from viremic mother-to-child
- Needlestick
- Lab exposures
- Possibility of transfusion or transplant transmission

The Virus

- Family Togaviridae, genus Alphavirus
  - Enveloped, single-stranded RNA virus
  - Plus-sense, unsegmented genome of 11.5-11.8 kb
- First isolated from human serum during an outbreak in Tanganyika in 1953
- Asian and African strains
  - Distinct biological and transmission patterns
Chikungunya

Infection and Disease
- 72-97% of those infected develop clinical symptoms
- Incubation period usually 3-7 days (1-12)
- Primary symptoms of fever and polyarthralgia

Clinical Manifestations
- Fever with abrupt onset
  - >102.2°F
- Joint pain
  - Severe
  - Most common in hands and feet
  - Multiple joints
  - Usually bilateral and symmetric
- Other manifestations
  - Headache, nausea/vomiting, rash, conjunctivitis, myalgia, arthritis

Laboratory Diagnosis
- Virus culture
- RT-PCR
- IgM serology and confirmatory neutralizing antibody testing
- Serology for >4-fold antibody titer rise using PRNT or IFA

Viremia and Immune Response
Optimal Timing for Diagnosis

<table>
<thead>
<tr>
<th>ASSAY</th>
<th>DAYS POST-ONSET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral Culture</td>
<td>&lt;=3 days</td>
</tr>
<tr>
<td>RT-PCR</td>
<td>&lt;=8 days</td>
</tr>
<tr>
<td>IgM Serology</td>
<td>&gt;=4 days</td>
</tr>
</tbody>
</table>

Test Availability
- CDC Arboviral Diseases Branch
- State Public Health Laboratories
  - California
  - New York
  - Florida
  - Others
- Commercial Laboratories
  - Focus Diagnostics
    - RT-PCR
    - IgG and IgM IFA

Treatment
- No specific antiviral therapy
- Supportive care
  - Rest and fluids
  - Non-steroidal anti-inflammatory drugs for fever and pain

Surveillance and Reporting
- Consider chikungunya in travelers from areas where chikungunya is present who present with acute onset of fever and joint pain
- Be aware of possible local transmission where there are Aedes mosquitos
- Report suspect cases to local and state health departments

State Vectorborne Disease Epidemiologist
Diep Hoang-Johnson
Wisconsin Division of Public Health
Bureau of Communicable Diseases
608-267-0249

MERS-Coronavirus
MERS-CoV

What we know!

• Initially referred to as “novel” coronavirus
• Virus is different from SARS-Coronavirus and seasonal coronaviruses OC43, HKU1, 229E & NL63
• First cases documented in spring 2012 (nurse & university student)-Jordan
• All cases linked to the Middle East
• Age range 1 to 94
• Severe morbidity and mortality
• Transmission mainly human-to-human
• Genetically stable

Transmission

Human → Human

Zoonotic

• Recent evidence of camel to human transmission (Azhar et al, 2014)
  • Index patient and 3 friends had contact with camels
  • Index patient, friends and camels tested for MERS-CoV by PCR

Epidemiology

Human infections (MMWR, May 2014)

• Median age 49 years
• 65% male
• 19% healthcare workers
• 62% severe disease (hospitalization)
• 5% mild illness
• 21% asymptomatic (case investigations)
• June 4, 2014: 815 cases and 313 deaths (38% mortality)
• Role of co-morbidities

Coronaviruses

• First identified in mid-1960s
• Single-stranded RNA
• Six infect humans
  • 229E, NL63, OC43, HKU1, SARS, MERS
• MERS
  • Clades A and B
  • Earliest cases Clade A
  • New cases Clade B
• Bat reservoir?
MERS-CoV in the US

- **Case 1**: Indiana (Reported 5/1/2014)
  - HCW w/onset 4/24/14
  - Flew to Chicago 4/24/14
  - Travelled to Indianapolis via bus 4/24/14
  - Hospitalized 4/28/14
  - Recovered and discharged 5/9/14
  - A small number of exposed WI residents were tested for antibody

- **Case 2**: Florida (Reported 5/11/2014)
  - Travel related (SA ↔ UK ↔ Boston ↔ Atlanta ↔ Orlando)
    - HCW NOT linked to Indiana case
    - Began travel 5/1/14
    - Hospitalized 5/8/14
    - MERS-CoV testing 5/10/14
    - Patient recovered & discharged 5/19/14
    - A small number of exposed WI residents were tested for antibody

What is the Risk in the US?

Points of entry and volume of travelers on flights to the United States and Canada from Saudi Arabia and the United Arab Emirates — May–June 2014 Source: (MMWR, 2014)
What testing is available?

- FDA issued an EUA in 2013 authorizing qualified PHL to perform MERS-CoV PCR
- WSLH Test Code: VR01738
- CPT Code: 87798
- Fee exempt
- Serology available only at CDC

If you have a suspect case of MERS-CoV, please contact your local public health agency, or Tom Haupt (608-266-5326) at the WDPH.

All requests for MERS-CoV testing must be approved by public health before the WSLH will perform any testing.

MERS Enhanced Surveillance

- Criteria for testing
  - History of travel from the Arabian Peninsula or a neighboring country
  - OR close contact with a person with the above risk factor
  - Exposure timeline
    - Within 14 days prior to illness onset
  - Signs and symptoms (must have all 3)
    - Fever $>100.4$
    - Cough
    - Suspicion of pulmonary parenchymal disease
      - Pneumonia, ARDS, consolidation

Knowledge Gap

What we don't know, but wish we did!

- Limited person-to-person so why the spike in cases recently?
- Camels intermediate host or natural reservoirs?
- Natural reservoir that maintains the virus?
- Community prevalence?
- Route of transmission? Food, water, vector??
- Treatment options?
- Testing & surveillance capacity in other countries?

Specimens for Testing

- PCR
  - Lower respiratory tract specimen preferred
    - Sputum
    - Bronchoalveolar lavage
    - Bronchial wash
    - Tracheal aspirate
    - Nasopharyngeal swab
    - Stool

Additional specimen collection information is available from CDC at http://www.cdc.gov/coronavirus/mers/guidelines-clinical-specimens.html

Symptoms

- Low grade fever—many afebrile
- Cough
- Runny nose
- Sneezing
- Body/muscle aches
- No specific treatment
- Supportive therapy

EV-D68

- More than 70 types of HEVs
- Less common than other Evs
- First identified 1962 in CA
- August 2014 increase in severe resp illness
  - Kansas City, MO
  - Chicago, IL
  - $>65\%$ asthmatic or history of wheezing
- As of 9/15—104 confirmed cases in 10 states
  - No deaths documented
Association with Neurologic Disease

- Colorado
  - 9 children ages 1-18 with sudden onset of neurologic illness from Aug 9 - Sept 15-2014
  - Muscle weakness in one or more arms or legs
  - Double vision, difficulty swallowing, difficulty speaking (dysarthria)
  - All had fever, most with respiratory illness about one week prior to onset of muscle weakness
  - No altered mental status or seizures

Association with Neurologic Disease

- MRI scans --- abnormalities in the gray matter in the spinal cord
- CSF negative for viruses, including WNV and enteroviruses
- 8 tested with RVP
  - 6 Rh/Ent; 4 of those were EV-D68
  - Evs known to cause aseptic meningitis, less commonly encephalitis, and rarely, acute myelitis and paralysis

Association with Neurologic Disease

- Sept 26 --- CDC issued request for states to report similar neurologic illnesses
- As of Oct 23
  - 51 cases reported in 23 states
  - Investigating another half-dozen
- Other possible causes
  - Guillain-Barre, other Enteroviruses, Adenovirus, WNV and similar viruses, HSV

Enhanced EV-D68 Surveillance

- Population for surveillance
  - Inpatient pediatric clusters with severe respiratory illness (w/wo fever)
  - Individual ICU-admitted pediatric cases of severe respiratory illness
- Specimens
  - Combined NP/OP swabs placed in viral transport medium

Diagnostic/Surveillance Testing

- Clinical laboratory testing
  - Perform normal diagnostic testing for RV/ENT
  - If patient meets surveillance criteria:
    - Set aside a 1 ml aliquot and store at 2-8C
  - If specimen positive for RV/ENT
    - Send aliquot to WSLH
  - WSLH
    - Test for RV/ENT with single-plex PCR assay
    - Submit specimens to CDC for typing
References


