Finding the Needle in the Haystack

Catherine Feeney
November 17, 2021
Agenda

- RI Outbreak Investigations
- Pathogens causing FBI
- Salmonella Outbreaks
- E Coli
- Histamine
- Amnesic Shellfish Poisoning
- Copper Poisoning
- Campylobacter
Rhode Island FBI Investigations
About Rhode Island

- Population: 1.1 million
- Centralized Structure
  - No Locals
  - 3 field offices for Retail
  - Manufactured Foods
  - Dairy
  - Shellfish
- EHS-Net State, Rapid Response Team
- Program Standards (manufactured food & retail)
Foodborne Illness Outbreak (FBOI) Plan

Center for Food Protection (CFP)
Center for Acute Infectious Disease Epidemiology (CAIDE)
State Health Laboratory (SHL)
7 Steps in an FBI Investigation

- Reportable Disease
- FBI Complaint
- Clinical & Food Sample Testing
- Interview Ill Individuals
- Environmental Investigations

(CDC, 2018)
Environmental Antecedents

- People
- Processes
- Equipment
- Food/Water
- Economics

contributing factors

SOLVE
Figure A. Sequence of events in investigating a typical outbreak of foodborne illness.
The Pathogens
The FBI Pathogens

- Over 250 foodborne diseases identified
- Most of them are caused by:
  - Bacteria
  - Viruses
  - Parasites
- Harmful toxins and chemicals can also contaminate food and cause foodborne illness
Top 5 Causes of FBI

• **Norovirus:** virus, spreads quickly usually associated with ready-to-eat foods.

• **Salmonella:** bacteria, commonly associated with chicken and eggs.

• **Clostridium perfringens:** bacteria, found on raw meat and poultry, in the intestines of animals and in the environment.

• **Campylobacter:** bacteria, raw or undercooked poultry

• **Staphylococcus aureus:** bacteria, 25% of people and animals have staph on their skin and in their nose.
Other Bacteria

- **Listeria**: bacteria, associated with deli meats, soft cheeses, raw sprouts, melons.

- **E. Coli**: bacteria, associated with meat, leafy greens.

- **Clostridium botulinum**: bacteria, associated with home-canned foods, honey (for infants).

- **Vibrio**: bacteria, associated with shellfish when water temperatures get warmer
Chemically Related FBI Hazards

• Toxins
  – Marine toxins
    • Ciguatoxin
    • Scombroid toxin
    • Paralytic shellfish poison
    • Puffer fish toxin

• Heavy metals
  • Can cause vomiting in high concentrations
  • Occurs a few minutes to several hours (but in most cases in less than 1 hour) after ingestion
Salmonella
Salmonella Montevideo

- National outbreak associated with salami products produced in RI
- July 2009-April 2010
- 272 people in 44 states reported ill
- Identified the suspect product through shopper card records in Washington state
Company said they routinely tested finished products
  – All results were negative for *Salmonella*

What they *actually* tested were *almost-finished* products
  – Tested products after they were cured, but BEFORE they were coated in pepper
Black pepper and crushed red pepper tested positive for *Salmonella* Montevideo

- Pepper from two companies
- Imported from three countries
- Contaminated with four other serotypes of *Salmonella*

Pepper samples also had high standard plate counts (indicator of bacterial contamination)
Lessons Learned

• Make sure finished product testing is done on *finished* products

• Cause of illness may not be final product, but rather an *ingredient*

• *Spices* have high bacterial contamination; use irradiated spices if possible if the spices will not go through a cooking process
Beginning…

March 25, 2011

- Notified of 11 illnesses and 7 hospitalizations at a nursing home
- Two cases preliminarily positive for *Salmonella*

Interviews identified that zeppoles, a cream-filled pastry, were served earlier in celebration of St. Joseph’s Day (March 19)
Investigation

- Environmental Investigation
  - Pastry cream improperly cooled
  - Pastry shells stored in used egg boxes
  - Equipment/utensils not properly sanitized

- Inspection resulted in:
  - Closure of bakery (two locations)
  - Recall of all products from bakery
  - Inspection of other bakeries selling products from suspect bakery
Epidemiology

- Epi Investigation
  - Interviewed 80+ cases
    - 83 cases; 3 deaths

- Implicated food
  - Zeppole or cream-filled pastry from Defusco’s

- People who ate zeppoles or cream filled pastry from Defusco’s were 8 times more likely to become ill than people who did not eat cream filled pastries from Defusco’s
Lab Results

• Samples

  – 54 Food Samples
    • All negative for Salmonella

  – 54 Environmental Samples (boxes, swabs, pastry bags)
    • All negative for Salmonella

  – Stool or Blood Samples
    • Ill patrons- 53 positive for Salmonella
    • All employees (stool)- All negative for Salmonella
E Coli
• 17 ill in 8 states in May 2019

• RI had one case who worked at a bakery

• Ate raw cookie dough

• Sampled unopened bag of flour

• Positive for Ecoli 026 and matched outbreak strain
Dangers of Raw Dough

• 1st recall May 22nd

• Expanded recall in June, August, September, October

• Consumers need a wake-up call about dangers raw flour

• https://www.foodsafetynews.com
Harmful Algal Blooms
About Harmful Algal Blooms

- Amnesic Shellfish Poisoning (ASP) - also known as domoic acid (DA) poisoning

- Domoic acid is produced by diatoms of the phytoplankton genus *Pseudonitzschia*

- NSSP Model Ordinance requires that growing areas be placed in the closed status when the DA concentration is equal to or exceeds 20 parts per million in the edible portion of raw shellfish
Timeline of Activities

- **10/5/16**
  Elevated Pseudonitzschia cell counts in RI waters and elevated levels of domoic acid

- **10/7/16**
  Initial closure of portions of RI waters

- **10/29/16**
  Shellfishing closure lifted for all RI waters

- **2/28/17**
  Shellfish collected exceed mandatory domoic acid closure level

- **3/1/17**
  Portions of RI waters closed to shellfishing

- **3/24/17**
  Shellfishing closure lifted for all RI waters
Response Activities

- Updating MOUs between RI Department of Health and RI Department of Environmental Management
- Establishing SOPs for routine monitoring, including measures of:
  - Plankton presence in waters
  - Toxin presence in plankton
  - Toxin presence in shellfish meats
- Establishing SOPs for water closures and re-openings
- Added a new laboratory method to facilitate confirmatory testing (LC-MS/MS)
Scombroid Poisoning
Scombroid Fish Poisoning

- Scombroid fish poisoning
  - Aka Histamine fish poisoning
- Histamine is produced when bacteria metabolize naturally occurring histidine in fish.
  - Most often occurs when fish is held at warm temperatures
- Resembles an allergic reaction:
  - Facial flushing, sweating, rash, burning or peppery taste in mouth, diarrhea, and abdominal cramps
- Symptoms typically disappear within several hours
- Associated with fish from the Scombridae family, such as tuna and mackerel
Tuna Steaks

UNIT PRICE: $7.99/lb
NET WEIGHT: 0.69 lb
TOTAL PRICE: $5.51

SELL BY: 06/23/17
**Timeline of Activities**

- **4/24/17**
  - CFP collects tuna samples through routine surveillance

- **4/28/17**
  - SHL reports 2 samples with elevated histamine levels from same lot. FDA notified.
  - CFP contacts retailer and product is voluntarily removed from sale
  - CFP contacts distributor and initiates traceback
Timeline of Activities

5/3/17
CFP collects additional tuna samples

5/4/17
SHL reports 1 sample with elevated histamine levels from same lot

5/4/17
CFP works with distributor to initiate voluntary recall of adulterated lot

5/4/17
A consumer advisory is issued by retailer and RIDOH
Public Health Press Release

For: Immediate release
Date: May 4, 2017
Contact: Joseph Wendelken (401-222-3998)

Dave’s Marketplace Recalling Frozen Tuna Steaks

The Rhode Island Department of Health (RIDOH) is advising consumers that Dave’s Marketplace is recalling 10oz Frozen Tuna King tuna steaks sold at the retailer on or after March 23, 2017.

This lot of frozen tuna steaks is being recalled as a result of elevated histamine levels that were detected during routine surveillance sampling at RIDOH’s State Health Laboratories.

When consumed in food, histamine can result in symptoms including tingling or burning in the mouth, facial swelling, rashes, hives and itchy skin, nausea, vomiting or diarrhea. Anyone experiencing these symptoms after consuming frozen Tuna King tuna steaks from Dave’s Marketplace should seek medical attention. Young children, elderly people, individuals who are immunocompromised, and pregnant women are particularly susceptible to foodborne illness. At this time, there have not been any reports of illnesses associated with this recall.
On September 16th, 2019, healthcare provider alerted CAIDE about a scombroid case
  • Restaurant A

Scombroid is on the reportable diseases & conditions
• CFP received an illness complaint from two individuals who became ill after eating at Restaurant A.

Table 1. Symptoms for Rhode Island Cases

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Rhode Island Cases (n=3)</th>
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<tbody>
<tr>
<td>Redness/Flushing</td>
<td>3 (100)</td>
</tr>
<tr>
<td>Dizziness</td>
<td>3 (100)</td>
</tr>
<tr>
<td>Rash or Hives/Urticaria</td>
<td>3 (100)</td>
</tr>
<tr>
<td>Itching</td>
<td>2 (66.6)</td>
</tr>
<tr>
<td>Headache</td>
<td>2 (66.6)</td>
</tr>
<tr>
<td>Paresthesia</td>
<td>1 (33.3)</td>
</tr>
<tr>
<td>Stomach pain/nausea</td>
<td>2 (66.7)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2 (66.6)</td>
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<tr>
<td>Vomiting</td>
<td>1 (33.3)</td>
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</table>
Scombroid Outbreak: Investigation

- CFP conducted another on-site investigation
  - No storage or handling issues were observed
- Product consumed by ill individuals came from the same source as the product that caused the first illness
  - They had received a new shipment of this contaminated product
- CFP contacted Restaurant A’s supplier to determine their distribution in Rhode Island
- Collected additional samples
• CFP Performed an onsite investigation at RI establishment
  • No issues observed at the retail level (e.g., temperature abuse, etc.)
  • Collected invoices for traceback
  • Collected samples of frozen tuna loins and steaks
  • Embargoed Product
### Table 2. Sample Results for Rhode Island Food Samples

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<th>Collection Site</th>
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</tr>
<tr>
<td>Restaurant A</td>
<td>Tuna</td>
<td>&lt;2.5</td>
</tr>
<tr>
<td>Restaurant A</td>
<td>Tuna Loin</td>
<td>3200</td>
</tr>
<tr>
<td>Market B</td>
<td>Tuna Loin</td>
<td>3200</td>
</tr>
<tr>
<td>Ready to Eat Stand at Market A</td>
<td>Tuna Loin</td>
<td>6400</td>
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<td>Tuna Loin</td>
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Scombroid Outbreak: Traceback

Figure 1. Traceback of the tuna to the Vietnamese firm and the trace forward from the distributor that Restaurant A received their tuna from.
**Figure 1.** Traceback of the tuna to the Vietnamese firm and the trace forward from the distributor that Restaurant A received their tuna from.
Scombroid Outbreak: Investigation

• September 17th two of the frozen unopened samples had histamine levels in amounts greater than 500ppm.

• Released the embargo at Restaurant A and all product was disposed.

• Notified FDA of sample results to initiate recall. FDA notified CFP that the product was traced back to Importer A, an importer in Florida who had received the product from a Vietnamese firm.

Additional cases in Vermont potentially linked to this product.
• 10 samples of frozen tuna collected:
  • Samples collected at 3 different facilities in RI.
  • 6 samples >500ppm of histamine
  • 3 of those 6 were greater than 3000ppm
Sent an advisory to all licensed RI Establishments via MailChimp

Notified FDA of all sample results and traceback documents

CAIDE issued a provider advisory
Scombroid Outbreak: Results

• Multi-state Scombroid Fish Poisoning (SFP) Outbreak
  • Suspect Food: Tuna

• 51 cases across 11 states

• Florida Importer did a recall on October 3rd

• Vietnamese firm was put on import alert in November 2019

• Several recalls were conducted from various importers
Scombroid Outbreak: AAR

• **Successes**
  ➢ Collected samples that helped lead to the recall
  ➢ Conducted traceback/traceforward
  ➢ Publication with FDA and multiple states
  ➢ FDA was able to identify the firm and put them on the import alert list

• **Challenges**
  ➢ Delays with recall
• Scombroid is a reportable illness in RI

• Such high histamine levels had not been seen before in RI
  - suggest the product was highly contaminated and decomposed.

• Early detection of cases and a prompt recall is essential to preventing additional cases.
Copper Poisoning
Rose Gold Cake

- The cake was ordered from a RI bakery
- The frosting on the cake was described as “metallic, glittery, and rose gold.” (pictured on right)
Epidemiologic Investigation

• **Interviews:**
  - 6 ill individuals (ages 1-11)
  - No other common events were identified

• **Exposures:** the cake was a common item among all ill individuals, no well individuals consumed the frosting

• **Symptoms:** vomiting, diarrhea

• **Onset:** 30 minutes to 10 hours after consumption of cake

• **Duration:** generally, less than 10 hours
Environmental Health Investigation

• CFP sent state food inspectors to the bakery.
• Key components:
  • Implement immediate control measures;
  • Conduct a food flow of suspect items;
  • Collect invoices and other information about suspect ingredients; and
  • NEARS manager interview and NEARS environmental observations.
Food Flow of Cake

Ingredients: Cake Mix, Frosting, Luster Dust

Cake is baked

Cake is frozen

Cake is frosted

Cake is frozen

Luster dust is added to butter extract and painted on cake with a brush in intervals to get nice thick layer
Luster Dust

- A non-edible ingredient called **Rose Gold Dust** was applied as a decoration to the frosting of the cake in question.

- This ingredient is also broadly known as a type of **Luster Dust**.
Control Measures

- All non-edible Luster Dust bottles were placed under embargo
  - Some bottles were not labeled as edible or non-edible
  - Those without ingredients were considered non-edible
- Identified and embargoed other products for sale in the retail area that were coated with Luster Dust
  - Chocolate Pops
  - Pretzels with Chocolate
Luster Dust
Copper Highlighter Dust – 2 oz (Non Edible – Non Toxic)

This copper highlighter can be used for decorating show pieces or cake stands. It’s non-toxic and edible, making it a great choice for sprinkling on pastry stands.

SKU: DCD2
Categories: Dust, Gold & Silver Décor, Gold & Silver Décor
Tag:
### SECTION III – COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical characterisation of the ingredients(s) (in the preparation)</th>
<th>Hazard(ous) Ingredient(s):</th>
<th>%weight</th>
<th>CAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: IUPAC</td>
<td>Copper</td>
<td>90, 80, 70</td>
<td>7440-</td>
</tr>
<tr>
<td>Name: IUPAC</td>
<td>stearic acid</td>
<td>+/- 1%</td>
<td>57-1</td>
</tr>
</tbody>
</table>
Luster Dust Traceback

Metallic pigments for industrial coatings

The metallic effect finishes (special effects) combined with the excellent hiding power have resulted in the use of aluminium and gold bronze pigments for a wide variety of industrial coatings, including consumer goods, interior design, floor coverings...

Gold bronze and copper pigments for Industrial coatings

Available in Rich Gold, Rich Pale Gold, Pale Gold and Copper shades

<table>
<thead>
<tr>
<th>Conventional</th>
<th>Water based</th>
<th>Particle size</th>
<th>Optical Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powders</td>
<td>Pastes</td>
<td>Aquastab Pastes</td>
<td>D10</td>
</tr>
<tr>
<td>2500</td>
<td>2500/WS/85-15</td>
<td>2500/BG8B&quot;/80-20</td>
<td>16</td>
</tr>
</tbody>
</table>
Food Sampling

CFP collected a leftover slice of cake from the party host’s residence for chemical testing by the SHL.
More Luster Dust Sampling
Laboratory findings of the slice of cake:

- 22.1 milligrams of copper per gram of Rose Gold-coated frosting
- ~nearly 900 milligrams of copper on the slice of cake
- A RIDOH toxicology specialist confirmed that these levels would have been sufficient to cause the symptoms that were described.
Outbreak Conclusions

• Symptoms and illness onsets were most consistent with a heavy metal poisoning

• The cake frosting was identified as the suspect food item:
  • It was consumed by all ill individuals
  • It was decorated with a product that was not labeled for consumption

• Laboratory evidence supported this suspect etiology and identified copper as the metal associated with the poisoning.
• **What are other inedible luster dusts made of?**
  • RIDOH sampled 28 other luster dusts and found: aluminum, barium, chromium, copper, iron, lead, manganese, nickel, and zinc.

• **Do other bakeries use these properly?**
  • A few other RI bakeries visited were using inedible luster dust on an edible part of a food.

• **RIDOH issued guidance to bakeries**
  • Edible glitters and dusts must have an ingredient list.
FDA Advises Home and Commercial Bakers to Avoid Use of Non-Edible Food Decorative Products

FDA is advising home and commercial bakers to avoid using glitter and dust products to decorate cakes and other food items unless the products are specifically manufactured to be edible.

The agency has become aware that some non-edible decorative glitters and dusts are promoted for use on foods. Home and commercial bakers need to be aware that these types of glitters and dusts are not intended to be used directly on foods and may contain materials that should not be eaten.
Take Home Messages

• Luster dust is a trend with bakers

• There are edible dusts so it’s important to educate environmental health staff to identify the differences

• Inedible luster dust is meant for decorations

• Guidance to consumers and bakeries could potentially prevent another outbreak from happening
Campylobacter in Oysters
Changing Outbreaks

- FBI complaints – 8 from 2 parties, 2 others
- 6 of 9 reported ill 8-16 oyster farm tour
- 1 of 4 reported ill 8-19
- Other unrelated
- 3 confirmed for Campylobacter Jejuni
- Sampled oysters from restaurant
- 1 positive for Campylobacter Lari
Positive Sample

- Oyster Farm on Potters Pond
- Campylobacter Lari associated with Seagulls
Closed for Shell Fishing

- Worked with Dept of Environmental Management
- In Consultation with FDA
- Model Ordinance warrants closure
  - Human illnesses related to Campylobacter Jejuni
  - Positive sample for Campylobacter Lari
Sampling and Next Steps

- Picked up additional samples
- 3 more C Lari positives & 1 C Jejuni
- Elevated fecal coliform
- Starting with bird abatement plan
- Consultation with FDA to establish reopening criteria
Take Home Messages

• Work with other agencies and FDA

• Develop criteria to reopen

• 3 weeks of sampling
  
  o No positives for Campylobacter
  
  o Fecal coliform below established level

Reopened 1st week of November
Thank you!