Retrospective Investigations

Jessie Marus, MPH
CDC Outbreak Response and Prevention Branch

What are they?
Why investigate?
How do we do it?
What is a Retrospective Outbreak?

Food or Environmental Isolate → Clinical Isolates Match → Epi or Traceback Confirms Link → Public Health and Regulatory Action!
Retrospective?
Why Investigate Retrospective Outbreaks?

- Improved Targeting of Resources
- Identify or Attribute Novel Vehicles
- Address Food Safety Issues
- Prevent Large(r) Outbreaks
Under What Scenarios Might We Investigate a Retrospective Outbreak?

1. Human Illnesses Occur During the Same Time Period as Food/Environmental Isolate
2. Human Illnesses Occur Before or After Pathogen is Isolated in Food/Environment
3. Human Illnesses Occur During the Same Time Period, but There are also Historic Human Illnesses
4. Food or Environmental Testing During an Investigation Identifies Additional Strains Not in Case Definition
What factors do we consider when deciding whether to investigate a retrospective cluster?
What Factors Do We Consider?

- WGS Relationship
- Serotype, PFGE Pattern – is it rare?
What Factors Do We Consider?

• Specificity of Food Item
  • Brand/type?
  • Easy to remember?
  • Ingredient that is further processed?
What Factors Do We Consider?

- Environmental vs. Food – and where in the environment?
  - From a processing line used for multiple different foods?
  - From a particular line used only for specific food?
  - Food contact surface?
  - Location that could allow for pathogen to become resident (e.g., drain)?
What Factors Do We Consider?

• Regulatory History
  • Firm compliance history
  • Firm and pathogen characteristics
What Factors Do We Consider?

• Is epi evidence needed to take regulatory action?
  • Already enough information for action to be taken without epi link?
What Factors Do We Consider?

• Timing of isolates identified
  • How long ago were the illnesses?
  • Timing of the food/environmental samples
Examples of Retrospective Outbreaks
Scenario 1: *Salmonella* and Tahini

**Number of people**

**Date of Illness Onset**

FDA Import Sample Collected
Scenario 1: *Salmonella* and Tahini

Fall 2018: FDA import sample of Baron’s brand tahini imported from Israel positive for *Salmonella* Concord

Canada also investigating an increase in *Salmonella* Concord

CDC queries PulseNet for clinical isolates, which match tahini sample

Epi Investigation indicates that patients had tahini exposure

November 28, 2018: Achdut Ltd voluntarily recalls various brands of tahini
Scenario 2: *Listeria* and RTE deli country ham
Scenario 2: *Listeria* and RTE deli country ham

**Outbreak of *Listeria* Infections Linked to Deli Ham (Final Update)**

**Food Safety Alert**

Posted December 18, 2018 at 3:30 PM ET
Scenario 3: *Listeria* and Ice cream

One recent match, but two matches from 2013

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Scenario 3: *Listeria* and ice cream

- **9/25/2018 – 10/15/2018**
  - Follow up inspection at the firm
  - Sanitation and production issues
  - More Lm isolates collected

- **10/18/2018**
  - Working Cow Homemade Inc issues a voluntary recall of ice cream products manufactured during May 2018

- **10/19/2018**
  - FDA Suspends Food Registration of the firm
## Scenario 3: Listeria and Ice Cream

<table>
<thead>
<tr>
<th>Key</th>
<th>cdc_id</th>
<th>WGS_id</th>
<th>WGST</th>
<th>Outbreak</th>
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### Notes
- The images and tables above provide a detailed analysis of the scenario involving Listeria and ice cream. The data includes various identifiers, outbreak details, and other relevant information.
- The images show a container of ice cream, which is likely related to the scenario.
- The tables and diagrams illustrate the genetic and epidemiological aspects of the outbreak.

### Key
- **Key**: Identifiers used for tracking and analysis.
- **cdc_id**: CDC identifier for each sample.
- **WGS_id**: Whole-genome sequence identifier.
- **WGST**: Whole-genome sequence type.
- **Outbreak**: Details of the outbreak.
- **SourceSite**: Source of the sample.
- **IsolatDate**: Date of isolation.
- **PFGE-Ascl-pattern**: PFGE pattern using Ascl restriction enzyme.
- **PFGE-ApaI-pattern**: PFGE pattern using ApaI restriction enzyme.
- **PFGE-SmaI-pattern**: PFGE pattern using SmaI restriction enzyme.
- **PFGE-SmaI-status**: Status of PFGE-SmaI pattern.
- **Genus**: Genus of the organism.
- **Species**: Species of the organism.
- **Lineage**: Lineage of the organism.
- **Serotype**: Serotype of the organism.
- **SourceState**: Source state of the sample.

### Additional Information
- The images and tables are part of a comprehensive analysis to understand the spread and impact of Listeria in the context of ice cream production and consumption.
Scenario 4: *Salmonella* and Maradol papayas

People infected with the outbreak strains of *Salmonella*, by date of illness onset*

- S. Kiambu – traditional investigation identifies papayas
- S. Thompson – papaya sampling identifies strain, large outbreak occurs simultaneously
- S. Agona, S. Gaminara, S. Seftenberg identified through papaya sampling, added to case definition

*n=220 for whom information was reported as of October 30, 2017. Some illness onset dates have been estimated from other reported information.*
Scenario 4: Salmonella and Maradol Papayas
One we didn’t follow up on.

- Lm and avocados
One where follow up was not successful at linking illnesses to firm of interest
In Summary

• Retrospective outbreaks are likely going to become more common as WGS is fully implemented for all pathogens

• Each potential investigation should be evaluated on many factors to determine if it is a good use of resources to proceed with the investigation

• Retrospective outbreak investigations can be beneficial for addressing food safety issues and preventing larger outbreaks
Thank you!

CDC ORPB
FDA CORE
USDA-FSIS