

Hold the Tomato? Investigating Produce-related Outbreaks

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Presentation Outline

- Summarize current nationwide *Salmonella* Saintpaul investigation as example of produce-related outbreak
- Present more details about produce-related outbreaks
- Describe techniques for molecular epidemiology and how used to support outbreak investigations

Current nationwide *Salmonella* Saintpaul investigation

- Reportedly largest foodborne outbreak in U.S.
- Over 1,100 cases of salmonellosis associated with outbreak
- Since initial alerts about tomato consumption released, estimated losses to tomato growers and sellers could exceed \$250 million

Current nationwide *Salmonella* Saintpaul investigation

May 19, 2008

- The first cluster of patients were identified on the Navajo Nation in New Mexico
- Indian Health Service staff noticed a cluster of gastroenteritis cases in healthy adults

Current nationwide *Salmonella* Saintpaul investigation

- Tests showed patients had *Salmonella* Saintpaul
- Relatively rare serotype
- Same genetic fingerprint
 - Only 3 persons infected with this strain of *Salmonella* Saintpaul were identified in the country during the same period in 2007
- Additional cases soon identified in Texas

Current nationwide *Salmonella* Saintpaul investigation

- Initial epidemiologic investigation in New Mexico and Texas
- Compared foods eaten by persons who were ill in May to foods eaten by well persons
- Consumption of raw tomatoes epidemiologically linked to illness

Current nationwide *Salmonella* Saintpaul investigation

June 3, 2008

- First alert to public issued
- The Food and Drug Administration (FDA) warns consumers in New Mexico and Texas that a salmonellosis outbreak appears to be linked to consumption of certain types of raw red tomatoes and products containing raw red tomatoes

Current nationwide *Salmonella* Saintpaul investigation

- New Mexico State lab posts cluster investigation to PulseNet
- Additional case finding ongoing
- Cases later on appear nationwide

Current nationwide *Salmonella* Saintpaul investigation

June 7, 2008

- FDA warns consumers nationwide not to eat certain types of raw red tomatoes (red plum, red Roma, or round red) **unless** the tomatoes were from sources cleared by the agency
- Tomatoes not implicated included cherry, grape, sold with the vine still attached, and grown at home

Current nationwide *Salmonella* Saintpaul investigation

- Larger, nationwide case control study conducted in June
- Ill persons were more likely to have recently consumed raw tomatoes, fresh jalapeño peppers, and fresh cilantro
- These items were commonly, though not always, consumed together,
- Study could not determine which item(s) caused the illnesses

Current nationwide *Salmonella* Saintpaul investigation

July 7, 2008

- Change in CDC and FDA alerts from focus on tomatoes to include other produce such as peppers (jalapeño and serrano), cilantro
- Outbreak ongoing despite FDA recommendations about tomatoes
- New cases still occurring
- Included info from cluster investigations

Current *Salmonella* Saintpaul Cluster Investigations

- Recently, many clusters of illnesses have been identified in several states among persons who ate at restaurants
- The accumulated data from all investigations indicate that jalapeño peppers caused some illnesses but that they do not appear to explain all illnesses

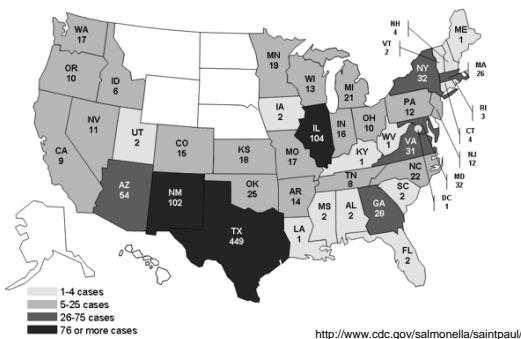
Current Salmonella Saintpaul Cluster Investigations

- Raw tomatoes, fresh serrano peppers, and fresh cilantro also remain under investigation
- Investigators from many agencies are collaborating to track the source of the implicated peppers and other produce items

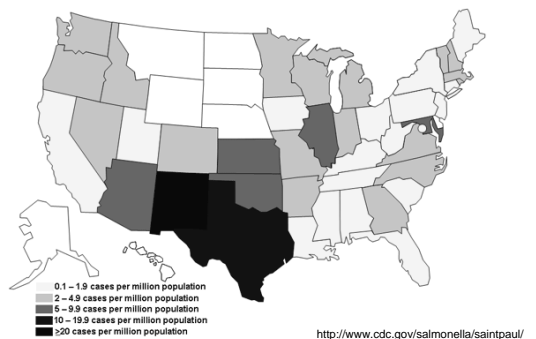
Current nationwide *Salmonella* Saintpaul investigation

- Since April:
 - 1167 confirmed cases
 - Reported from 42 states, DC, Canada
 - Onsets of illness range from April 10– July 4
 - Ages range from <1 to 99 years
 - 50% are female
 - At least 220 hospitalizations reported

Cases infected with the outbreak strain of *Salmonella* Saintpaul, United States, by state, as of July 14, 2008 9pm EDT



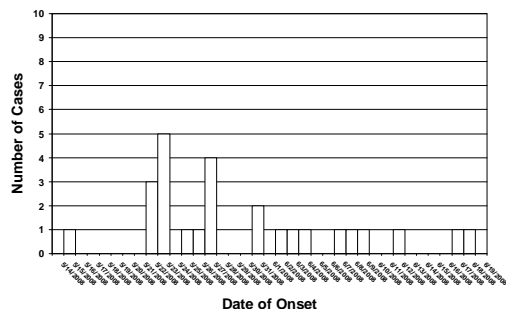
Incidence of cases infected with the outbreak strain of *Salmonella* Saintpaul, United States, by state, as of July 14, 2008 9pm EDT



Maryland *Salmonella* Saintpaul Cases

- Maryland identified its first case June 13
- Since April:
 - 32 confirmed cases
 - Reported from multiple jurisdictions
 - Onsets of illness range from May 15–June 18
 - Ages range from 1 to 65 years; median=25
 - 53% are female
 - 4 hospitalizations reported; no deaths

Maryland *Salmonella* Saintpaul Investigation
Number of Cases by Date of Illness Onset



Challenges to outbreak investigation

- Many steps must occur between a person becoming ill and the determination that the illness was caused by the a certain outbreak etiology
- Inherent delays in disease detection and reporting (average of 2-3 weeks)
- Many persons with illness do not have a stool specimen tested
- It is likely many more illnesses have occurred than those reported

Challenges to outbreak investigation

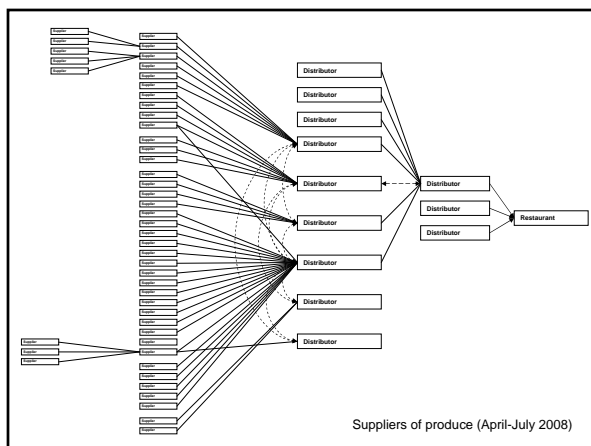
- Investigations are complex and difficult
- People often have often can't remember exactly what foods they ate, let alone specific ingredients in those foods
- Lab testing of foods might help identify the source, but foods consumed by ill persons are often not available to test, especially if perishable, such as produce

Challenges to outbreak investigation

- When food items are mixed together and consumed in the same dish, all the items may be statistically linked to illness
- In that case, determining by statistical means which item caused the illness can be difficult or impossible

Challenges to outbreak investigation

- Tracing suspect produce items back to processors and growers is an integral part of the effort to identify a single source and a possible means of contamination
- Difficulty and complexity increased when product may be nationally distributed



Tomato warning protested

Industry wants health alert lifted, compensation

BY JONATHAN D. ROCKOFF
(CNN REPORTER)

WASHINGTON // Frustrated tomato growers and sellers have blamed the government to lift a five-week-old nationwide warning and avoid waiting certain tomatoes from suspected regions, later identified as parts of Florida and Mexico.

Industry officials say they no longer see a need to keep the warning. "We haven't been harassed from the associated risk in weeks, and investigations haven't found any evidence that tomatoes were in Mexico. Last week, the government said it had expanded the focus of the investigation to include jalapeno peppers and other produce."

"After going through fields and packing houses, testing over 1,000 samples and not finding one positive, we feel that time has come to release tomatoes and make it clear they were not part of the crisis," said Bob Spencer, a part owner of West Coast Tomatoes, a Florida grower and packer. Industry officials from California and Florida, two of the country's leading tomato producing states, said they have started talking to members of Congress about getting legislation that would compensate them for losses that could reach \$20 million.

The warning, the FDA basically dropped the bomb, said John Rodriguez, an adviser to Florida Farmers Inc., a trade association. "This was a blatant goof-up, and they should pay."

Since the outbreak began in April, the new strain of salmonella has sickened more than 1,000 people nationwide, including at least 29 in Maryland. It is the largest salmonella outbreak in at least a decade, and the FDA's inability to identify the source has intensified criticism of the government food safety system.

State and federal investigators implicated tomatoes early on, and the FDA issued a nationwide warning June 7 that contained a list of tomato-growing areas. The warning required growers to stop shipping tomatoes to restaurants, grocery stores and other outlets. "The very next day we saw a lot of tomatoes from areas that weren't on the list," Rodriguez said.

That list of banned regions has grown to encompass virtually all sources of tomatoes — all states and eight countries, a spokesman said. "It's not just Florida growers and packers," he said. "It's also Mexico and Florida."

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Baltimore Sun, July 15, 2008

Produce in the US

- Americans consume large amounts of fresh produce*
 - Approx. 675 lbs of fruits & vegetables per capita per year
 - Approx. 196 lbs as fresh vegetables
 - Approx. 20 lbs as raw fresh tomatoes (~5-6 billion lbs/yr)
- \$12 billion in annual sales of fresh produce
 - Consumption appears to have leveled off or declined slightly recently
- Fruits and vegetables account for nearly 1/3 of the US cash crop

* Estimates based on USDA data

Tomato Consumption – FoodNet Population Survey

- 30-40% of respondents had eaten raw tomatoes sometime in the previous 7 days
- Proportion increased with increases in:
 - Age
 - Education
 - Income
- More women than men reported recent raw tomato consumption

Source: 2002 FoodNet Population Survey

Fresh Produce and Health

- Important component of a healthy diet
 - Vitamins
 - Minerals
 - Fiber
- However, can sometimes cause infections
 - Bacterial
 - Viral
 - Parasitic

Fresh Produce Outbreaks

- From 1973 through 1997, 190 produce-associated outbreaks reported to CDC
 - 16,058 illnesses, 598 hospitalizations, 8 deaths
 - Proportion of all foodborne outbreaks increased
 - 0.7% of all foodborne outbreaks in the 70s
 - 6% of all foodborne outbreaks in the 90s
- Per FDA, between 1996-2006, 72 outbreaks associated with fresh produce

Fresh Produce Outbreaks

- FoodNet Sites, 1999-2002
 - 890 foodborne outbreaks
 - 457 (51%) specific food implicated
 - 97 (21%) produce implicated
 - 63/97 (66%) had confirmed or suggested etiology
 - 43 (68%) norovirus
 - 20 (32%) bacterial

Recent Produce-Related Outbreaks

- Tomatoes
 - *S. Newport* (2005) 16 states, 72 cases
 - *S. Braenderup* (2005) 8 states, 82 cases
 - *S. Newport* (2006) 19 states, 115 cases
 - *S. Typhimurium* (2006) 21 states, 190 cases
- Spinach
 - *E. coli* O157:H7 (2006) 26 states, 199 cases
- Lettuce
 - *E. coli* O157:H7 (2007) 4 states, 78 cases

CDC, MMWR. 2007;56(35):909-911.

Factors Associated with Produce-Related Outbreaks

- Increased global trade
- More complex food production and supply chain (“farm to fork”)
- Foods often consumed raw
- Potentially more susceptible people

Factors Associated with Produce-Related Outbreaks

- Improved surveillance & detection of foodborne illness in general
- Enhanced case and outbreak investigation tools
- New lab methods to identify pathogens

From FDA, “Guide to Minimize Microbial Food Safety Hazards of Fresh-cut Fruits and Vegetables”

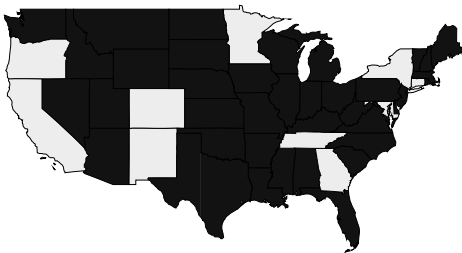
Improved Surveillance & Detection of Foodborne Illness

- Relies on strong public health reportable diseases system
 - Comprehensive reporting by providers & labs
 - Rapid case investigation by local health department (LHD) staff
- Requires rapid investigation of reported cases and outbreaks by LHD staff
- Benefits from enhancements like “FoodNet”

What is FoodNet?

- Component of the national “Emerging Infections Program” (EIP)
- Collaboration between CDC, FDA, USDA, selected states and academic partners
- Established nationally in 1996
- Currently 10 sites

FoodNet Sites



FoodNet Goals

- Determine the burden of foodborne illness in the United States
- Monitor trends in the burden of specific foodborne illness over time
- Attribute the burden of foodborne illness to specific foods and settings
- Develop and assess interventions to reduce the burden of foodborne illness

What Makes FoodNet Unique?

- Active laboratory- and population-based surveillance
 - Lab audits
 - Well defined denominators
- Platform for other important activities
 - Population, provider, and laboratory surveys
 - Risk factor and outcome studies
 - Retail foods study

Pathogens Under Surveillance

- *E. coli* H7:O157 and STECs
- *Listeria monocytogenes*
- *Salmonella*
- *Shigella*
- Non-cholera *Vibrio*
- Non-plague *Yersinia*
- *Campylobacter*
- *Cryptosporidium*
- *Cyclospora*

Enhanced Case and Outbreak Investigation Tools

- Increasing use of common (or similar) case investigation forms
- Secure electronic sharing of information between jurisdictions (e.g. Epi-X, foodborne listserv)
- Improved submission of isolates to public health lab
- “DNA fingerprinting” of isolates and sharing fingerprint patterns nationally (“PulseNet”)

PulseNet

- National network of public health and food regulatory agency laboratories
- Coordinated by the CDC
- Database of PFGE patterns uploaded from state labs nationwide
- Allows for rapid comparison of patterns and recognition of clusters
- Can include epidemiologic evidence (if available)

Even with these new tools...

- Produce-associated outbreak-investigations rely on “shoe-leather” techniques
 - Case interviews
 - Case-control studies and cohort studies
 - Product tracebacks
- Produce-associated outbreak-investigations are complex
 - Multiple state and federal agencies with overlapping responsibilities
 - Difficult tracebacks compared to other products