Emerging Infections: The bugs are one step ahead and they are on the move

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Our society is very mobile!

Tiger Woods played golf in San Diego on January 27 and in Dubai on January 29, 2008
The new kids on the block

<table>
<thead>
<tr>
<th>Virus/Microorganism</th>
<th>Year</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Influenza H5N1 (bird flu)</td>
<td>1997</td>
<td>MERS</td>
<td>2012</td>
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<tr>
<td>Metapneumovirus</td>
<td>2001</td>
<td>Enterovirus D68</td>
<td>2014</td>
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<tr>
<td>SARS-CoV</td>
<td>2003</td>
<td>Ebola</td>
<td>2014</td>
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<tr>
<td>Chickengunya</td>
<td>2004</td>
<td>Zika</td>
<td>2016</td>
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<tr>
<td>Human Bocavirus</td>
<td>2005</td>
<td>Influenza H7N9</td>
<td>2017</td>
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<tr>
<td>Influenza pH1N1</td>
<td>2009</td>
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</table>
What will allow you to discover the next emerging disease?

Take a travel history!
Enterovirus D68-Acute flaccid paralysis
The enterovirus D68 story

- Emergency medicine doctor in Kansas City noticed an unusual increase in severe asthma in the summer of 2014
- He/she called the local health department
- Health department noted an increase in laboratory detection of enterovirus/rhinovirus in their lab
- CDC notified 8/19/2014
- Virus identified via sequencing and MMWR published by 9/8/2014

![Graph showing increase in cases](image)

**MMWR 2014; 63: 798-799**
Enterovirus D-68

- 1395 cases in the United States in 2014; 138 cases in 2016
- Viral isolates from the 2014 outbreak were genetically similar to previous EV68 isolates
- Mild to severe respiratory illness
- Increase risk in young children and children with asthma
- No antiviral therapy available
Enterovirus-D68

- Shares biologic similarities with rhinoviruses
- Recognized in 1962: 4 California children with respiratory illness
- Reported rarely over next 36 years
- A few clusters between 2008-2010 with typically unusually severe respiratory illness in children (total 95 in world)
- Most illness appears in children
- Will there be more???
Acute flaccid paralysis

- 320 cases in the United States since 2014
- Median age=8 years
- Most had fever and respiratory symptoms
- Mild lymphocytic CSF pleocytosis; glucose and protein normal or near normal
- CSF negative for EV68, EV71, and polio by PCR
- Clinically these cases are indistinguishable from polio thus a travel history and coordination of testing with your local and state public health lab is very important

Yellow fever
Yellow Fever Outbreak-Brazil

- Started in 2017
- As of May 2018 there have been 364 deaths including international travelers
- WHO expanded areas in Brazil for which yellow fever vaccine recommended
- Vaccine recommended for travelers 9 months of age and older
  - Immunization should be provided >10 days before travel
  - Immunize only those at risk
  - Immunization only available at selected certified sites
- Expanded effort to immunize the general population in Brazil has led to a global shortage of vaccine

http://www.who.int/ith/updates/20180503/en/
Yellow fever-presentation

- Incubation=3-6 days
- Symptoms
  - Fever
    - Chills
    - Severe headache
    - Back pain
    - Fatigue
  - Illness duration=5-7 days
- Subset of patients develop a biphasic illness with increase severity (30-60% mortality)
  - Jaundice
  - Bleeding
  - Shock
  - Organ failure

https://www.cdc.gov/yellowfever/symptoms/index.html
Zika
Zika-presentation

- Incubation period=3-12 days
- Often asymptomatic
- Symptoms
  - Fever
  - Maculopapular red rash
  - Headache
  - Joint pain
  - Conjunctivitis
  - Myalgia
- Symptoms last several days up to 1 week

Zika in the newborn

Incidence of defects
- Overall = 5%
- Perhaps higher in first trimester
- Not tightly associated with maternal sxs

Findings
- Microcephaly
- Hearing loss
- Retinopathy
- Joint contractures
- Hypertonia

Evaluation
- Comprehensive physical exam
- Ophthalmology referral
- Hearing screen
- Lab testing
- Referrals for confirmed infection
  - Neurology
  - Endocrinology
  - Clinical Genetics
# Zika-differential diagnosis

<table>
<thead>
<tr>
<th>Measles</th>
<th>Dengue</th>
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<tbody>
<tr>
<td>Rubella</td>
<td>Chickengunya</td>
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<tr>
<td>Parvovirus</td>
<td>Malaria</td>
</tr>
<tr>
<td>Enterovirus</td>
<td>Yellow fever</td>
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<tr>
<td>Adenovirus</td>
<td>Leptospirosis</td>
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</table>

Zika-diagnostic testing

Nucleic acid testing (NAT)
- Serum or Urine
- Decline over 6 weeks

Trioplex rRT-PCR detects (FDA EUA)
- Zika
- Dengue
- Chickengunya

IgM serology
- Cross reactions common
- Usually positive by day 4 of illness
- Remain positive for up to 12 weeks

Patients with exposure and compatible symptoms
- NAT alone is first line
- IgM serology if NAT negative

Pregnant women with symptoms should get both NAT and IgM

Screening asymptomatic pregnant women not routinely recommended

Screening of asymptomatic non-pregnant patients not recommended including pre-conception screening

Chickengunya and Dengue
Chickungunya

- Made it to the Caribbean in 2013
- Rapidly spread in the Americas
- Transmitted by Aedes aegypti and Aedes albopictus (bite during the day)
- Incubation=2-12 days

Presentation
- Fever
- Joint pain and swelling
- Headache and myalgias
- Rash

- Illness duration= 1 week
Chickungunya

- Differential Diagnosis: Dengue, Malaria, Leptospirosis, Rickettsia

- Diagnosis
  - Labs: Lymphopenia, thrombocytopenia, elevated creatinine, elevated transaminases
  - Serology: IgM
  - PCR
Dengue

• Clinically similar to and transmitted by the same mosquitoes as Chickungunya
• 4 distinct serotypes that do not provide cross protection
• Incubation period=5-7 days
• Often asymptomatic especially in children
• Symptoms: fever, headache (retro-orbital pain), myalgias, arthralgias, rash
• Illness duration 2-7 days
• Sequential infections increase risk of hemorrhagic fever
• Almost all United States cases have been in travelers/immigrants particularly from Puerto Rico
Ebola
Ebola

• 25,855 cases/10,702 deaths as of April 15, 2015
• Young children at lower risk compared to those 15 years of age and above
• New outbreak in the Democratic Republic of the Congo in 2018
• Symptoms include fever, headache, myalgia, abdominal pain and weakness followed by vomiting and diarrhea
• Don’t forget malaria and typhoid
• Vaccine trial promising
Ebola-presentation

• Incubation period=2-21 days

• Symptoms
  ◦ Fever
  ◦ Severe headache
  ◦ Myalgia
  ◦ Weakness
  ◦ Fatigue
  ◦ Diarrhea
  ◦ Vomiting
  ◦ Abdominal pain
  ◦ Bleeding

• Illness duration 6-10 days
Middle Eastern Respiratory Syndrome (MERS)
MERS-CoV (Coronavirus)

- First identified in September 2012
- 1900 cases and 412 deaths
- Presents with fever and respiratory symptoms. Occasional diarrhea. Incubation period 14 days
- Labs: leukopenia, thrombocytopenia, elevated LDH
- Majority of cases have a travel history to Saudi Arabia, UAE, Qatar, or Jordan
- Other countries Oman, Kuwait, Yemen, Lebanon, Iran
- No specific treatment available
- Prevention: hand washing, avoid contact with people who have respiratory disease

MMWR 2015; 64:61-62
The Birds

- Highly Pathogenic Avian Influenza (HPAI)
- H5N2, H5N8, H5N1 all identified in the United States December 2014-January 2015
- H7N9 among the latest concerning strains
- Some HPAI detected in the United States in birds
- Outbreaks in 5 domestic flocks, backyard flocks, wild aquatic birds
- Antiviral prophylaxis recommended for contacts
- Stay tuned and be wary of patients with influenza like illness who have bird contact

MMWR 2015;64:111
H7N9 Influenza

- First reported in China in 2013
- Annual epidemics in China since then mostly in individuals with poultry exposure
- 5th epidemic in 2016-2017 included 766 human cases
- 39% mortality rate
- So far limited person to person transmission
- Based on the CDC Influenza Risk Assessment Tool H7N9 rated as having the greatest potential to cause a pandemic
- Potential vaccine candidate strains already stockpiled by CDC
- Suspect H7N9 if your patient has returned from China in the last 10 days, has respiratory tract illness, and had poultry exposure in China

Avoiding H7N9 Influenza

• Don’t go to China
• Don’t touch birds
• Avoid live poultry markets
• Eat fully cooked chicken and chicken eggs
• Don’t eat from street vendors
• Hand hygiene
Your role in identifying and preventing the spread of emerging infections

• Be curious about things that seem out of the ordinary
• Take a travel history
• Report unusual cases to your local Health Department
• Immunize
Resources

• CDC.gov
• WHO
• AAP Red Book online