CDC's Role in Investigating Foodborne Outbreaks

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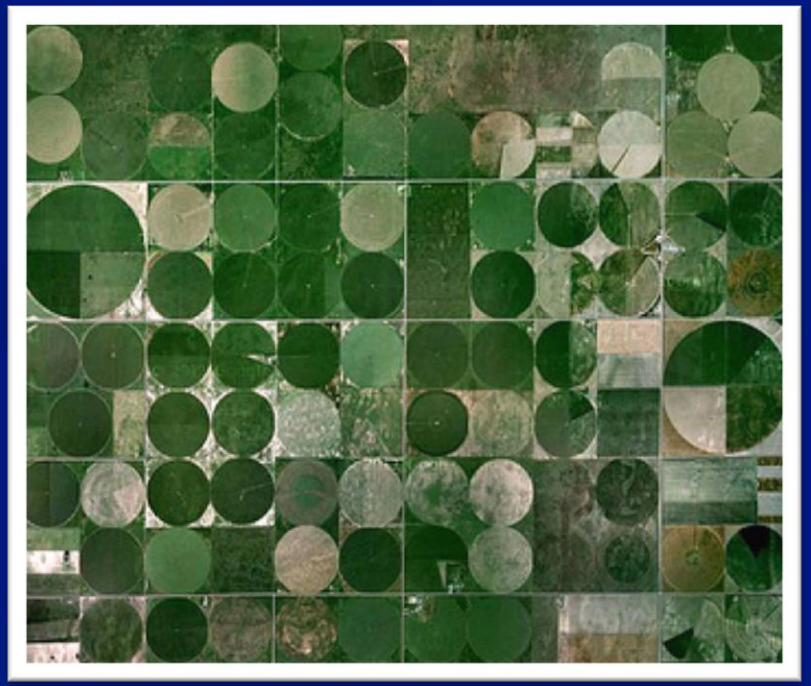
CHANGING LANDSCAPE OF FOODBORNE OUTBREAKS

Foodborne Diseases: A Changing Landscape

- Significant shift in food production and distribution over the last 30 years
- Changes in patterns of foodborne disease and outbreaks



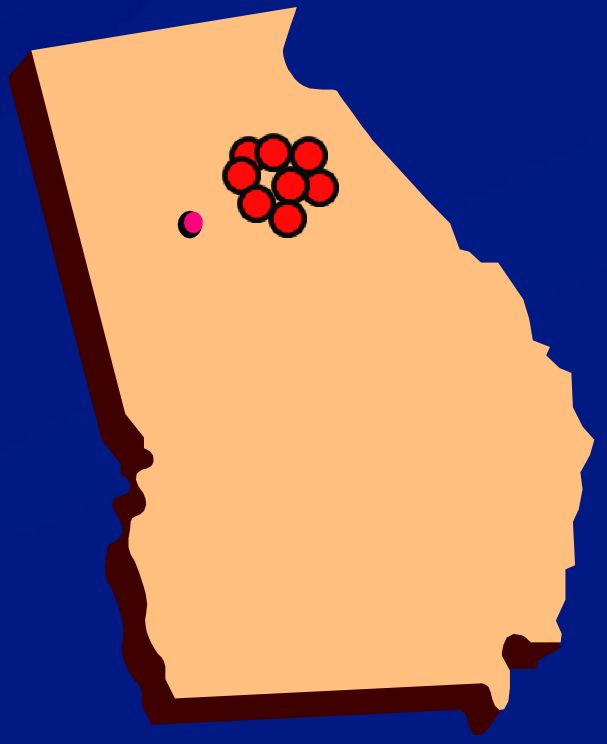
- New ways of detecting, investigating, and preventing outbreaks were required

A Changing Landscape: Past

- Path from farm to table shorter
- Food distribution more localized

A Changing Landscape: Past

- Large number of illnesses in one jurisdiction
- Often caused by local food handling errors
- Detected, investigated, and solved locally

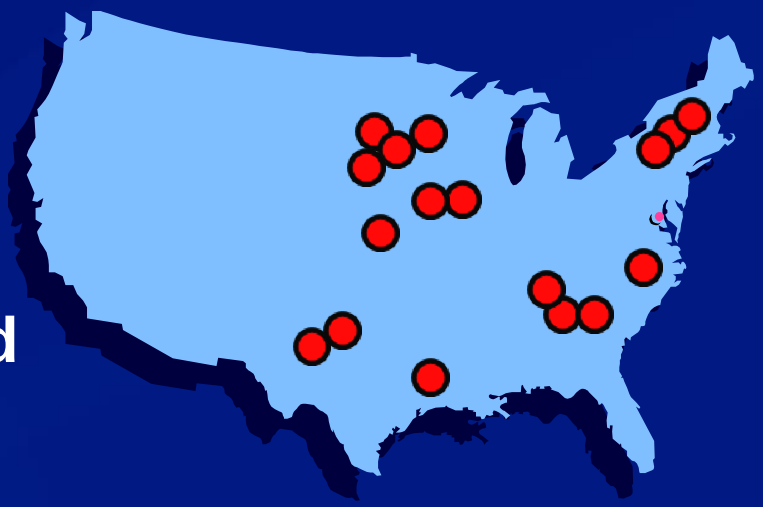


A Changing Landscape: Present

- Fewer, but larger producers with wide distribution
- Food generally comes from farther away
- Many ready-to-eat items
- New techniques for producing, processing, and preparing foods

A Changing Landscape: Present

- Frequently caused by industrial contamination events
- Few illnesses in many jurisdictions
- Detection by laboratory-based surveillance
- Response requires coordination among local, state, and federal agencies



PROCESS FOR INVESTIGATING MULTISTATE FOODBORNE OUTBREAKS

PulseNet

- National molecular sub-typing network for foodborne disease surveillance

- 80+ public health and regulatory laboratories participate

- Create DNA “fingerprints” of bacteria isolated from ill persons using pulsed-field gel electrophoresis (PFGE)

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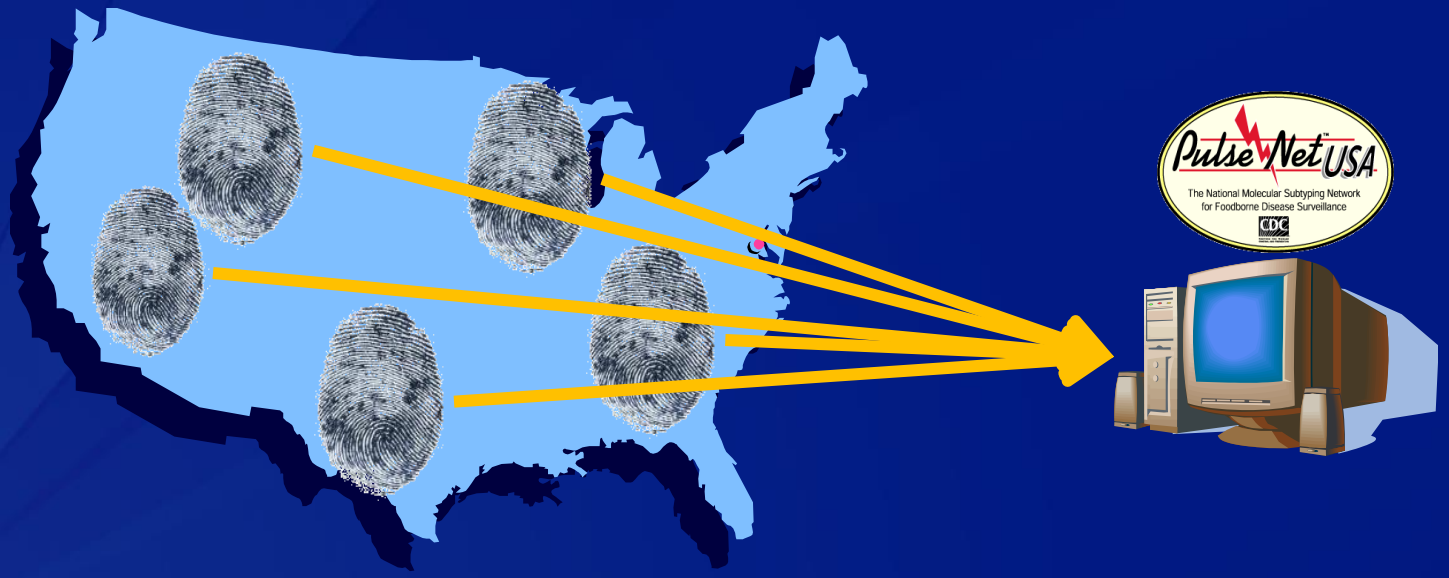
PulseNet

- DNA “fingerprints” uploaded to the national PulseNet database at CDC from laboratories across the US
- PulseNet monitors for matching “fingerprints” in a 2–4 month window
- When a cluster is identified, PulseNet notifies epidemiologists

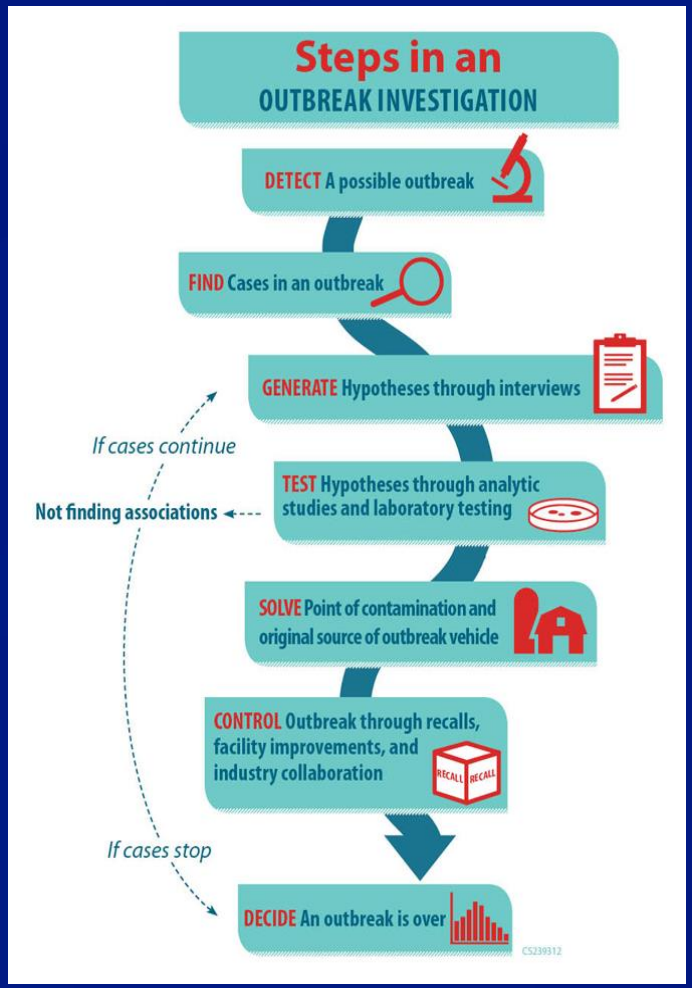


CDC Foodborne Outbreak Response Team

- **Rapid response and management of enteric disease outbreaks**
  - ***Salmonella***
  - ***E. coli***
  - **Occasionally other pathogens (e.g., *Listeria*)**
- **Focused on dispersed multistate foodborne outbreak scenarios**
- **Coordinate efforts of local, state, and federal health officials**
  - **CDC PulseNet**
  - **State and local health departments**
  - **USDA Food Safety Inspection Service (FSIS) – *meat and poultry***
  - **FDA Coordinated Outbreak Response and Evaluation (CORE) Network – *produce, dairy, fish***

Steps in an Outbreak Investigation

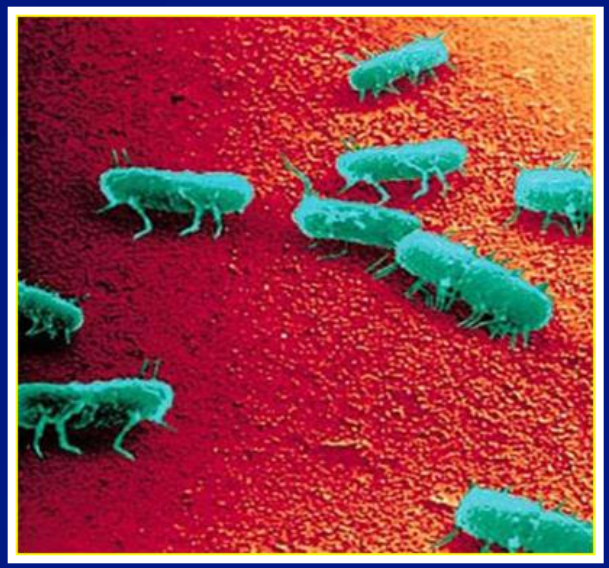
1. Detect a possible outbreak
2. Find additional ill persons
3. Generate hypotheses about the cause
4. Test hypotheses with studies and microbiologic testing
5. Pinpoint the cause
6. Take actions to stop the outbreak
7. Confirm the outbreak is over



REAL WORLD EXAMPLE OF A MULTISTATE OUTBREAK INVESTIGATION

Salmonella in the United States

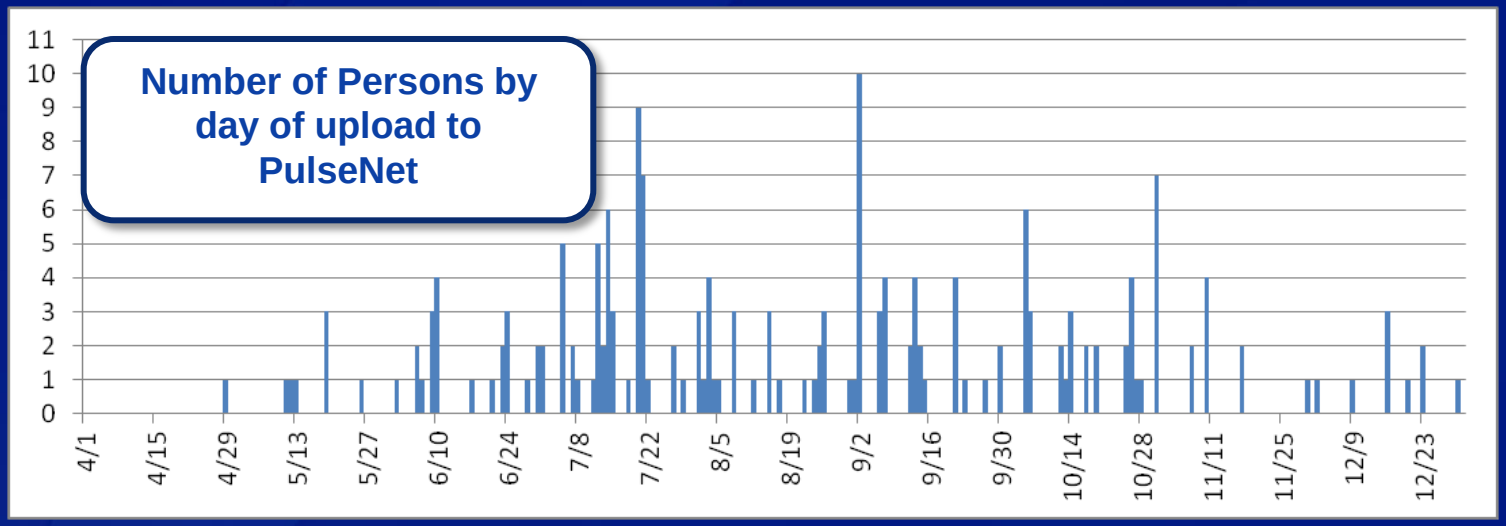
- >1 million illnesses and 400 deaths annually
- Many different potential sources
  - Meat
  - Poultry
  - Produce
  - Processed foods
  - Animal contact

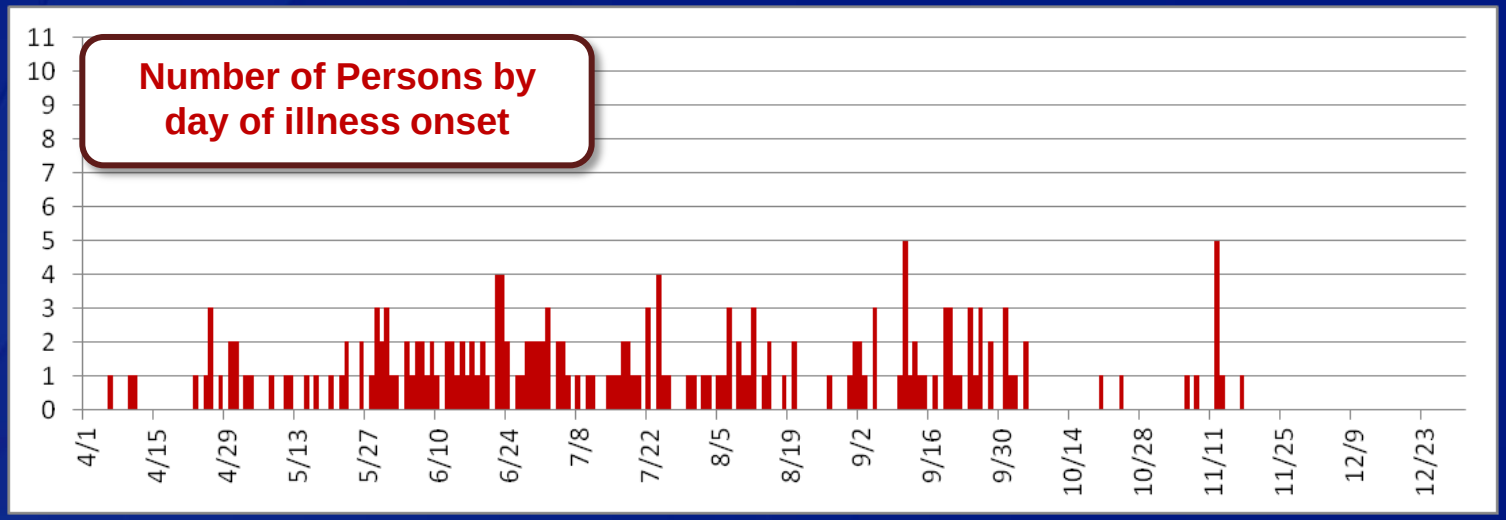


Timeline for Reporting *Salmonella* Illnesses

In can take 2-4 weeks after eating a contaminated food to be confirmed as part of an outbreak

Outbreak Timeline

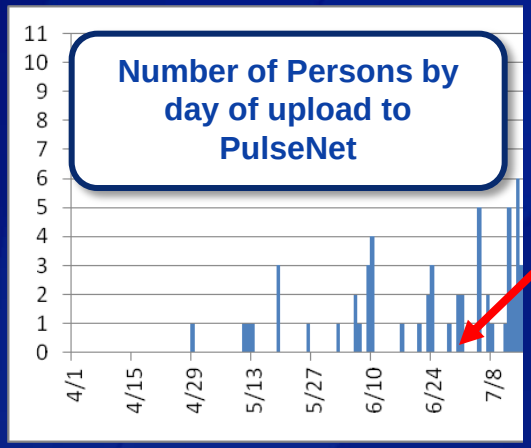


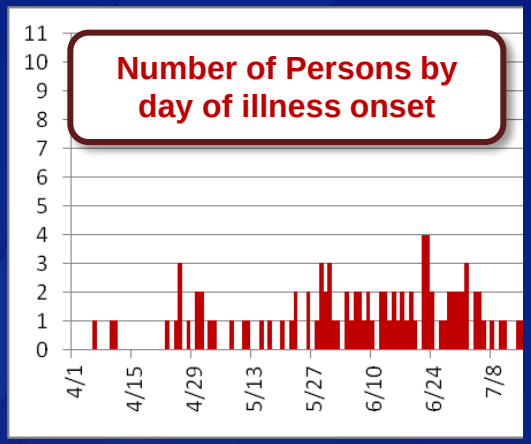


Detecting a Possible Outbreak

July 6, 2011

New Jersey notifies CDC of 5 *Salmonella* Heidelberg infections in an observant Jewish community with identical DNA "fingerprints"





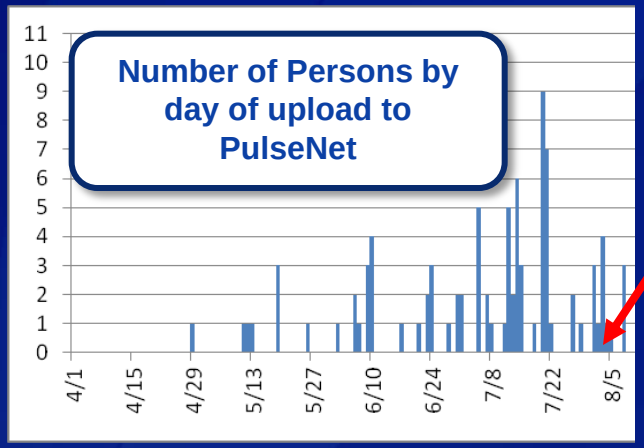
Detecting a Possible Outbreak

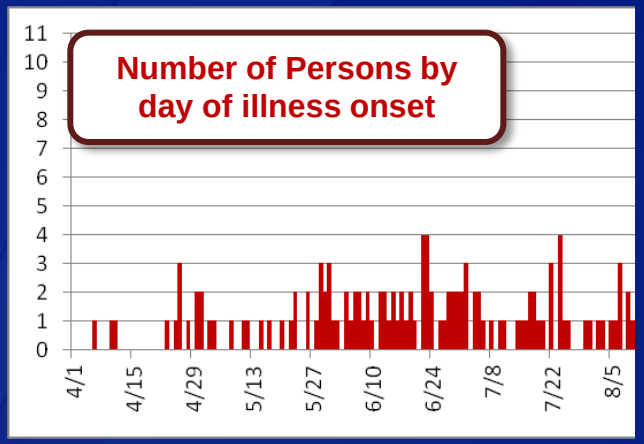
- The "fingerprint" from the *Salmonella* Heidelberg infections reported from New Jersey (Pattern 22) is a very common type of *Salmonella*
- Are these infections part of the normal "background" we expect to see?
- Is it an outbreak?

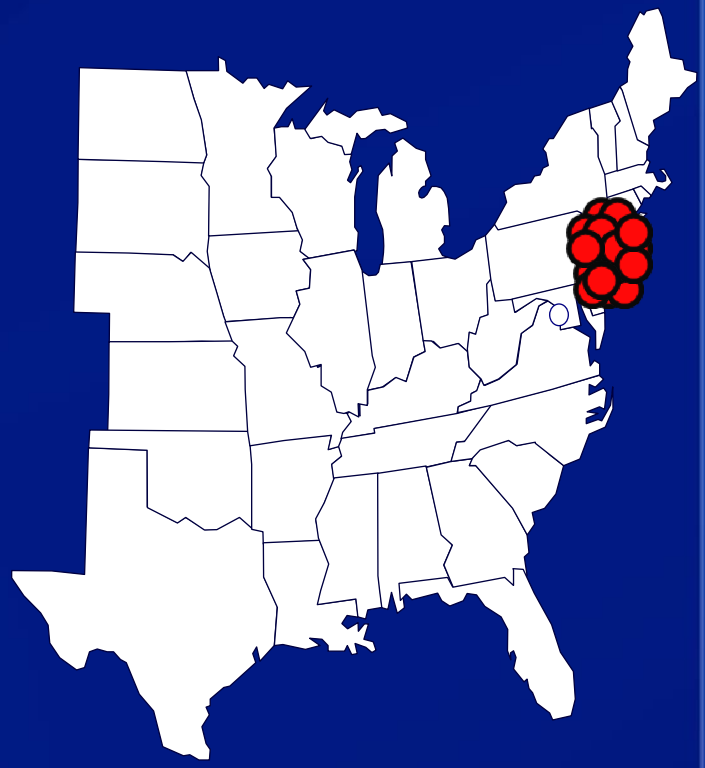
Detecting a Possible Outbreak

By August 4, 2011

NYC notifies CDC of 12 more *Salmonella* Heidelberg infections in an observant Jewish neighborhood with the same "fingerprint"







Finding Additional Cases

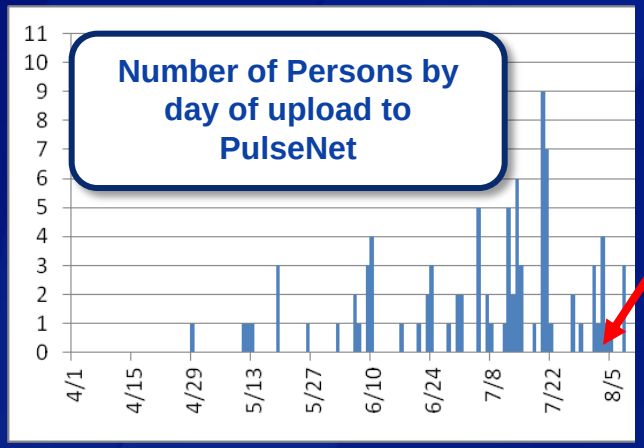
- CDC PulseNet confirms that Heidelberg Pattern 22 is being reported more frequently than expected in the NY/NJ area

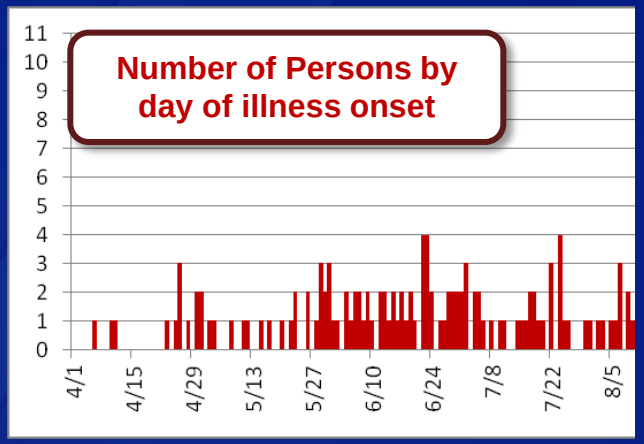
- The PulseNet database is queried to find additional cases across the country
  - *Salmonella* Heidelberg infection
  - Outbreak strain (i.e., with the Pattern 22 “fingerprint”)
  - Illness onset date on or after April 1, 2011

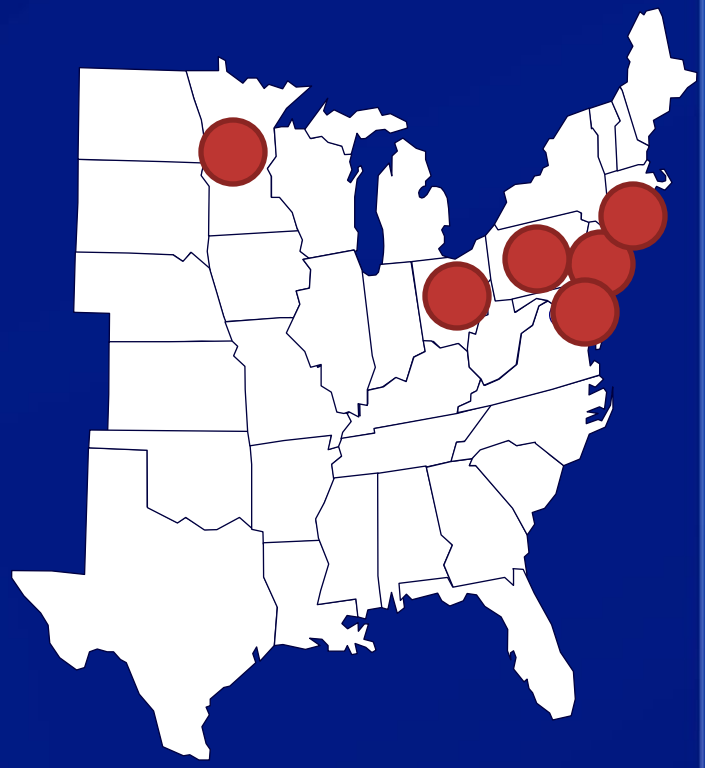
Finding Additional Cases

August 4, 2011

CDC identifies matching *Salmonella* Heidelberg in four additional states (MD, MN, OH, PA) for a total of 86 cases







Hypothesis Generation: Structured Questionnaire

- State and local health departments collected information using a structured questionnaire and submitted data to CDC (n = 65)
  - Food items commonly consumed by observant Jewish community
  - No strong hypothesis identified

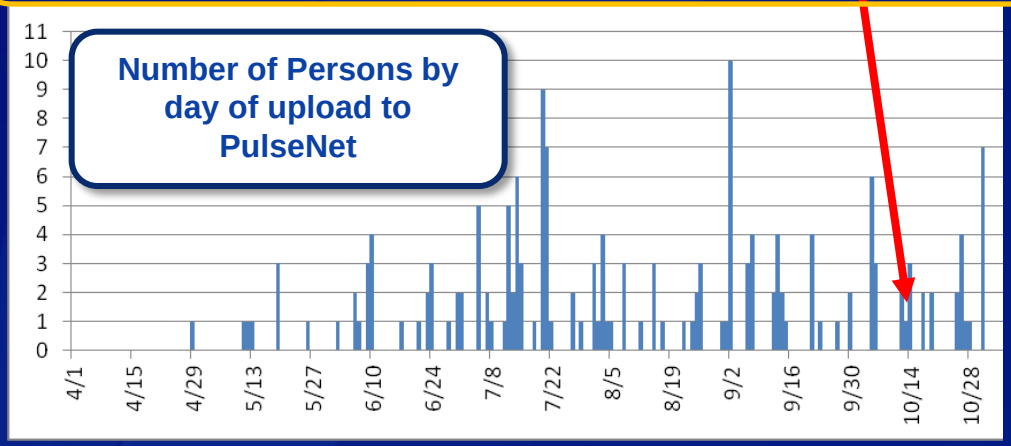
Hypothesis Generation: Case-Case Comparison

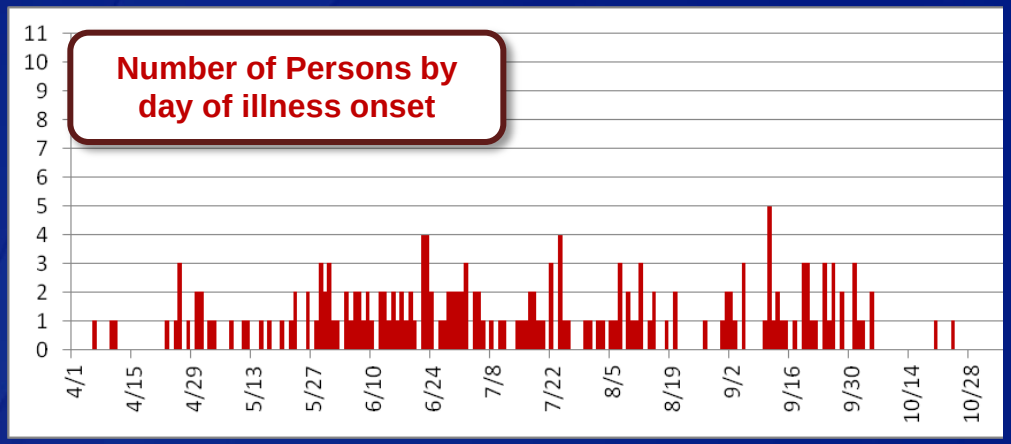
- **Conducted by New York City**
  - **All cases interviewed with standardized *Salmonella* questionnaire**
  - **Compared to non-outbreak *Salmonella* cases interviewed using same questionnaire**

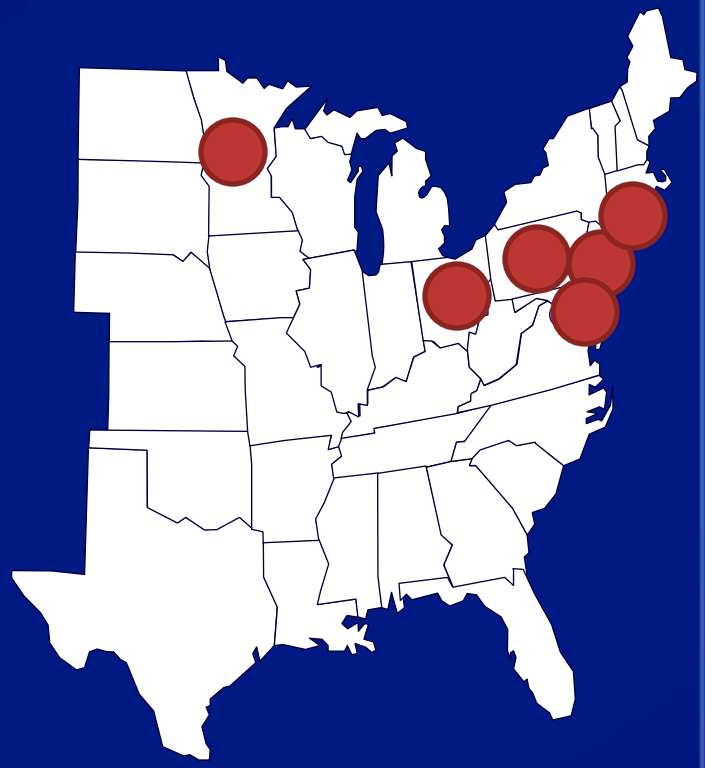
A Break in the Investigation

October 2011

NYC identifies a sub-cluster of 7 cases in another Jewish neighborhood: all consumed chicken livers and shopped at the same 3 grocery stores. Total cases: 172







Neighborhood Sub-Cluster Investigation

- On October 30, 2011 the New York State Department of Agriculture and Markets visited the three grocery stores reported by cases

- Collected samples of chicken livers
- Obtained traceback information on products

Confirming the Hypothesis: Product Testing and Traceback

- Outbreak strain identified in two food products
  - Broiled chicken livers (Grocery Stores A & B)
  - Store-prepared chicken liver and onions (Grocery Store A)

- Both food products were made with livers labeled as “broiled” and produced by a single company (Company A)

Stopping the Outbreak: Voluntary Recall

- **FSIS worked with NY Department of Agriculture and Markets to confirm the livers traced back to Company A**
  - The product was distributed to 8 states
- **On November 8, 2011 Company A issued voluntary recall for Kosher broiled chicken livers**
- **Company A also permanently discontinued production of the product**

Communication

- **CDC posted an investigation web page 2 days after the recall was announced**
  - Investigation summary
  - Link to FSIS recall information
  - Advice to consumers and retailers

Multistate Outbreak of Human *Salmonella* Heidelberg Infections Linked to "Kosher Broiled Chicken Livers"

• Epi Curve

November 10, 2011

On this Page

- Introduction
- Investigation of the Outbreak
- Recall Information
- Clinical Features/Signs and Symptoms
- Advice to Consumers, Retailers, and Others
- Key Resources
- CDC's Role in Food Safety

Introduction

CDC is collaborating with public health and agriculture officials in New York, New Jersey, other states, the U.S. Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS), and the U.S. Food and Drug Administration to investigate a multistate outbreak of *Salmonella* Heidelberg infections linked to a kosher chicken liver product labeled as "kosher broiled chicken livers," which is not ready-to-eat and requires further cooking before eating. Public health investigators are using DNA

Epi Curve

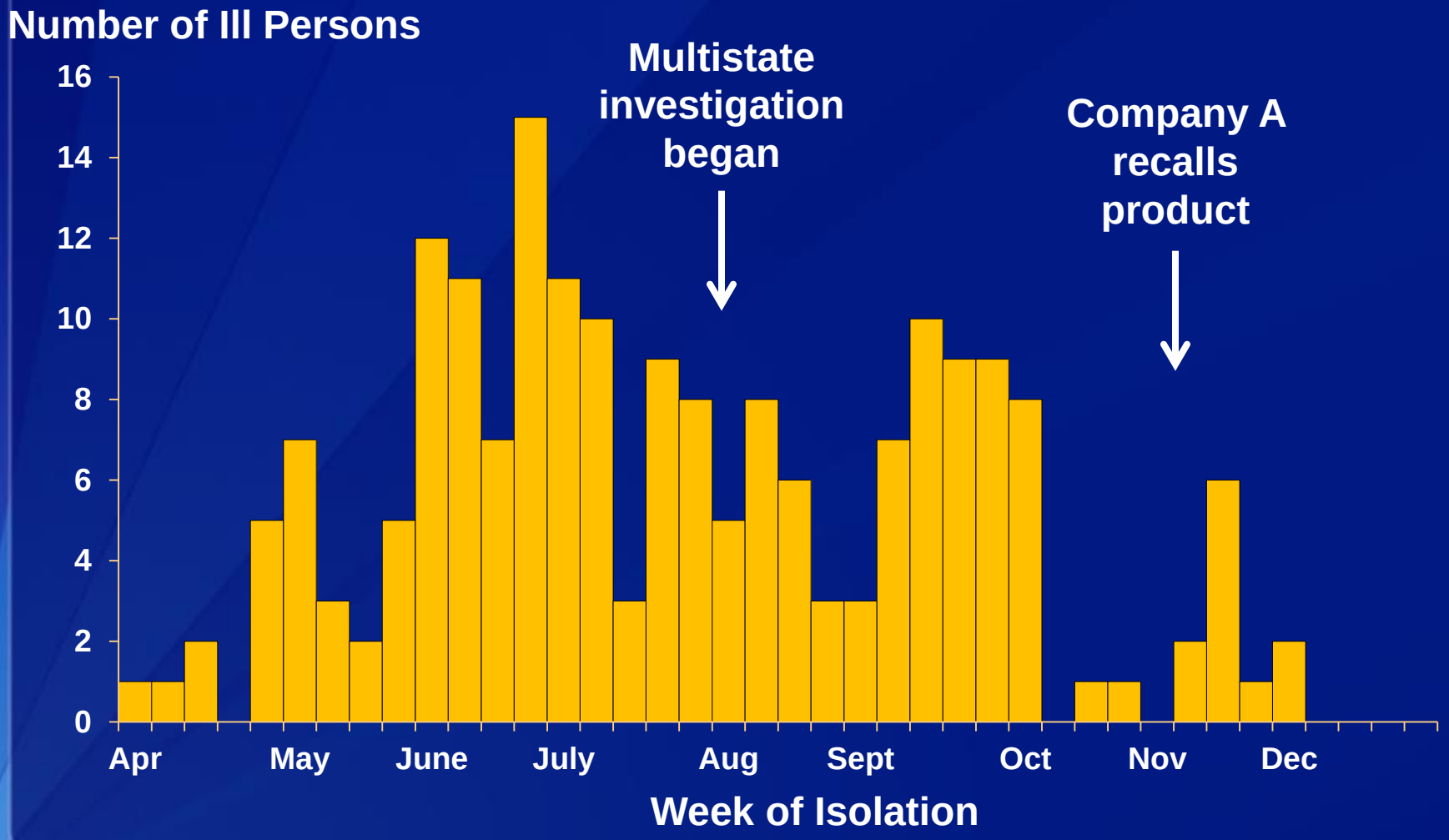
Click graph to view a larger image.

- **Two more web postings with additional information on Nov 21, 2011 and Jan 11, 2012.**

An Exacerbating Cause: Confusing Labeling

- **The product was labeled as “broiled” suggesting the livers were ready-to-eat**
- **Livers appeared cooked on the outside**
- **“For further thermal processing”**
  - Although this appeared in the packaging, the phrasing is confusing
  - Not always prominently positioned on the label

Confirming the Outbreak Is Over



The FSIS Role

- **In typical multistate investigations, where illnesses are distributed across the country, FSIS typically:**
  - Conducts initial/primary traceback analysis
  - Coordinates product testing
  - Obtains shopper card records (when applicable)

- **In this investigation, the state agricultural agency took a more prominent role**
  - Illnesses were more localized than in most multistate investigations
  - Most of the epidemiologic and product testing information came from a single state

Conclusions

- **Multistate foodborne outbreak investigations can be complex, but require swift, coordinated action**
- **Multiple agencies play unique and critical roles**
  - CDC
  - State and local health departments
  - Federal regulatory agencies and their field staff
- **Multiple data streams must come together to get the right answer**
  - Epidemiology
  - Traceback
  - Microbiology and environmental health

Acknowledgements

State and Local Health Departments & Public Health Laboratories

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