Under-recognized Respiratory Disease Outbreaks: When to Look for Zebras Instead of Horses

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Outline
- Examples of outbreaks due to “Zebras”
  - Unusual organism
  - Unusual timing
  - Unusual population/setting
- MI local health department experience

Respiratory Outbreak “Horses”
- Viral
  - Influenza
  - RSV
  - Rhinovirus
  - Parainfluenza
  - Adenovirus
- Bacterial
  - Strep pneumoniae
  - Pertussis
  - Legionella
Respiratory “Zebras” to Consider

- Viral
  - Coronavirus
  - Human metapneumovirus
  - Enteroviruses
  - Echoviruses

- Bacterial
  - Mycoplasma pneumoniae
  - Chlamyphilia pneumoniae

- The "unknown" pathogen

Keys to PH Investigation

- Population
  - Age range
  - Rise in individual cases vs. contained facility
  - Residents vs. staff

- Disease characteristics
  - Symptoms and severity
  - Incubation period
  - Length of outbreak

- Current activity/surveillance

- Lab testing

- Vaccination status

- Infection control/treatment

Unusual Organism: Coronavirus - WI

- October-December 2008 in a LTC facility
- Acute onset of sore throat, fever, chills, fatigue, myalgia, nasal drainage
- Residents and staff affected
  - Attack rates of 31% and 40%
  - Staff had longer duration of illness and more symptoms
  - 3 deaths in residents

- Why not flu?
  - Rapid tests on residents and staff negative
  - Low flu activity in that part of the state
  - Confirmatory testing was negative for flu

- Lab testing
  - Human Coronavirus OC-43+ at WI state lab and CDC
Unusual Organism: Mycoplasma – RI

- November-December 2006
- Pediatrician saw 3 children w/ encephalitis in 2 wks
- Attended 2 schools, which had high student rates of pneumonia
- 2 separate nearby schools also had high rates of pneumonia
- Pneumonia incidence 3.4-6.6x higher than expected
- Why not flu?
  - Very high rate of pneumonia
  - Flu activity low at the time
  - Further in the investigation, testing for flu –
- Lab testing: 10+ for M. pneumoniae via PCR at CDC

Unusual Organism: Mycoplasma – RI

- During 22 week outbreak, among student cases:
  - 76 cases pneumonia
  - 3 cases neurologic disease
  - Most cases presented with tracheobronchitis
- 42% of students w/ pneumonia had 2° transmission to household members
- Control measures implemented at schools in early January
- 1200 doses of antibiotics distributed by one school
- 3 school districts closed for 2 days

Number of cases of pneumonia among students at schools A–D in Rhode Island, by week of symptom onset, from September 1 2006 through 9 February 2007.

3 peaks separated by 4-6 weeks

Unusual Timing: Mycoplasma – Navy ship
- February-May 2007
- 179 respiratory disease cases, 50 w/ pneumonia
- Respiratory illness attack rate of 17%
- 5.4 pneumonia cases per week
- Why not flu?
  - Epi curve inconsistent with influenza
  - High rate of pneumonia
  - Negative lab testing
- 24+ for M. pneumoniae via PCR at naval lab
- M. pneumoniae outbreaks tend to occur in fall

Unusual Timing: Mycoplasma – Navy ship

![Graph showing respiratory illness cases and radiographically confirmed pneumonias]

Note multiple, staggered peaks (incubation 1-4 weeks)


Unusual Population: RSV - MI
- April-May 2011 in a LTC facility
- Nasal discharge, cough, few possible pneumonias
- Quick symptom resolution
- 23% attack rate in residents; no ill staff
- Why not flu?
  - Negligible flu activity at that time
  - Lack of fevers
  - Most residents vaccinated
  - Confirmatory testing was negative for flu
- Lab testing: 2/2 positive for RSV via PCR at MDCH
- RSV activity was declining but higher than flu
Zebras in Berrien County

The Local Health Department Experience

Human Metapneumovirus
- Paramyxoviridae
  - SS negative sense RNA, enveloped virus
  - Two major groups, 4 subgroups
- Identified 2001
- Symptoms
  - Cough, congestion, fever, sore throat, SOB, vomiting
- No routine testing or surveillance

Human Metapneumovirus
- Information sources limited
- Incubation
  - 3-9 days (?)
- Length of illness
  - At least 7 days
- Epidemiology
  - Common worldwide
  - Young children
Facility Information

- Resident Population: 81
- Staff: 120
- Three units
- Long- and short-term care
- History of problems with infection control procedures

Monday 2/22/2010

- Initial report from facility
  - Illnesses began 2/19
  - 13 residents, 3 staff ill
    - 14 C, 2 N units
  - Respiratory Sx
- Suspicious of 2009 H1N1 influenza
- 3 Rapid influenza tests, all negative
  - Tamiflu started in 4 residents

Monday 2/22

- Recommendations given:
  - 3 NP swabs sent for full resp. panel
  - Keep residents in rooms
  - Reduce visitors
  - Exclude ill employees
  - Keep employees in one unit only, no floaters
  - Droplet precautions for symptomatic residents
Case Definition

Any individual with acute onset of illness with respiratory symptoms (cough, congestion, sore throat) who has had contact with the facility within the week prior to illness

Tuesday 2/23

- 22 total reported ill
  - 16 C, 6 N units
- Begin receiving more detailed clinical information
  - Cough, congestion, fever, pneumonia
  - No response to Tamiflu
- Infection control challenges
  - Administration not overly concerned
  - Excluding ill employees

Wednesday 2/24

- Full respiratory panels negative
- Residents quarantined, few visitors, most staff restricted to just one unit
- Director of Nursing becomes ill
- BCHD obtains 5 samples for MDCH-BOL
  - 3 nasal
  - 2 nasopharyngeal
Thursday 2/25
- Specimens arrive at BOL
  - Negative for H1N1
- More residents becoming ill; seems to have slowed in employees
  - Now in 5 unit
- All ill residents are still symptomatic
- DON hospitalized
- Droplet precautions for whole facility recommended

Friday 2/26
- Deliver masks to facility (x2)
- Transmission continues
- Positive result for Human Metapneumovirus (2/5 specimens)
  - Different nurses
  - Nasal vs NP swabs
  - Request additional samples

Monday 3/1
- MDCH-BOL obtains 3 additional specimens
  - 5/7 positive for hMPV
- Symptoms beginning to resolve
- Transmission continues
- Infection control measures remain in place
- Off-unit employees becoming ill (i.e. Lobby, Kitchen, etc.)
Waning Transmission 3/1-3/5

- Last case had onset on 3/5
- Quarantine lifted unit by unit over following week
- Total ill: 53
  - 32 Residents (39.5%)
  - 21 Staff (17.5%)

EpiCurve: Onset of Illness (N=53)

- A: Initial notification to public health authorities and recommendation of initial infection control measures
- B: Recommendation of facility-wide droplet precautions
- C: Laboratory confirmation of first HMPV-positive specimen

Frequency of Reported Symptoms (N=53)
Age and Duration of Illness

- **Age of cases**
  - **Mean**
  - **Median**
  - **Range**
  - Residents: 83 85 46-95
  - Staff: 38 36 18-59

- **Duration of illness**
  - **Mean**
  - **Median**
  - **Range**
  - Residents: 13.4 13 3-24
  - Staff: N/A N/A N/A

- 75% female

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**February 19-21**

Red = New Cases
Yellow = Existing Cases
Green = Recovered Cases

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**February 22**

Red = New Cases
Yellow = Existing Cases
Green = Recovered Cases
February 23
Red = New Cases
Yellow = Existing Cases
Green = Recovered Cases

February 24
Red = New Cases
Yellow = Existing Cases
Green = Recovered Cases

February 25
Red = New Cases
Yellow = Existing Cases
Green = Recovered Cases
March 1

Red = New Cases
Yellow = Existing Cases
Green = Recovered Cases

March 2

Red = New Cases
Yellow = Existing Cases
Green = Recovered Cases

March 3

Red = New Cases
Yellow = Existing Cases
Green = Recovered Cases
Discussion

- Keep the zebras in mind!
- Lack of infection control measures contributed to spread
- Nasal vs. nasopharyngeal specimens
- Work with local lab to preserve samples during an outbreak
- Regional communications crucial