Minnesota Department of Health
Approach to the Investigation of Foodborne Disease Outbreaks

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Selected Notable Enteric Disease Outbreaks, 2011

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Pathogen</th>
<th>No. Cases</th>
<th>No. States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazelnuts</td>
<td><em>E. coli</em> O157:H7</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td><em>S. Panama</em></td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Lebanon Bologna</td>
<td><em>E. coli</em> O157:H7</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Microbiology Labs</td>
<td><em>S. Typhimurium</em></td>
<td>73</td>
<td>35</td>
</tr>
<tr>
<td>Chicks &amp; Ducklings</td>
<td><em>S. Altona &amp; S. Johannesburg</em></td>
<td>68</td>
<td>20</td>
</tr>
<tr>
<td>Fenugreek Sprouts</td>
<td><em>E. coli</em> O104:H4</td>
<td>&gt;4,000</td>
<td>Germany</td>
</tr>
<tr>
<td>Alfalfa &amp; Spicy Sprouts</td>
<td><em>S. Enteritidis</em></td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>African Dwarf Frogs</td>
<td><em>S. Typhimurium</em></td>
<td>241</td>
<td>42</td>
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<tr>
<td>Papayas</td>
<td><em>S. Agona</em></td>
<td>106</td>
<td>25</td>
</tr>
<tr>
<td>Ground Turkey</td>
<td><em>S. Heidelberg</em></td>
<td>136</td>
<td>34</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td><em>L. monocytogenes</em></td>
<td>146</td>
<td>28</td>
</tr>
<tr>
<td>Turkish Pine Nuts</td>
<td><em>S. Enteritidis</em></td>
<td>43</td>
<td>5</td>
</tr>
<tr>
<td>Kosher Broiled Chicken Livers</td>
<td><em>S. Heidelberg</em></td>
<td>179</td>
<td>6</td>
</tr>
<tr>
<td>Romaine Lettuce</td>
<td><em>E. coli</em> O157:H7</td>
<td>60</td>
<td>10</td>
</tr>
</tbody>
</table>

Factors Involved in Changes in the Modern Diet

- Health
- Convenience
- Taste / food preference
- Year-round demand

- Food production and food processing technologies changing to meet consumer demands in these areas
- Changing epidemiology of foodborne disease
- Challenges for outbreak investigations
Outbreak Investigations are a Disproportionately Important Aspect of Foodborne Disease Surveillance

- Additional illnesses can be prevented
- Food hazards can be identified
  - New vehicles can be recognized
  - Risky production practices can be revealed
- Media interest provides opportunities for public health communication
- Monetary damages, loss of sales, and damage to brand names get industry’s attention
- Political interest is stimulated

Examples of Industries Stimulated to Change by Foodborne Disease Investigations

- Peanut products
- Ready-to-eat & “ready-to-cook” foods
- Eggs
- Beef
- Spices
- Leafy greens
- Other vegetables
- Tree nuts
- Melon
- Poultry
- Sprouts
Background: Foodborne Disease in Minnesota

Confirmed Foodborne Outbreaks, Minnesota, 1995-2011
Confirmed Foodborne Outbreaks by Etiology, Minnesota, 1999-2011 (n=656)

- Norovirus: 59%
- Bacterial intoxications: 10%
- Salmonella: 13%
- E. coli O157:H7: 13%
- Other/unknown: 5%

Norovirus Outbreaks by Month, Minnesota, 2002-2011

Since the 1990’s, global epidemics have been associated with Genogroup II, genotype 4 (GII.4)

- Foodborne, person-person, waterborne
- Marked winter seasonality
- 2 to 4-year epidemic cycle
Number of Foodborne Outbreaks of Salmonellosis in Minnesota, 2000-2011

Selected Enteric Pathogens Reported to MDH, 2000-2011
Primary Foodborne Disease Outbreak Detection Mechanisms in Minnesota

- Notification by health care professional or patient of multiple illnesses from common event
  - e.g., wedding reception, graduation party, conference
- Multiple individual complaints about same restaurant
- Active laboratory surveillance of reportable pathogens (pathogen-specific surveillance)

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Minnesota Foodborne Illness Hotline
Call to report foodborne illness
Toll free statewide:
1- 877- 366-3455
1- 877- FOOD ILL

- Centralized at State Health Department
- Coordinated by one person
- Complaints received from public directly or from public via local health departments
### Foodborne Illness Report

**Minnesota Department of Health**  
**Phone:** (651) 201-5414  
**Fax:** (651) 201-5082

**Complaint date:**  
**How you got it:**  
**Tennessee:**

**Agency:** Minnesota Department of Health  
**Reporter:** Dawn Kahlke

**First Name:**

**Last Name:**

**Age:**

**Sex:**

**Address:**

**Zip:**

**Email:**

**Home phone:**

**Work phone:**

**Cell:**

**Establishment that the complaintant suspects:**

**Number of persons exposed:**

**Number ill:**

**Did complaint call the establishment?**

**If yes, who did they speak with:**

*If a retail food product is suspected, please fill out page 4 (Retail Food Product Complaint) in addition to the 4-day food history*

### ILLNESS HISTORY

**Illness Onset:**

**Time:**

**Recovery:**

**Time:**

**Vomiting:**

**Diarrhea:**

**Number of stools per 24-hr. period (max):**

**Cramps:**

**Fever:**

**N (temp):**

**Bloody stools:**

**Other symptoms:**

**Visited health care provider:**

**Date of visit:**

**If yes, name and location:**

**Provider requested stool sample:**

**If yes, date stool submitted:**

**Hospitalized:**

### FOOD HISTORY

*If only one person is ill or if all persons live in same household, complete the entire five-day food history. If more than one person is ill and they live in different households, record only the common meals.*

<table>
<thead>
<tr>
<th>Meal Time</th>
<th>Date: <strong>/</strong>/____</th>
<th>Hours to Illness Onset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brk:</td>
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<td></td>
<td>location:</td>
<td>food/drink:</td>
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<td>Lsn:</td>
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<td></td>
<td>location:</td>
<td>food/drink:</td>
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<td>location:</td>
<td>food/drink:</td>
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<tr>
<td>Other:</td>
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<tr>
<td></td>
<td>location:</td>
<td>food/drink:</td>
</tr>
</tbody>
</table>

-Page 1-
Foodborne Outbreaks in Minnesota 2000-2006 (n=332)

- 261 (79%) detected solely from consumer complaints
  - 162 (62%) about food establishments
  - 99 (38%) about an event
- Additional 8% of outbreaks detected through combination of complaints and other surveillance methods
Foodborne Outbreaks in Minnesota 2000-2006 (n=332)

• Almost all outbreaks due to non-reportable pathogens detected through complaints
  – Norovirus, *Clostridium perfringens*, *Bacillus cereus*, *Staphylococcus aureus*, Scombroid toxin

• 14% of *Salmonella* outbreaks detected solely through complaints
  – Complaints contributed to detection of an additional 11% of *Salmonella* outbreaks
**Diseases Reportable to the Minnesota Department of Health**

**FOODBORNE AND WATERBORNE DISEASES**

- **Botulism** (*Clostridium botulinum*)
- **Campylobacteriosis** (*Campylobacter sp.*) *
- **Cholera** (*Vibrio cholerae*) *
- **Cryptosporidiosis** (*Cryptosporidium parvum*)
- **Enteric Escherichia coli infection** (*E. coli O157:H7* and other pathogenic *E. coli* from gastrointestinal infections) *
- **Giardiasis** (*Giardia lamblia*)
- **Hemolytic uremic syndrome**
- **Listeriosis** (*Listeria monocytogenes*) *
- **Salmonellosis, including typhoid** (*Salmonella sp.*) *
- **Shigellosis** (*Shigella sp.*) *
- **Toxoplasmosis**
- **Yersiniosis** (*Yersinia sp.*) *

*Submit clinical specimens to the Minnesota Department of Health*

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**Foodborne Disease Surveillance at the Minnesota Department of Health (MDH)**

- Person becomes ill
- Goes to the doctor
  - Doctor requests stool sample for testing
- Stool is positive for a reportable foodborne pathogen
  - Doctor sends report to MDH Epi
  - Specimen is sent to MDH Laboratory
- Lab and Epi data are combined
Keys Components of MDH Foodborne Outbreak Investigations

- Mandatory isolate submission to MDH
- Real-time PFGE subtyping of all isolates
- Centralized surveillance/investigation of cases
  - Everything done at state level
- Real-time interviews done with all cases using a detailed questionnaire
  - Specific food info, point of sale/service
- Iterative cluster investigation model
- Obtain product source info when needed

Keys Components of MDH Foodborne Outbreak Investigations

- Investigate all clusters; follow leads aggressively
- Resources (people) dedicated to enteric diseases
  - Experience from working with clusters every day leads to knowledge of when a cluster likely represents an outbreak and the extent to which resources should be allocated during an investigation
- Cluster investigations given high priority
  - Sense of urgency
**Pulsed-Field Gel Electrophoresis (PFGE)**

1. **Bacteria**
2. **Molten agarose**
3. **DNA**
4. **Pulse electrophoresis**
5. **Enzyme digestion (XbaI)**

- Lysis: 1.5 hours
- 18 hours
- 1.5 hours

**PulseNet Series 3**

**PFGE Patterns**

Department of Health and Human Services, CDC & ATSDR
The National Molecular Subtyping Network for Foodborne Disease Surveillance

Electronic Data Transmission

Public health laboratories → PFGE patterns → National database at CDC
Bacterial Isolate Flow from Clinical Labs to Public Health Labs

- Completeness and timeliness of isolate submission to public health labs, and timeliness of serotyping/PFGE subtyping at public health labs, determines the sensitivity of outbreak detection
  - i.e., need this for optimal detection of outbreaks (local and multistate) caused by *Salmonella*, *E. coli* O157:H7, *Listeria*

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Human specimen isolates uploaded to PulseNet USA, and investigated clusters, 1996-2010†

![Graph showing data on human specimen isolates](image)

† Data are preliminary and subject to change
Detecting Multistate Outbreaks

- Multistate outbreaks detected more frequently
- Each year, >150 national or multistate and >1,000 state and local investigations
- Since 2006, 13 newly recognized food vehicles that can transmit pathogens

Data from Foodborne Disease Outbreak Surveillance System

Average weekly number of clusters CDC Outbreak Response Team followed by month and pathogen, February 1, 2008 – December 31, 2010
Daily Report from MDH Lab to Epi

Cultures Confirmed Yesterday

Daily Report from MDH Lab to Epi

Cultures Confirmed or Subtyped in the Past 30 Days
Epidemiologic Follow-up of Clusters

- Determines the likelihood of identifying the source of an outbreak

Process from Exposure/Illness to Data Availability at State Health Department Takes Time

EDITS Median 15-18 days

Actionable

Z Z Z Z Z

Incubation period Collect sample Culture sample Forward culture to public health lab PFGE and submission to PulseNet

1-7 1-7 2-5 1-7 2-30

Time/days

Typical duration of each phase

Total delay: 7-56 days (8-22 days if optimal)
Minnesota Surveillance Philosophy

- Interview all cases, ASAP
- Collect details on specific exposures
  - Restaurant, grocery store names
  - Food brand, variety names
  - Open-ended food histories
- Investigation of all PFGE clusters
  - Intensity/resource expenditure depends on the exact nature of the cluster
  - Follow leads aggressively

“Team Diarrhea”

- MPH Students from U of MN SPH
- Hired as temporary MDH employees
- ~20 hours/week, including evenings and weekends
- Intensive training, oversight by MDH epidemiologists
- Person-power to rapidly interview all cases, do calls for cluster investigations
MDH Exposure Questions: *Salmonella* and STEC

- Drinking water
- Raw milk
- Travel
- Gatherings
- Animal contact
- Daycare
- Ill contacts
- Recreational water

## Food or Beverages Outside the Home

1. **Did you eat any food or beverages from any restaurant, coffee shop, cafeteria, deli, or food stalls/most vendors during the seven days before your illness?**
2. **Name:**
3. **Address:**
4. **Food name:**
5. **Date:**
6. **Time:**
7. **Note:**

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**Did you eat any food or beverages from any restaurant, coffee shop, cafeteria, deli, or food stalls/most vendors during the seven days before your illness?**

**Name:**

**Address:**

**Food name:**

**Date:**

**Time:**

**Note:**
### Open Ended Food and Beverage History

**Food Consumption History**

Please indicate for each item listed below whether you definitely ate it, probably ate it, or definitely did not eat it throughout the past 24 hours:

<table>
<thead>
<tr>
<th>Item</th>
<th>Definitely Ate</th>
<th>Probably Ate</th>
<th>Definitely Did Not Eat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Did you eat a prepared dish (e.g., vegetables, quiche,重点) that contained egg? Yes ☐ No ☐
2. Did you sample any food that used raw egg in the preparation? Yes ☐ No ☐

<table>
<thead>
<tr>
<th>Item</th>
<th>Definitely Ate</th>
<th>Probably Ate</th>
<th>Definitely Did Not Eat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snack bars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frozen snacks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black bread</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>French fries</td>
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<td></td>
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<tr>
<td>Cheese stick</td>
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<tr>
<td>Quiche (Veggie)</td>
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<tr>
<td>Gourmet dishes (e.g., Robin's, Bob's, or other specialty stores)</td>
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<tr>
<td>Ice cream</td>
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<tr>
<td>Frozen dessert</td>
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<tr>
<td>Yogurt</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Tennessee Public Health Association_2012 21
<table>
<thead>
<tr>
<th>Item (Minute rice)</th>
<th>Size</th>
<th>Did not eat</th>
<th>May have eaten</th>
<th>How prepared</th>
<th>Variety or brand</th>
<th>Date purchased</th>
<th>Grocery store where purchased</th>
<th>Date eaten</th>
<th>Restaurant where eaten (include address)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk (e.g., cow's milk, or rice milk)</td>
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<tr>
<td>Other dairy (e.g., cottage cheese, cream cheese, sour cream)</td>
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<tr>
<td>MEAT/Poultry</td>
<td>Ground beef</td>
<td>/ /</td>
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<tr>
<td>Other beef (e.g., skirt)</td>
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<tr>
<td>Chicken (including gizzards)</td>
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<tr>
<td>Stuffed chicken breast (e.g., dressing, Cornish)</td>
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<tr>
<td>Turkey (including gizzards)</td>
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<tr>
<td>Poultry (e.g., ham, bacon)</td>
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<tr>
<td>Lamb</td>
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<td>Sausage</td>
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<td>Other meat/poultry</td>
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<tr>
<td>Fish</td>
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<tr>
<td>Bony</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Item (Meal/party oak)</th>
<th>Size</th>
<th>Did not eat</th>
<th>May have eaten</th>
<th>How prepared</th>
<th>Variety or brand</th>
<th>Date purchased</th>
<th>Grocery store where purchased</th>
<th>Date eaten</th>
<th>Restaurant where eaten (include address)</th>
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</thead>
<tbody>
<tr>
<td>Other seafood</td>
<td>/ /</td>
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<td>/ /</td>
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<tr>
<td>FROZEN FOODS</td>
<td>Frozen dumplings (e.g., Lune Cuisin, pot pies)</td>
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<tr>
<td>Frozen pizza</td>
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<td>Other frozen microwaveable foods</td>
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<tr>
<td>FRUITS</td>
<td>Oranges</td>
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<td>Other citrus (e.g., grapefruit, lemon, lime, tangerine)</td>
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<tr>
<td>Pears</td>
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<tr>
<td>Apples</td>
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<td>Other tree fruit (e.g., apricot, plum, orange, grape)</td>
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<td>Strawberries</td>
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<tr>
<td>Other berries (e.g., black, blue, or raspberries)</td>
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<tr>
<td>Grapes (grapey color)</td>
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<td>/ /</td>
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<tr>
<td>Peaches</td>
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</tr>
<tr>
<td>Item (Fruits cont.)</td>
<td>Ate</td>
<td>Did not eat</td>
<td>May have eaten</td>
<td>Have prepared</td>
<td>Variety or brand</td>
<td>Date purchased</td>
<td>Grocery store where purchased</td>
<td>Date eaten</td>
<td>Restaurant where eaten (include address)</td>
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</tr>
<tr>
<td>Watermelon</td>
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<tr>
<td>Cantaloupe</td>
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<tr>
<td>Honeydew or other melon</td>
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<tr>
<td>Other fruit (e.g., pomegranate, kiwi, mango, pineapple)</td>
<td></td>
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<tr>
<td>Unpresweetened apple cider</td>
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<td></td>
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<tr>
<td>Other unpresweetened juice</td>
<td></td>
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<td></td>
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<tr>
<td>Other juice</td>
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</tr>
</tbody>
</table>

**VEGETABLES**

<table>
<thead>
<tr>
<th>Item (Vegetables cont.)</th>
<th>Ate</th>
<th>Did not eat</th>
<th>May have eaten</th>
<th>Have prepared</th>
<th>Variety or brand</th>
<th>Date purchased</th>
<th>Grocery store where purchased</th>
<th>Date eaten</th>
<th>Restaurant where eaten (include address)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepackaged salad</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Iceberg</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romanesco</td>
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<td></td>
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<td></td>
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<tr>
<td>Spinach</td>
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<td></td>
<td></td>
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<tr>
<td>Cabbage</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (non-starchy) green (e.g., red leaf, radish, mustard, collard)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Tomatoes (e.g., Roma, heirloom, Roma, beefsteak, grape – including in a sandwich or salad)</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Item (Vegetables cont.)</th>
<th>Ate</th>
<th>Did not eat</th>
<th>May have eaten</th>
<th>Have prepared</th>
<th>Variety or brand</th>
<th>Date purchased</th>
<th>Grocery store where purchased</th>
<th>Date eaten</th>
<th>Restaurant where eaten (include address)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cucumbers</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Peppers (e.g., green, yellow, red, yellow, orange)</td>
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<tr>
<td>Asparagus</td>
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<tr>
<td>Celery</td>
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<tr>
<td>Cucumbers (pickled or raw)</td>
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<tr>
<td>Radishes</td>
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<tr>
<td>Peppercorn seed</td>
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<tr>
<td>Cucumbers (pickled or raw)</td>
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<tr>
<td>Green onions</td>
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<td></td>
<td></td>
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<tr>
<td>Broccoli</td>
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<td></td>
<td></td>
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<tr>
<td>Cauliflower</td>
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<tr>
<td>Spinach (e.g., yellow, bean, radish, green)</td>
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<tr>
<td>Collardimes (specify which)</td>
<td></td>
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<tr>
<td>Other fresh herbs (e.g., basil, dill, mint, sage)</td>
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<tr>
<td>Madrignes (parsley, white, Italian)</td>
<td></td>
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<tr>
<td>Tofu</td>
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<tr>
<td>Other vegetables</td>
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</tbody>
</table>
Average time to complete interview: 27 minutes
Presentations of Outbreaks due to Commercially Distributed Food Items

• Cases in community, no obvious common exposure
  – Retail food (grocery stores)
• Cases occur among patrons of restaurant(s)
• Cases clustered in institution(s)
• Any combination of above three

For every type of outbreak, the key to solving it is to get detailed exposure information for as many cases as possible, as soon as possible!!!

Minnesota Surveillance Philosophy

• Interview all cases, ASAP
• Collect details on specific exposures
  – Restaurant, grocery store names
  – Brand names
  – Open-ended food histories
• Investigation of all PFGE clusters
  – Intensity/resource expenditure depends on the exact nature of the cluster
  – Follow leads aggressively
Traditional Approach to Investigation of PFGE Clusters

PFGE Cluster Identified
\[\rightarrow\]
Hypothesis-Generating Questionnaire Used
\[\rightarrow\]
Hypothesis Determined
\[\rightarrow\]
Case-Control Study Started

Minnesota Approach to Investigation of PFGE Clusters: Dynamic Cluster Investigation Model

Case #1 ↔ Case #2 ↔ Case #3 ↔ Case #4
Multi-state *Salmonella* I 4,[5],12:i:- Outbreak Associated with Pot Pies, 2007

- 401 cases
- 41 states
- 32% hospitalized

![Banquet Turkey Pot Pie](image)

**Hypothesis Generation**

*Date of illness onset reported for 336 cases and estimated for 65 cases*
Dynamic Cluster Investigation - Pot Pies

Initial trawling questionnaire interview date

- 9/10
- 9/27
- 10/3 night

Trawling questionnaire

- 10/4 afternoon
- 10/4 evening
- 10/4 morning

Consumed Banquet PP

Re-interviewed cases about frozen foods and pot pies

Improving Outbreak Investigations

- Accelerate investigations by combining features of:
  - Hypothesis-generating interviews
  - Case-control studies
  - Food tracebacks
  - Food testing
Sub-Clusters

- In some outbreaks, there may be sub-clusters of epi-linked cases
  - e.g., multiple cases at a restaurant, nursing home, or school
- Often the key to solving multistate outbreaks: warrants aggressive approach
- Specific analytic studies in these settings
  - Ingredient specific
  - Often requires active case finding among others exposed (meal companions, credit card receipts)
- Look for common food items and suppliers
Food Tracebacks

• Traditionally done after a food vehicle is implicated by other means (epi, lab testing)

Food Tracebacks

• Increasingly necessary as part of epidemiologic investigation to implicate a food item
  – A way to further increase exposure specificity, especially for generic or co-linear foods
  – Critical if multiple sub-clusters
  – Often important in validating conclusion based on traditional epidemiologic methods
  – Can substantially accelerate identification of vehicle vs. using traditional methods alone

• Requires effective collaboration between epidemiology and regulatory agencies
Food Testing

• Presence of pathogen in suspect food definitive
• Resource intensive
  – Can’t test everything: “needle in haystack”
  – Epidemiology must be used to target what to test and when

A Chronological History of Selected Foodborne Outbreak Investigations at MDH
**Salmonella Typhimurium Cases by Pulsed-Field Gel Electrophoresis Subtype and Week of Illness Onset, Minnesota, August – October, 1998**

**Table:**

<table>
<thead>
<tr>
<th>Week of Onset</th>
<th>TM127</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/21</td>
<td></td>
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<tr>
<td>8/28</td>
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<tr>
<td>9/4</td>
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<tr>
<td>9/11</td>
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<td>9/18</td>
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<tr>
<td>9/25</td>
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<tr>
<td>10/2</td>
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<tr>
<td>10/9</td>
<td></td>
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</tr>
<tr>
<td>10/16</td>
<td></td>
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<tr>
<td>10/23</td>
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<tr>
<td>10/30</td>
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</tbody>
</table>

**Graph:**

- **PFGE Subtype:**
  - TM127
  - Other

**Legend:**

- **Week of Onset**
- **Number of Cases**

**Table:**

<table>
<thead>
<tr>
<th>Item (Dairy)</th>
<th>Did not eat</th>
<th>May have eaten</th>
<th>How prepared</th>
<th>Date purchased (mo/da)</th>
<th>Condiment when purchased</th>
<th>Date eaten (mo/da)</th>
<th>Restaurant where eaten (City/State)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice cream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frozen desert toppings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yogurt</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MEAT/Poultry</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Chicken</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Turkey</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hamburger</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Notes:**

- Red lines indicate ingredient types of foods.
- Red lines indicate presence or absence of condiments.
- Red lines indicate restaurant names.

**Page 2 of 5**
Salmonella Typhimurium TM127 Outbreak, 1998

• Consumption of chicken Kiev associated with illness
  – 11 of 15 cases vs. 0 of 9 age-matched, community controls; MOR, undefined; p=0.0005
• Of 15 cases who could recall some product brand information, 14 named Maple Leaf Farms brand

Outbreak strain isolated from multiple packages with implicated code date
E. coli O157:H7 and Frozen, Vacuum-Packed Steaks, 2003

June 11, 2003

- Minnesota Department of Health (MDH) Public Health Laboratory notified epidemiologists of two O157 isolates with an indistinguishable PFGE pattern
- Case 1 immediately interviewed and reported consuming vacuum-packed, frozen steaks sold by a door-to-door vendor; brand information not available
- Case 2 hospitalized with HUS; husband not immediately available for interview
Culture-confirmed *E. coli* O157:H7 Cases at Cluster Detection, 2003
<table>
<thead>
<tr>
<th>Farmers Pride Meat Company</th>
<th>Now Making Commercial and Residential Deliveries:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triple Trimmed</td>
<td>North Dakota</td>
</tr>
<tr>
<td></td>
<td>South Dakota</td>
</tr>
<tr>
<td></td>
<td>Minnesota</td>
</tr>
<tr>
<td></td>
<td>Nebraska</td>
</tr>
<tr>
<td></td>
<td>Wisconsin</td>
</tr>
<tr>
<td></td>
<td>Iowa</td>
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<tr>
<td></td>
<td>Missouri</td>
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<tr>
<td></td>
<td>Illinois</td>
</tr>
<tr>
<td></td>
<td>Michigan</td>
</tr>
<tr>
<td></td>
<td>176 East Main Ave. West Fargo, ND 58078</td>
</tr>
<tr>
<td></td>
<td>4516 S. 80th Omaha, NE 68127</td>
</tr>
<tr>
<td></td>
<td>3031 82nd Lane NE Blaine, MN 55440</td>
</tr>
<tr>
<td></td>
<td>5631 East Superior St. Duluth, MN 55810</td>
</tr>
<tr>
<td></td>
<td>9864 Starr St. SE Grand Rapids, MI 49546</td>
</tr>
<tr>
<td></td>
<td>1-800-692-1146</td>
</tr>
</tbody>
</table>

Home Chef's SELECTIONS

USDA Inspected and Approved

Quality Assured

Flash Frozen for Maximum Freshness
Individual, Vacuum-Packed Portions
Superior Trim

Safe Handling Instructions:
The product was prepared from inspected and graded meat and is safe to
serve and eat. For best results and to maintain quality, keep the product
refrigerated in original container for your protection. Know these handling
instructions:

- Keep raw meat and poultry separate from other foods, rinse cutting
  boards and utensils after you cut raw meat or poultry.
- Cook meat thoroughly.
- Keep hot food hot. Keep refrigerate冷 or frozen food in a freshness
  cooler.

Customer Service
Call Toll Free
1-800-692-1146
• Steaks needle-tenderized
• Outbreak strain of O157 cultured from interior of partially cooked steaks
Culture-confirmed Steak Outbreak-Associated *E. coli* O157:H7 Cases, 2003
Outbreak of *E. coli* O157:H7 Infections, 2005 - Detection

**September 27, 2005**

- Three O157 isolates with indistinguishable PFGE patterns identified by Minnesota Public Health Laboratory
- PFGE pattern new in Minnesota, rare in United States
  - 0.35% of patterns in National Database
Outbreak Investigation - Methods

September 28–29, 2005

• 7 additional O157 isolates of outbreak PFGE subtype received
  – Supplemental interview form created
• Case-control study initiated
  – Age-matched community controls recruited through sequential digit dialing anchored on case’s telephone number

Supplemental Interview Form:

- Name: 
- Date interviewed: 
- Time: 

Did you eat lettuce before your illness? (Yes) N DK
When did you eat the lettuce?
Was the lettuce prepackaged?
Do you recall brand name of prepackaged lettuce?

ANS: Brand Name or None
- FRESH EXPRESS BRAND
- DOLE
- EARTH BOUND FARMS
- ARCHER FARM

Do you recall the type of lettuce or salad components?
- If so, list type of lettuce:
- If yes, was it romaine lettuce?
- If yes, was it iceberg lettuce?

Do you recall the store purchased from?
- If yes, list name:

Did you purchase this lettuce from any of the following stores?
- RAINBOW
- Publix
- Safeway
- Publix
- Kroger
- Walmart

Location of lettuce consumption:
- Date purchased lettuce or salad
- Original grocery store receipt available?
- Remaining lettuce from package at home?
Case-Control Study Results

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Cases</th>
<th>Controls</th>
<th>Matched OR*</th>
<th>95% CI†</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any lettuce</td>
<td>9/10</td>
<td>17/26</td>
<td>3.5</td>
<td>0.5–25.0</td>
<td>0.17</td>
</tr>
<tr>
<td>Prepackaged lettuce salad</td>
<td>9/10</td>
<td>10/26</td>
<td>8.4</td>
<td>1.2–59.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Brand A prepackaged lettuce salad</td>
<td>9/10</td>
<td>5/23</td>
<td>10.1</td>
<td>1.5–67.3</td>
<td>0.002</td>
</tr>
</tbody>
</table>

* OR = odds ratio
† CI = confidence interval

E. coli O157:H7 Cases Associated with Brand A Prepackaged Lettuce by Date of Illness Onset

Minnesota Department of Health
News Release
September 30, 2005
Contact information

Health officials investigate E. coli O157:H7 cases related to prepackaged lettuce mixes

Case-control study implicated Brand A salad

Case-control study initiated

Initial cluster of 3 isolates among MN residents identified

Date of Onset
2005

Number of Cases

September

Date of Onset
October
PFGE Patterns of *E. coli* O157:H7 Isolates from Lettuce

<table>
<thead>
<tr>
<th>Source</th>
<th>Isolate 1</th>
<th>Isolate 2</th>
<th>Isolate 3</th>
<th>Isolate 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Minnesota Case-patient</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Classic Romaine Bag #1</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>Classic Romaine Bag #2</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
</tbody>
</table>

*E. coli* O157:H7 MN744 Cases Associated with Sam’s Club Ground Beef Patties, by Receipt of Isolate in MDH Public Health Laboratory, 2007

- 3rd case household – Sam’s Club Ground Beef Patties
- 2 case households: Sam’s Club Ground Beef Patties

Date of Isolate Receipt at MDH Lab

- September
- October

Number of Cases

- 1
- 2
- 3
- 4
- 5
- 6
- 7
**E. coli O157:H7 MN744 Cases Associated with Sam’s Club Ground Beef Patties, by Receipt of Isolate in MDH Public Health Laboratory, 2007**

<table>
<thead>
<tr>
<th>Date of Isolate Receipt at MDH Lab</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Product Packaging Information from 2 case households

3rd case household – Sam’s Club Ground Beef Patties

2 case households: Sam’s Club Ground Beef Patties
E. coli O157:H7 MN744 Cases Associated with Sam’s Club Ground Beef Patties, by Receipt of Isolate in MDH Public Health Laboratory, 2007

Date of Isolate Receipt at MDH Lab

Number of Cases

September October

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

E. coli O157:H7 cases linked to frozen ground beef patties purchased at Sam’s Club stores in August and September. Product removed from store shelves; customers asked to return or destroy.
### E. coli O157:H7 MN744 Case-Patient Characteristics (n=11)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (range)</td>
<td>19 yrs (1–85)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
<td>63%</td>
</tr>
<tr>
<td>Bloody diarrhea</td>
<td>10</td>
<td>91%</td>
</tr>
<tr>
<td>Hospitalized</td>
<td>7</td>
<td>63%</td>
</tr>
<tr>
<td>Hemolytic uremic syndrome</td>
<td>4</td>
<td>36%</td>
</tr>
<tr>
<td>– all 3 female cases had HUS (ages 4, 9, and 20 yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leftover product + for O157</td>
<td>6/6</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Number of Laboratory-Confirmed Cases of Salmonella Saintpaul, by Date of Illness Onset – United States, 2008*

*Includes cases with onset information received as of August 25, 2008. Some illness onset dates (n = 366) were estimated by subtracting 3 days from the specimen date. Illness that began during July 29–August 25 might not yet be reported.

MMWR 2008 Vol. 57 No. 34
Initial Implication of Tomatoes

May 21-25
• NM detected increase in S. Saintpaul cases, raw tomatoes most common item consumed

May 26
• Started case-control study
• 51 cases in NM, TX
• Raw tomatoes only significant item

May 31
• NM DOH announces link to tomatoes

Problems with the Tomato Hypothesis

• No one type of tomato came up consistently
• Tomato tracebacks didn’t converge
• Tomatoes tested negative
• Cases continued to occur after advisory
• Unique case characteristics (Hispanic/American Indian, Mexican style foods)
Texas Restaurant Outbreaks

June 20
• First restaurant cluster - TX, 47 cases
• Salsa only item significant
  – Raw tomatoes, raw jalapenos

June 24
• Second restaurant cluster - TX, 62 cases
• Salsa only item significant
  – Canned tomatoes, raw jalapenos

Salmonella Saintpaul Patron Cases Associated with Restaurant A by Date of Isolate Receipt in MDH Laboratory, June 2008

<table>
<thead>
<tr>
<th>Date of Isolate Receipt</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>7</td>
</tr>
<tr>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>29</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Two cases name Restaurant A
Restaurant A Outbreak

June 30, 2008

• MDH and Ramsey County staff visited restaurant
  – Interviewed management and employees
  – Collected invoices for ingredients used in dishes consumed by cases (for traceback)
  – Requested credit card receipts from same time period (to find more cases, controls)
  – Obtained copies of menu; determined ingredients in each menu item
  – Began enrolling meal companions of cases
Univariate and Multivariate Results of Ingredient-Specific Case-Control Study

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>No. cases exposed/total</th>
<th>OR</th>
<th>p</th>
<th>aOR</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red salsa</td>
<td>13/18</td>
<td>14.7</td>
<td>&lt;0.001</td>
<td></td>
<td>Not significant</td>
</tr>
<tr>
<td>Avocado salsa</td>
<td>14/19</td>
<td>7.5</td>
<td>&lt;0.001</td>
<td></td>
<td>Not significant</td>
</tr>
<tr>
<td>Mexican garnish</td>
<td>17/19</td>
<td>69</td>
<td>&lt;0.001</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Red peppers</td>
<td>17/19</td>
<td>43</td>
<td>&lt;0.001</td>
<td></td>
<td>Not significant</td>
</tr>
<tr>
<td>Cilantro</td>
<td>18/19</td>
<td>21.4</td>
<td>&lt;0.001</td>
<td></td>
<td>Not significant</td>
</tr>
<tr>
<td>Fresh tomatoes</td>
<td>6/19</td>
<td>0.5</td>
<td>0.2</td>
<td></td>
<td>Not significant</td>
</tr>
<tr>
<td><strong>Jalapenos</strong></td>
<td><strong>17/19</strong></td>
<td><strong>69</strong></td>
<td><strong>&lt;0.001</strong></td>
<td><strong>62</strong></td>
<td><strong>&lt;0.001</strong></td>
</tr>
</tbody>
</table>

Salmonella Saintpaul Patron Cases Associated with Restaurant A by Date of Isolate Receipt in MDH Laboratory, June 2008

- Two cases name Restaurant A
- Visit restaurant
- Initial case-control study/traceback results to CDC
Salmonella Typhimurium Outbreak Cases

December 3, 2008

Infections with the outbreak strain of Salmonella Typhimurium, by date of illness onset*

Number of persons

1st 11 cases in MN

Date of illness onset

*Some illness onset dates have been estimated from other reported information
Minnesota S. Typhimurium Investigation

**Nov. 17 – Dec. 19, 2008**

- MDH received 11 outbreak isolates
- All chicken for first 4 cases traced back - source did not converge with other states’ investigations or with each other
- First 8 interviewed cases reported eating peanut butter
  - Suspicious, but not enough evidence to implicate one product, or even peanut butter overall, as the vehicle

Minnesota S. Typhimurium Investigation

**December 22, 2008**

- Medical director of LTCF (LTCF A) in northern MN reported confirmed *Salmonella* infections in 3 residents
  - Specimens from 2 other residents pending
    - All five cases confirmed with outbreak strain of S. Typhimurium
- Outbreak cases identified in other institutions
Minnesota S. Typhimurium Investigation

- LTCF A, LTCF B, elementary school all purchased food from a common distributor in Fargo, North Dakota
- Only food common to the 3 institutions was King Nut Creamy Peanut Butter
- Open tub of King Nut peanut butter collected from LTCF A by Minnesota Department of Agriculture on January 5
  - Multiple subsamples positive
    - Both outbreak PFGE subtypes present

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**NEWS RELEASE**

FOR IMMEDIATE RELEASE: Friday, January 9, 2009

CONTACTS: Michael Schonmer, MDA Communications, 651-260-2956
          Doug Schultz, MDH Communications, 612-250-2236

Agriculture, Health officials issue product advisory for King Nut peanut butter

Product contaminated with Salmonella bacteria was shipped to institutions in Minnesota

ST. PAUL, Minn. – Officials from the Minnesota Department of Agriculture (MDA) and the Minnesota Department of Health (MDH) today issued a product advisory after MDA’s preliminary laboratory testing indicated the presence of Salmonella bacteria in a 5-pound container of King Nut brand creamy peanut butter.

The product is distributed in Minnesota to establishments such as long-term care facilities, hospitals, schools, universities, restaurants, delis, cafeterias and bakeries. At this time, the product is not known to be distributed for retail sale in grocery stores. State officials are urging establishments who may have the product on hand to avoid serving it, pending further instructions as the investigation progresses.
**Week of January 12, 2009**

- CT isolates outbreak strain from intact tub of King Nut peanut butter
- State health depts. report cases had eaten Austin, Keebler PB crackers
- Plant in NC that makes these crackers found to use peanut paste from PCA
- Crackers implicated in national case-control study
- Outbreak strain ultimately isolated from crackers

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**Multistate Outbreak of *E. coli* O157:H7 Infections, Dec. 2010-Feb. 2011**

**February 7, 2011**

- Minnesota Department of Health (MDH) PHL determined that 2 clinical *E. coli* O157:H7 isolates submitted through routine surveillance had indistinguishable PFGE patterns
- Wisconsin Department of Health called MDH regarding 3 case isolates with same pattern
- 1 matching case in Michigan
- Multistate investigation initiated
Multistate Outbreak of *E. coli* O157:H7 Infections: 1st 6 cases

- Median age, 63 years
- 83% male
- All 6 reported in-shell mixed nut or in-shell hazelnut (filbert) consumption
  - Hazelnuts were included in mixed nuts
  - 2 reported only in-shell hazelnuts (not other in-shell nuts)
- 5 of 6 purchased from bulk bins

---

Interview Excerpts from 1st Two Minnesota Cases

<table>
<thead>
<tr>
<th>Item</th>
<th>Ate</th>
<th>Did not eat</th>
<th>May have eaten</th>
<th>How prepared</th>
<th>Variety or brand</th>
<th>Date purchased</th>
<th>Grocery store where purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTHER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts (e.g., almonds, pecans, walnuts, peanuts, cashews, other type) - specify roasted, raw, in the shell</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cashwise</td>
</tr>
</tbody>
</table>

[Table content continues]
### Binomial Model of Probability of Number of Cases Eating Hazelnuts, Given Estimated Background of Hazelnut Consumption of 34%

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># cases with</td>
<td>P (at least</td>
<td>P (exactly</td>
</tr>
<tr>
<td></td>
<td>exposure</td>
<td>that many hits)</td>
<td>that many hits)</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>0.0015</td>
<td>0.0015</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>0.0195</td>
<td>0.0180</td>
</tr>
<tr>
<td></td>
<td>sample size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>0.1089</td>
<td>0.0873</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>0.3328</td>
<td>0.2260</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>0.6519</td>
<td>0.3290</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>0.9173</td>
<td>0.2555</td>
</tr>
<tr>
<td></td>
<td>background rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>34.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>1.0000</td>
<td>0.0827</td>
</tr>
</tbody>
</table>

### Consumption of Hazelnuts among MN *E. coli* O157:H7 Outbreak Cases (3/3) vs. Non-peanut Nuts among MN *Salmonella* Cases (7/34)

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

Chi-Squares: 0.84
Fisher exact results recommended.
Interventions

• Recall of in-shell hazelnuts shipped by California distributor from November 2 through December 22
  – Hazelnuts originated in Oregon, but poor record keeping prevented identification of grower
• Public advisories

Isolation of Outbreak Strain of *E. coli* O157:H7 from Hazelnuts/Mixed Nuts

• March 5: Hazelnuts from Minnesota case home
• March 25: Mixed nuts returned to distributor in Wisconsin
• March 28: Mixed nuts from distributor in California
### E. coli O157:H7 Outbreak Cases by Week of Illness Onset

<table>
<thead>
<tr>
<th>Week of Onset</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Cases</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

- **Cluster Detected**
- **Press Release & Recall**

#### E. coli O157:H7 and Hazelnuts

- New vehicle-pathogen combination
- Example of why a company should maintain internal traceability
- Could lead to changes in production
  - Previous *Salmonella* outbreaks with almonds led to pasteurization
- How did the hazelnuts become contaminated?
Outbreak of *Salmonella* Enteritidis Infections Associated with Organic Eggs, August-October 2011
Background

- 6 *Salmonella* Enteritidis isolates submitted to MDH through routine surveillance with indistinguishable PFGE patterns
- Initial interviews revealed high egg consumption; two self-reported eating organic eggs
  - Re-interviewed all cases specifically about sources of eggs consumed

Investigation

- Conducted community case-control study
  - Organic eggs from Larry Schultz Organic Farm (Owatonna) statistically significant (sold under brand name and store brands [Lund's, Byerly's, Kowalski's])
    - 5/6 cases vs. 1/16 controls; OR = 75; 95% CI, 3.9-1434; p = 0.004
- Minnesota Dept. of Agriculture visited farm
  - Isolates from egg belt matched human isolates
**NEWS RELEASE**

FOR IMMEDIATE RELEASE: Wednesday, October 17, 2012

**Salmonella illnesses linked to organic eggs**

**Consumers, find prepare to avoid egg shells**

**ST. PAUL, Minn.** - The Minnesota Department of Agriculture (MDA) and the Department of Health (MDH) are investigating illnesses in at least six people in Minnesota with a match of organic shell eggs due to contamination with Salmonella Enteritidis. The case was traced back to the MDA to Larry Schultz Organic Farm of Owatonna, whose environment the source of Salmonella Enteritidis. Larry Schultz's Organic Farm is cooperating with the MDA and has issued a voluntary recall of the product.

Unidentified disease monitoring by state health officials identified six cases of salmonella infection with the same DNA fingerprint. The individuals became ill between Aug. 12 and illnesses occurred in both children and adults, and all are residents of the southeastern part of the county were hospitalized but have since recovered. Two of the six cases have reported Larry Schultz Organic Farm purchased at grocery stores or co-ops.

**Monday October 24, 2011**

**Owatonna organic farm recalls eggs**

Owatonna, MN — Local organic farmer Larry Schultz has issued a voluntary recall of his products after the state health department reported they traced at least six cases of salmonella back to organic shell eggs from Larry Schultz Organic Farm, pictured above in Owatonna. Following the discovery, Schultz issued a voluntary recall of his products.
All *Salmonella* Enteritidis Isolates Received August-October 2011 (n=63)

All *Salmonella* Enteritidis SE1 Isolates Received August-October 2011 (n=32)
All *Salmonella* Enteritidis SE1B173 Isolates Received August-October 2011 (n=7)

Keys Components of MDH Foodborne Outbreak Investigations

- Mandatory isolate submission to MDH
- Real-time PFGE subtyping of all isolates
- Centralized surveillance/investigation of cases
  - Everything done at state level
- Real-time interviews done with all cases using a detailed questionnaire
  - Specific food info, point of sale/service
- Iterative cluster investigation model
- Obtain product source info when needed
Keys Components of MDH Foodborne Outbreak Investigations

• Investigate all clusters; follow leads aggressively

• Resources (people) dedicated to enteric diseases
  – Experience from working with clusters every day leads to knowledge of when a cluster likely represents an outbreak and the extent to which resources should be allocated during an investigation

• Cluster investigations given high priority
  – Sense of urgency
Thank You

Team Diarrhea