S405- Update on Emerging Infections

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Disclosure of Relevant Relationship

- Dr. Rathore (or spouse/partner) has not had (in the past 12 months) any conflicts of interest to resolve or relevant financial relationship with the manufacturers of products or services that will be discussed in this CME activity or in his presentation.

- Dr. Rathore will support this presentation and clinical recommendations with the “best available evidence” from medical literature.

- Dr. Rathore does not intend to discuss an unapproved/investigative use of a commercial product/device in this presentation.
EID through the History

• 1340: Bubonic Plague “Black Death”: 75 million deaths - 30-60% of European population killed
• 1500s: Smallpox to the Americas: 10-15 million deaths - End of Aztec civilization
• Malaria
• 20th Century: HIV/AIDS: >50 million deaths
<table>
<thead>
<tr>
<th>Emerging Disease</th>
<th>Year IDed</th>
<th>Estimated Global Impact</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ebola Virus Disease</td>
<td>1976</td>
<td>19,568</td>
<td>7,653</td>
<td></td>
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<tr>
<td>HIV/AIDS</td>
<td>1981</td>
<td>78 million</td>
<td>39 million</td>
<td></td>
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<tr>
<td>Variant Creutzfeldt-Jakob disease (or “MCD”)</td>
<td>1996</td>
<td>229</td>
<td>229</td>
<td></td>
</tr>
<tr>
<td>H5N1 Influenza (“bird flu”)</td>
<td>1997</td>
<td>668*</td>
<td>393*</td>
<td></td>
</tr>
<tr>
<td>Severe Acute Respiratory Syndrome (SARS)</td>
<td>2003</td>
<td>8096</td>
<td>774</td>
<td></td>
</tr>
<tr>
<td>H1N1 (2009) Influenza (“swine flu”)</td>
<td>2009</td>
<td>unknown</td>
<td>&gt;284,500</td>
<td></td>
</tr>
<tr>
<td>Middle East Respiratory Syndrome (MERS)</td>
<td>2012</td>
<td>699</td>
<td>209</td>
<td></td>
</tr>
<tr>
<td>H7N9 Influenza (“bird flu”)</td>
<td>2013</td>
<td>453</td>
<td>175</td>
<td></td>
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</tbody>
</table>
Some major factors that underlie disease emergence and reemergence

<table>
<thead>
<tr>
<th>The Microbial Agent</th>
<th>The Human Host</th>
<th>The Human Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic adaptation and change</td>
<td>Human susceptibility to infection</td>
<td>Climate and weather</td>
</tr>
<tr>
<td>Polymicrobial diseases</td>
<td>Human demographics and behavior</td>
<td>Changing ecosystems</td>
</tr>
<tr>
<td>International trade and travel</td>
<td>Intent to harm (bioterrorism)</td>
<td>Economic development and land use</td>
</tr>
<tr>
<td>Occupational exposures</td>
<td></td>
<td>Technology and industry</td>
</tr>
<tr>
<td>Inappropriate use of antibiotics</td>
<td></td>
<td>Poverty and social inequality</td>
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<tr>
<td></td>
<td></td>
<td>Lack of public health services</td>
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<tr>
<td></td>
<td></td>
<td>Animal populations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>War and famine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lack of political will</td>
</tr>
</tbody>
</table>

http://127.0.0.1:8081/plospathogens/article?id=info:doi/10.1371/journal.ppat.1003467
Factors causing disease emergence

• Microbial adaption: genetic drift/shift - Flu A
• Changing human susceptibility: HIV/AIDS cause immunocompromise
• Climate & weather: zoonotic vectors (mosquitoes) - WNV, dengue, Chikungunya moving further from tropics as climate warms
• Change in human demographics & trade: rapid travel → SARS, Ebola, MERS, Measles
Factors causing disease emergence

- Economic development: antibiotics use to increase meat yield → antibiotic resistance
- Breakdown of public health: Liberia civil war
- Poverty & social inequalities: TB, malaria, HIV
- War and famine: Ebola, polio
- Bioterrorism: 2001 Anthrax attacks
- Dam and irrigation system construction: malaria and other mosquito borne diseases
Factors causing disease emergence

– Dispersal of vectors (and pathogens) through trade, transport, migration
– Injudicious and widespread use of Abx
– Mobile human populations
– Environmental modification (Legionnaires disease)
– Human population encroachment on wilderness (vector populations)
– Concentration of human populations
Some other Recent Emerging Infections

- Avian Flu
- Chikungunya
- Enterovirus D68
- Heartland Virus Disease
- Zika Virus Infection
Enterovirus D68 (EV-D68)

• 2014, nationwide outbreak of associated with severe respiratory illness.
  – From mid-August a total of 1,153 people in 49 states and the DC confirmed with EV-D68 respiratory illness
    • Almost all cases in children, with asthma or h/o wheezing
    • Likely millions of mild infections for which no medical treatment sought and/or test done
• CDC received ~ 2,600 specimens for test in 2014, much more than usual
  – 36% tested +ve; 33% +ve for EV or rhinovirus not EV-D68
• EV-D68 was detected in specimens from 14 patients who died and had samples submitted for testing
Enterovirus D68 (EV-D68)

- Wide spectrum: *mild*-fever, runny nose, sneezing, cough, body & myalgia to *severe*-wheezing difficulty breathing.
- Causes respiratory illness, present in respiratory secretions-saliva, nasal mucus, or sputum
- Spreads person to person: cough, sneeze, surface contamination
- In the United States, people are more likely to get infected with enteroviruses in the summer and fall.
- Many EV circulate annually, actual EV varies in different years
- EV-D68 reported regularly since 1987
- In 2014 much greater than thin previous years
- No prediction for future seasons
Enterovirus D68 (EV-D68)

- Children most likely get infected because lack of immunity
- Adults more likely to have no or mild symptoms
- Asthmatics higher risk for severe illness
- Diagnosed by specific lab tests on respiratory secretions
- Molecular testing for EV commonly available but not for EV-D68. CDC and state health departments can test
- Only consider EV-D68 testing for patients with severe respiratory illness and when the cause is unclear
- There is no specific antiviral treatment currently available
- Severe respiratory illness may need to be hospitalized.
Chikungunya Fever
Chikungunya Fever

• Prior to 2013, outbreaks in Africa, Asia, Europe, and the Indian and Pacific Oceans.
• Late 2013 first local transmission in Caribbean
• Local transmission means mosquitoes have been infected and are spreading to people
• Since then, spread to most countries in the Americas with >1 million suspected cases
• Symptoms similar to those of dengue
Chikungunya Fever
Chikungunya Fever

• *Aedes* mosquitoes transmit this virus to people
• These mosquitoes found globally and in the US
• Most often spread by *A. aegypti* & *A. albopictus*
• Same mosquitoes that transmit dengue virus
• Bite mostly during the daytime-nets??
• Mosquitoes infected after feeding on infected person
• Rarely transmitted from mother to newborn around the time of birth-not by breast feeding
Chikungunya Fever

- If you have recently traveled, tell your doctor.
- Most infected individuals will develop some symptoms.
- Incubation after bite 3–7 days (range 1-12 days).
- Symptoms are fever (usually >39 °C) and polyarthritis (usually bilateral and symmetrical), also HA, myalgia, arthritis conjunctivitis, N/V or maculopapular rash.
- Lymphopenia, thrombocytopenia, ↑ creat & ALT/AST.
- Typically symptoms resolve in 7-10 days.
- Symptoms can be severe and disabling but death rare.
- Most better in a week; some the joint pain for months.
Chikungunya Fever

• Differential Diagnosis
  – Leptospirosis
  – Malaria
  – Rickettsia
  – GAS
  – rubella, measles, parvovirus, enteroviruses, adenovirus, other alphavirus infections
  – post-infections arthritis
  – rheumatologic conditions
Chikungunya Fever

• Rare complications: uveitis, retinitis, myocarditis, meningoencephalitis, hepatitis, nephritis, hemorrhage, myelitis, GBS, cranial nerve palsies

• Risk for more severe disease: newborns infected around the time of birth, ≥65 years age, high blood pressure, diabetes, or heart disease

• Rheumatologic symptoms may relapse months later

• Once infected, likely protected from future infections

• Lab diagnosis: serum/plasma to detect virus, viral nucleic acid, IgM and neutralizing antibody
Chikungunya Fever

• No medicine to treat infection or disease.
• Decrease the symptoms:
  – Rest
  – Fluids to prevent dehydration
  – Medicines: ibuprofen, naproxen, acetaminophen, or paracetamol, to relieve fever and pain.
Zika Virus Infection

• Member the Flaviviridae family and transmitted by mosquitoes
• Virus isolated in 1947 from a rhesus monkey in the Zika forest, Uganda
• Related to other vector borne flaviviruses including dengue, WNV and JEV
• Some of these species bite during the day as well as in the late afternoon/evening.
Zika Virus Infection

• Endemic in Africa and Asia; No evidence of transmission in Europe & imported cases rare
• 2007: outbreak on the Yap island in the Pacific
• First documented transmission outside of its traditional endemic areas
• The potential to spread to new areas where the *Aedes* mosquito vector is present
Zika Virus Infection

• *Symptoms*: low grade fever, conjunctivitis, transient arthritis/arthralgia (mainly in the smaller joints of the hands and feet) and maculo-papular rash (that often starts on the face and then spreads throughout the body)

• Symptoms are mild & short-lasting (2-7 days).

• No evidence that Zika infection affects pregnant women or their babies.
Zika Virus Infection

• Identified by RT-PCR in acutely ill patients from day 5 post-onset of fever
• IgM & IgG: Acute within 5 days of symptom onset & convalescent 2–3 weeks later
• The two samples to rule out cross-reactions with closely related flaviviruses are possible
• Symptomatic: non-salicylic analgesics, non-steroid anti-inflammatories; no vaccine or preventive drug is available.
Heartland Virus Infection

- Belongs to Phleboviruses family found globally
- Most of the phleboviruses are passed through the bite of a mosquito, tick, or sandfly.
- It is not yet fully known how people become infected with Heartland virus
- Lone Star ticks may transmit the virus
- 8 cases identified among residents of Missouri and Tennessee, unknown if found in other areas of the United States
Heartland Virus Infection

- All males ≥50 years old
- Infected during May-Sept
- Most patients reported exposure to ticks before becoming unwell
- Symptoms: fever, fatigue, anorexia, nausea, diarrhea, headache, myalgias
- Leukopenia, thrombocytopenia, elevated ALT. They were given doxycycline
Heartland Virus Infection

- Outside activities with exposure to ticks or insects, may be more likely to be infected
- Most patients required hospitalization
- 7 patients fully recovered; one elderly patient with multiple comorbidities died.
- No routine testing available
- No available medications or therapies
- Supportive care, most cases have fully recovered.
Some EID Expect to Hear more

• *Thogotovirus* Species Infection
• Carbapenem Resistant Enterobacteriaceae (CRE)
• Cholera
• Enterovirus 71
• Extensively Drug Resistant Tuberculosis (XDR-TB)
MERS

- Still occurring in Middle East
- Concern of spread during Hajj
- Probably spread by bats; camels have been implicated
- Spread by direct contact
- No specific treatment
Countries with MERS Cases

**Lab-Confirmed**
- Saudi Arabia
- United Arab Emirates (UAE)
- Qatar
- Oman
- Jordan
- Kuwait
- Yemen
- Lebanon
- Iran

**Travel-associated Cases**
- Europe
  - UK, France, Italy, Greece, Austria, Turkey, Netherlands
- Africa
  - Tunisia, Egypt, Algeria
- Asia
  - Malaysia, Philippines
- Americas
  - USA
SYMPTOMS OF MERS

• MOST PEOPLE CONFIRMED TO HAVE MERS-COV INFECTION HAVE HAD SEVERE ACUTE RESPIRATORY ILLNESS WITH SYMPTOMS OF:
  • FEVER
  • COUGH
  • SHORTNESS OF BREATH
  • SOMERTIMES GI: DIARRHEA AND NAUSEA/VOMITING
MERS-CoV Infection

• Incubation Period 5-6 days (range 2-14 days)
• Those with comorbid conditions more likely to become infected
  – Diabetes, cancer, and chronic lung, heart and renal disease
  – Immune compromised
• Also will have a more severe disease
• Transmission through close contact
Ebola Virus

• You have heard way too much about it so I am going to let this one go