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Public Health Surveillance is a Pre-Requisite for Effective Food Control Programs

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Why Public Health Surveillance?

- Effective food control
- Public health surveillance
- Role of epidemiology in food control
- Examples-what we can do to improve surveillance

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Effective Food Control

- Characterize food item or process
- Identify hazards
- Identify points at which hazards contaminate food item, enter process, or can be controlled
- Monitor control points
- Initiate corrective action when process is out of control

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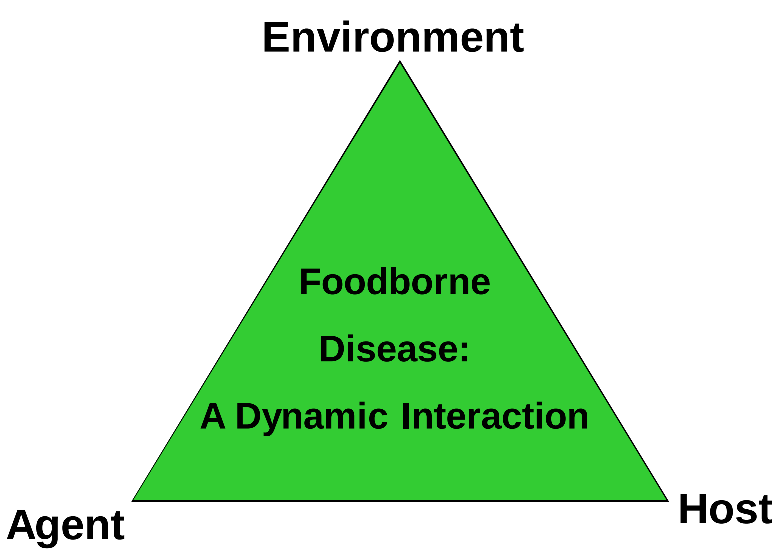

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Public Health Surveillance

- *"Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health event for use in public health action to reduce morbidity and mortality and to improve health."* CDC, 2001.

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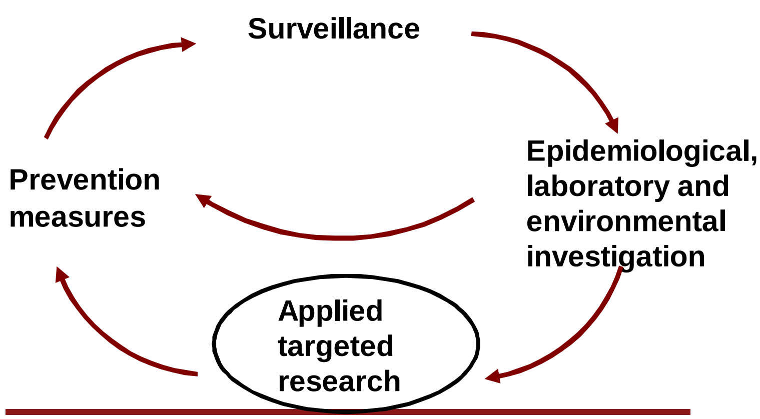
The Cycle of Public Health Prevention



Epidemiology

- Epidemiology is the study of events in populations.
  - Usually thought of in terms of diseases (e.g. Salmonella) but also includes factors associated with their occurrence (e.g. food consumption patterns).
  - Epidemiology differs from clinical medicine in that the unit of measurement is not the individual, but a defined population over a specified time period of observation.

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The Importance of Epidemiology

- Because public health surveillance, as a tool of epidemiology, involves the monitoring of populations, and
- Because consumption of contaminated food items by the population represents a complete sampling of the food item,
- Surveillance will always be more sensitive to product contamination than any quality assurance testing program.

Humans are the ultimate bioassay for the food supply

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Role of Epidemiology in Food Control

- Identify new hazards
- Prioritize food safety interventions
- Provide feedback on effectiveness of food safety systems

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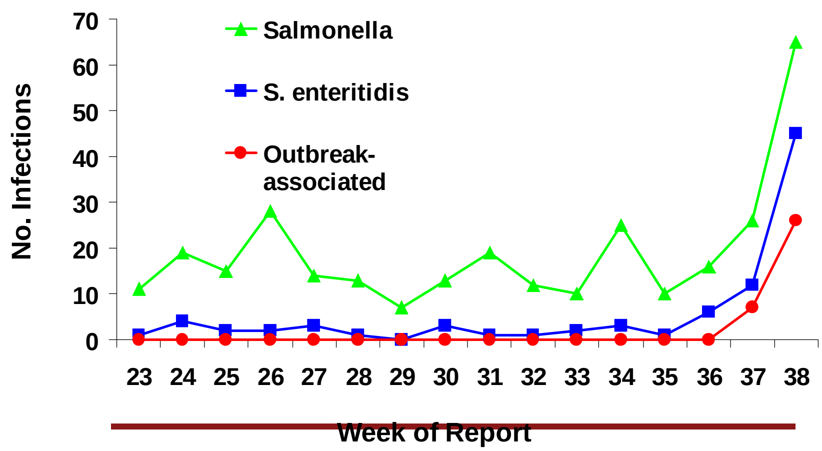
Salmonella Infections by Week of Report, Minnesota, June-September 1994



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Consumption of Ice Cream Among Cases and Matched Controls, Minnesota

• **10 (67%) /15 cases,** • **2 (13%) /15 controls** **Ate:** <u>Schwan's</u> ice cream **(Matched OR=10.0;** **95% CI, 1.4-434.0; p=0.007)**	• **13 (87%) /15 cases,** • **10 (67%) /15 controls** **Ate:** <u>any</u> ice cream **(Matched OR=2.5;** **95% CI, 0.4-26.3; p=0.2)**

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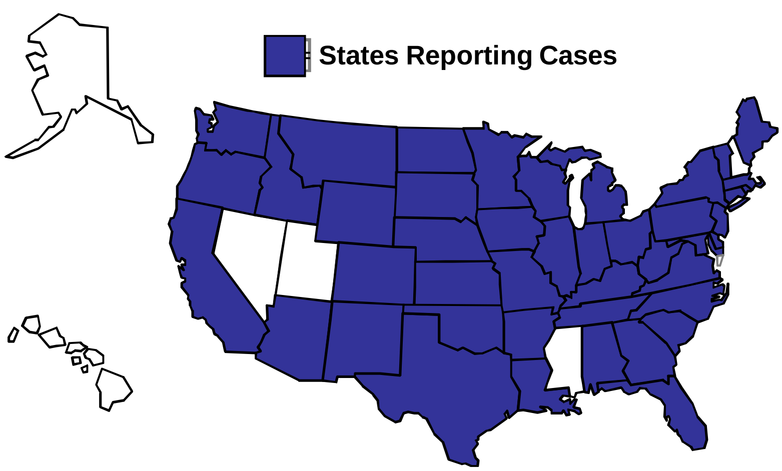
States Reporting Cases Associated with Schwan's Ice Cream



Size of Outbreak: ~ 224,000 cases in the U.S.

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Microbiologic Investigation: Ice Cream and Environmental

- 266 unopened products, 32 production dates
- 8 positive for SE, 1 positive for *S.* Thompson
- SE positive products from 4 production dates
- Phage typing on 5 isolates: all were type 8
- Environmental samples: All negative

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Concentration of *S.* Enteritidis in Ice Cream

Date	Most probable number per g	Most probable number per 65 g (1/2 cup)
8/25	<0.003	<0.2
8/25	0.093	6.0
8/26	0.093	6.0
9/12	<0.003	<0.2

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Schwan's Ice-Cream Associated Outbreak; 1994

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Source of Contamination

Tanker loads pre-mix after eggs	Number case products	Number control products	Odds ratio*
0 %	2	6	Reference
1-24%	7	17	1.2
25-50%	5	9	1.7
51-100%	7	3	7.0
Total	21	35	

*Chi-square test for trend, p=0.02

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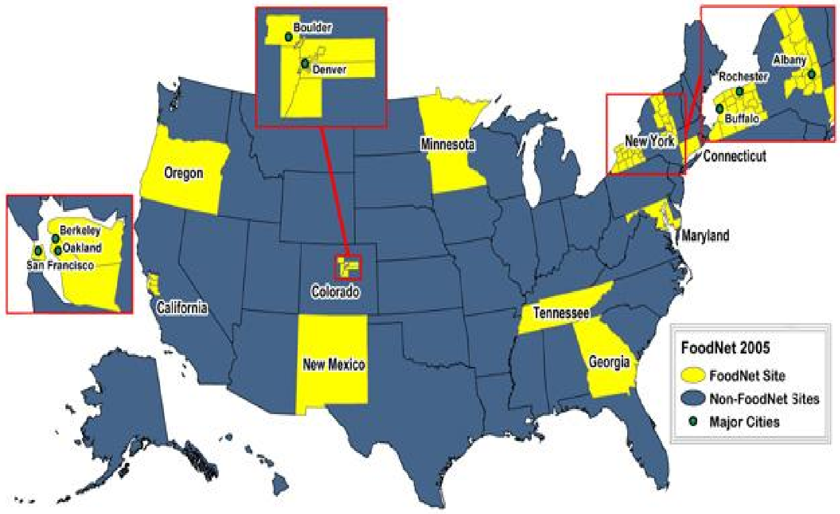
FoodNet Active Surveillance Network



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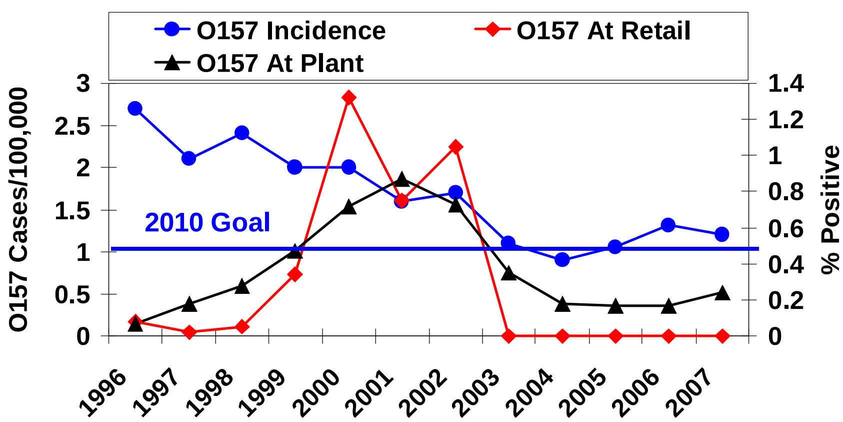
E. coli O157:H7 in Ground Beef and Incidence of O157 in FoodNet, 1996-2007



USDA Microbiological Testing Program/ FoodNet

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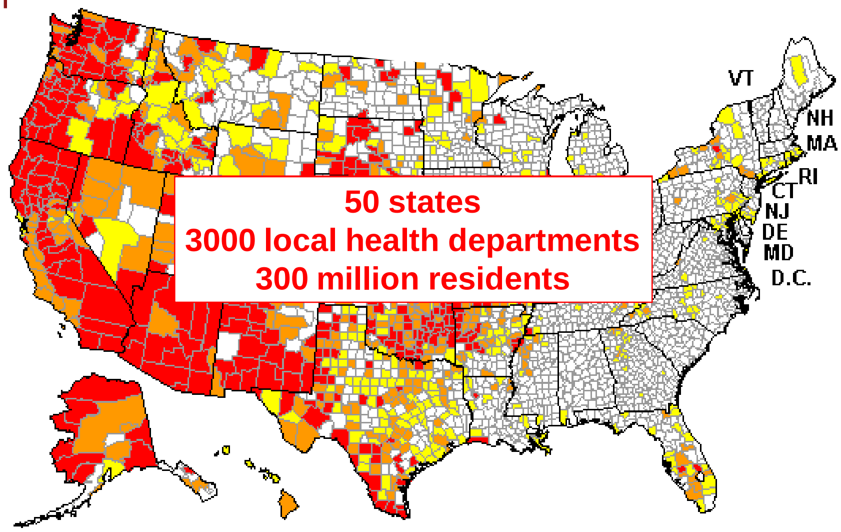
Foodborne Disease Surveillance In the United States



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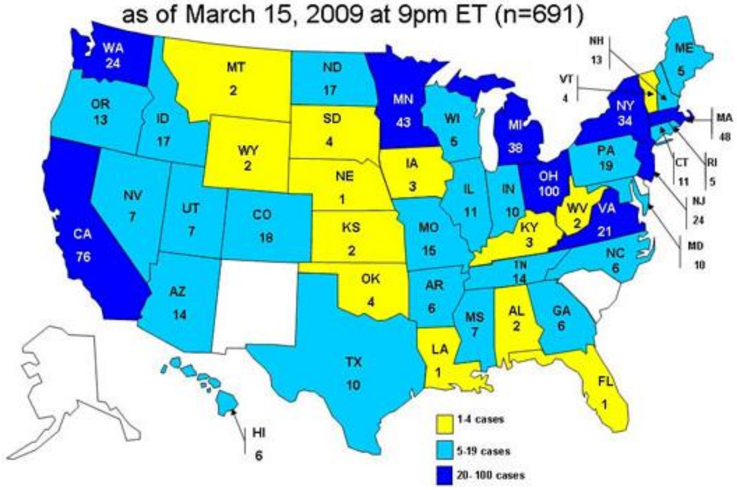
Cases infected with the outbreak strain of *Salmonella* Typhimurium, United States, by state, as of March 15, 2009 at 9pm ET (n=691)



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Median Intervals (days) and Range (by state) from Onset of Symptoms to Timeline Event

Timeline Event	*Salmonella*	*E. coli* O157
Collection of stool sample	4 (2, 4)	3 (2, 6)
Case report from clinician to health department	9 (8, 11)	7 (6, 7)
Submission of isolate to public health laboratory	10 (8, 11)	8 (5, 9)
Case interview	14 (14, 22)	12 (9, 16)
PFGE subtyping	18 (15, 28)	15 (11, 22)

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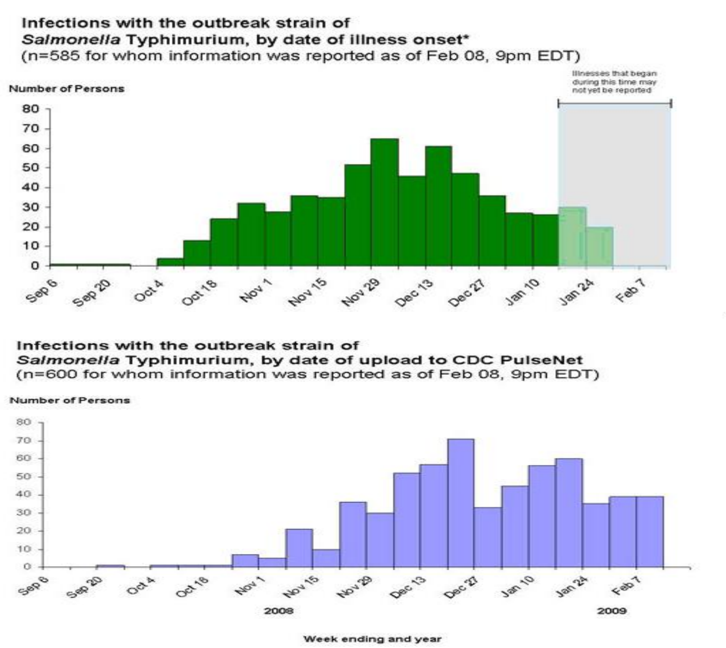

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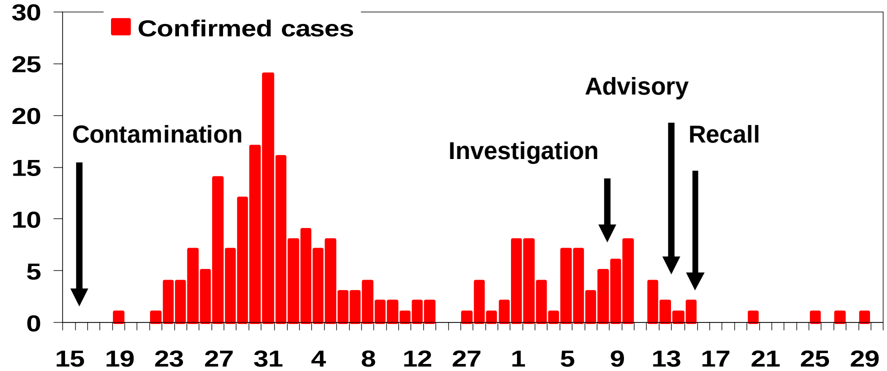
E. coli O157:H7 Associated with Fresh Bagged Spinach, 2006

30 days from contamination to intervention



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How to Improve Public Health Surveillance?

- Improving the safety of our food supply will require a commitment to public health surveillance of foodborne diseases based on the principles of epidemiology. Applying epidemiology to this task will require a similar commitment to increasing:
- The sensitivity of outbreak detection
- The specificity of outbreak investigation,
- with respect both to case-definitions and exposure sources
- The speed with which outbreaks are investigated

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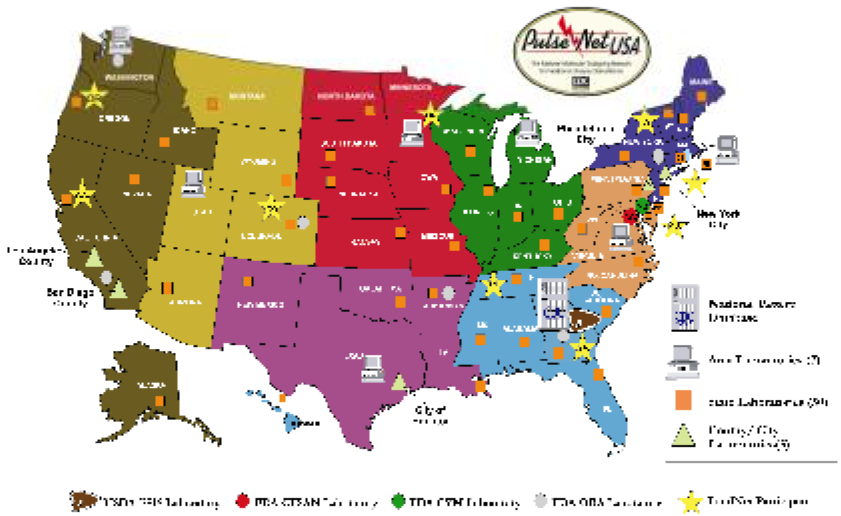
The Most Important Foodborne Disease *Epidemiology* Tool Developed in My Lifetime



August 2002

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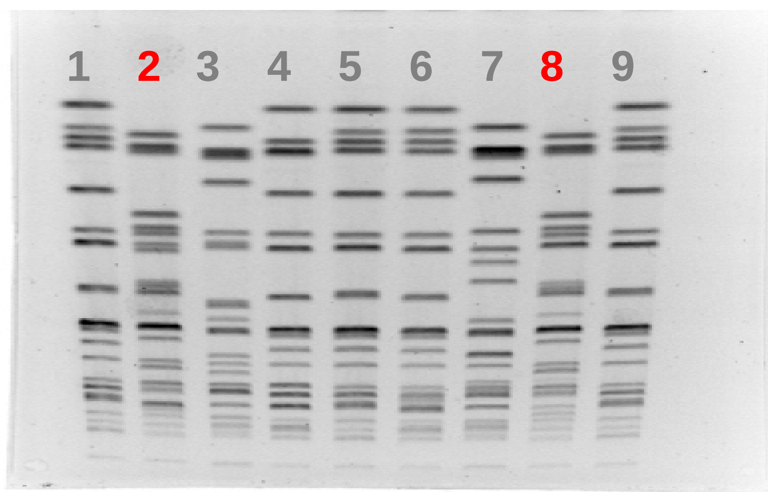
Shigella sonnei PFGE Patterns

Minnesota, 1998



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Outbreaks of *Shigella sonnei* Infections Associated with Parsley, July-August, 1998

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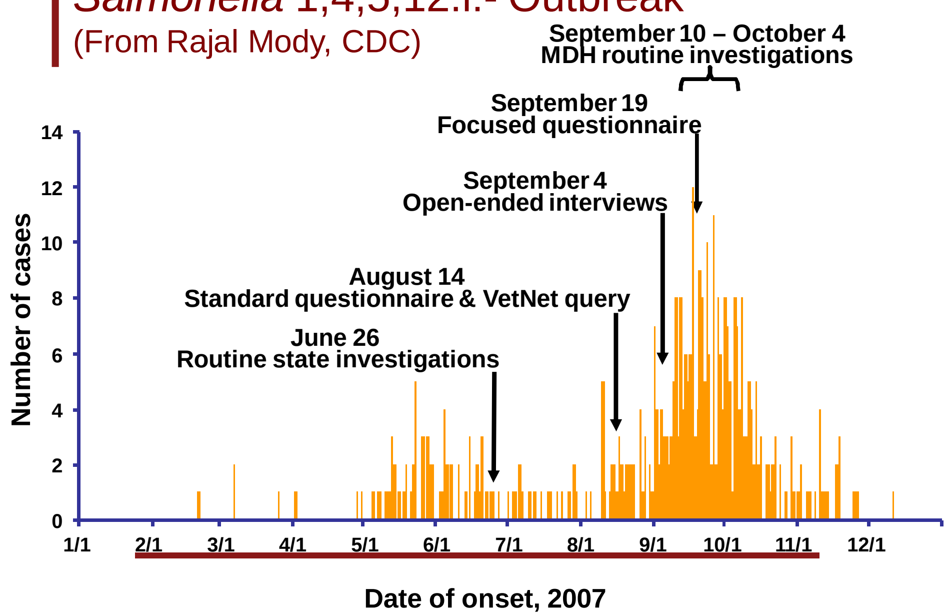
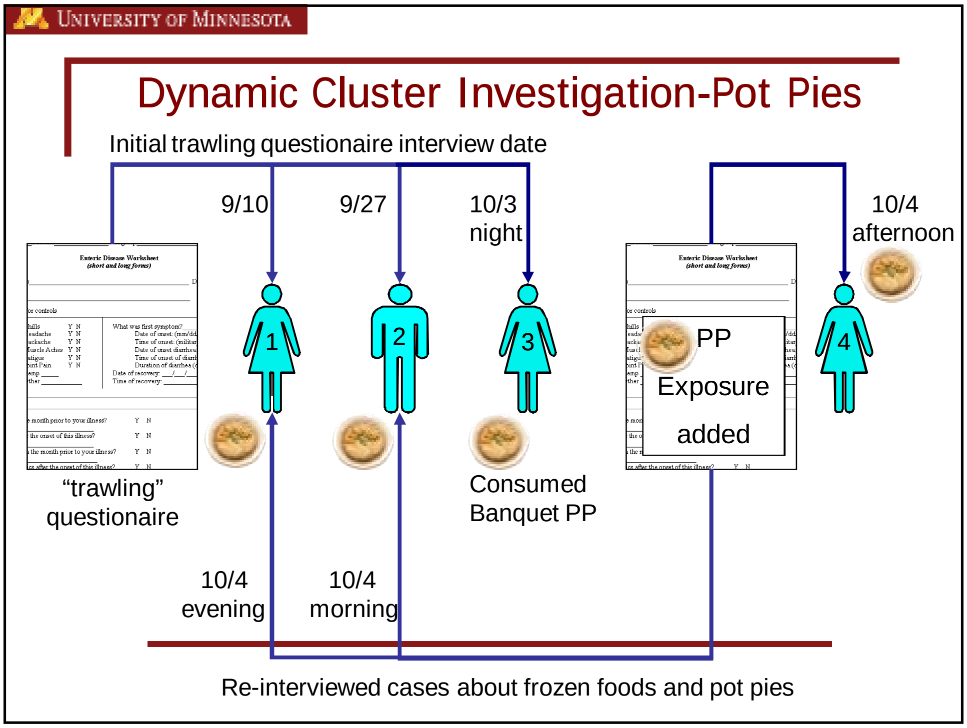
Salmonella 1,4,5,12:i:- Outbreak

(From Rajal Mody, CDC)

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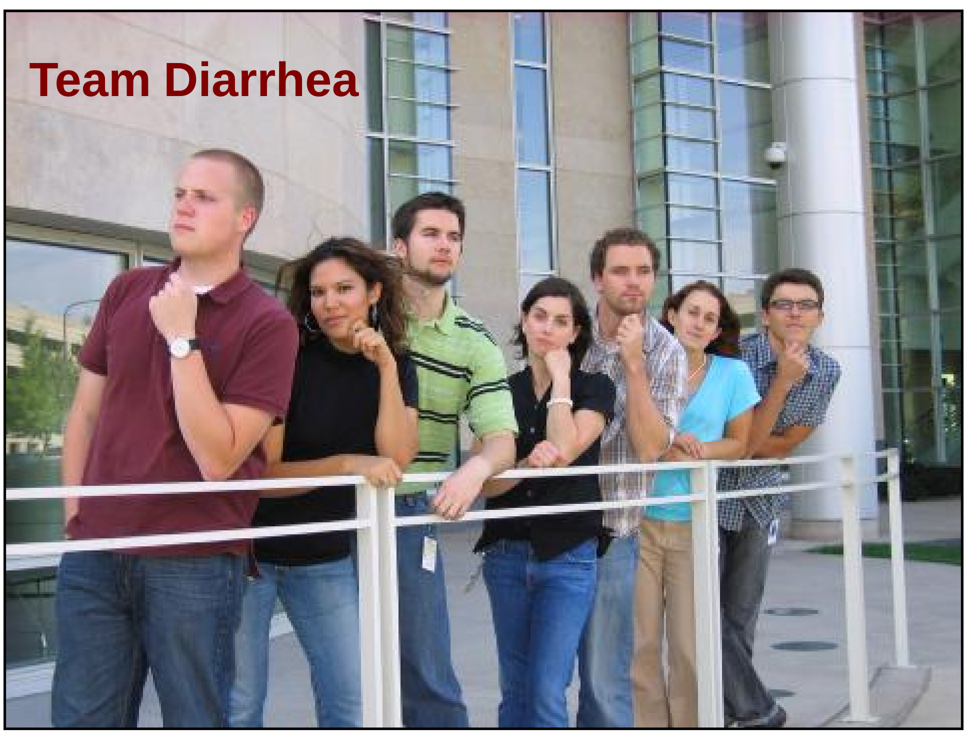
Dynamic Cluster Investigation-Pot Pies
Initial trawling questionaire interview date
9/10
9/27
10/3
night
10/4
afternoon
1
2
3
4
PP
Exposure
added
"trawling"
questionaire
Consumed
Banquet PP
10/4
evening
10/4
morning
Re-interviewed cases about frozen foods and pot pies


Team Diarrhea

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The Council to Improve Foodborne Outbreak Response (CIFOR)

- CIFOR is a multidisciplinary working group convened to increase collaboration across the country and across relevant areas of expertise in order to reduce the burden of foodborne illness in the United States.
- The Council of State and Territorial Epidemiologists (CSTE) and the National Association of County and City Health Officials (NACCHO) are co-chairing CIFOR with support from the Centers for Disease Control and Prevention (CDC).
- CIFOR is actively exploring methods to evaluate and improve foodborne disease surveillance in USA.

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Conclusion

- The unique ability of public health surveillance to identify new hazards, and provide population-based evaluation of the effectiveness of control measures makes it a pre-requisite for effective food control programs, and a primary tool for food control research.
- Improving public health surveillance for foodborne diseases will require considerable investments at multiple levels. However, such investments are critical to the improvement of our food safety systems.