Multistate Outbreak of Salmonella Associated with Cantaloupe Exposure

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Background

• Salmonella is a genus of bacterium that causes disease in humans
  – Typhoid fever
  – Gastrointestinal illness

• Illness typically associated with eating raw or undercooked food
  – Symptoms appear 12-72 hours after ingestion of a large dose (inoculum)
  – Diarrhea, fever, abdominal cramps lasting 4-7 days
  – Illness most severe in infants/children and older adults
Recent National Outbreaks

Ground Beef Recall

Food Safety News, LA Times, healthypets.mercola.com
Foods associated with *Salmonella* outbreaks*

*These contaminated ingredients or single foods (belonging to one food category) were associated with 1/3 of the *Salmonella* outbreaks.

†Other includes: Sprouts, leafy greens, roots, fish, grains-beans, shellfish, oil-sugar, and dairy.

Foodborne Reportable Disease Investigation

• Enteric disease questionnaires
  – Food history 72 hours prior to illness onset
  – Environmental exposures
  – Attempted for every reported case

• Entered into NEDSS locally- accessed at KDPH electronically
  – NEDSS does not have all questionnaire data
Definition of Outbreak

• More than 2 linked cases
  – Known to be related- family, school, etc.
  – Similar risk factor

• CIFOR Guidelines
  – Council to Improve Foodborne Outbreak Response
  – Triggers for outbreak investigation
Reported Salmonellosis Cases* in Kentucky
2008-2012

* Includes 2012 confirmed and non-confirmed cases
Reported Salmonellosis Cases* in Kentucky
2008-2012

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Outbreak Recognized

• Outbreak recognized through epidemiologic evidence by Local Health Departments
  – Western KY
  – Late July

• Salmonella samples were prioritized by the Division of Laboratory Services (DLS)
Specimen Collected → Private Laboratory Testing → Local Health Department

Local Health Department → Positive Salmonella → KDPH Reportable Disease Section

Send Isolate for further testing → KDPH Division of Laboratory Services

Results of further testing
## Bacterial Testing

<table>
<thead>
<tr>
<th>Species</th>
<th>Hospital/ Contract Lab</th>
<th>Salmonella enterica</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Hospital/ Contract Lab OR State Lab</td>
<td>Group B</td>
</tr>
<tr>
<td>Serotype</td>
<td>State Lab</td>
<td>Typhimurium</td>
</tr>
<tr>
<td>PFGE Pattern</td>
<td>State Lab</td>
<td>JPXX01.0324</td>
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Pulsed-Field Gel Electrophoresis

Figure 1 - PFGE

1. Add to buffer to make suspension
2. Add molten agarose to make plug
3. Lyse cells
4. Enzyme digest
5. Electrophoresis

http://www.foodsafetynews.com/files/2012/10/PFGE-Figure-1.png
PFGE Steps Continued
Image for Analysis
PulseNet

- CDC program used by state public health labs to detect foodborne disease clusters and outbreaks
  - www.cdc.gov/pulsenet
- Started after 1993 E. Coli outbreak associated with Jack In The Box
PulseNet

• Outbreak of Salmonella: 3 or more isolates with matching PFGE patterns or 2x baseline for common PFGE patterns
• Images sent to CDC electronically
• CDC assigns ID to isolate pattern (can take several days)
Case Definition

• A case (person, place, time):
  – A person infected with Salmonella Typhimurium PFGE Pattern JPXX01.0324
  – In the United States
  – Illness onset July 6th through October 1st
Initial Laboratory Investigation

• PFGE Results
  – many of the isolates from Western Kentucky were genetically related

• Connected to IN cases through PulseNet
Increase in Salmonellosis Cases

Timeline

First 0324 cases in Pulsenet

Regional Epidemiologists - Increase in Salmonellosis Cases

MMWR Week

[28] July

[29]

[30] 31 32 33 34 35 36

August September

Contact with IN
KDPH Food Safety Branch

Specimen Collected

Private Laboratory Testing

1. Questionnaires

Local Health Department

2. Enter Data

NEDSS

KDPH Reportable Disease Section

3. Analysis

KDPH Division of Laboratory Services
Epidemiologic Investigation

• All regional epidemiologists and local health departments statewide warned of increase in Salmonellosis cases
• Association suspected between illness and melon consumption based on questionnaires
  – Enteric Disease Questionnaire data from cases to date downloaded from NEDSS
• Melon traceback investigation initiated
Traceback Investigation

• Patient questionnaires:
  – Enteric- where they generally shopped for food
  – Melon- when/where melons purchased, consumption

• Food Safety Branch analyzed aggregated purchasing data and arranged site visits
  – Melon Supplier Questionnaire
    • Collected information on all sources of melon
  – Where applicable:
    • Collect melons for testing
    • Swab facility for contamination
Increase in Salmonellosis Cases

Timeline

First 0324 cases in Pulsenet

July

Regional Epidemiologists-
Increase in Salmonellosis Cases

Contact with IN

First 0926 cases in Pulsenet

KY-IN conference call

Multistate CDC Investigation

Melon Questionnaires Distributed

August

MMWR Week

32

31

30

28

29

33

34

35

36

September
# Bacterial Testing

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Laboratory Investigation

• Foodborne illness survey data includes non-outbreak cluster cases
  – Each pattern may have different source of outbreak
  – Background cases dilute the signal
• Laboratory results can narrow to only outbreak patient data
10 Cases of Salmonellosis
7/10 Report Eating Cantaloupe

50% of people eat cantaloupe each week in the summer

7 Cases Match Outbreak Strain
86% of Cases Report Eating Melon
Timeline

Regional Epidemiologists-Increase in Salmonellosis Cases

First 0324 cases in Pulsenet

Mulitstate CDC Investigation

Melon Questionnaires Distributed

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First Melon Samples Received by DLS

MMWR Week

28 July

29

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31 August

32

33

34

35 September

36
Melon Traceback

• Focused traceback investigation on stores where outbreak cases purchased melons
  – Western Kentucky
  – Additional Regions
Food Testing Process at DLS

• LHD and Reportable Disease Section communicate with DLS Food Lab to choose appropriate food sample for testing

• Forms
  – Source
  – Date Collected

• Packing Instructions
Food Testing at DLS

• Each pathogen has own test protocol

• Melon testing
  – Whole melon
  – Cut up melon
Food Testing at DLS

• Determine if a bacterial pathogen is detected
  – ~4 days

• Sent to the Bacteriology lab for identification
  – ~2-3 days

• PFGE lab for genetic analysis
  – ~4 days
Traceback Investigation

• As testing was in process, additional melon supplier surveys conducted

• Two chains were implicated more often than others
  – Regional?
  – Common distributor of contaminated produce?
# Traceback Investigation

## Results of Melon Survey

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<th>Pattern</th>
<th>Background</th>
<th>0324</th>
<th>0926</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grocery Store 1</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Grocery Store 2</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>19</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>30</td>
<td>10</td>
<td>4</td>
<td></td>
</tr>
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## Grocery Stores 1 & 2

- Reported by 9 of 10 patients with the outbreak pattern
  - 90%

- Reported by 11 of 30 patients with background patterns
  - 37%
Melon Traceback

- Identified single supplier for stores - Farm A
Timeline

Regional Epidemiologists- Increase in Salmonellosis Cases

First 0324 cases in Pulsnet

July

MMWR Week

28 29 30

Contact with IN

First 0926 cases in Pulsnet

KY-IN conference call

Multistate CDC Investigation

Melon Questionnaires Distributed

First Melon Samples Received by DLS

FDA CORE Team Visit Farm

Melon Positive for 0324

Cantaloupe Voluntary Recall

August

03 32 33 34

First Melon Samples

September

35 36
Melon Traceback

• Food and Drug Administration visited Farm A to conduct investigation of practices and collect samples

• Salmonella matching the outbreak strain was isolated from a field on the farm
Reported Salmonellosis Cases* in Kentucky
2008-2012

* Includes 2012 confirmed and non-confirmed

Average 2008-2011
2012

MMWR Week
0  5  10  15  20  25  30  35  40  45  50  55  60
Number of Cases

Courtesy of TJ Sugg
Summary of Outbreak

• 70 Cases of Salmonellosis Matching the Outbreak Strain
  – Average Age: 48 years
  – 73% Female
  – 75% Hospitalized

• Outbreak Strain Isolated:
  – Store
  – Farm
Kentucky Salmonella Typhimurium Cases with PFGE JPXX01.0324 by County
9/13/12: 70 Cases

No Confirmed Cases
Confirmed Cases

Courtesy of Amanda Wilburn
National Case Count

http://www.cdc.gov/salmonella/typhimurium-cantalo-08-12/map.html
Successes

• Communication and Coordination
  – local, state, and federal partners
  – LHD – RDS – DLS – all informed at every step

• Data collection and documentation by local health departments
  – Invoices critical for traceback
Collaborative Effort

KDPH Food Safety Branch

Local Health Department

Sanitarians

Regional Epidemiologists

KDPH Division of Laboratory Services

KDPH Reportable Disease Section
Challenges

• Data
  – NEDSS does not have all Enteric Disease Questionnaire variable fields

• Cannot speed up laboratory processes

• Information sharing with federal partners

• Incredible complexity of the food supply
  – Even for single product!
Acknowledgements

• Local Health Departments
  – Nurses
  – Sanitarians
  – Epidemiologists
• Kentucky Department for Public Health
  – Reportable Disease Section
  – Division of Laboratory Services
  – Food Safety Branch
  – Preparedness
  – Division of Epidemiology and Health Planning
• Indiana State Department for Health
• Centers for Disease Control and Prevention
• Food and Drug Administration
  – CORE Team
THANK YOU!
QUESTIONS?
Patient seeks medical care: specimen collected

Bacterial testing at hospital or reference lab

Positive for: Salmonella, Shigella, STEC, Campylobacter

Preliminary Report to State Reportable Disease Division

Confirmation of results and additional testing (type, PFGE)

Isolate sent to KY Division of Laboratory Services

~10 days

<1-3 days

~3 days
Patient seeks medical care: specimen collected

Bacterial testing at hospital or reference lab

Positive for: Salmonella, Shigella, STEC, Campylobacter

Preliminary Report to State Reportable Disease Division
Bacterial Suspension → Mix with Agarose → Chemical Lysis and Washing → DNA in Plugs → Restriction Enzyme → Electrophoresis (PFGE) → Documentation (capture gel image) → Data Analysis
Reported Salmonellosis Cases* in Kentucky
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