Update in Infectious Diseases

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Nelson Iván Agudelo Higuita, M.D.

I have no financial relationships or affiliations to disclose.
Outline

• Global
  – Ebola update
  – Malaria resistance/vaccine
  – MERS
  – Chikungunya

• Local
  – New tick-borne diseases
  – Community outbreak of HIV in Indiana
  – Measles outbreak
  – Plague
  – Leprosy and Legionella outbreak
  – New STD guidelines

• Antimicrobial resistance

• Vaccines
  – Meningococcus – serogroup B and a reminder to vaccinate MSM
  – Yellow fever booster
Meliandou Village, Guéckédou
Child, 2 yrs of age
Onset Dec 2, 2013; died Dec 6, 2013

Village midwife hospitalized in
Guéckédou Jan 25, 2014
Died Feb 2, 2014

Doctor at Macenta with onset of symptoms Feb 19th. Funeral in
Kissidougou

Healthcare worker at Guéckédou Hospital with symptom onset Feb 5.
Went to Macenta and died Feb 10

Family member of the Doctor died Feb 28th at
Nzérékoré

Total of 15 cases 12/14 died
Before end of March
111 suspected cases
79% mortality rate

Undiagnosed Acute Viral Febrile Illnesses, Sierra Leone

Randal J. Schoepp, Cynthia A. Rossi, Sheik H. Khan, Augustine Goba, and Joseph N. Fair

Patients’ antibody reactions to arthropod-borne and hemorrhagic fever virus antigens, Lassa Diagnostic Laboratory, Kenema, Sierra Leone, October 2006–October 2008*

<table>
<thead>
<tr>
<th>Virus</th>
<th>No. positive/total (%)</th>
<th>No. IgM only positive/total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dengue</td>
<td>11/253 (4.3)</td>
<td>6/250 (2.4)</td>
</tr>
<tr>
<td>West Nile</td>
<td>7/253 (2.8)</td>
<td>3/250 (1.2)</td>
</tr>
<tr>
<td>Yellow fever</td>
<td>5/201 (2.5)</td>
<td>5/201 (2.5)</td>
</tr>
<tr>
<td>Rift Valley fever</td>
<td>5/253 (2.0)</td>
<td>5/253 (2.0)</td>
</tr>
<tr>
<td>Chikungunya</td>
<td>10/253 (4.0)</td>
<td>5/253 (2.0)</td>
</tr>
<tr>
<td>Ebola</td>
<td>19/220 (8.6)</td>
<td>18/219 (8.2)</td>
</tr>
<tr>
<td>Marburg</td>
<td>8/220 (3.6)</td>
<td>7/219 (3.2)</td>
</tr>
<tr>
<td>Crimean-Congo hemorrhagic fever</td>
<td>0/220</td>
<td>Not tested</td>
</tr>
<tr>
<td>Total</td>
<td>65/253 (25.7)</td>
<td>49/253 (19.4)</td>
</tr>
</tbody>
</table>
### Organ System

<table>
<thead>
<tr>
<th>Organ System</th>
<th>Clinical Manifestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Fever (87%), fatigue (76%), arthralgia (39%), myalgia (39%)</td>
</tr>
<tr>
<td>Neurological</td>
<td>Headache (53%), confusion (13%), eye pain (8%), coma (6%)</td>
</tr>
<tr>
<td>Hematological</td>
<td>Any unexplained bleeding (18%), melena/hematochezia (6%), hematemesis (4%), vaginal bleeding (3%), gingival bleeding (2%), hemoptysis (2%), epistaxis (2%), bleeding at injection site (2%), hematuria (1%), petechiae/ecchymoses (1%)</td>
</tr>
<tr>
<td>Integumentary</td>
<td>Conjunctivitis (21%), rash (6%)</td>
</tr>
</tbody>
</table>

Some previously healthy and young patients have developed clinical evidence of immunosuppression such as orbital mucormycosis.

3343 confirmed cases

667 probable cases
Phases of Ebola Virus Disease

Days of Illness

- Days 3-6: Non-specific phase
- Days 6-9: GI/hypotensive phase
- Days 9-12: Vascular leak phase
- Days 12-15: Sepsis phase
- Days 15-18: Recovery phase

Potential Clinical Issues
- Hypovolemic Shock
- AKI & lytes
- Rash
- ARDS
- Third spacing
- Superinfx

Laboratory Changes
- Viremia
- IgM
- IgG

Diagnostics

Temperature

Detection of Ebola Virus in Different Human Body Fluids over Time

Possible Sexual Transmission of Ebola Virus — Liberia, 2015

Athalia Christie, MIA1, Gloria J. Davies-Wayne, MPH2, Thierry Cordier-Lasalle, DESS2, David J. Blackley, DrPH1, A. Scott Laney, PhD1, Desmond E. Williams, MD, PhD1, Shivam A. Shinde, MBBS2, Moses Badio, MSc3, Terrence Lo, DrPH1, Suzanne E. Mate, PhD4, Jason T. Ladner, PhD4, Michael R. Wiley, PhD4, Jeffrey R. Kugelman, PhD4, Gustavo Palacios, PhD4, Michael R. Holbrook, PhD5, Krisztina B. Janosko, MS5, Emmie de Wit, PhD5, Neeltje van Doremalen, PhD5, Vincent J. Munster, PhD5, James Pettitt, MS5, Randal J. Schoepf, PhD4, Leen Verhenne, MD6, Iro Eklampidou, MD6, Karsor K Kollie, MPH3, Sonpon B. Sieh3, Alex Gasasira, MBChB2, Fatorma Bolay, PhD7, Francis N. Kateh, MD3, Tolbert G. Nyenswah, MPH3, Kevin M. De Cock, MD1

Ebola virus identified in semen by PCR 199 days after disease onset

CDC and WHO recommend abstinence or condom use for 3 months following recovery from Ebola
Persistence of Ebola Virus in Ocular Fluid during Convalescence

Long-term sequelae after Ebola virus disease in Bundibugyo, Uganda: a retrospective cohort study

## Current Situation

<table>
<thead>
<tr>
<th></th>
<th>Total Cases</th>
<th>Confirmed Cases</th>
<th>Total Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea</td>
<td>3,792</td>
<td>3,338</td>
<td>2,530</td>
</tr>
<tr>
<td>Liberia</td>
<td>10,672</td>
<td>3,151</td>
<td>4,808</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>13,683</td>
<td>8,699</td>
<td>3,953</td>
</tr>
<tr>
<td>Nigeria</td>
<td>20</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Spain</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Senegal</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>United States</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Mali</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>UK</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Italy</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>28,183</strong></td>
<td><strong>15,222</strong></td>
<td><strong>11,306</strong></td>
</tr>
</tbody>
</table>

http://apps.who.int/iris/bitstream/10665/184271/1/ebolasitrep_9Sept2015_eng.pdf?ua=1
Efficacy and effectiveness of an rVSV-vectored vaccine expressing Ebola surface glycoprotein: interim results from the Guinea ring vaccination cluster-randomised trial

Ana Maria Henao-Restrepo, Ira M Longini, Matthias Egger, Natalie E Dean, W John Edmunds, Anton Camacho, Miles W Carroll, Moussa Doumbia, Bertrand Draguez, Sophie Duraffour, Godwin Enwere, Rebecca Grais, Stephan Gunther, Stefanie Hossmann, Mandy Kader Kondé, Souleymane Kone, Eeva Kuisma, Myron M Levine, Sema Mandal, Gunnstein Norheim, Ximena Riveros, Aboubacar Soumah, Sven Trelle, Andrea S Vicari, Conall H Watson, Sakoba Kéïta, Marie Paule Kieny*, John-Arne Røttingen*

- Open-label, cluster-randomized ring vaccination trial (modelled on approach used to eradicate smallpox)

- Vaccinate cluster of contacts and contact of contacts
  – Immediate vs. delayed (>21 days) vaccination

- 7651 people included in the planned interim analysis
  – 1498 received delayed vaccination – 16 cases
  – 2014 received immediate vaccination – 0 cases
Isolation of a Novel Coronavirus from a Man with Pneumonia in Saudi Arabia


SUMMARY

A previously unknown coronavirus was isolated from the sputum of a 60-year-old man who presented with acute pneumonia and subsequent renal failure with a fatal outcome in Saudi Arabia. The virus (called HCoV-EMC) replicated readily in cell culture, producing cytopathic effects of rounding, detachment, and syncytium formation. The virus represents a novel betacoronavirus species. The closest known relatives are bat coronaviruses HKU4 and HKU5. Here, the clinical data, virus isolation, and molecular identification are presented. The clinical picture was remarkably similar to that of the severe acute respiratory syndrome (SARS) outbreak in 2003 and reminds us that animal coronaviruses can cause severe disease in humans.
MERS Clinical Manifestations

• Severe illness with pneumonia and ARDS

• Some have acute kidney injury

• Also rarely reported:
  – Pericarditis, DIC, GI symptoms including diarrhea, abdominal pain

• Immunocompromised persons may have atypical or subtle presentation
  – Fever, diarrhea, abdominal pain but without early respiratory symptoms
  – Pneumonia diagnosed incidentally on chest X-ray

• Asymptomatic ~ 20% - very concerning

Incubation period ~ 5.2 days (range 2-12 days)

MERS-CoV Case Definition

- **Patient under investigation (PUI) for severe illness**
  - Fever (>38.3C) and pneumonia or ARDS
    - **AND**
  - History of travel from countries in or near the Arabian Peninsula within 14 days before symptom onset
    - **OR**
  - Close contact with a symptomatic traveler who developed fever and acute respiratory illness (not necessarily pneumonia) within 14 days after traveling from countries in or near the Arabian Peninsula
    - **OR**
  - A history of being in a healthcare facility (as a patient, worker, or visitor) in the Republic of Korea within 14 days before symptom onset
    - **OR**
  - Is a member of a cluster of patients with severe acute respiratory illness of unknown etiology in which MERS-CoV is being evaluated, in consultation with state and local health departments

How Did This Happen?

- MERS-CoV is a zoonotic virus
Evidence for Camel-to-Human Transmission of MERS Coronavirus

Esam I. Azhar, Ph.D., Sherif A. El-Kafrawy, Ph.D., Suha A. Farraj, M.Sc.,
Ahmed M. Hassan, M.Sc., Muneera S. Al-Saeed, B.Sc.,
Anwar M. Hashem, Ph.D., and Tariq A. Madani, M.D.

\[ R_0 \]

Average number of secondary cases by an infected individual throughout its entire course of infection in a completely susceptible population and in the absence of control interventions

0.60-0.69
Current Situation

CONFIRMED CASES OF MIDDLE EAST RESPIRATORY SYNDROME - CORONAVIRUS 2012 - 2015

MAP DATE: 07 September

Total 1542
Deaths 544

185 cases
36 deaths
Last case July 4, 2015
Fever with Thrombocytopenia Associated with a Novel Bunyavirus in China


A New Phlebovirus Associated with Severe Febrile Illness in Missouri

Clinical and Laboratory Course

**Haemaphysalis longicornis**
(2.1-5.4% are infected)

Novel Thogotovirus Associated with Febrile Illness and Death, United States, 2014

Olga I. Kosoy, Amy J. Lambert, Dana J. Hawkinson, Daniel M. Pastula, Cynthia S. Goldsmith, D. Charles Hunt, J. Erin Staples

Rare illness caused by a tick diagnosed found in Oklahoma, only second case in U.S.

When to suspect Heartland or Bourbon virus?

11,515 patient over a 2 year period with undifferentiated febrile illness tested for 3 pathogens by PCR

1% tested positive for *B. miyamotoi* and *A. phagocytophilum* vs. 3% for *B. microti*

Treatment parallel treatment of Lyme disease – tetracycline, B-lactams and macrolides

1-5% infected 15-30% with *B. burgdorferi*
## Diseases Transmitted by *Ixodes* spp.

<table>
<thead>
<tr>
<th>Infection</th>
<th>Year First Reported in Patients</th>
<th>Class of Etiologic Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. muris</em> – like agent</td>
<td>2011</td>
<td>Bacteria</td>
</tr>
<tr>
<td><em>B. miyamotoi</em> sensu lato</td>
<td>2011</td>
<td>Bacteria</td>
</tr>
<tr>
<td>Deer tick virus</td>
<td>1997</td>
<td>Virus</td>
</tr>
<tr>
<td><em>B. burgdorferi</em></td>
<td>1976</td>
<td>Bacteria</td>
</tr>
<tr>
<td><em>Anaplasma phagocytophilum</em></td>
<td>1990</td>
<td>Bacteria</td>
</tr>
<tr>
<td><em>Babesia microti</em></td>
<td>1957</td>
<td>Parasite</td>
</tr>
</tbody>
</table>

COMMUNITY OUTREACH
9AM-6PM
Indiana HIV Outbreak Overview

• In late 2014, 3 new HIV diagnoses in Austin IN
  – Only 5 HIV infections had been reported 2004-2013

• Of new infections, DIS learned 2 had shared needles by mid January 2015
  – 8 more new infection diagnosed by January 23, 2015 through contact tracing of needle-sharing partners

• Source of infection – injection of the opioid oxymorphone

Presentation by Joan M. Duwve, MD, MPH
Indiana HIV Outbreak: Geographic Distribution
Scott County pop. 24,000; Austin, IN pop. 4,200

Scott County: Among the state’s 92 counties, ranked 92nd in a variety of health and social indicators, including life expectancy

Presentation by Joan M. Duwve, MD, MPH
Demographics of HIV-infected Cases (N: 135)

• Median age 32 years, range 18-57
• 55% male and 100% white
• Of 112 interviewed, 108 (96%) injected drugs
  – All oxymorphone, some methamphetamines and heroin as well
• High poverty (19%) and unemployment (8.9%)
• Low educational attainment (21.3% no high school)
• High proportion without health insurance
• 84% co-infected with HCV

Presentation by Joan M. Duwve, MD, MPH
Drug Use Among HIV-Infected Cases (N:108)

- Multigenerational
- Sharing of equipment common
- Daily infections: 4-15
- Number of partners: 1-6 per injection event

<table>
<thead>
<tr>
<th>Dosage Strength</th>
<th>OPANA® ER with INTAC® Tablet Images*</th>
<th>GENERIC oxymorphone ER Global Pharma (Impax) Tablet Images*</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mg</td>
<td>![40 mg images]</td>
<td>![40 mg images]</td>
</tr>
<tr>
<td>30 mg</td>
<td>![30 mg images]</td>
<td>![30 mg images]</td>
</tr>
</tbody>
</table>
Cumulative HIV infections diagnosed, Scott County, Indiana through June 14, 2015 (n:170)

- Over 28,000 cumulative syringes dispensed
- Local HIV clinic opened
- Syringe exchange started
- MMWR and HAN issued
- Public health emergency declared
- Federal support requested
- Local incident command established
- HIV testing staff & DIS deployed
- Initial diagnosis

Presentation by Joan M. Duwve, MD, MPH
Problems Highlighted by the Outbreak

• Epidemiologic profile is different
  – Mirrors the current U.S. heroin epidemic
  – HCV incidence is on the rise – 364% increase between 2006 and 2012 in central Appalachia

• The problem of opioid abuse and dependence
  – In 2013, nearly 2 million abuse prescribed painkillers
  – Each day, 7000 people are treated in ED for using these drugs
  – Each day, 44 people die by overdose (16,000 died in 2013)

• Lack of comprehensible substance abuse programs by most states
  – Needle and syringe exchange programs
  – Opioid substitution therapy

http://www.cdc.gov/drugoverdose/pubs/index.html
Needle and Syringe Exchange Program
Does it Work?

Doesn't work because:
- Encourage drug use
- Dissuade injection drug users from seeking help
- Signal governmental acceptance of illegal behavior
- Perpetuate the cycle of drug crime
- Contradict law enforcement efforts and threaten public health

Evidence - NSEPs "do not result in increased drug use among participants or the recruitment of first-time drug users"
- Programs don't offer only needles
- They are cost effective
- Support human rights


HIV in people who use drugs 6

People who use drugs, HIV, and human rights

Ralf Jürgens, Joanne Csete, Joseph J Amon, Stefan Baral, Chris Beyrer
Case Report

Resurgence of intravenous Opana as a cause of secondary thrombotic thrombocytopenic purpura

Opana-ER used the wrong way: intravenous abuse leading to microangiopathic hemolysis and a TTP-like syndrome

Ali Imran Amjad and Rahul A. Parikh
Measles

• **Febrile illness**
  – Contagious from 4 days before to 4 days after rash onset
  – $R_0$: 12-16 with secondary attack rate in susceptible house contacts of ~ 90%

• **Prodrome**
  – Fever
  – Cough, coryza and/or conjunctivits
  – Enanthem (Koplik spots)

• **Rash**
  – Appears ~ 14 days after exposure (range 7-21 days)
## Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>8%</td>
</tr>
<tr>
<td>Otitis media</td>
<td>7 – 9%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1 – 6%</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>1 per 1,000 cases</td>
</tr>
<tr>
<td>Death</td>
<td>1 – 3 per 1,000 cases</td>
</tr>
<tr>
<td>Subacute sclerosing panencephalitis</td>
<td>1 per 100,000 cases 7-10 years of measles</td>
</tr>
</tbody>
</table>

Global Burden

• **Deaths**
  - Estimated 2.6 million deaths/year in 1980
  - 75% decrease from 2000 to 2013
    • 145,700 death in 2013 (~ 400 deaths/day)
  - Remains a leading cause of vaccine preventable deaths in children < 5 years old

• **Cases**
  - Estimated 20 million per year
  - 72% decrease in incidence from 2000 to 2013

• Median 60 cases/year (range 37 to 220)

• Importations ~ 33/year, majority US residents
  – ~ 25% cases hospitalized
  – 2 deaths in approx. 1,000 cases

• Incidence < 1 case/million population

• Vaccination status
  – 65% unvaccinated
  – 20% unknown vaccination status
  – 15% vaccinated

• 4 outbreaks/year (range 2 – 12)
Reported cases 220, 55, 189, 644
  – Median 205
  – Mean 277

Importations and Outbreaks
  – 2011 80 importations 14 outbreaks 3-21 cases
  – 2012 21 importations 4 outbreaks 3-14 cases
  – 2013 54 importations 11 outbreaks 3-58 cases
  – 2014 60 importations 23 outbreaks 3-383 cases

• **644 cases reported from 27 states including 23 outbreaks**
  – 60 importations
    • 25 from the Philippines and 9 from India
    • 54 (91%) among US residents
  – 98% cases import-associated
  – 78 cases (12%) hospitalized

• **Cases in US residents (N:635)**
  – 77% unvaccinated
  – 15% unknown (most adults)
  – 8% vaccinated

• **Among unvaccinated**
  – 79% were personal belief exemptors
  – 3% travelers age 6 months to 4 years
  – 8% too young to be vaccinated
  – 10% unknown/misc.
Oklahoma Reports First Measles Case in 18 Years

Oklahoma has its first confirmed measles case since 1997, state health officials reported Friday, as an outbreak largely linked to Disneyland has now infected nearly 180 people.

The ill patient, in Stillwater, is an international traveler to Oklahoma and the spouse of an Oklahoma State University student who lives off campus.

'Anyone who thinks they may have been at risk of exposure should review their immunization records and contact their local county health department with any additional questions. Persons are protected if they are immunized with two doses of a measles-containing vaccine after the first birthday, or if they were born during or before 1957,' Oklahoma health officials said in a statement.
British researcher Andrew Wakefield, along with 12 co-authors, published a paper in the *Lancet* claiming evidence of measles virus in the digestive systems of autistic children.

In press conferences after the paper was published, Wakefield suggested a relationship between the MMR (measles, mumps and rubella) vaccine and autism. Wakefield then recommended that the combination MMR vaccine be suspended in favor of single-disease vaccinations given separately over time.

Vaccination rates in England dropped in response, from more than 90% to 80% or lower—well below the level required for herd immunity to measles. Measles cases, meanwhile, began to rise: while only 56 cases were confirmed in Wales and England in 1998, 1,348 were confirmed by 2008.
It was reported that some of the subjects of Wakefield’s paper had been recruited by a lawyer involved in a lawsuit against vaccine manufacturers; in response to this and other problems with the paper, 10 of the 12 co-authors eventually retracted the interpretation regarding a link between the vaccine and autism.

Numerous epidemiological studies performed since have also provided additional evidence that no such link exists. In 2010, Britain’s General Medical Council ruled that Wakefield had engaged in misconduct during the course of conducting and publishing the study. Subsequently, the *Lancet* formally retracted the paper; in May 2010, Wakefield was banned from practicing medicine in Britain.

Despite this and the lack of any evidence to support a link between vaccines and autism, some groups remain convinced of the allegations raised by Wakefield in 1998.
MMR Vaccines

• Live attenuated
  – Licensed in 1963
  – Combination MMR vaccine licensed in 1971

• Excellent safety profile with 50+ years use
  – Low risk of febrile seizures in children 12-23 months
    • (1 in 3,000 doses)
  – Temporary pain/stiffness
  – Temporary low platelet count – ITP (~1 out of 30,000 doses)

• Effectiveness
  – 1 – dose: ~ 93%
  – 2 – dose: ~ 97%
First US vaccine for meningococcal disease serogroup B approved by FDA
Current MenACWY Conjugate Vaccine Recommendations for Persons at Increased Risk

- Routine vaccination of persons aged ≥2 months at increased risk for meningococcal disease, including:
  - Persons with persistent complement component deficiencies\(^1\)
  - Persons with anatomic or functional asplenia\(^2\)
  - Microbiologists who are exposed routinely to isolates of *Neisseria meningitidis*
  - Persons at risk during a community outbreak attributable to a vaccine serogroup
  - Persons who travel to or reside in countries in which meningococcal disease is hyperendemic or epidemic
  - Unvaccinated or incompletely vaccinated first-year college students living in residence halls
  - Military recruits

1 Including inherited or chronic deficiencies in C3, C5-9, properdin, factor D, or factor H,
2 Including sickle cell disease

Eculizumab (Soliris®)

- Monoclonal antibody approved for treatment of atypical hemolytic uremic syndrome (aHUS) and paroxysmal nocturnal hemoglobinuria (PNH)

- Binds to C5 and inhibits the terminal portion of the complement cascade

- 5/326 subjects in a clinical trial developed meningococcal disease despite prior vaccination with MenACWY

Vaccination reduces, but does not eliminate, the risk of meningococcal infections. In clinical studies, 2 out of 196 PNH patients developed serious meningococcal infections while receiving treatment with Soliris; both had been vaccinated [see Adverse Reactions (6.1)]. In clinical studies among non-PNH patients, meningococcal meningitis occurred in one unvaccinated patient. In addition, 3 out of 130 previously vaccinated patients with aHUS developed meningococcal infections while receiving treatment with Soliris [see Adverse Reactions (6.1)].

- Not explicitly included in MenACWY conjugate vaccine recommendations

http://soliris.net/sites/default/files/assets/soliris_pi.pdf
Use of Serogroup B Meningococcal Vaccines in Persons Aged ≥10 Years at Increased Risk for Serogroup B Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices, 2015

Temitope Folaranmi, MBChB1; Lorry Rubin, MD2; Stacey W. Martin, MSc3; Manisha Patel, MD3; Jessica R. MacNeil, MPH3
Two MenB Vaccines For Persons Aged 10–25 Years in the United States

• **Trumenba® (Pfizer), 3-dose series (0, 2, 6 months)**
  Components: fHbp subfamily A/v2,3; subfamily B/v1
  • Licensed in the U.S. on October 29, 2014

• **Bexsero® (Novartis), 2-dose series (0, 1–6 months)**
  Components: fHbp subfamily B/v1, NhbA, NadA, Por A1.4
  • Licensed in the U.S. on January 23, 2015
  • Licensed in >30 countries for persons ≥2 months of age
How Many People Fall Into Each Risk Group?

<table>
<thead>
<tr>
<th>Group</th>
<th>Estimated Persons Aged ≥ 10 years</th>
<th>Reported Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent complement component deficiencies</td>
<td>Prevalence of 0.03% ~ 80,000 persons</td>
<td>6 cases since 2005 in ABCs (none serogroup B)</td>
</tr>
<tr>
<td>Anatomic or functional asplenia (including sickle cell)</td>
<td>Sickle cell ~ 90,000-100,000 (all ages)</td>
<td>11 cases since 1995 in ABCs (2 serogroup B)</td>
</tr>
<tr>
<td>Microbiologist</td>
<td>~ 100,000 clinical and 400 research</td>
<td>22 cases worldwide 1985-2014 (at least 10 serogroup B)</td>
</tr>
<tr>
<td>Outbreak at-risk population</td>
<td>60,000 in 5 serogroup university outbreaks</td>
<td>32 cases combined 2009-2013</td>
</tr>
<tr>
<td>Total</td>
<td>300,000 – 350,000 person</td>
<td></td>
</tr>
</tbody>
</table>

1 Active Bacterial Core surveillance (ABCs)
Special Populations Not Included for MenB

- **First-year college students living in residence halls**
  - Broader adolescent/college student policy options being considered separately

- **Travelers**
  - Risk primarily due to serogroups other than B

- **Military recruits**
  - Current serogroup B epidemiology similar to US population
  - DOD sets own vaccination policy

Serogroup B meningococcal (MenB) vaccine series should be administered to persons aged ≥10 years at increased risk for meningococcal disease. (Category A)

- Persons with persistent complement component deficiencies
- Persons with anatomic or functional asplenia
- Microbiologists routinely exposed to isolates of Neisseria meningitidis
- Persons identified to be at increased risk because of a serogroup B meningococcal disease outbreak

1 Including inherited or chronic deficiencies in C3, C5-9, properdin, factor D, factor H, or taking eculizumab (Soliris®)
2 Including sickle cell disease

Future Directions

• **Persons aged ≥2 months**
  - Bexsero® licensed for persons aged ≥2 months in other countries
  - Data not currently available for Trumenba® for children <10 years
  - Potential for expanded age indication in US in the future
    - Work Group will review data for persons aged 2 months–10 years and may propose expanded policy options for persons at increased risk in the future

• **Persons aged ≥10 years**
  - Goes beyond licensed indication but no theoretical differences in safety for those >25 years as compared to those 10–25 years

HIV Alone is not an Indication For Meningococcal Vaccination

Incidence rate among MSM 18–64 yrs of age – 12.6/100,000
Non-MSM – 0.16/100,000

All HIV positive MSM and all MSM, regardless of HIV status, who regularly have close or intimate contact with multiple partners, or who seek partners through the use of digital applications, particularly those who share cigarettes, marijuana or use illegal drugs, should visit their health provider to be vaccinated against invasive meningococcal disease.
Conclusions

There are other infectious agents that will be the emerging infectious diseases of the future

We must be vigilant as a society and do our best to prevent their emergence by learning from lessons of the present day
Thank You

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