

From Laboratory Detection to Interaction with Epidemiology Programs

Dave Boxrud
Minnesota Department of Health
May 15, 2008



Case 1

Exposure

Doctor

Transport

Culture

Transport

Serotype

PFGE

Report

Interview



Case 2

Exposure

Doctor

Transport

Culture

Transport

Serotype

PFGE

Report

Interview



Case 3

Exposure

Doctor

Transport

Culture

Transport

Serotype

PFGE

Report

Interview



Cluster investigation



Outbreak Detection

Exposure

Exposure

Exposure

Doctor

Doctor

Doctor

Transport

Transport

Transport

Culture

Culture

Culture

Transport

Transport

Transport

Serotype

Serotype

Serotype

PFGE

PFGE

PFGE

Report

Report

Report

Interview

Interview

Interview



Cluster investigation



Outbreak Detection

Activities Done In Real-Time :

- Isolate acquisition
- Subtype analysis
- Subtype reporting
- Case interviewing
- Cluster investigation

Activities Done In Real-Time :

- Isolate acquisition
- Subtype analysis
- Subtype reporting
- Case interviewing
- Cluster investigation

Diseases Reportable to the Minnesota Department of Health

651-201-5414 or 1-877-676-5414

24 hours a day, 7 days a week

Report Immediately by Telephone

Anthrax (*Bacillus anthracis*)^a
 Botulism (*Clostridium botulinum*)
 Brucellosis (*Brucella* spp.)^a
 Cholera (*Vibrio cholerae*)^a
 Diphtheria (*Corynebacterium diphtheriae*)^a
 Hemolytic uremic syndrome^a
 Measles (rubeola)^a
 Meningococcal disease (*Neisseria meningitidis*)
 (all invasive disease)^{a, b}
 Orthopox virus^a

Plague (*Yersinia pestis*)^a
 Poliomyelitis^a
 Q fever (*Coxiella burnetii*)^a
 Rabies
 (animal and human cases and suspected cases)
 Rubella and congenital rubella syndrome^a
 Severe Acute Respiratory Syndrome (SARS)^{a, f}
 Smallpox (variola)^a
 Tularemia (*Francisella tularensis*)^a
 Unusua

Report Within One Work

Amebiasis (*Entamoeba histolytica/dispar*)
 Anaplasmosis (*Anaplasma phagocytophilum*)
 Arboviral disease
 (including but not limited to, LaCrosse encephalitis, eastern equine encephalitis, western equine encephalitis, St. Louis encephalitis, and West Nile virus)
 Babesiosis (*Babesia* spp.)
 Blastomycosis (*Blastomyces dermatitidis*)
 Campylobacteriosis (*Campylobacter* spp.)^a
 Cat scratch disease (infection caused by *Bartonella* spp.)
 Chancroid (*Haemophilus ducreyi*)^c
 Chlamydia trachomatis infection^c
 Coccidioidomycosis
 Cryptosporidiosis (*Cryptosporidium* spp.)^a
 Cyclosporiasis (*Cyclospora* spp.)^a
 Dengue virus infection
 Diphyllbothrium latum infection
 Ehrlichiosis (*Ehrlichia* spp.)
 Encephalitis (caused by viral agents)
 Enteric *E. coli* infection
 (*E. coli* O157:H7, other enterohemorrhagic [Shiga toxin-producing] *E. coli*, enteropathogenic *E. coli*, enteroinvasive *E. coli*, enterotoxigenic *E. coli*)^a
 Enterobacter sakazakii (infants under 1 year of age)^a
 Giardiasis (*Giardia lamblia*)
 Gonorrhea (*Neisseria gonorrhoeae*)^c
 Haemophilus influenzae disease
 (all invasive disease)^a
 Hantavirus infection
 Hepatitis (all primary viral types including A, B, C, D, and E)^g
 Histoplasmosis (*Histoplasma capsulatum*)
 Human immunodeficiency virus (HIV) infection, including Acquired Immunodeficiency Syndrome (AIDS)^{a, d, g}
 Influenza
 (unusual case incidence, critical illness, or laboratory confirmed cases)^{a, e}
 Kawasaki disease
 Kingella spp. (invasive only)^{a, b}
 Legionellosis (*Legionella* spp.)^a
 Leprosy (Hansen's disease) (*Mycobacterium leprae*)
 Leptospirosis (*Leptospira interrogans*)

Listeriosis
 Lyme disease
 Malaria
 Meningitis
 Mumps
 Neonatal
 exclu
 Pertussis
 Psittacosis
 Retrovirus
 Rye
 Rheumat
 Rocky Mountain spotted fever (*Rickettsia rickettsii*, *R. canada*)
 Salmonellosis, including typhoid (*Salmonella* spp.)^a
 Shigellosis (*Shigella* spp.)^a
 Staphylococcus aureus (vancomycin-intermediate *S. aureus* [VISA], vancomycin-resistant *S. aureus* [VRSA], and death or critical illness due to community-associated *S. aureus* in a previously healthy individual)^a
 Streptococcal disease (all invasive disease caused by Groups A and B streptococci and *S. pneumoniae*)^{a, b}
 Syphilis (*Treponema pallidum*)^c
 Tetanus (*Clostridium tetani*)
 Toxic shock syndrome^a
 Toxoplasmosis (*Toxoplasma gondii*)
 Transmissible spongiform encephalopathy
 Trichinosis (*Trichinella spiralis*)
 Tuberculosis (*Mycobacterium tuberculosis* complex) (Pulmonary or extrapulmonary sites of disease, including laboratory confirmed or clinically diagnosed disease.) Latent tuberculosis infection is not reportable.^a
 Typhus (*Rickettsia* spp.)
 Unexplained deaths and unexplained critical illness (possibly due to infectious cause)^a
 Varicella-zoster disease
 (1. Primary [chickenpox]: unusual case incidence, critical illness, or laboratory-confirmed cases; 2. Recurrent [shingles]: unusual case incidence, or critical illness.)^a
 Vibrio spp.^a
 Yellow fever
 Yersiniosis, enteric (*Yersinia* spp.)^a

^a Submission of clinical materials required. Submit isolates or, if an isolate is not available, submit material containing the infectious agent in the following order of preference: a patient specimen; nucleic acid; or other laboratory material. Call the MDH Public Health Laboratory at 651-201-4953 for instructions.

Footnotes

^a Submission of clinical materials required. Submit isolates or, if an isolate is not available, submit material containing the infectious agent in the following order of preference: a patient specimen; nucleic acid; or other laboratory material. Call the MDH Public Health Laboratory at 651-201-4953 for instructions.

To Report A Case

For diseases that require immediate reporting call: 651-201-5414 or 1-877-676-5414.
 To report by mail, fill out a Minnesota Department of Health case report form (available at www.health.state.mn.us/diseasereport) and mail to: 625 Robert St. N., PO Box 64975, St. Paul, MN 55164-0975.

Activities Done In Real-Time :

- Isolate acquisition
- Subtype analysis
- Subtype reporting
- Case interviewing
- Cluster investigation

PFGE in Minnesota

PN Real-Time

- *E. coli* 0157:H7
- *Listeria monocytogenes*
- *Salmonella*
- *Shigella sonnei*
- *N. meningitidis* groups B, C, and Y

Batch

- MRSA
- Invasive GAS
- *B. pertussis*
- Others

PFGE Flowchart

Sequential Testing

Isolate received

Biochemicals

1 day

3 days

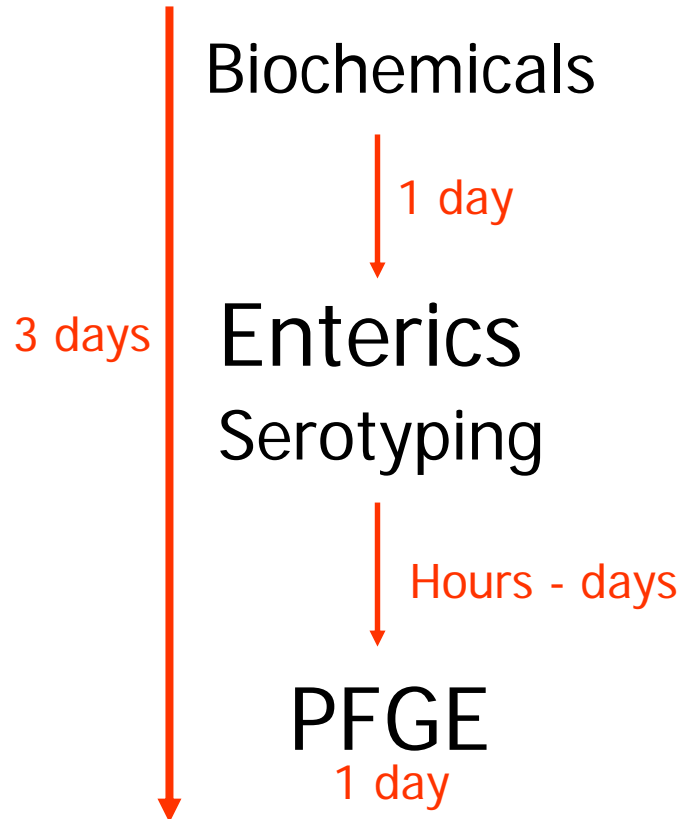
Enterics

Serotyping

Hours - days

PFGE

1 day

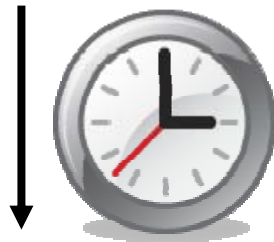


PFGE Flowchart

Concurrent

Isolate received

Biochemicals + TSBA



PFGE Reporting

- Local database
- National database
- Document cluster
- LIMS

Daily Report

Automatic printout of any serotype/PFGE info added into LIMS

- Previous days
- Moving time frame
- Historical perspective
- National clusters

Daily Report

Enteric Isolates Reported on 15-Mar-2003

SPEC	LNAME	FNAME	CITY	AGE	AGENT	SUBTYPE	DATE
01774	Larsen	William	Bloomington	37	Campylobacter jejuni	Fla9	11-mar-03
01770	Simon	Pauline	Minneapolis	72	Campylobacter jejuni	Fla72	10-mar-03
01778	Hilgren	Sven	Rosemount	6	Escherichia coli	MN31	10-mar-03
01773	Hilgren	Cody	Rosemount	5	Escherichia coli	MN31	12-mar-03
01765	Bergstrom	Theresa	Rosemount	31	Escherichia coli	MN31	11-mar-03
01768	Roberts	MaryIn	Bemidji	76	Escherichia coli	MN1	11-mar-03
01777	Desowitz	Robert	St. Cloud	47	Salmonella saintpaul		14-mar-03
01776	Beers	Trevor	Minneapolis	3	Salmonella typhimurium	TM43	10-mar-03
01769	Sampson	Elsa	St. Paul	53	Salmonella typhimurium	TM2B	11-mar-03
01774	Brady	Harold	Bloomington	16	Shigella flexneri 3a		13-mar-03
01767	Crandon	Louise	Chisago	24	Shigella sonnei	SS1	10-mar-03
01764	Petrovich	Helen	Edina	67	Shigella sonnei	SS44	09-mar-03

Daily 30 Line Listing

Moving Frame Subtype / Serotype History

<u>SPEC</u>	<u>LNAME</u>	<u>FNAME</u>	<u>CITY</u>	<u>AGE</u>	<u>AGENT</u>	<u>SUBTYPE</u>	<u>DATE</u>
01778	Hilgren	Sven	Rosemount	6	Escherichia coli	MN31	10-mar-03
01773	Hilgren	Cody	Rosemount	5	Escherichia coli	MN31	12-mar-03
01765	Bergstrom	Theresa	Rosemount	31	Escherichia coli	MN31	11-mar-03
01762	Hilgren	Elizabeth	Rosemount	24	Escherichia coli	MN31	10-mar-03
01760	Edlestein	Michael	Invr Grove Hts	7	Escherichia coli	MN31	08-mar-03
01758	Langley	Joel	Rosemount	6	Escherichia coli	MN31	06-mar-03
01743	Sigurson	Marie	Rosemount	8	Escherichia coli	MN31	06-mar-03
01768	Roberts	Maryln	Bemidgi	76	Escherichia coli	MN1	11-mar-03
01777	Desowitz	Robert	St. Cloud	47	Salmonella saintpaul		14-mar-03
01776	Beers	Trevor	Minneapolis	3	Salmonella typhimurium	TM43	10-mar-03
01762	Horlath	Brett	Minneapolis	5	Salmonella typhimurium	TM43	10-mar-03
01747	Peterson	Mary	Minneapolis	9	Salmonella typhimurium	TM43	29-feb-03
01769	Sampson	Elsa	St. Paul	53	Salmonella typhimurium	TM2B	11-mar-03
01771	Yang	Xiong	Duluth	47	Salmonella typhimurium	TM2B	29-feb-03

Daily Analysis

15-MAR-2003

Page 1

Historic Perspective: Enteric Agents Report 15-Mar-03

AGENT	SUBTYPE	MAR-03	FEB-03	JAN-03	CY-03	CY-02	CY-01
Campylobacter jejuni	Fla09	1	2	1	9	0	0
Campylobacter jejuni	Fla72	0	1	0	1	3	0
Campylobacter jejuni	All isolates	14	35	36	85	770	674
Escherichia coli O157:H7	MN31	7	1	0	8	1	2
Escherichia coli O157:H7	MN1	1	0	1	2	8	12
Escherichia coli O157:H7	All isolates	8	4	5	17	158	168
Salmonella saintpaul	All isolates	1	0	0	3	5	2
Salmonella typhimurium	TM43	2	1	0	3	78	0
Salmonella typhimurium	TM2b	1	2	1	4	54	0
Salmonella typhimurium	All isolates	17	25	16	197	205	160
Shigella flexneri 3a	All isolates	2	0	4	6	2	2
Shigella sonnei	SS1	1	1	0	2	5	134
Shigella sonnei	SS44	1	0	0	1	11	0

Daily National Report

National clusters last 3 months

<u>AGENT</u>	<u>ALERT DATE</u>	<u>STATE</u>	<u>SUBTYPE</u>	<u>EPI ASSOCIATION</u>
SALMONELLA NEWPORT	01-MAR-03	VA	NEW132	RESTAURANT
ESCHERICHIA COLI O157:H7	25-FEB-03	MI	MN41	SPROUTS
SALMONELLA MUENCHEN	23-FEB-03	NE	NE96046-3	?
SHIGELLA SONNEI	12-FEB-03	WA	SS1	DAYCARE
SALMONELA MONTEVIDEO	05-FEB-03	TX	SMON11	PEANUTS
SALMONELLA AGONA	08-JAN-03	CO	SAG8	TOMATOES

Activities Done In Real-Time :

- Isolate acquisition
- Subtype analysis
- Subtype reporting
- Case interviewing
- Cluster investigation

Epidemiology in Minnesota

- Foodborne illness hotline
- Centralized epidemiology
- Real-time comprehensive interviews
- Dynamic cluster investigation
- Student workers

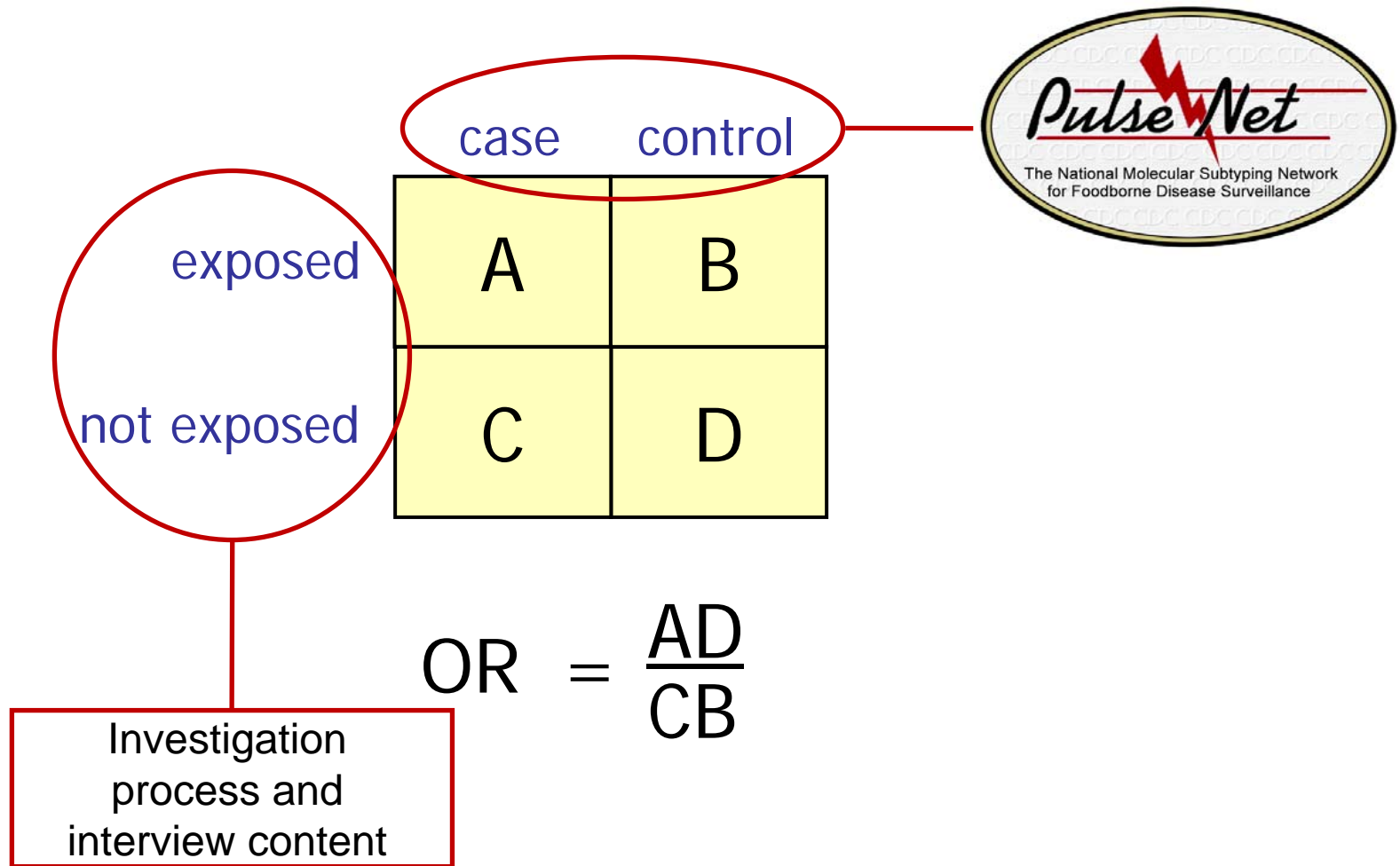
Minnesota Foodborne Illness Hotline

Call to report
foodborne illness:
(651) 201-5655
Toll free statewide:
1-877-366-3455
1-877-FOOD ILL



625 North Robert Street
PO Box 64975
St. Paul, MN 55164
www.health.state.mn.us

Measure of Association



Enteric Disease Interview

- 11 pages, 15-40 minutes
- Large # of organisms
- Demographics
- Symptoms/treatment
- Exposures
- 7 day restaurant history
- 5 day meal history
- 7 day food consumption history

Team Diarrhea and the Vector Squad

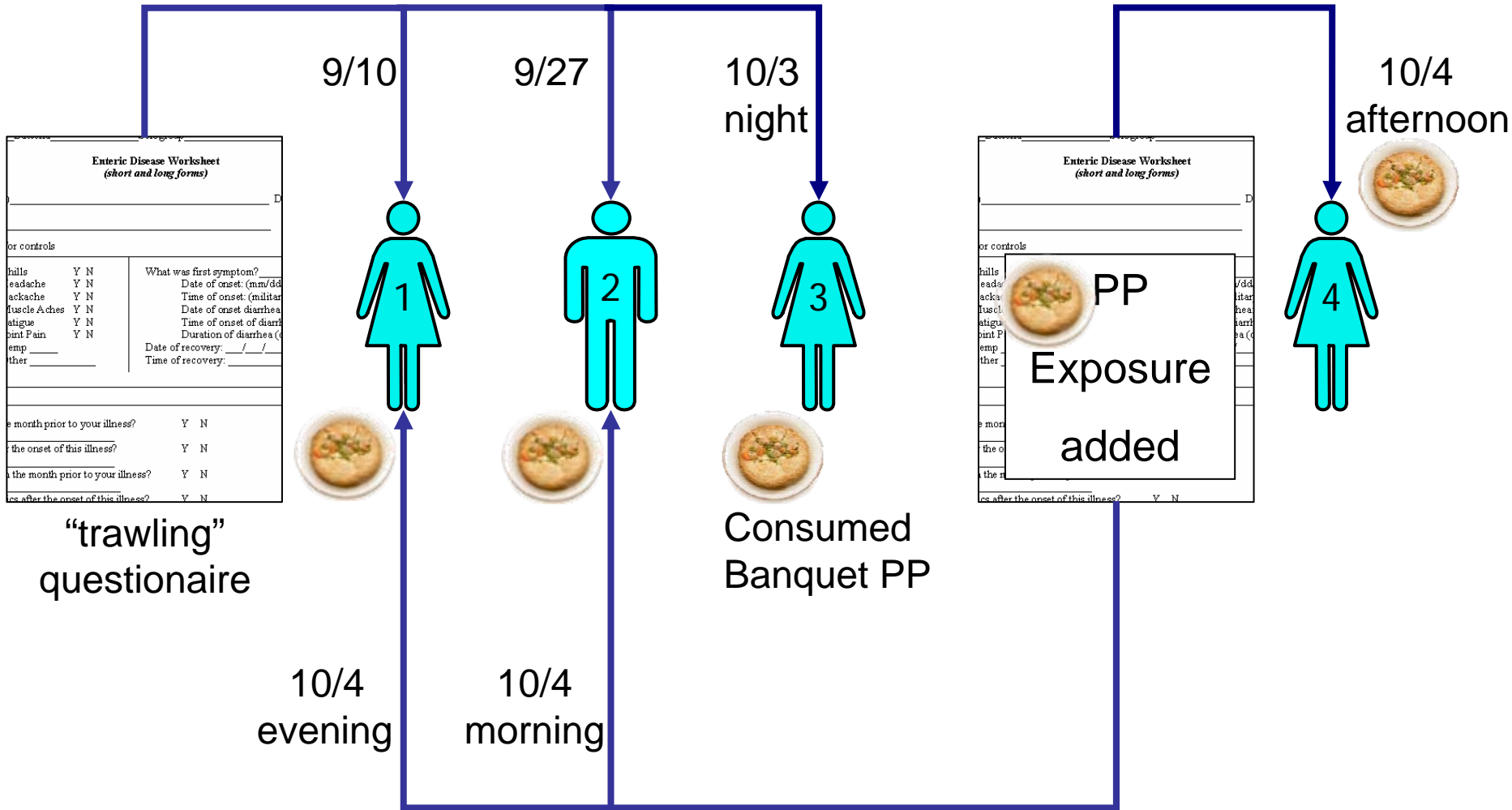


Salmonella I 4,5,12:i:- Outbreak – Banquet Pot Pies

- Nationwide cluster identified June 6, 2007
- CC started in September-chicken, breaded chicken products, and eggs

Dynamic Cluster Investigation-Pot Pies

Initial trawling questionnaire interview date

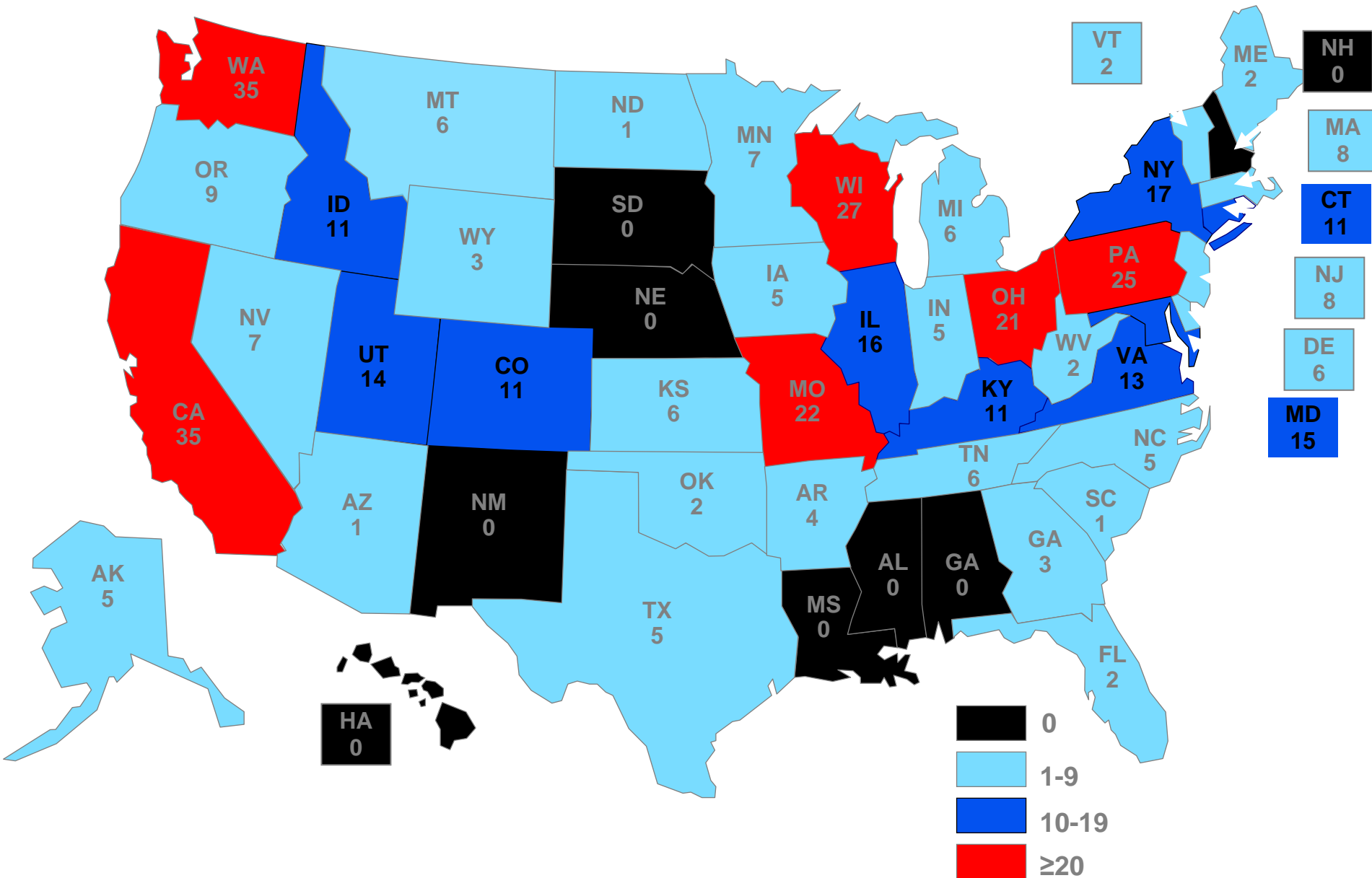


Re-interviewed cases about frozen foods and pot pies

Salmonella I 4,5,12:i:- Outbreak – Banquet Pot Pies

- October 4, 4 PM – 3 pot pie eaters, email CDC and other states
- October 4 – Other states report consumption of PP
- October 8 – ConAgra stopped pot pie line
- October 9 - USDA-FSIS and CDC posted advisories
- ConAgra recalled Banquet pot pies on Oct 11
- *Salmonella* positive pot pies in several states
- Currently 401 cases in 41 states

Distribution of cases by state, 2007 (n=401)



Laboratory/Epidemiology Partnership

- Team approach
- Funding collaboration
- Education
- Daily report
- Physical proximity



MN OBS 2000-2005

- Analyzed MN FDB enteric OBs
- Reported OBs (n=10)
- Pathogen-Specific Surveillance OBs (n=28)
 - Millions of lbs of product recalled
 - 10 multi-state outbreaks
 - Frozen steaks, ground beef, alfalfa sprouts, ice cream, frozen stuffed chicken...

Controlling Underlying Problems



Steaks tenderized by injection



Retail ice cream blended with raw egg product



Product labeling issues



Contaminated sprout seed & incubation conditions



Contaminated trim meat → hamburger

Barriers Identified for Foodborne Disease Surveillance



Barriers Identified for Foodborne Disease Surveillance

- Money
- Isolate submission
- Out of state reference labs
- Physical proximity
- Different interview strategies
- Non-centralized epidemiology
- Administrative support
- Experience

Summary

- Real-time pathogen specific surveillance enhances ability to detect FBD OBs
- Laboratory-epi communication and collaboration vital