Multidrug-Resistant *Salmonella* Infections Linked to Raw Turkey Products – Leveraging a Multi-sector Response

Part 1: Epi Background

Sean Buuck, MPH

Epidemiologist

Foodborne Diseases Unit

DEPARTMENT OF HEALTH

MINNESOTA

Integrated Food Safety Center of Excellence
Outbreak Overview (as of 2/13/2019)

- 279 cases from 41 states (plus District of Columbia)
- 48% of cases hospitalized, one death
- Median age: 43 years
- 53% female

Source: https://www.cdc.gov/salmonella/reading-07-18/map.html
Epi Overview

- Illness onset dates: Nov 20, 2017 to Jan 29, 2019

Source: https://www.cdc.gov/salmonella/reading-07-18/epi.html
Non-Human Isolates

• 277 non-human isolates also included in cluster code
  – 263 food isolates (260 turkey, 1 stuffing, 1 beef, 1 chicken)
  – 3 raw turkey pet food isolates
  – 11 animal isolates (10 turkey, 1 dog)
Exposure Data

• 78 (55%) of 141 reported preparing or eating turkey purchased raw
  − Ground turkey, turkey pieces, and whole turkey
  − Many different brands and stores
• 4 (3%) had pets that ate raw ground turkey pet food
• 5 (4%) worked with live turkeys or in turkey processing facilities, or had a household member did so
Whole Genome Sequencing

• 335 isolates sequenced
  – 166 clinical, 163 food, 3 pet food, 3 animal
  – Isolates differ by 0-35 alleles
  – Most isolates further cluster into one of four sub-clades
Whole Genome Sequencing Clades

• All 4 clades contain both clinical and food isolates
• Turkey exposure rates ~65% for each clade
• Different types of turkey exposure do not cluster by clade
Antibiotic Resistance Characteristics

• Mix of susceptible and resistant isolates

• 157 isolates with no predicted antibiotic resistance (79 human, 78 food/animal/environmental)

• 222 isolates with genes for resistance or decreased susceptibility (107 human, 115 food/animal/environmental)
  – Resistance to all or some of the following: ampicillin, streptomycin, sulfamethoxazole, tetracycline, kanamycin, gentamicin, nalidixic acid, ciprofloxacin, fosfomycin
  – Most infections susceptible to antibiotics commonly used for treatment of *Salmonella* infection
Recent Increase in Human S. Reading Cases in Minnesota

No. cases

Year of Specimen Collection


Other
JLGX01.0098
Summary of Minnesota Outbreak Case Exposures

- 21 cases (onsets from Dec 1, 2017 to Jan 25, 2019)
- 9 reported eating ground turkey
- 2 ate other turkey products
- 3 lived in households with pets who ate raw ground turkey pet food
- 1 worked in turkey processing facility
- 2 lived with family members who work with live turkeys
- 2 denied turkey consumption or exposure
- 2 lost to follow-up
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January 24, 2018

• Minnesota Department of Health (MDH) Public Health Lab (PHL) identified a cluster of S. Reading isolates with the same PFGE pattern (CDC pattern JLGX01.0098; MDH pattern designation RED18), including two clinical cases and a ground turkey sample tested through the NARMS Retail Food Study.
January 26, 2018

• Interviewers instructed to collect as much detail as possible from cases about turkey consumption and other turkey exposures
  • Initial attempts to reach cases for interview were unsuccessful
• MDH PHL identified another case that matched by PFGE
• Physician notified MDH staff that the sibling of a previously identified case was hospitalized and tested positive for *Salmonella* at a clinical lab
Initial Case Interview

January 29, 2018

- Interview conducted with parent of two sibling cases (ages: 2 and 4 years old)
- Parent reported that cases did not eat any ground turkey or other turkey products in week before their illness

<table>
<thead>
<tr>
<th>Item</th>
<th>Ate 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>Turkey (Including ground)</td>
<td>(\checkmark)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
January 29, 2018

- Parent mentioned ground turkey when asked about raw foods fed to household pets
January 31, 2018

• Minnesota Department of Agriculture (MDA) collected samples from case household
  – CDC notified; PulseNet identifies additional recent human, food, animal, and environmental isolates in multiple states

February 2, 2018

• Ground turkey pet food samples presumptively positive for *Salmonella*
Investigation Timeline

February 4, 2018

• Samples matched clinical cases by PFGE

• Philadelphia Eagles defeat New England Patriots, 41-33 in Super Bowl LII at U.S. Bank Stadium in Minneapolis
Investigation Timeline

February 5, 2018
• Recall announced of approximately 4000 lbs. of raw ground turkey pet food manufactured on Oct 12, 2017

February 9, 2018
• MDH and MDA issued joint press release
  – FDA also issued release

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News Release
February 9, 2018

Salmonella cases linked to raw meat dog food

Recall issued for Raws for Paws Ground Turkey Food for Pet; consumers advised to return, do not use

The Minnesota Departments of Health (MDH) and Agriculture (MDA) are investigating two cases of Salmonella Reading infection with the same DNA fingerprint pattern; the cases are children in the Twin Cities metro area who became ill after raw ground turkey food for pets was fed to pets in their home.
December 18, 2018

- *Salmonella* case interviewed through routine surveillance
  - Mentioned raw food fed to pet in household

12. During the week prior to your illness, did you have any contact with pets (e.g. dogs, cats, reptiles, hedgehogs, rodents, or pet livestock such as chickens, pigs, or horses) at home or elsewhere (including school or someone else’s home)? *Please indicate if pet had diarrhea*
  - If yes, what kind of animal(s)? *Dog (adult) - Ø iii*
    - If reptile exposure, complete reptile questionnaire. Questionnaire completed? Yes ☒ No ☐
  - If yes, Did you feed animal-based products such as rawhides, pig’s ears or cow hooves, treats or raw foods to your pet?
    - Type: *Raw food - Woody’s*

  - At this point, no information on serotype or PFGE
Investigation Timeline

December 20, 2018

- Case matched outbreak by PFGE, re-interviewed with supplemental questionnaire
- Information shared with MDA

2. Raw prepackaged pet food (refrigerated or frozen)?
   2a. What was the brand of the raw pet food? 
      - [ ] Only Natural Pet
      - [x] Raw for Paws
      - [ ] Nature’s Variety
      - [ ] Other: 
      - [ ] Unknown

2b. What store did you purchase the raw pet food from?
   - [3000 W. 50th Street] (Handwritten)

2c. Is there any pet food leftover? 
   - [ ] Yes
   - [ ] Maybe
   - [x] No
   - [ ] Unknown
   If yes, is it in its original packaging? 
   - [ ] Yes
   - [ ] Maybe
   - [ ] No
   - [ ] Unknown
   Would you be willing to have a sample collected by health officials for testing? 
   - [ ] Yes
   - [ ] Maybe
   - [ ] No
   - [ ] Unknown

2d. If known, what was the “Best If Used/Expiration” date and lot number on that package? 
   - [Handwritten]
   - [Handwritten]
   - [Handwritten]
   - [Handwritten]

2e. Did you (your family) prepare your own raw pet food? 
   - [ ] Yes
   - [ ] No
   - [ ] Unknown
   If yes, what raw meats did you include in the food? 
   - [ ] Ground turkey
   - [ ] Ground chicken
   - [ ] Ground beef
   - [ ] Other
   - [ ] Unknown
Investigation Timeline

January 15, 2019
- Samples collected from facility (3 different production dates)

January 20, 2019
- 5/6 aliquots presumptively positive for Salmonella; firm notified of presumptive results and decided to stop manufacture and sale of raw turkey pet foods

January 28, 2019
- S. Reading from one sample confirmed as PFGE match to the human case (other samples positive for S. Uganda and S. Senftenberg)
- Recall issued for the three production dates sampled by MDA
MDA/MDH Joint Consumer Advisory

News Release
January 28, 2019

Contact information

State Issues Consumer Advisory for Woody’s Pet Food Deli Raw Free Range Turkey Pet Food

Human illness linked to product contaminated with Salmonella bacteria

The Minnesota Department of Agriculture (MDA) is notifying consumers of a recall of raw turkey pet food from Woody’s Pet Food Deli due to Salmonella contamination. This recall is being issued after product samples collected by the MDA tested positive for Salmonella. Sampling was begun after the Minnesota Department of Health (MDH) identified a human case of Salmonella linked to the pet food.
Thank You!

sean.buuck@state.mn.us
Interviews with Other Patrons Who Purchased Implicated Lots of Product

• Firm provided names and contact information for other customers who purchased products from same lots as cases’ parents

• 50 additional patrons interviewed
  – 1 reported recent diarrheal illness which lasted for 3 days
    ▪ Stool sample collected and tested at MDH PHL was negative for *Salmonella*
Stool Sample Testing - Pets

- Stool kits were sent to consenting owners of 7 pets who were fed the implicated product
- Samples tested for Salmonella only
- 5/7 positive for Salmonella - cat and dog from cases' household positive for S. Enteritidis - dog from a separate household positive for outbreak strain of S. Reading

<table>
<thead>
<tr>
<th>Pet</th>
<th>Salmonella Results</th>
<th>Serotype</th>
<th>Duration Fed Raw Meat-Based Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat</td>
<td>Positive</td>
<td>Enteritidis*</td>
<td>~3 months</td>
</tr>
<tr>
<td>Dog</td>
<td>Positive</td>
<td>Enteritidis*</td>
<td>~3 months</td>
</tr>
<tr>
<td>Dog</td>
<td>Positive</td>
<td>Reading**</td>
<td>5 years</td>
</tr>
<tr>
<td>Dog</td>
<td>Positive</td>
<td>Duesseldorf</td>
<td>1.5 years</td>
</tr>
<tr>
<td>Dog</td>
<td>Positive</td>
<td>Kentucky</td>
<td>7 years</td>
</tr>
<tr>
<td>Dog</td>
<td>Negative</td>
<td>n/a</td>
<td>5 years</td>
</tr>
<tr>
<td>Dog</td>
<td>Negative</td>
<td>n/a</td>
<td>1 year</td>
</tr>
</tbody>
</table>

*pets from cases' household

**PFGE match to outbreak strain
“What do you plan to do with any remaining product?”

- 43% Keep and Continue Feeding
- 47% Return
- 10% Unsure