Escherichia coli O157:H7 Outbreak Associated with Bagged Salad, Tennessee, 2012

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**E. coli O157:H7**

- Most common serotype of Shiga toxin-producing *E. coli*
- Causes diarrhea, bloody stool, cramps
  - Children <5 years at highest risk of HUS
- Outbreaks associated with beef, lettuce, spinach, sprouts
May 3, 2012

- Routine surveillance identified cluster of 3 cases of *E. coli* O157:H7, PFGE pattern “A”
- All attended “Daycare 1”
May 20, 2012

- 14 cases in Tennessee
- Subclusters
  - 2 daycares
  - 2 private schools
  - 2 public schools
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**MLVA_composite**

**TN, GA, OH**

**OR, NY**
Case Definition

- Confirmed case definition
  - *E. coli* O157:H7
  - PFGE pattern “A”
  - Outbreak MLVA type
  - Illness onset on or after April 15

- Probable case definition
  - Clinically compatible illness
  - Epidemiologically linked to confirmed case
*E. coli* O157:H7 pattern “A”

Infections by Illness Onset Date

![Bar Chart]

Number

Illness Onset Date


*Probable case*
E. coli O157:H7 pattern “A”
Infections by Illness Onset Date

* Probable case
Descriptive Epidemiology

- 17 cases
  - TN: 14 (includes 1 probable case)
  - GA: 2
  - OH: 1
- Median age: 23 years (range: 3-88 yrs)
- Female: 76%
- Hospitalized: 35%, 2 deaths
Subclusters

School A (n=4)
Subclusters

School A (n=4)

Daycare 1 (n=3)
Subclusters

- School A (n=4)
- Daycare 1 (n=3)
- School B (n=1)
- School C (n=1)
- Caterer
Subclusters

School A (n=4)

Daycare 1 (n=3)

Caterer

School B (n=1)

Daycare 2 (n=2)

School C (n=1)
Subclusters

- School A (n=4)
- Daycare 1 (n=3)
- School B (n=1)
- Caterer
- School C (n=1)
- Daycare 2 (n=2)
- School D (n=1)
Subclusters

School A (n=4)

Daycare 1 (n=3)

Caterer

School B (n=1)

Daycare 2 (n=2)

School C (n=1)

OH Case

GA Case 1

GA Case 2

School D (n=1)
Subclusters and Epi Traceback

1. School A (n=4)
2. Daycare 1 (n=3)
3. School B (n=1)
4. School C (n=1)
5. Daycare 2 (n=2)
6. Caterer
7. OH Case
8. GA Case 1
9. GA Case 2
10. Bagged Salad from Producer A
Matched Case-Control Study

- 7 cases included
- 3 controls: 1 case, matched on school and grade
- Exposures common among ≥ 25% on initial questionnaire
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<th>No.</th>
<th>Percent</th>
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<td><strong>LEAD-IN QUESTIONS</strong></td>
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<tr>
<td>Worked/attended daycare or school</td>
<td>5</td>
<td>62.5</td>
<td>Any pre-packaged deli meats</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>Ate food prepared by daycare or school</td>
<td>6</td>
<td>75.0</td>
<td>Any bologna, corned beef, or other processed meats</td>
<td>2</td>
<td>25.0</td>
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<td><strong>EATING AND SHOPPING VENUES</strong></td>
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<tr>
<td>Ate ay any restaurants</td>
<td>4</td>
<td>50.0</td>
<td>Any “mini” carrots (peeled)</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Ate at fast-food restaurants</td>
<td>2</td>
<td>25.0</td>
<td>Any bell peppers (green, red, yellow or orange)</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>Ate at cafeteria/dining room other than school</td>
<td>2</td>
<td>25.0</td>
<td>Any commercial fresh tomatoes eaten raw</td>
<td>3</td>
<td>37.5</td>
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<td><strong>SOURCES OF FOOD AT HOME</strong></td>
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<tr>
<td>Ate from grocery store/supermarket</td>
<td>6</td>
<td>75.0</td>
<td>Any bagged, pre-washed lettuce or salad mix</td>
<td>5</td>
<td>62.5</td>
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<td><strong>RESTAURANT GENRES</strong></td>
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<td>Ate at a pizzeria</td>
<td>3</td>
<td>37.5</td>
<td>Any bottled water</td>
<td>2</td>
<td>25.0</td>
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<td><strong>EGGS AND DAIRY</strong></td>
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<td>Ate eggs</td>
<td>2</td>
<td>25.0</td>
<td>Any other beef (steak, etc.) away from home</td>
<td>2</td>
<td>25.0</td>
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<tr>
<td>Ate eggs at home</td>
<td>2</td>
<td>25.0</td>
<td>Anything from a salad bar</td>
<td>3</td>
<td>37.5</td>
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<td>Drank any pasteurized milk</td>
<td>4</td>
<td>50.0</td>
<td>Any kind of salad made with lettuce or greens</td>
<td>3</td>
<td>37.5</td>
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<tr>
<td>Drank any pasteurized 2% milk</td>
<td>3</td>
<td>37.5</td>
<td>Any pizza from a pizzeria or school</td>
<td>2</td>
<td>25.0</td>
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<td><strong>CHEESE</strong></td>
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<td>Any pre-shredded cheese</td>
<td>4</td>
<td>50.0</td>
<td>Any contact with dogs or puppies</td>
<td>3</td>
<td>37.5</td>
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<td><strong>LIVE ANIMAL CONTACT, PETS, AND PET FOOD</strong></td>
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Results Implicating Bagged Lettuce

- Descriptive epi
  - 75% female
  - Temporal distribution - produce shelf life

- Epi traceback - complex but compelling

- Matched subcluster case-control study
  - One unique exposure identified
  - “Ate lettuce provided by the school cafeteria?”, mOR=9.4, p<0.05
Bagged Lettuce Producer A

- Epi traceback and FDA traceback converged
  - Single day of production implicated
  - Specific produce growing areas identified
Interventions

• Presented findings to Producer A:
  • No voluntary recall
  • Unsure of other industry actions

• FDA scheduled heightened inspections of produce growing areas
Conclusions

• Outbreak of *E. coli* O157:H7 associated with bagged salad from Producer A

• Outlier investigation can support or refute hypotheses

• Institution-level subcluster epidemiologic traceback and case-control study utilized

• Multiple epidemiologic approaches can be helpful during foodborne outbreak investigations
Thank You

Amanda Ingram
Katie Garman
John Dunn
FoodCORE Team