

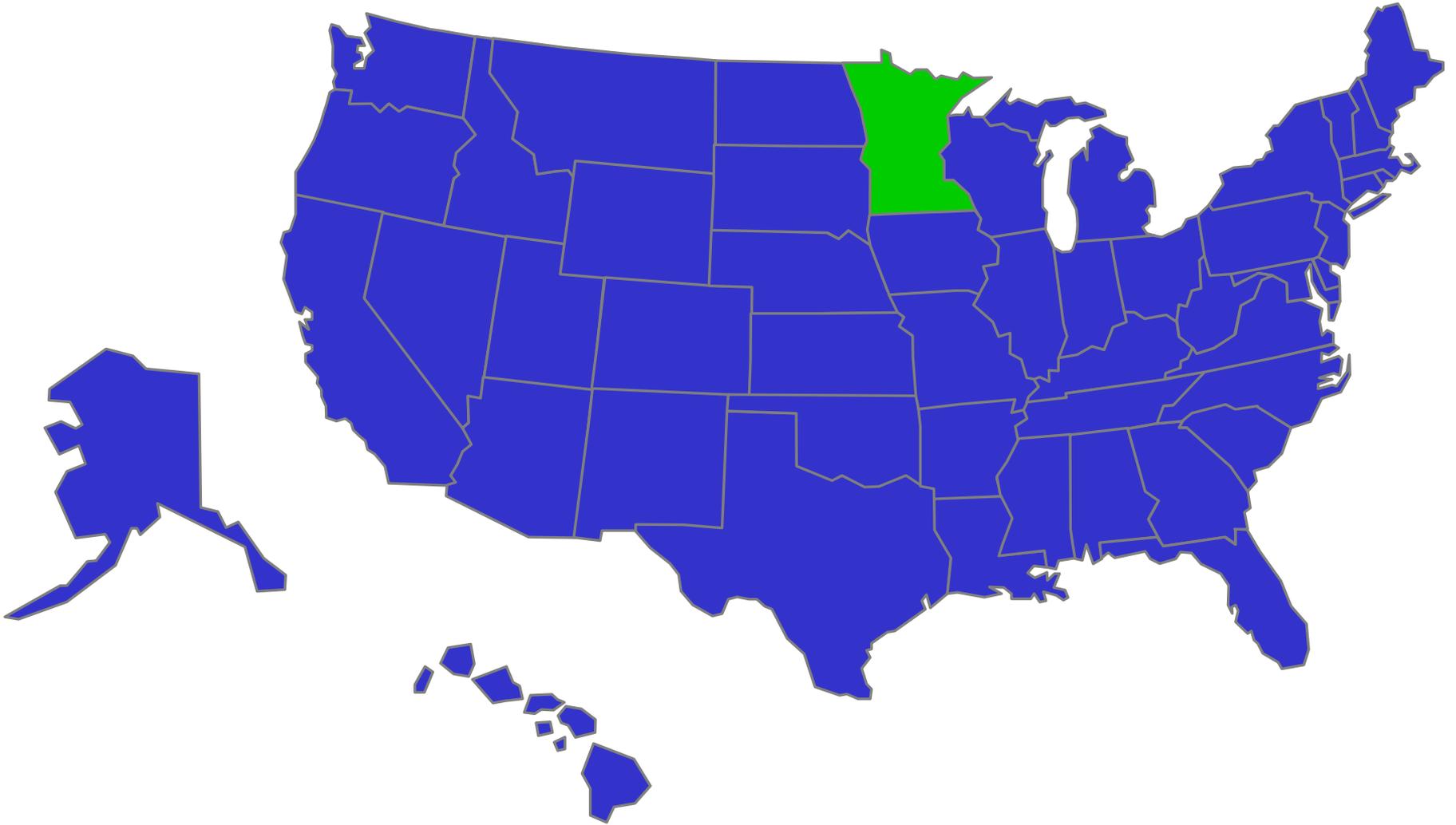


Multistate Listeriosis Outbreak Associated with Soft Cheese, The Power of Specific Exposure Ascertainment

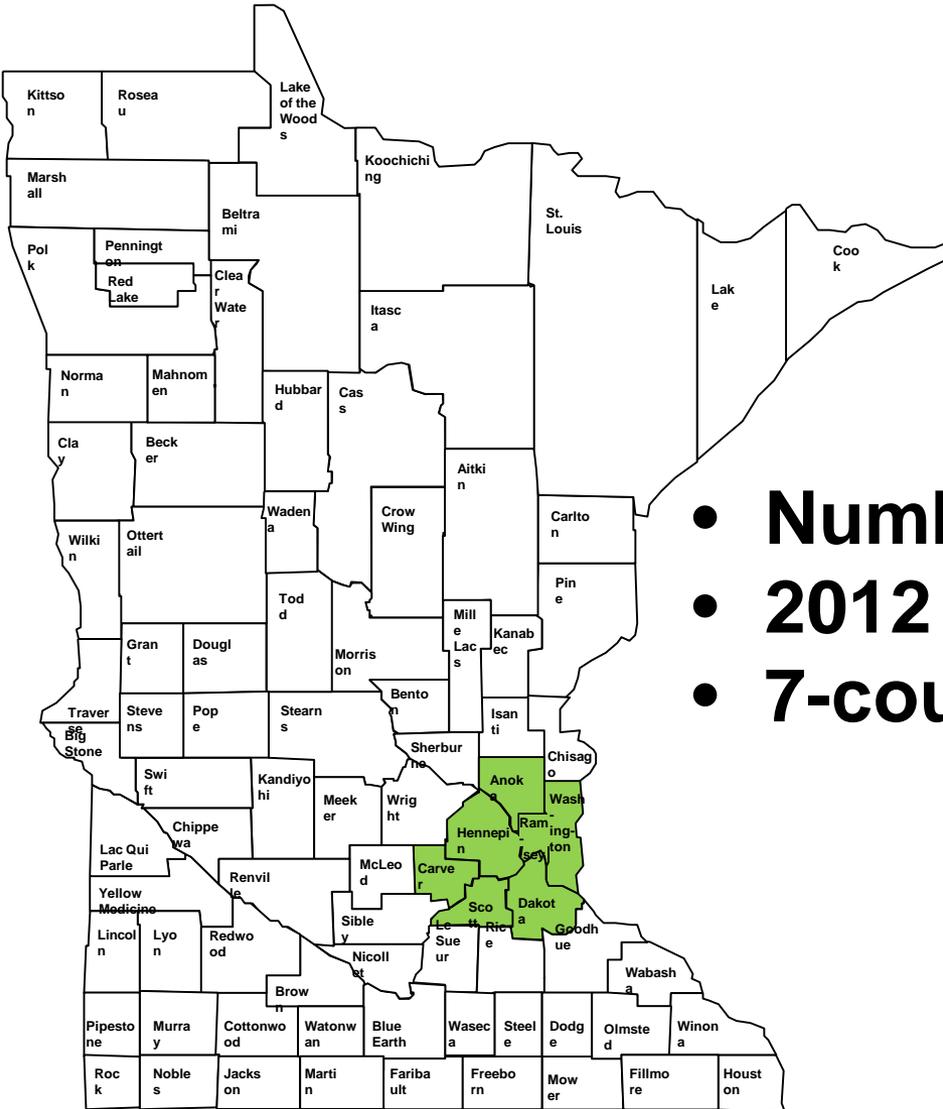


**Carlota Medus, PhD, MPH
Foodborne Diseases Unit
Minnesota Department of Health**

Minnesota At A Glance



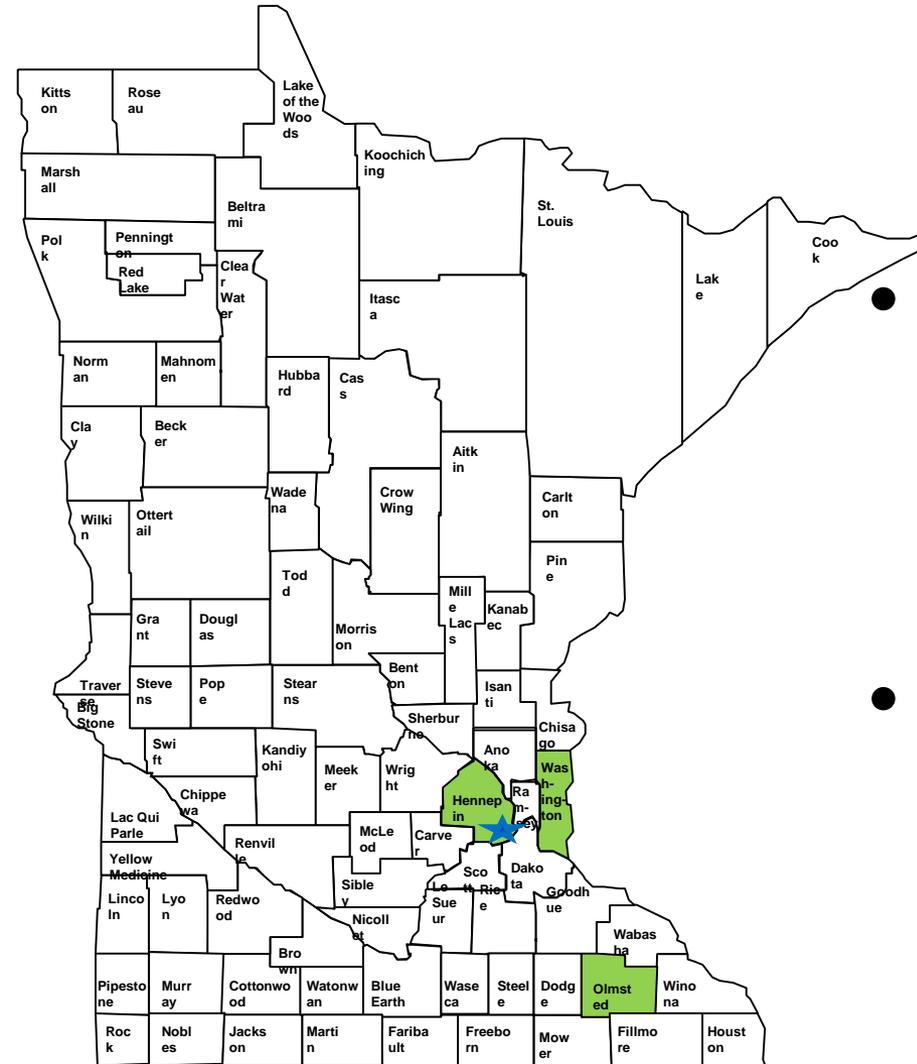
Minnesota At A Glance



- **Number of Counties: 87**
- **2012 Pop.: 5.4 million**
- **7-county metro-area: 2.9 million**



Minnesota Organization: Foodborne Disease Epidemiology



- Surveillance activities are centralized, including PFGE cluster detection/investigation
- Epi outbreak investigations are mostly centralized

**FOODBORNE AND
WATERBORNE DISEASES**

Botulism (*Clostridium botulinum*)

Campylobacteriosis (*Campylobacter* sp.)*

Cholera (*Vibrio cholerae*)*

Cryptosporidiosis (*Cryptosporidium* sp.)

Enteric *Escherichia coli* infection (*E. coli* O157:H7 and other pathogenic *E. coli* from gastrointestinal infections)*

Giardiasis (*Giardia lamblia*)

Hemolytic uremic syndrome

Listeriosis (*Listeria monocytogenes*)*

Salmonellosis, including typhoid (*Salmonella* sp.)*

Shigellosis (*Shigella* sp.)*

Toxoplasmosis

Yersiniosis (*Yersinia* sp.)*

***Submit clinical specimens to the
Minnesota Department of Health**

Minnesota Approach to Investigation of PFGE Clusters: Dynamic Cluster Investigation Model



**FOODBORNE AND
WATERBORNE DISEASES**

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Toxoplasmosis

Yersiniosis (*Yersinia* sp.)*

***Submit clinical specimens to the
Minnesota Department of Health**

Routine Follow-up of Reported Cases

0) Source of specimen: CEREBROSPINAL FLUID Onset Date 1/1/13

1) Isolated Bacteria LISTERIA MONOCYTOGENES subtype: _____

2) If specimen collection date is not available, date received in laboratory (mo/day/yr): 06/13/2013

A. Hospital Follow-up:

13) Patient status at the time of specimen collection: Hospitalized Outpatient Unknown

emergency temp: post

was working in barn, lots of molded corn dead in mid

14) If outpatient, was the patient subsequent...

15) If patient was hospitalized (that is, if answer to 13) is "Hospitalized", provide the following information:

Hospital name: SUNFORD

Patient ID number: 3426103

15a) Transferred to another hospital?

15b) Transfer hospital name: _____

16) Outcome: Alive Dead

17) Treated with antibiotics: Yes No

B. Health Department Follow-up: If isolate forwarded to state laboratory, provide the following information:

18) State lab isolate ID number: _____

19) Case found during audit? Yes No

20) Case in the case-control study? Yes No

19a) If no, reason not in case-control study: _____

Listeria Case Form Patient State Laboratory ID No. C2013011015

CASE-PATIENT INTERVIEW

Date of interview (mm/dd/yyyy): 6/19/13 Initials of interviewer: _____

Interviewee: Case-patient Surrogate Unknown

If surrogate, relationship to patient: Parent Child Sibling Spouse Other, Specify _____

When did your illness begin? (Onset of illness) (mm/dd/yyyy): 6/5/13 Not applicable (e.g. prodromal symptoms only)

During the 4 weeks before your illness (delivery date), were you admitted to a hospital (overnight)?

During the 4 weeks before your illness (delivery date), were you a resident in a nursing home or other long term care facility?

If yes, Date of admission (mm/dd/yyyy) 1/1/13 or Still hospitalized or residing in facility

Date of discharge (mm/dd/yyyy) 1/1/13

During the 4 weeks before your illness (delivery date), did you travel to a state outside your state of residence?

21) Is case report complete? Yes No Unknown

21a) If yes, date case report completed (mo/day/yr): 6/19/13 21b) Person completing case report (initials): _____

Source of specimen: BLOOD Onset Date _____

Isolated Bacteria LISTERIA MONOCYTOGENES subtype: _____

If specimen collection date is not available, date received in laboratory (mo/day/yr): 06/13/2013

Routine Follow-up of Reported Cases

10) Source of specimen: BLOOD Onset Date 06/11/13

11) Isolated Bacteria LISTERIA MONOCYTOGENES subtype: LS88LAP177
12) If specimen collection date is not available, date received in laboratory (mo./day/yr): 06/20/2013

A. Hospital Follow-up:
13) Patient status at the time of specimen collection: Hospitalized Outpatient Unknown

14) If o
15) If p

Listeria Case Form Patient State Laboratory ID No. C201301498

CASE-PATIENT INTERVIEW	
Date of interview(mm/dd/yyyy): <u>6/20/13</u>	Initials of interviewer: <u>BSV</u>
Interviewee: <input type="checkbox"/> Case-patient <input checked="" type="checkbox"/> Surrogate <input type="checkbox"/> Unknown	
If surrogate, relationship to patient. <input type="checkbox"/> Parent <input type="checkbox"/> Child <input type="checkbox"/> Sibling <input checked="" type="checkbox"/> Spouse <input type="checkbox"/> Other, Specify _____	
When did your illness begin? (Onset of illness) (mm/dd/yyyy): <u>6/11/13</u> <input type="checkbox"/> Not applicable (e.g. pregnant woman w	
During the 4 weeks before your illness (delivery date), were you admitted to a hospital (≥overnight)? <input type="checkbox"/> Yes	
During the 4 weeks before your illness (delivery date), were you a resident in a nursing home or other long term care facility? <input type="checkbox"/> Yes	

16) O
17) Tr

B. Heal
18) Stat

19) Case found during audit? Yes No Unknown

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19a) If no, reason not in case-control study _____

21) Is case report complete? Yes No Unknown

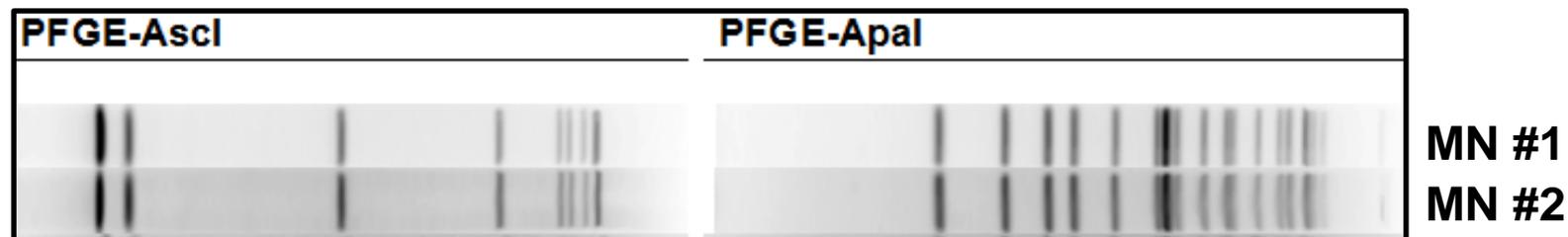
21a) If yes, date case report completed (mo./day/yr): 6/25/13 Person completing case report (initials): TAW

21c) Person entering case report (initials): TAW

Outbreak Detection

June 27, 2013

- **Minnesota Department of Health (MDH)**
 - **Invasive listeriosis**
 - **Two Minnesota residents**
 - **Isolates indistinguishable by two-enzyme pulsed-field gel electrophoresis (PFGE)**





Invasive Listeriosis

- **Populations at increased risk**
 - **Pregnant women**
 - **Older adults**
 - **Immunocompromised persons**
- **Manifestations include meningitis, septicemia, fetal loss**
- **Incubation period: 3–70 days**
- **Case fatality rate: 20–30%**
- **In MN, median number of cases: 7 per year (range, 3 to 19); 12 cases in 2013**



Outbreak Investigation

MDH
reports
cluster



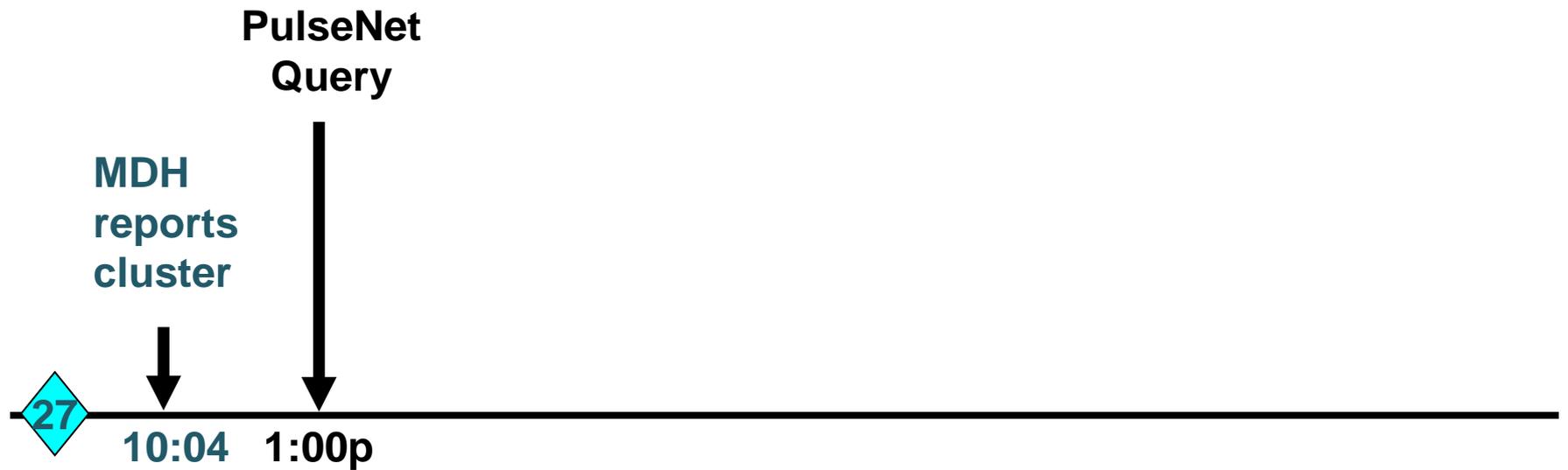
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10:04

June 2013

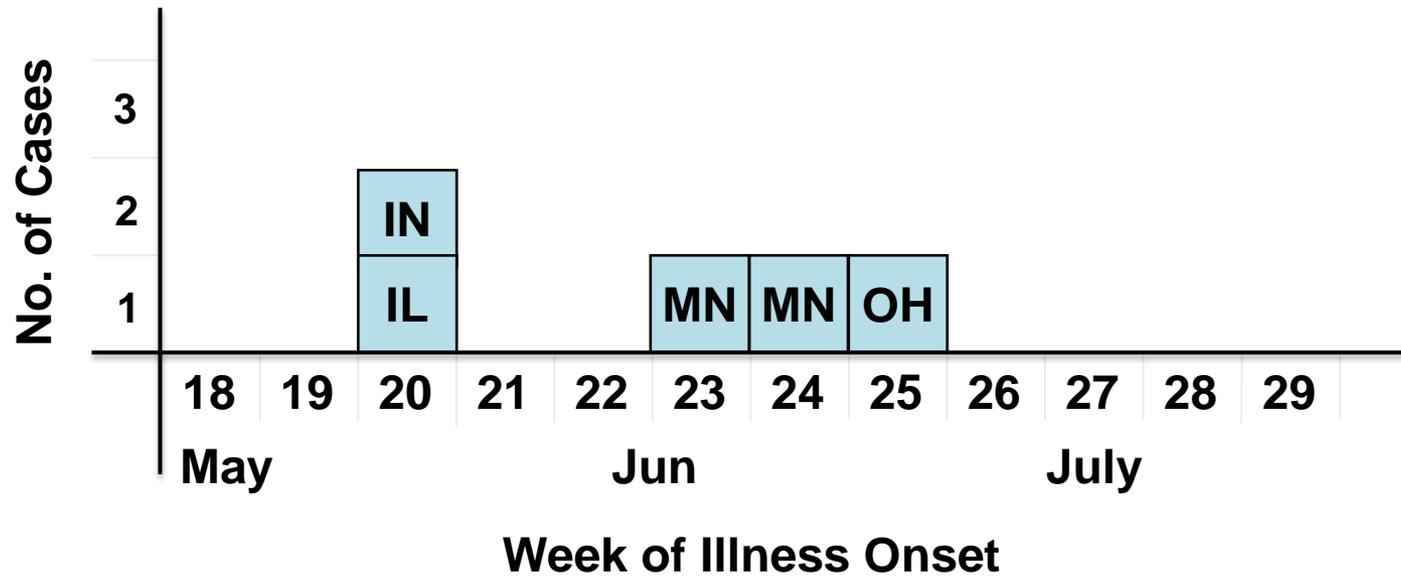


Outbreak Investigation



June 2013

Cases by Week of Illness Onset (N=5)



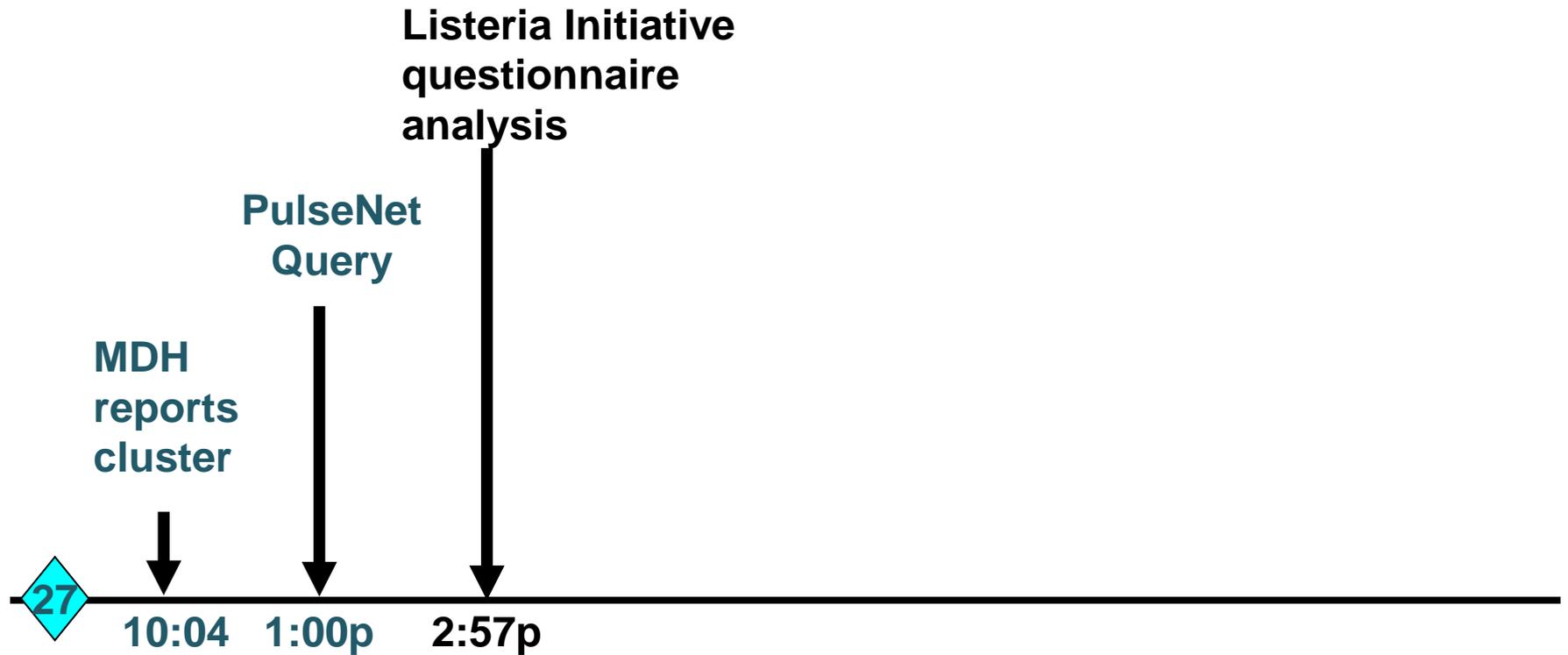


Case Characteristics (N=5)

Median age, years (range)	55 (31–67)
Female	4 (80%)
Pregnant, miscarriage	1
Hospitalized	5
Died	1 (Stage IV lung cancer)



Outbreak Investigation



June 2013



Analysis of *Listeria* Initiative Questionnaires

State	Food Item	Point of Purchase
IL	Brie, cottage cheese, mozzarella	Grocery store
IN	Havarti, Brie, blue cheese	Grocery store, IN restaurant
MN 1	blue cheese	Grocery store
MN 2	Brie, goat cheese	Grocery store, ND restaurant
OH	Feta, queso fresco, cottage cheese, mozzarella, cream cheese, goat cheese	Grocery store

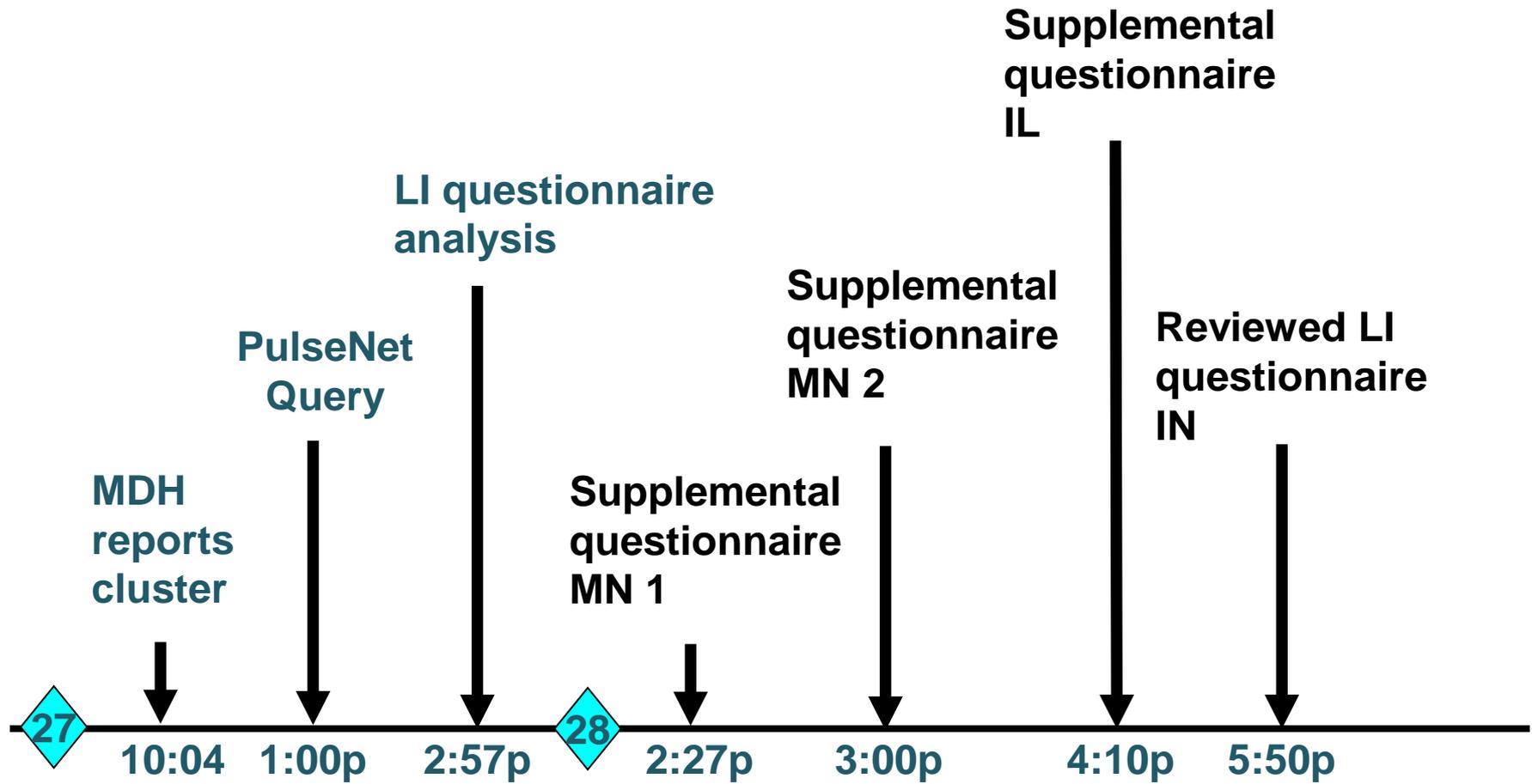


Case-Case Analysis of *Listeria* Initiative Questionnaires

- Cases associated with this cluster compared to sporadic cases reported to the *Listeria* Initiative from 2004 to 2013
 - Association with soft cheese consumption
OR=10.8 (1.8 - ∞)
- All patients were re-interviewed using a supplemental cheese questionnaire



Outbreak Investigation



June 2013



Cheese Exposure Ascertainment

State	Retail Location	Type of Cheese
MN 1	MN grocer A, location X	Blue Cheese
MN 2	Cheese plate served at ND restaurant	Manchester, Gruyere, cheddar cheese, blue cheese, Company A Les Frères

Cheese Exposure Ascertainment Restaurant Cheese Tray

- **Permission from ND Department of Health**
- **Called ND restaurant**
 - **List of cheeses served**
 - **Rotation of cheeses (how long each cheese lasted at the restaurant)**
 - **Invoices for cheeses on the cheese tray**





Cheese Exposure Ascertainment

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Cheese Exposure Ascertainment

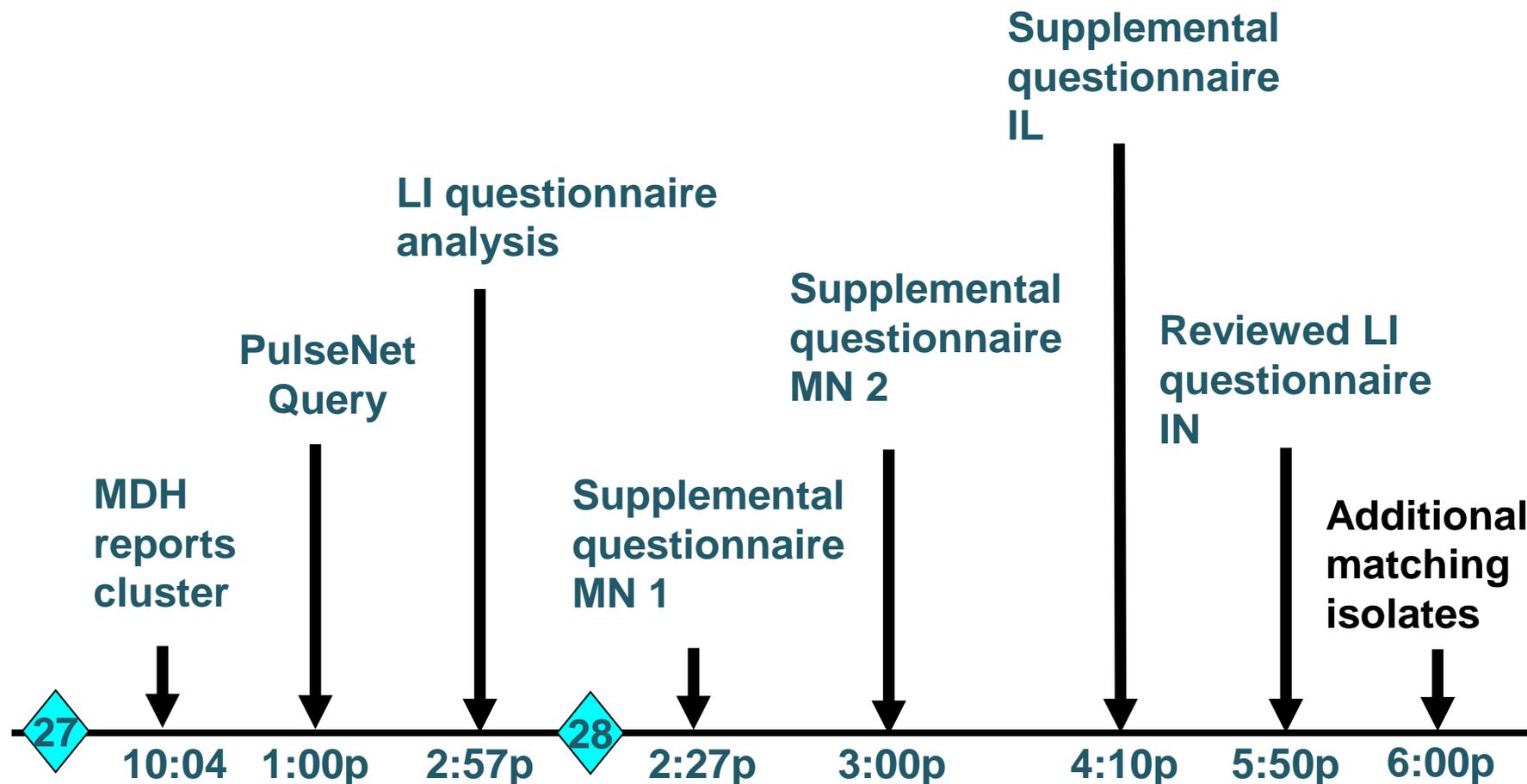
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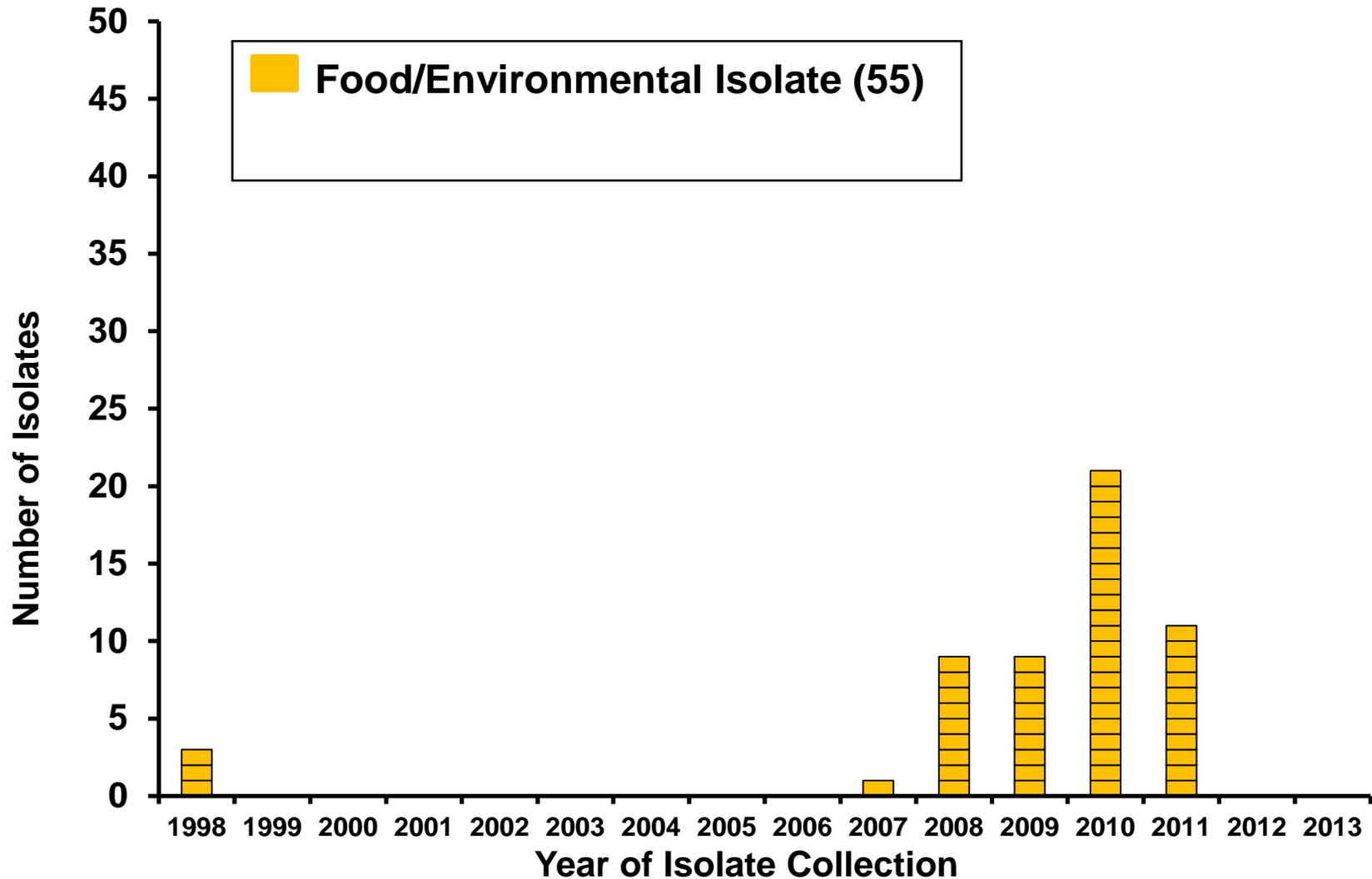
Outbreak Investigation



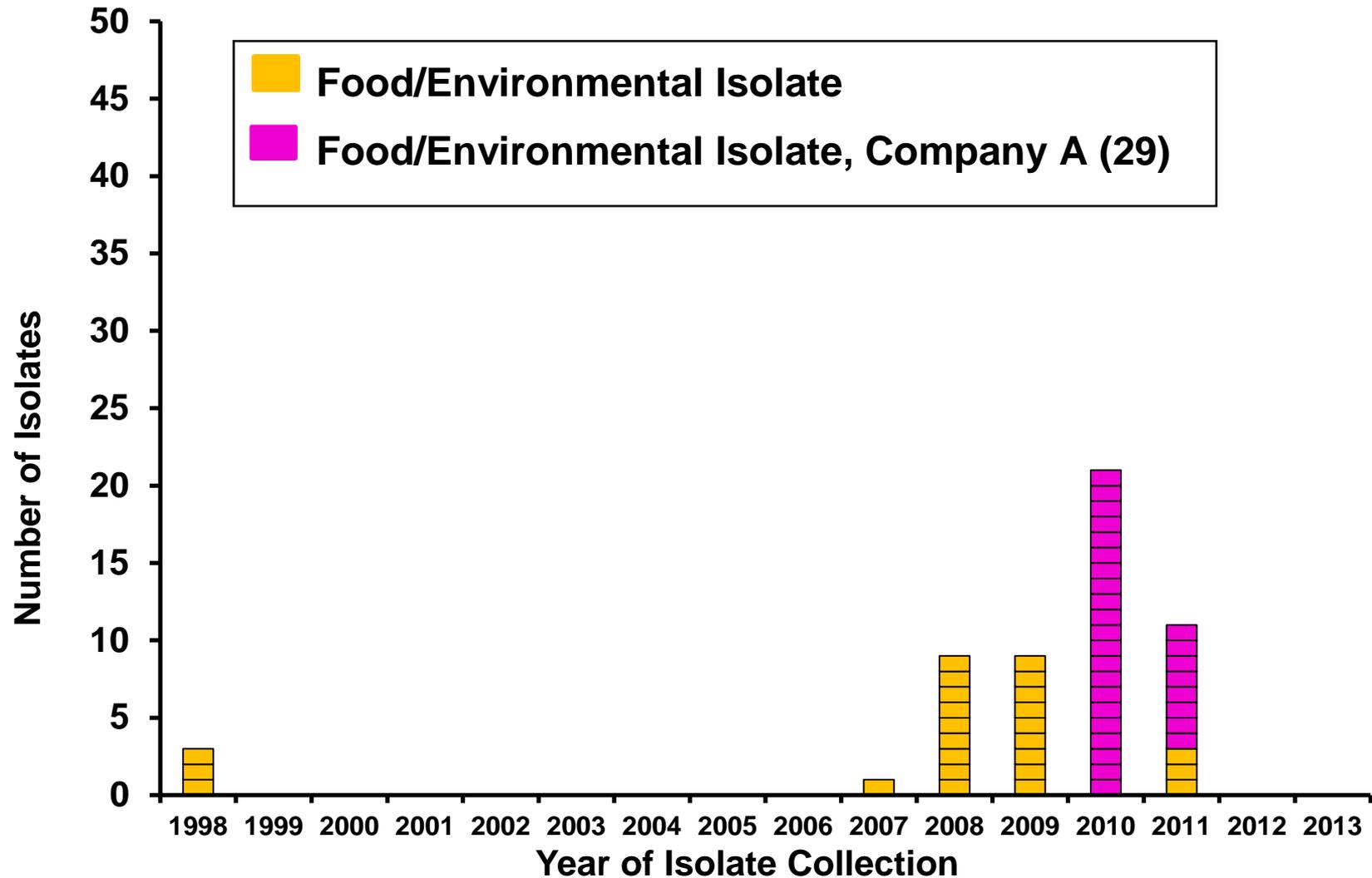
June 2013



L. mono Outbreak PFGE Pattern: Non-Human Isolates — U.S., 1998-2013



L. mono Outbreak PFGE Pattern: Non-Human Isolates — U.S., 1998-2013

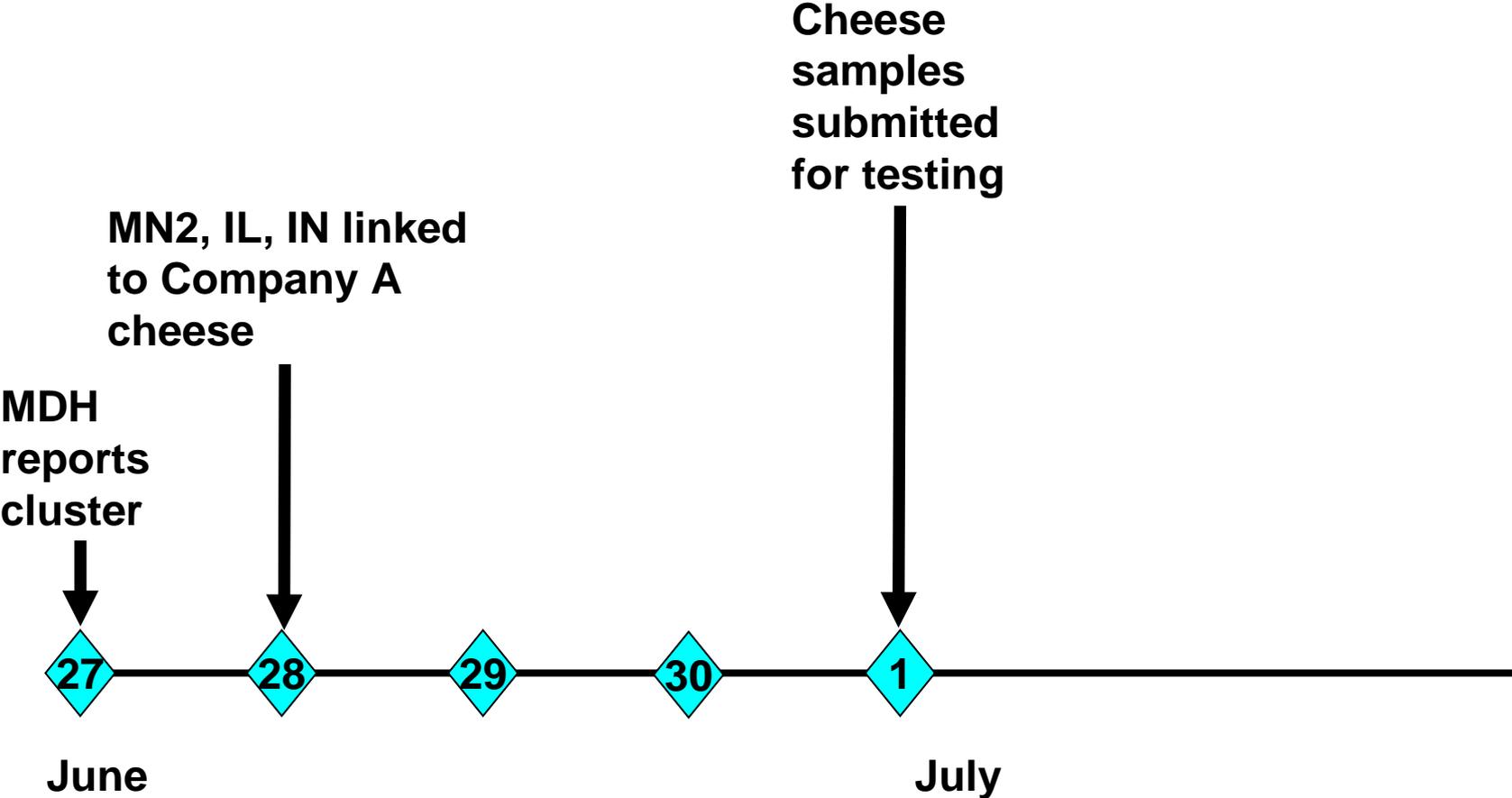


Company A

- Family owned dairy farm and creamery
- Located in Wisconsin
- Produces 5 varieties of cheese made from pasteurized milk:
 - Petit Frère
 - Petit Frère with Truffles
 - Les Frères
 - Mozzarella
 - Mascarpone

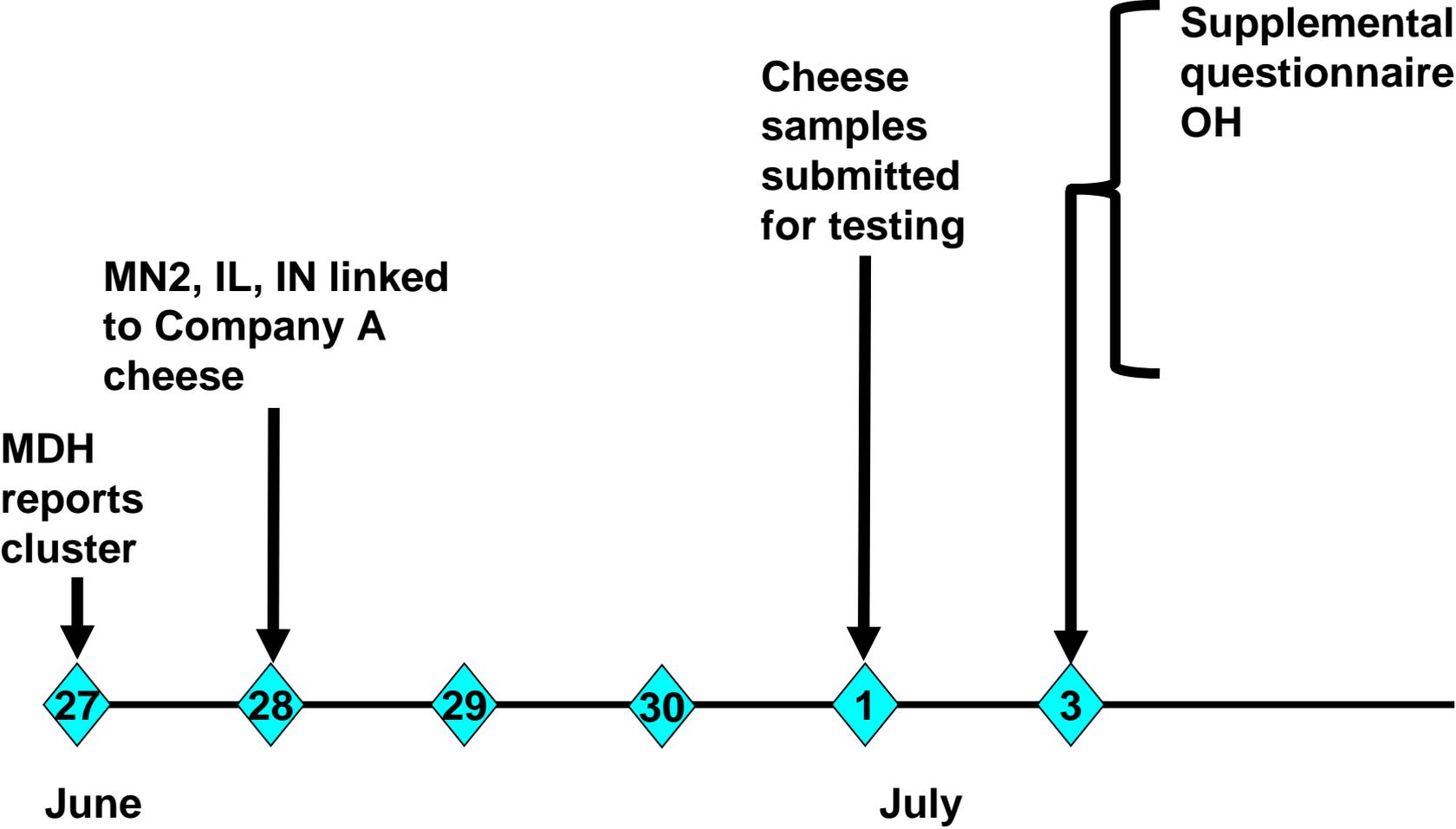


Outbreak Investigation





Outbreak Investigation

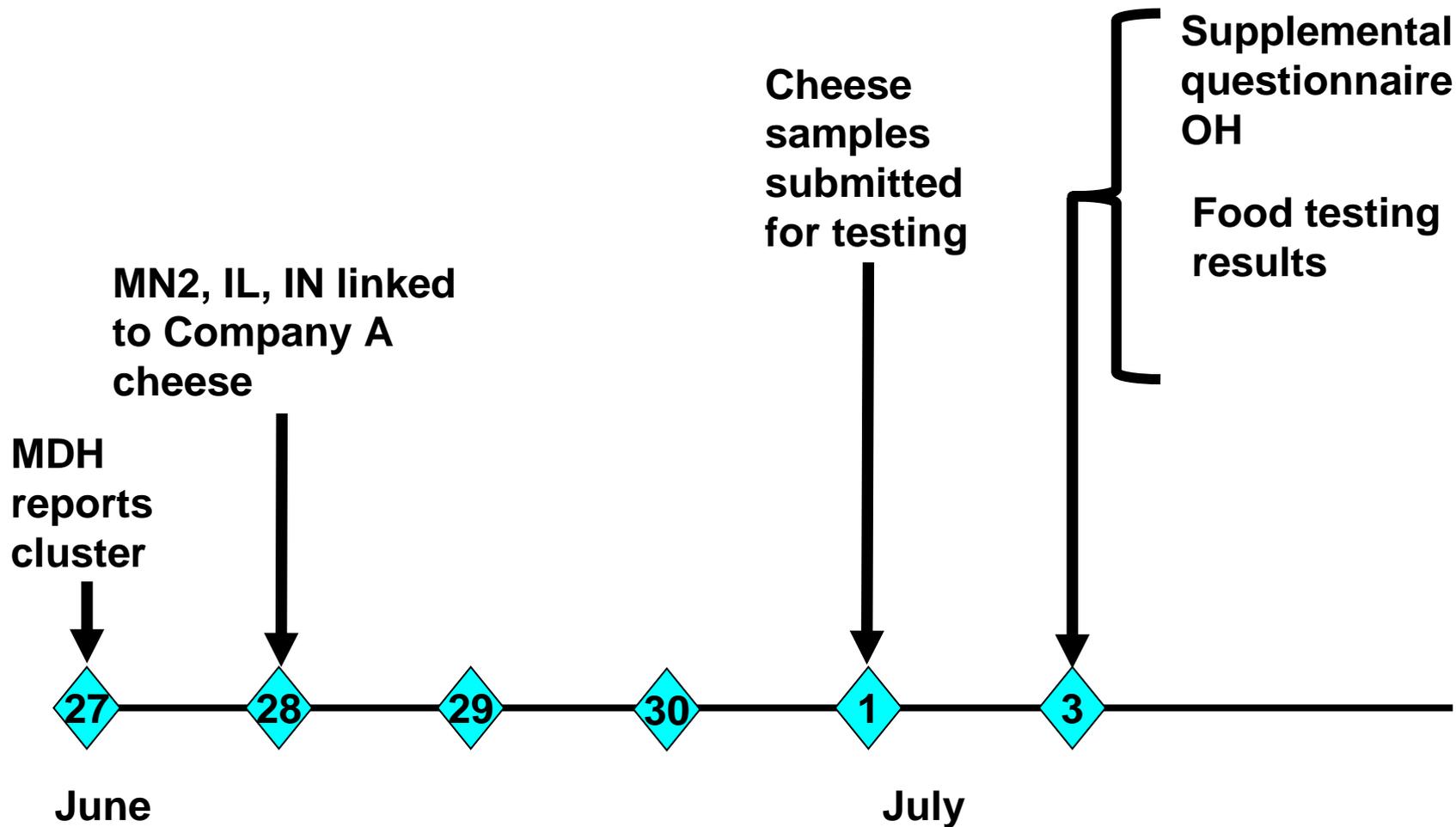




Supplemental Cheese Questionnaire

State	Retail Location	Type of Cheese
MN 1	MN grocer A, location X	Blue Cheese
MN 2	Cheese plate served at ND restaurant	Manchester, Gruyere, cheddar cheese, blue cheese, Company A Les Frères
IL	Chain grocer	Company A Les Frères
IN	Cheese plate served at IN restaurant	Stilton, Taleggio, goat cheese, Manchego, Triple Cream, Company A Les Frères
OH	Cheese plate served in OH restaurant	Company A Les Frères

Outbreak Investigation



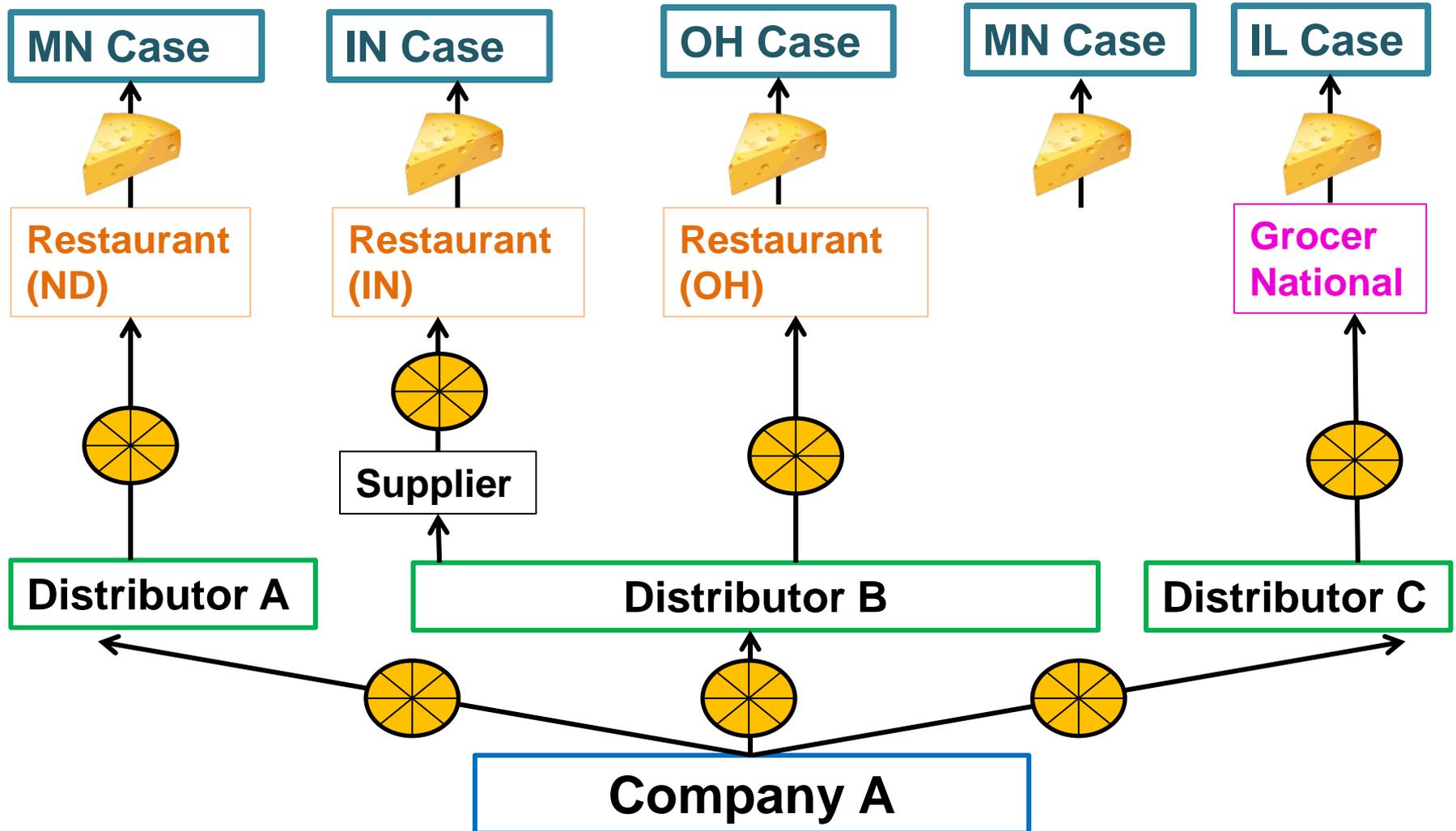


Results Cheese Testing (Enzyme-linked Immunoassay)

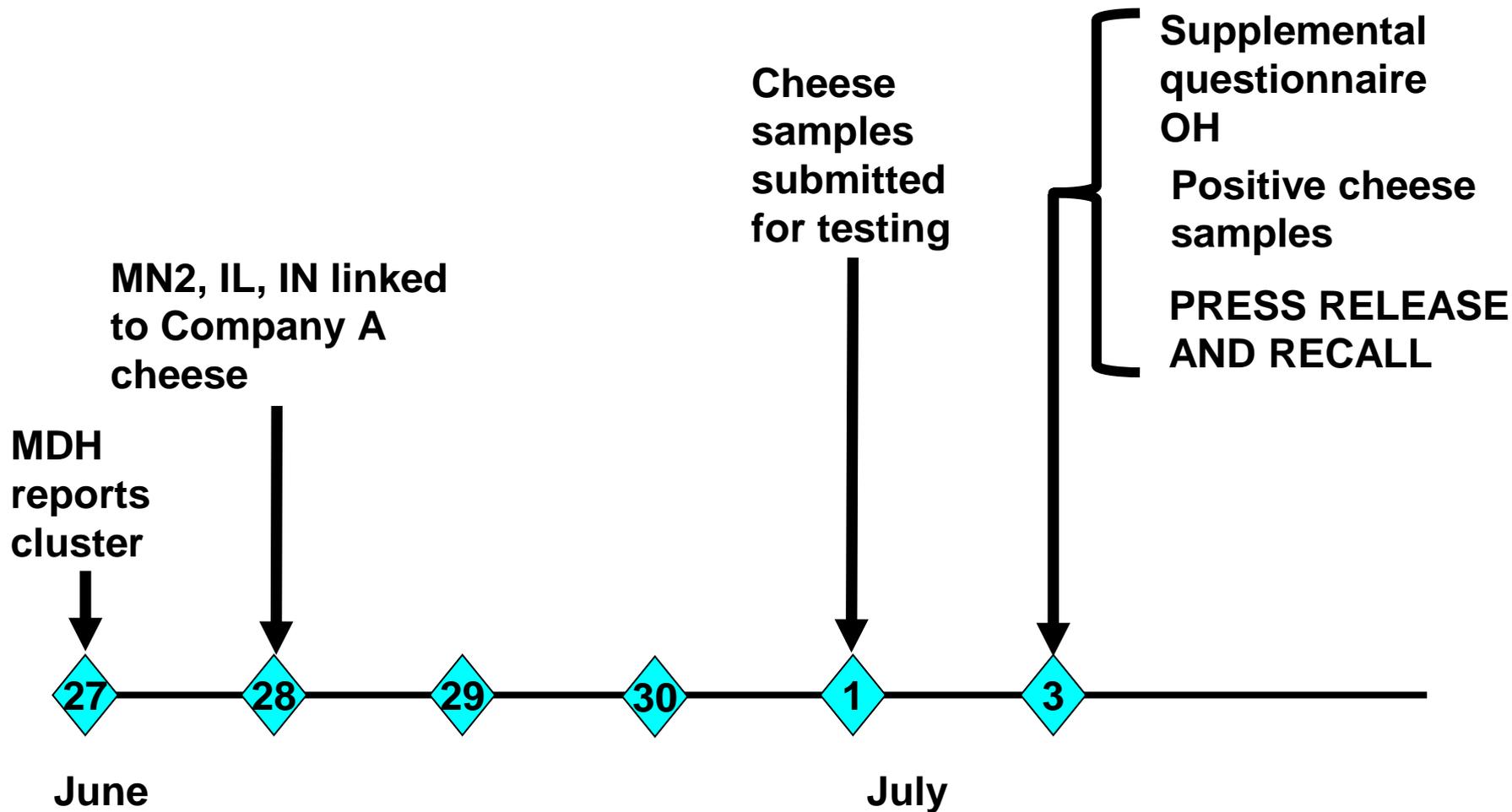
July 3

- **14 retail cheese samples submitted for testing**
- **3 samples were positive for *L. monocytogenes***
 - **1 wedge of Petite Frère with Truffles, Grocer A location X**
 - **2 wedges of Les Frères, Grocer A location Y**

Product Distribution Chain



Outbreak Investigation





Press Release and Recall

July 3

- MDH/MDA issued a joint press release warning consumers not to eat Company A Les Frères, Petit Frère, Petit Frère with Truffles
- Company A issued a voluntary nationwide recall of Les Frères, Petit Frère, Petit Frère with Truffles
- Inspection of the cheese-making facility revealed substantial sanitary deficiencies
 - Led to *Listeria* contamination during the cheese-making process



“I Think We Bought the Petit Frère with Truffles”

July 6

- **MDH received a call from the proxy of the deceased MN case**
 - **“I think we bought the Petit Frère with Truffles at the same time we bought the blue cheese”**
 - **Purchased cheese with credit card**
- **Contacted MN Grocer A**
 - **Credit card transaction numbers**
 - **Date of transactions**
 - **Amount of transactions**

Credit Card Statement

Transactions

Payments and Credits

Trans Date	Post Date	Card Reference Number	Description	Amount
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Transactions

Trans Date	Post Date	Card Reference Number	Description	Amount
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	\$100.00
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	\$75.50
03/05	[REDACTED]	5542950EHRP1N5BY8M	[REDACTED]	\$8.60
03/11	[REDACTED]	7541823EN0618ZAJXM	[REDACTED]	\$24.00
03/12	[REDACTED]	5541734ERTAXGHAVYM	[REDACTED]	\$29.00
		14/03/12	[REDACTED]	
		1 DL X	[REDACTED]	
03/12	[REDACTED]	5541734ERTAXGHJ1YM	[REDACTED]	\$310.00
		14/05/02	[REDACTED]	
		1 DL V	[REDACTED]	
		2 DL T	[REDACTED]	
03/22	[REDACTED]	5548077F161AMH6QGM	[REDACTED]	\$382.75
03/24	[REDACTED]	5548077F30374WWYDM	[REDACTED]	\$77.62
03/26	[REDACTED]	7541823F706B058EAM	[REDACTED]	\$38.74
03/29	[REDACTED]	0541019F92LR7T8PJM	[REDACTED]	\$139.03
03/29	[REDACTED]	5550036F960YNEB8LM	[REDACTED]	\$28.59
03/29	[REDACTED]	5531558F9MH8Q6J08M	[REDACTED]	\$35.76
03/30	[REDACTED]	8534914FAWGNR886M	[REDACTED]	\$55.96
04/01	[REDACTED]	2524780FB0002FRQWM	[REDACTED]	\$75.50

Reprint of Original Receipt — MN Grocer A

*** Electronic Journal - Reprint of Original Ticket ***

BAKERY FS

BAGUETTE-DEMI \$1.25 F
██████████

GROCERY

TAYLORS TEA \$4.79 F
██████████

IMPORTED CHEESE

CASHEL BLUE
0.40 lb @ \$22.99/lb \$9.20 F
LES FRERES
0.39 lb @ \$15.99/lb \$6.24 F

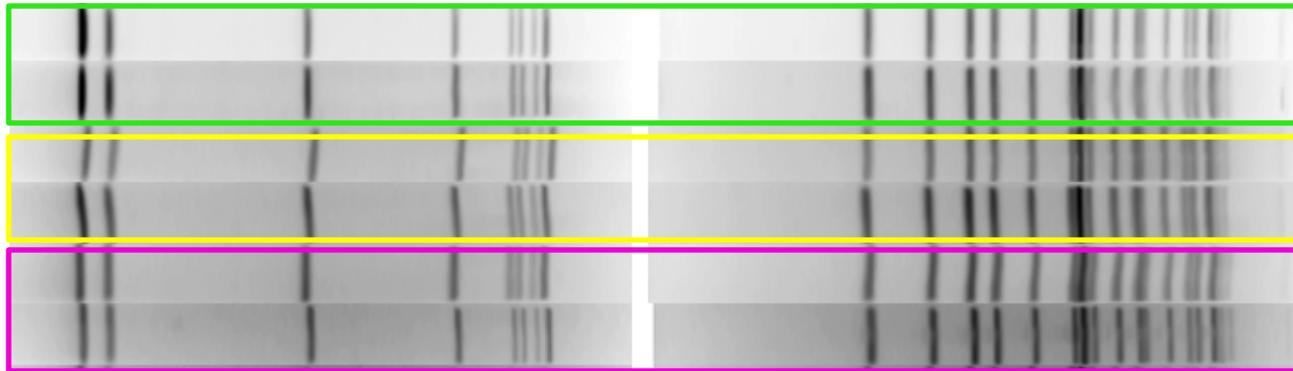


Supplemental Cheese Questionnaire

State	Retail Location	Type of Cheese
MN 1	MN grocer A, location X	Blue Cheese, Company A Les Frères
MN 2	Cheese plate served at ND restaurant	Manchester, Gruyere, cheddar cheese, blue cheese, Company A Les Frères
IL	Chain grocer	Company A Les Frères
IN	Cheese plate served at IN restaurant	Stilton, Taleggio, goat cheese, Manchego, Triple Cream, Company A Les Frères
OH	Cheese plate served in OH restaurant	Company A Les Frères



July 7, PFGE Testing Results — Les Frères



MN Patient 1
MN Patient 2

**Petit Frère with
Truffles**

Les Frères



Conclusion and Discussion

- **Multistate outbreak of listeriosis linked to pasteurized soft cheeses that were likely contaminated during or after the cheese-making process**
 - **Pasteurization eliminates *Listeria* in milk**
 - ***Listeria* contamination can occur after pasteurization**
- **Using credit/debit card information to retrieve itemized receipts from grocers can be a useful tool in the absence of shopper loyalty cards**

Conclusion and Discussion

Thorough exposure ascertainment was key to solving this outbreak quickly, and to actually solving it!

- Interviewing cases and case's proxy promptly**
- Calling cases back for more information**
- Aggressively pursuing leads on exposures from other sources**
 - Cheese plate details from restaurant**
 - Store receipt from credit card information**



Conclusion and Discussion

- **Solved with very few cases**
- **Did not wait for CDC to determine if the number of cases was “above baseline”**
- **Following leads even when each jurisdiction only had 1 or 2 cases**
- **Did not rely on cases’ memory alone**
- **Team work**



Morbidity and Mortality Weekly Report (MMWR)

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Notes from the Field: Multistate Outbreak of Listeriosis Linked to Soft-Ripened Cheese — United States, 2013

*Weekly***April 4, 2014 / 63(13);294-295**

Mary J. Choi, MD^{1,2}, Kelly A. Jackson, MPH³, Carlota Medus, PhD¹, Jennifer Beal, MPH⁴, Carrie E. Rigdon, PhD⁵, Tami C. Cloyd, DVM⁴, Matthew J. Forstner⁵, Jill Ball⁶, Stacy Bosch, DVM³, Lyndsay Bottichio, MPH⁷, Venessa Cantu, MPH⁸, David C. Melka⁹, Wilete Ishow¹⁰, Sarah Slette, MS¹¹, Kari Irvin, MS⁴, Matthew Wise, PhD³, Cheryl Tarr, PhD³, Barbara Mahon, MD³, Kirk E. Smith, DVM, PhD¹, Benjamin J. Silk, PhD³ (Author affiliations at end of text)

On June 27, 2013, the Minnesota Department of Health notified CDC of two patients with invasive *Listeria monocytogenes* infections (listeriosis) whose clinical isolates had indistinguishable pulsed-field gel electrophoresis (PFGE) patterns. A query of PulseNet, the national molecular subtyping network for foodborne disease surveillance, identified clinical and environmental isolates from other states. On June 28, CDC learned from the Food and Drug Administration's Coordinated Outbreak Response and Evaluation Network that environmental isolates indistinguishable from those of the two patients had been collected from Crave Brothers Farmstead Cheese during 2010–2011. An outbreak-related case was defined as isolation of *L. monocytogenes* with the outbreak PFGE pattern from an anatomic site that is normally sterile (e.g., blood or cerebrospinal fluid), or from a product of conception, with an isolate upload date during May 20–June 28, 2013. As of June 28, five cases were identified in four states (Minnesota, two cases; Illinois, Indiana, and Ohio, one each). Median age of the five patients was 58 years (range: 31–67 years). Four patients were female, including one who was pregnant at the time of infection. All five were hospitalized. One death and one miscarriage were reported.

Questions or Comments?



carlota.medus@state.mn.us