Swine Flu, Pertussis, and MRSA
or
Pigs, Pertussis, and Puss

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Influenza A(H1N1) (Swine Flu): A Global Outbreak
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http://www.pitt.edu/~super1/lecture/lec34601/001.htm
Swine Influenza A(H1N1) Introduction

- Swine flu is a respiratory disease of pigs caused by type A influenza
- Human infections with swine flu rarely occur
- Human-to-human spread of swine flu occurs in the same way as seasonal flu, through coughing or sneezing of infected people
Influenza Virus

- Three types
  - A, B, C

- Surface antigens
  - H (haemagglutinin)
  - N (neuraminidase)
Swine Influenza A(H1N1) Transmission Through Species

Avian Virus

Human Virus

Swine Virus

Avian/Human Reassorted Virus

Reassortment in Pigs
<table>
<thead>
<tr>
<th>Haemagglutinin subtype</th>
<th>Neuraminidase subtype</th>
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<td>H1</td>
<td>N1</td>
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<tr>
<td>H2</td>
<td>N2</td>
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<tr>
<td>H3</td>
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<td>H15</td>
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<td>H16</td>
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</table>
Influenza

The Normal Burden of Disease

- **Seasonal Influenza**
  - Globally: 250,000 to 500,000 deaths per year
  - In the US (per year)
    - ~35,000 deaths
    - >200,000 Hospitalizations
    - $37.5 billion in economic cost (influenza & pneumonia)
    - >$10 billion in lost productivity

- **Pandemic Influenza** = $$$$
Swine Influenza A(H1N1) Timeline

- In March and early April 2009, Mexico experienced outbreaks of respiratory illness and increased reports of patients with influenza-like illness (ILI) in several areas of the country
  - Influenza-like-illness (ILI)
    - Fever, cough, sore throat, runny nose, headache, muscle aches. In some cases vomiting and diarrhea.

- Samples from the Mexico outbreak match swine influenza isolates from patients in California

Source: CDC
Swine Influenza A(H1N1) May 25, 2009

GLOBALLY:

- 12,727 Laboratory confirmed cases, from 46 countries
- 92 Deaths among laboratory confirmed cases from 4 countries
  - Mexico: 80 deaths
  - US: 10 deaths
  - Arizona -3
  - Missouri -1
  - New York -1
  - Texas -3
  - Utah -1
  - Washington -1
  - Canada: 1 death
  - Costa Rica: 1 death
- Most cases mild

Source: Secretaria de Salud, Mexico, CDC, Public Health Agency of Canada, European CDC, WHO
Global Distribution of Swine Influenza A(H1N1), May 25, 2009

US: 6,767 cases, 10 deaths
Canada: 805 cases, 1 death
Mexico: 4174 cases, 80 deaths
Guatemala: 4 cases
US: 6552 cases, 9 deaths

Total: 12,515 cases, 91 deaths

Chinese Taipei has reported its first confirmed case of influenza A (H1N1) with 0 deaths. This case has been included in the cumulative totals.

Source: WHO
Swine Influenza A(H1N1)
EU & EFTA Countries Confirmed Case Distribution, by Age

27 April to 8 May 2009
N=46

Age Group (Years)
0-9 10-19 20-29 30-39 40-49 50-59

Confirmed Cases
3 6 23 7 5 2

Source: ECDC
Swine Influenza A(H1N1) Mexico Death, by Occupation

- House Bound: 22 deaths
- Independent Worker: 15 deaths
- Private Sector Worker: 13 deaths
- Student: 8 deaths
- Tradesmen: 5 deaths
- Minor: 5 deaths
- Professional: 4 deaths
- Public Sector Worker: 3 deaths
- Unemployed: 3 deaths
- Retired: 2 deaths

N=80
Swine Influenza A(H1N1) Treatment

- No vaccine available
- Limited number of antivirals for the treatment and/or prevention of infection:
  - Oseltamivir (Tamiflu) or
  - Zanamivir (Relenza)
- For treatment, antiviral drugs work best if started soon after getting sick (within 2 days of symptoms)
- Warning! Do NOT give aspirin (acetylsalicylic acid) or aspirin-containing products (e.g. bismuth subsalicylate – Pepto Bismol) to children or teenagers (up to 18 years old) who are confirmed or suspected ill case of swine influenza A (H1N1) virus infection; this can cause a rare but serious illness called Reye’s syndrome. For relief of fever, other anti-pyretic medications are recommended such as acetaminophen or non steroidal anti-inflammatory drugs.

Source: CDC
Lessons Learned from Past Pandemics

- First outbreaks March 1918 in Europe, USA
  - Highly contagious, but not deadly
  - Virus traveled between Europe/USA on troop ships
  - Land, sea travel to Africa, Asia
  - Warning signal was missed
- August, 1918 simultaneous explosive outbreaks in in France, Sierra Leone, USA
  - 10-fold increase in death rate
  - Highest death rate ages 15-35 years
    - Cytokine Storm?
  - Deaths from primary viral pneumonia, secondary bacterial pneumonia
  - Deaths within 48 hours of illness
  - Coincident severe disease in pigs
- 20-40 million killed in less than 1 year
  - World War I – 8.3 million military deaths over 4 years
- 25-35% of the world infected
Lessons Learned from *Past Pandemics*

- Epidemiology reveals waves of infection
  - Ages/areas not initially infected likely vulnerable in future waves
  - Subsequent waves may be more severe
    - 1918- virus mutated into more virulent form
    - 1957 schoolchildren spread initial wave, elderly died in second wave
- Public health interventions delay, but do not stop pandemic spread
  - Quarantine, travel restriction show little effect
    - Does not change population susceptibility
    - Delay spread in Australia— later milder strain causes infection there
- Temporary banning of public gatherings, closing schools potentially effective in case of severe disease and high mortality
- Delaying spread is desirable
  - Fewer people ill at one time improve capacity to cope with sharp increase in need for medical care
Survival of Influenza Virus
Surfaces and Affect of Humidity & Temperature*

- Hard non-porous surfaces 24-48 hours
  - Plastic, stainless steel
    - Recoverable for > 24 hours
    - Transferable to hands up to 24 hours
- Cloth, paper & tissue
  - Recoverable for 8-12 hours
  - Transferable to hands 15 minutes
- Viable on hands <5 minutes only at high viral titers
  - Potential for indirect contact transmission

*Humidity 35-40%, Temperature 28C (82F)

Source: Bean B, et al. JID 1982;146:47-51
Swine Influenza A(H1N1) Guidelines for General Population

- Covering nose and mouth with a tissue when coughing or sneezing
  - Dispose the tissue in the trash after use.
- **Handwashing** with soap and water
  - Especially after coughing or sneezing.
- Cleaning hands with alcohol-based hand cleaners
- Avoiding close contact with sick people
- Avoiding touching eyes, nose or mouth with unwashed hands
- If sick with influenza, staying home from work or school and limit contact with others to keep from infecting them
Pertussis Outbreak in Kittitas County January – April 2009
Severe, debilitating cough illness ("100 day cough")

Highest morbidity and mortality among infants

Estimated worldwide deaths > 300,000/yr

Vaccine-preventable

Poorly controlled, despite high vaccine coverage
  - Incidence increasing in the United States

First U.S. pertussis vaccines for adolescents and adults (Tdap)† licensed in 2005

†Tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine
• Pertussis outbreaks first described in 16th century
• *Bordetella pertussis* isolated in 1906
• Reservoir = Human
• Transmission = Respiratory droplets (airborne transmission rare)
Infant Pertussis

- Young infants
  - Highest rates of disease and pertussis-related complications
- Atypical symptoms: Catarrhal stage and cough may be minimal or absent at presentation
  - Apnea (sometimes with seizures)
  - Sneezing
  - Gagging, choking, vomiting
- Whoop infrequent in young infants
- Cough illness among close contacts

Source: World Health Organization
Reported Pertussis-Related Deaths
United States, 1990-2004

Year

Number of deaths

Source: National Notifiable Diseases Surveillance System
## Reported Relationship of Source Case 494 Pertussis Cases Aged <4 Months 1999-2002

<table>
<thead>
<tr>
<th>Source Relationship</th>
<th>Number (%)</th>
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<tbody>
<tr>
<td>Unknown</td>
<td>282 (57)</td>
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<tr>
<td>Mother</td>
<td>75 (15)</td>
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<tr>
<td>Sibling</td>
<td>38 (8)</td>
</tr>
<tr>
<td>Father</td>
<td>29 (6)</td>
</tr>
<tr>
<td>Grandparent</td>
<td>17 (3)</td>
</tr>
<tr>
<td>Other</td>
<td>53 (11)</td>
</tr>
</tbody>
</table>

Among 264 known source-cases of infants <1 year, 55% identified as mother, father or grandparent. 51% were adults >19 years of age.

28 cases

- 18 PCR positive
- 2 PCR neg; culture pos
- 8 Epi-linked

226 negative PCR

1094 contact tracings

2 School Districts
Healthcare Exposures

- 2 healthcare facilities
- Prophylaxis and vaccine assessment for:
  - 73 HCWs
  - 63 contact tracings of patients
- Estimated cost = $20,000
## Diptheria, Tetanus & Pertussis Immunization Schedule

<table>
<thead>
<tr>
<th>Age Group</th>
<th>2 m</th>
<th>4 m</th>
<th>6 m</th>
<th>15-18 m</th>
<th>11-12 y</th>
<th>13-14 y</th>
<th>15 y</th>
<th>16-64 y</th>
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<tr>
<td>DTaP</td>
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<tr>
<td><strong>Range of recommended</strong></td>
<td><strong>Assess</strong></td>
<td><strong>Catch-up</strong></td>
<td><strong>Catch-up</strong></td>
<td><strong>Catch-up</strong></td>
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</tbody>
</table>

Methicillin Resistant *Staphylococcus aureus*

- Drug resistant “Staph”
- Bacterial wound that will not heal
- Toxins
- Most infections = wounds
- Rare in lung or spinal fluid
MRSA
Don’t let infection get under your skin.

CUTS AND SCRAPES ARE PART OF THE GAME. TAKE CARE OF THEM PROPERLY.

To avoid skin infections:

- Wash your hands frequently.
- Shower after playing sports; use a clean towel.
- Keep cuts and scrapes clean and covered with a bandage.

Tell your coach or athletic trainer if you think you have a skin infection.

www.cdc.gov/ncidod/dhqp/ar_mrsa_ca_posters.html
Treatment

- Incision and Drainage alone may be adequate therapy
- 90% success rate was achieved for deep skin abscesses
Prevalence of MRSA as cause of SSTI in Adult ED Patients


Slide courtesy of Rachel Gorwitz and Greg Moran
MRSA Study in NC WA

- Five counties:
  - Chelan
  - Douglas
  - Grant
  - Kittitas
  - Okanogan

- Data sources:
  - 11 hospitals
  - 3 clinics
  - 3 commercial labs

- 2003-2007 medical records
NC WA MRSA Trend - 2003 through 2007

n=2610

Incidence per 10,000 population

Incidence

2003: 8.21
2004: 16.39
2005: 17.82
2006: 26.44
2007: 30.70
WA Respiratory Fatality- Feb ’08

- 20-year old student at Western Washington University died from MRSA-pneumonia
- # of peds flu deaths
  - 2004-2005: 2.1% *S. aureus*
  - 2006-2007: 30.1% *S. aureus* (68.1% MRSA)
Prevention

- WASH YOUR HANDS - 20 sec
- Disinfect Equipment – Sani-cloth or 70% ethanol or 10% bleach
- Extra clothing layer with long sleeves
- Laundry-hot water/dryer
Questions?