



FDA/NSTA Web Seminar:
Teach Science Concepts and Inquiry
with Food

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Outbreak Investigation

“Be the Detective”



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Summary of Foodborne Outbreaks

Year	Produce	Sprouts	Dairy	Eggs	Processed foods	Seafood	Cosmetics	Total
1996	3	2	0	34	4	26		69
1997	4	3	1	32	1	8	0	49
1998	6	3	0	25	1	6	0	41
1999	9	6	0	30	3	8	0	56
2000	5	1	1	28	5	5	0	45
2001	8	3	3	16	1	13	0	44
2002	6	2	3	20	0	3	0	34
2003	7	5	4	15	3	6	0	40
2004	10	2	6	2	5	9	1	35
2005	7	0	3	4	4	6	2	26
2006	6	0	0	0	4	8	0	18
Total	71	27	21	206	31	98	3	457



Foodborne Illness in US

- **CDC estimates (Mead et al, 1999)**
 - 1.4 episodes of diarrhea/person/year
 - 76 million illnesses
 - 323,000 hospitalizations
 - 5,200 deaths



Are outbreaks in national news the most common types of outbreaks?

Yes	No	Maybe

E. coli Outbreak Source Located,
Outbreak Hits Nearly 20 states - CBS News



Source: cbsnews.com

What are the most common types of outbreaks?



- A. Widespread, multi-state, on-farm contamination
- B. Local, within state, banquet/church supper



50 sickened after Orland Park banquet

[Leah Hope](#) [abc7chicago.com](#)

February 20, 2004 - A mystery virus sickens at least 50 people in the southwest suburbs.

All became ill after attending a wedding celebration at a banquet hall in Orland Park.

What are the most common causes of foodborne outbreaks?



Eating raw but yummy cookie batter	Worker not wearing hairnets	Ill worker	Temp. abuse	None of the above





Contamination at Retail

- Ill workers
- Poor handwashing practices (or none)
- Temperature abuse





Anatomy of an Outbreak Investigation

- Disease Surveillance
- Epidemiological investigation
- Laboratory analysis
- Environmental investigation
- Traceback/traceforward
- Farm investigation



Knowing your pathogen:

- Zoonotic
 - Salmonella
 - E. coli O157
 - Campylobacter
- Human
 - Shigella
 - Hepatitis A virus
 - Norovirus
 - Cyclospora





Detecting outbreaks

- Laboratory Tools:
 - Standard methods to detect pathogens
 - National database and historical patterns
 - PHLIS
 - Pulsed-field gel electrophoresis
(DNA fingerprint of bacteria)
- Associations and unusual spikes
 - Clustering in time
 - same Genus species and DNA fingerprint



Is the Association solely based on laboratory analysis?

- Epidemiological evidence
 - Ill and well individuals food history
 - Common food
- Challenges:
 - Memory
 - Willingness to participate
 - Common ingredients





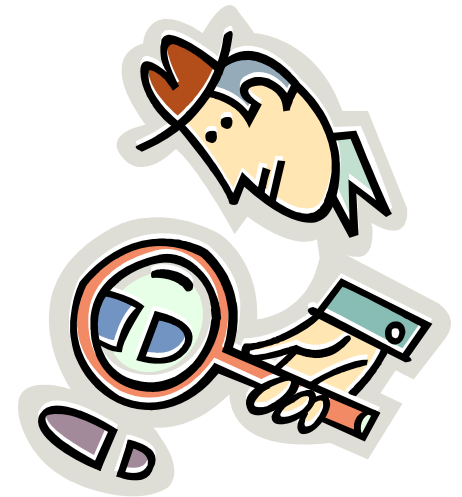
Let's Pause for Two Questions.

**Please type your questions on
the chat.**



Outbreak: Case Histories

Be the Detective





Contamination at Retail



Norovirus

- 332 ill
- 46 wedding cakes, common bakery
- Georgia, February 2000
- Direct hand contact in mixing frosting
- 2 workers ill the week before weddings
- Norovirus detected patients and ill worker

How can this be prevented?

1.

2.

3.



Contamination at Processor

Salmonella in Toasted Oats Cereal

- Outbreak:
 - 11 states
 - 209 ill, 47 hospitalized
 - April to May, 1998
 - *Salmonella* Agona with matching pfge
- How can this be? Cereal is processed.
 - Ideas?



How does science play a role?

1.

2.

3.

Outbreaks linked to Processed Foods: 2007

- Salmonella in peanut butter
 - events lead to conditions for growth
- Salmonella in Veggie booty snack food
 - marketed to children
- Botulinum toxin in hot dog chili sauce
 - Joint recall with USDA
 - Unprecedented outreach to consumers and industry



Contamination at the Farm



What's the goal of the investigation?

Avoid stepping in manure	Avoid a sunburn	Find the source of the contamination that caused the outbreak	All columns ←

E. coli O157:H7 outbreak linked to fresh bagged spinach

- 205 ill, 103 hospitalized
 - 31 with HUS, and 3 deaths
- 26 states involved
- Illness linked to fresh bagged spinach
- 13 bags supplied by patients yielded the outbreak strain (Genus, species, pfge).



What is reservoir for E. coli O157?

Animal and human	Fish	Human only

Why is this important?



Farm Findings

- Cattle nearby and evidence of Feral swine



- *Detectives:*

- Why is this important?
- What does it have to do with the spinach fields?

Connecting the dots and evidence.....

How does science play a role?

- Type of scientists needed
 - Wildlife biologist, Microbiologist, Agriculturist, Environmental engineer/sanitarian
- Equipment
 - GPS, microbiological sampling, and chemical field testing equipment
- Laboratory testing
 - Found same pfge in environment as patients and bagged spinach



Summary





Anatomy of an Outbreak Investigation

- Surveillance
- Epidemiological investigation
- Laboratory analysis
- Environmental investigation
- Traceback/traceforward
- Farm investigation



Outbreak Investigations

- Teamwork!
- Right kind of scientists
- Right kind of scientific equipment/testing
- Solve the Puzzle
- Alert consumers, remove product from distribution
- Develop policies, guidance, etc, based on sound science to prevent future outbreaks



Reality Check

Seldom do we find the “smoking gun”

Why not?

Delay between when the outbreak was detected and when consumers ate the contaminated food	Pathogens can't talk	Conditions at the source not the same as when the contamination occurred



Let's Pause for Two Questions.

**Please type your questions on
the chat.**



Conclusion

- Science plays a major role in detecting outbreaks and investigating the source of contamination in foodborne outbreaks
- Understanding how contamination occurred is critical in developing measures to minimize ongoing outbreaks and prevent future ones
- Consumers, government, academia, and industry all play a vital role in protecting public health



Resources

- www.fda.gov
 - Bad bug book, food safety, press releases on outbreaks, education, and more...
- www.cdc.gov
 - PulseNet, surveillance, pathogens, education, and more...
- www.foodsafety.gov

Thank You
FDA



<http://www.lluminate.com>



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