“A Tail of Two Outbreaks”

Tonia Parrott, APHL 2019 Annual Meeting
June 6, 2019
Respiratory Outbreak

• In late August, the VA Department of Health (VDH) received reports of 2 workers from “Plant A” who were hospitalized with fever, headache, cough, and radiographic evidence of pneumonia.

• By early September, 8 additional workers were hospitalized with similar clinical presentations.

• Plant A suspended operations.

What testing would your laboratory normally recommend?
Additional Information

• All 10 individuals worked at chicken slaughter “Plant A”

What other diseases could be added to the differential?
What Specimens Should Be Collected?

a) Serum for serological testing
b) Nasopharyngeal (NP)/oropharyngeal (OP) swabs for real-time PCR
c) Lower respiratory tract specimens for real-time PCR
d) Attempt to culture the organism
Results

Clinical specimens submitted to the Centers for Disease Control and Prevention (CDC) tested positive by PCR for *C. psittaci*

Chlamydia psittaci

- Chlamydia psittaci: obligate, Gram negative, intracellular bacteria
- 10 genotypes-A, B, C, D, E, F, G, E/B, M56, WC
- Biphasic (infectious/non-Infectious form)

What is the infectious form of Chlamydia called?
Elementary body

Chlamydia psittaci comparative genomics reveals intraspecies variations in the putative outer membrane and type III secretion system genes, B.J. Wolff et. al. Microbiology (2015), 161, 1378–1391
Psittacosis/Avian Chlamydiosis

- Disease in birds – avian chlamydiosis
  - Poor appetite
  - Inflamed eyes
  - Breathing difficulty
  - Diarrhea
- Disease in humans - psittacosis
  - Fever and chills
  - Headache
  - Muscle aches
  - Dry cough
Psittacosis Epidemiology

Since 1988, CDC reports that there has been a decline in reported psittacosis cases

How could changes in laboratory testing methodology contribute to this decline?
# Testing for Psittacosis

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<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Culture</td>
<td>*Provides clinical isolates for genotyping, antimicrobial susceptibility testing, and next generation sequencing</td>
<td>*Time-consuming</td>
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<td>*Technically difficult; requires specialized expertise</td>
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<td>*Must be cultivated within a tissue culture, mice, or chick embryo</td>
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<td>*Few laboratories perform</td>
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<td>Serologic test (e.g., complement fixation, microimmunofluorescent antibody test)</td>
<td>*Tests are available in many clinical laboratories</td>
<td>*Cross-reactivity with other Chlamydia species may occur</td>
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<td>*Requires acute and convalescent samples, and delays confirmation</td>
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<td>Real-time polymerase chain reaction (PCR)(^1)</td>
<td>*Rapid detection</td>
<td>*Requires specialized reagents and equipment</td>
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<td>*Sensitive and specific</td>
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<td></td>
<td>*Results can be obtained in time to guide treatment decisions</td>
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<td>*Useful for strain typing</td>
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Have You Heard About..

- VDH determined the chicken slaughter plant owned by “Company C”, had another slaughter facility located in Georgia, “Plant B”
- Plant B’s occupational health nurse heard about the outbreak at Plant A, and reported to VDH officials that she was aware of a 3 workers at Plant B who had a recent onset of a similar illness, one of whom was hospitalized with pneumonia
- CDC notified the Georgia Department of Public Health (GDPH) about the outbreak in VA, and that there were ill workers identified at the sister-plant B located in GA
A Second Plant Implicated in the Psittacosis Outbreak

- GDPH worked with the occupational health nurse and local hospital to have specimens collected on the 3 workers for *C. psittaci* testing at the CDC Pneumonia Surveillance and Response Laboratory
  - Sputum samples from all three patients tested positive for *C. psittaci* by PCR on Sept. 14th
Routing of Transmission

True or False

Workers having limited contact with live birds (i.e. performing other duties with poultry contact (e.g., deboning, cutting) or with sanitation, maintenance, or administrative duties are not at risk for disease transmission.

Psittacosis Transmission

- Breathing in the dust from dried feces and respiratory secretions
- Birds can infect people through bites and beak-to-mouth contact
- Human to human transmission may be possible
History of C. Psittaci

Until it was halted in 1969, what United States program actively investigated uses for Chlamydia psittaci?

*United States Biological Warfare program*

http://webarchive.loc.gov/all/20011002153149/http://www.cns.miis.edu/research/cbw/possess.htm#76
Case Finding

- On Monday 9/17 and Tuesday 9/18 the GDPH provided information about psittacosis through a company-sponsored “Town Hall” meeting
  - Employees were asked to complete a 1-page questionnaire surveying for recent respiratory illnesses
  - Employees were instructed to report any new onset of fever and respiratory illness to the company occupational health nurse
  - Plant remained closed pending results of EH investigation
- GDPH worked closely with the occupational health nurse to investigate any reported respiratory illnesses among employees
- Information about the outbreak was disseminated to area hospitals
The Georgia plant suspended operations after the 1st shift on September 15th:
- Approximately 10,000 birds were in the holding area – these were killed and rendered

A team of epidemiologists from GDPH visited Plant B on the afternoon of 9/15.

The team swabbed (triplicate swabs) 46 different sites:
- Live Shed, Live Receiving, Hanging and Picking, Evisceration

Swabs were submitted to UGA CVM Infectious Diseases Laboratory (PCR and culture) and CDC Pneumonia Response and Surveillance Laboratory (PCR).

On Sunday 9/16 the Plant B was “deep cleaned” by a professional environmental cleanup company (chlorine dioxide solution and bombs).
50 Cases occurred during August 3–September 8 in Virginia (5 laboratory confirmed)
31 occurred August 18–October 22 in Georgia (8 laboratory confirmed)
In GA, the last confirmed case was identified on 10/5/2018 and the last probable was 10/22/2018
14 case-patients hospitalized for 1 day or more
Randomized case-control conducted in GA
  • 31 cases, 150 controls
  • Risk factors identified
    • Working on 2nd shift (73%, 100% of confirmed)
    • Processing chickens prior to the acid wash/chiller
    • Working in the evisceration area
    • Actively eviscerating chickens
Other interesting observations from case data
  • 1st shift employee (bird hanger) stayed over to help second shift on 8/30
  • New employee worked 1st day on 8/30
Cases With Lab Evidence of *C. psittaci* in Employees of Chicken Slaughter Plants, By Date — VA and GA, 2018

What is the typical incubation period for psittacosis?
5-14 days but can be longer
Environmental Investigation Summary

- All swabs collected within the facilities were negative
- GA and VA environmental investigations and epidemiologic data suggested a point source exposure of *C. psittaci*,
- No evidence of continued exposure/contamination in the plants was found
- Origin was likely a particular shipment(s) from one farm
- The processes involved in slaughtering birds (likely with subclinical infections) is thought to be the exposure for the workers
Animal Health Investigation Summary

- USDA Animal health officials reviewed farm data and condemnation rates for each facility between 8/1-9/14

- 12 farms “of interest” were initially identified based on criteria that included split shipments and condemnation rates
  - There were no shipments to Plant B on August 30 or 31

- USDA reached out to state departments of agriculture/State Veterinarians in 2 states with farms that had split shipments to GA and VA

- Information on signs/symptoms of psittacosis was shared (in collaboration with state PH departments) with growers and employees of farms with split shipments
  - No compatible illnesses among this group were identified

- No environmental or bird testing was conducted
Public Health Partners Federal, State and Local Level

- HHS; Centers for Disease Control and Prevention
- USDA (many agencies)
  - APHIS
  - FSIS
  - Wildlife Services
- State Departments of Agriculture
  - State Veterinarian
- Infectious Diseases Laboratory, College of Veterinary Medicine, University of Georgia
- Industry-Georgia Poultry Federation
- Medical community
- Animal health officials
Notes from the Field: Multistate Psittacosis Outbreak at Chicken Slaughter Plants — Virginia and Georgia, 2018

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