

# Multistate Outbreak of Listeriosis Associated with Imported Ricotta Salata and Evidence of Cross-Contamination of Cut and Repackaged Cheeses

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InFORM

November 21, 2013

## The index patient – July 2012

- 68 year-old patient from PA developed meningitis caused by *Listeria monocytogenes* (Lm)
- Patient had consumed 2 cheeses purchased from Grocery Chain A
  - Raw milk blue cheese
  - Pasteurized milk l'Édel de Cléron



## The index patient – July 2012

- Allegheny County Health Department tested leftover cheese from index patient's refrigerator
  - Pulsed-field gel electrophoresis (PFGE) was performed on all isolates



*Was one of these cheeses contaminated when it was purchased?*

## Product sampling at Grocery Chain A– July 2012

- Allegheny County Health Department performed inspection and product sampling

### Grocery Chain A in PA

- Blue cheese, negative
- L'Édel de Cléron cut from wheel, positive
- PFGE subtype 1 and 2
- PFGE subtype 2 indistinguishable using MLVA

*Was l'Édel de Cléron  
the source of  
contamination?*



# **INITIATION OF A MULTISTATE OUTBREAK INVESTIGATION**

## Multistate outbreak investigation

- Allegheny County Health Department notified CDC and other state health departments
- CDC queried PulseNet
  - Identified 5 indistinguishable clinical isolates from 5 states within 120 days
    - 4 with PFGE subtype 1 (main subtype)
      - Rare (rank 262/3240)
    - 1 with PFGE subtype 2
      - New

*Was contaminated l'Édel de Cléron cheese the source of other illnesses?  
Or another cheese(s)?  
Or another vehicle?*

## Case definition

- **Clinical isolate of Lm**
  - Normally sterile site (blood or cerebrospinal fluid)
  - Products of conception (fetal or placental tissue)
- **Isolated during March-October 2012**
- **PFGE subtype and MLVA pattern indistinguishable from outbreak strain**
  - 4 PFGE subtypes included
  - MLVA confirmed genetic relatedness of PFGE subtypes

# INITIAL EPIDEMIOLOGIC ANALYSES



## Epidemiologic investigation

- **Listeria Initiative questionnaire collected information on**
  - Food exposures (select soft cheeses)
  - Where food was purchased
- **Supplemental cheese questionnaire collected information on**
  - Additional types and brands of cheeses consumed
  - Packaging information
  - Where cheese was purchased or consumed

## Initial analysis of *Listeria* Initiative data

- **Performed case-case analysis and compared foods consumed by**
  - Outbreak-related listeriosis patients (n=10)
  - “Sporadic cases”, or listeriosis patients not known to be associated with an outbreak during 2008–2012 (n=204)
- **Calculated odds ratios (OR) and *p*-values for exposure to each food item**

## Initial analysis of *Listeria* Initiative data

Food	Outbreak-related cases (n=10)	Sporadic cases (n=204)	Odds ratio	Pvalue
Any soft cheese	90%	37%	17.3	<0.01
Other soft cheese	70%	15%	17.2	<0.01
Brie	67%	10%	5.7	0.04
Blue/Gorgonzola	56%	12%	4.9	0.09
Feta	56%	16%	8.9	0.02
Camembert	33%	2%	26.4	0.02
Goat	22%	8%	3.9	0.33
Mexican style cheese	10%	18%	0.4	0.76
Farmer's cheese	0%	1%	17.3	1.00

\* Pvalues below 0.05 are considered statistically significant

## Initial analysis of *Listeria* Initiative data

### Listeria Initiative

- 90% of cases reported “any soft cheese”
- No single cheese type or brand

*Did patients consider l'Édel de Cléron to be an “other soft cheese”?  
Or is l'Édel de Cléron NOT the source of the outbreak?*

# Initial analysis of supplemental questionnaire data

- Questionnaires completed for 9 of 10 patients
  - 3 patients consumed cheese, but packaging information was unknown
    - Goat (3)
    - Feta (2)
  - 6 patients reported consuming cheese that was cut and repackaged
    - Ricotta salata (2)
    - Blue (2)
    - Brie (2)
    - Mozzarella (1)



# Initial analysis of supplemental questionnaire data

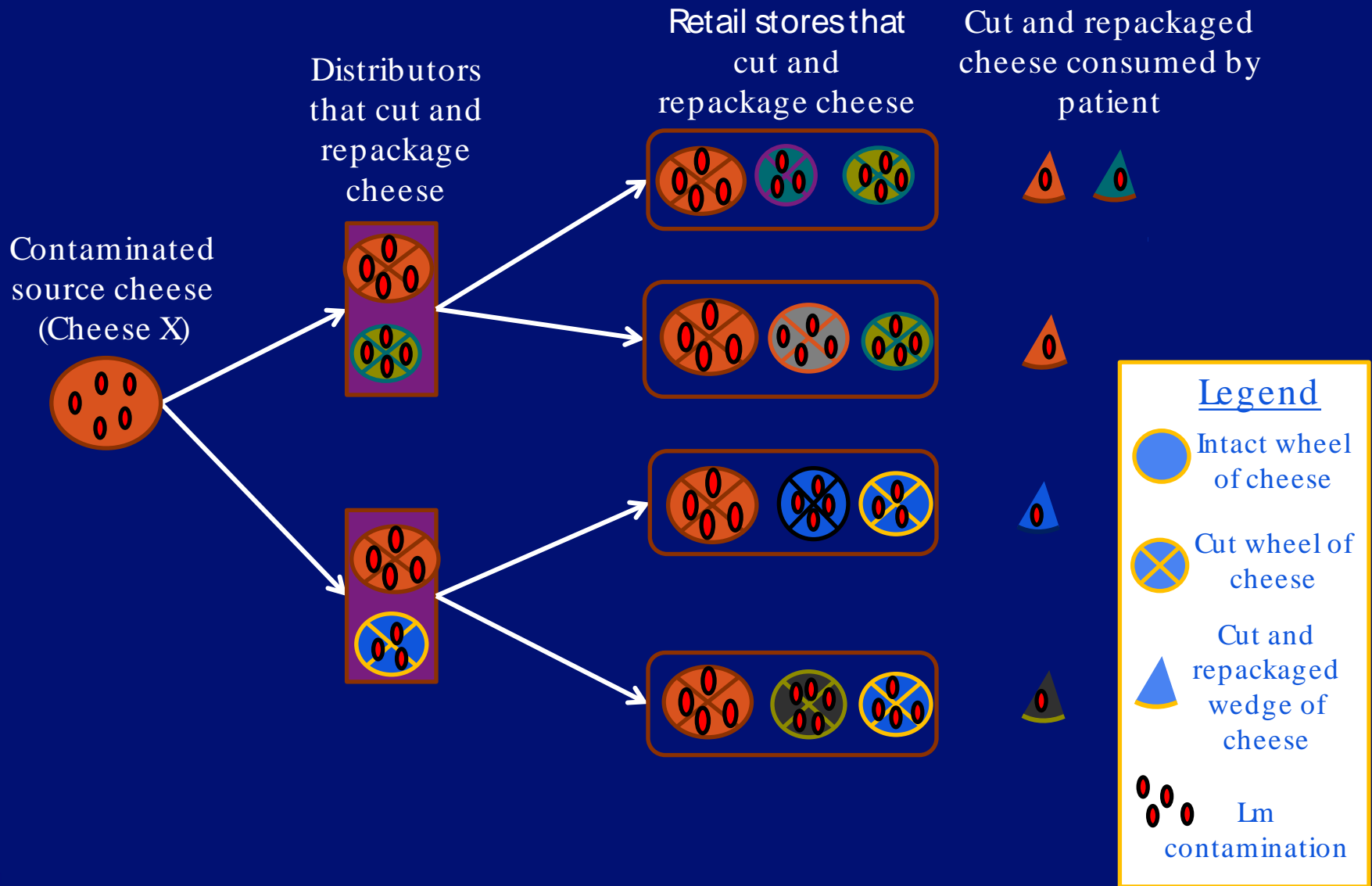
## Supplemental q'naire

- No single cheese type or brand (again!)
- No l'Édel de Cléron reported
- Cut and repackaged cheeses reported!

*What could explain these findings?*

# **HYPOTHESIS GENERATION**

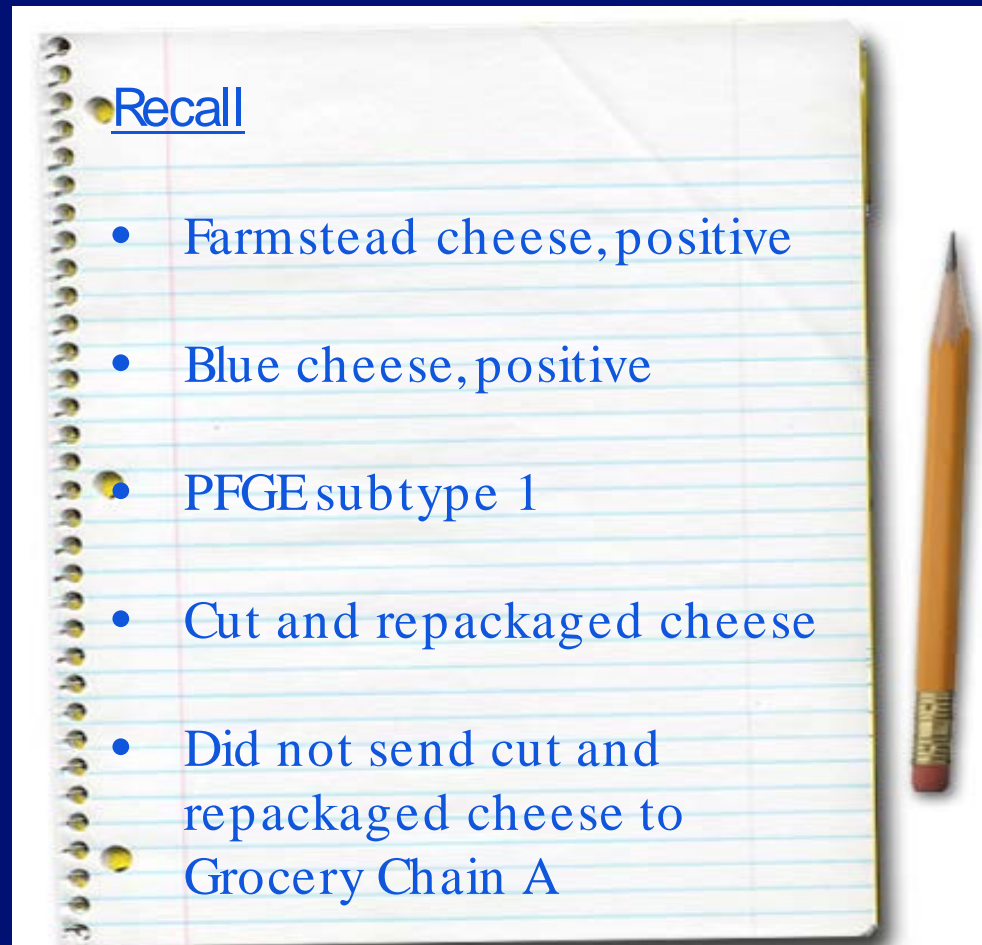
# Hypothesis: Cross-contamination of many cheeses by Cheese X



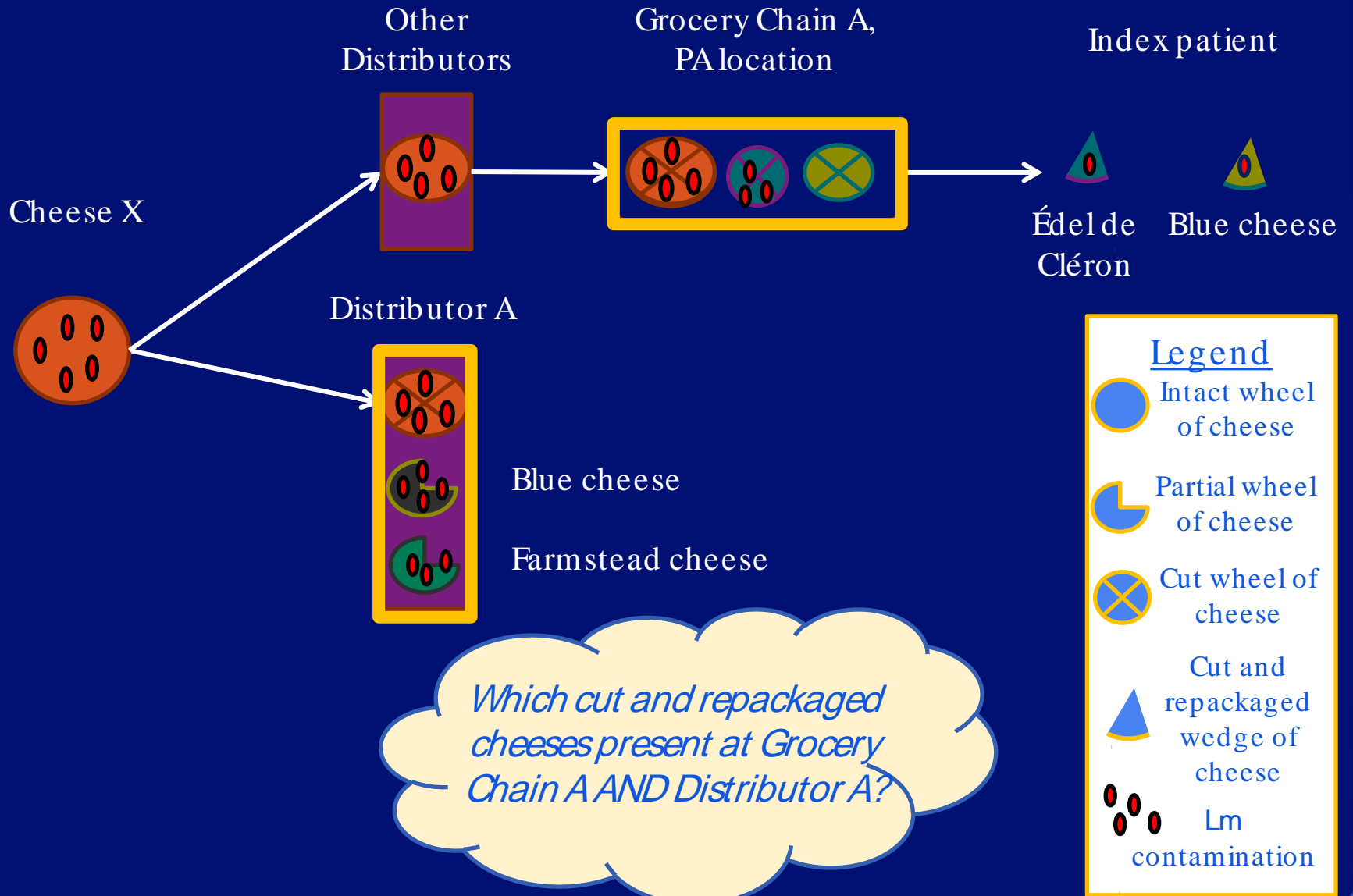


## And then...a related recall – August, 2012

- Distributor A in California recalled 2 partial wheels of cheese due to Lm contamination



# What we knew



# **EPIDEMIOLOGY-DIRECTED MICROBIOLOGIC TESTING**

## Finding Cheese X

- **Identified list of 17 cheeses cut and repackaged at**
  - Distributor A
  - Grocery Chain A in PA
  
- **Prioritized list of cheeses for testing based on**
  - Water activity
  - Texture
  - Whether a patient reported consuming the cheese

# **IDENTIFICATION OF THE OUTBREAK SOURCE**

## Cheese X identified, September 2012

- On September 5<sup>th</sup>, a single intact wheel of cheese yielded the outbreak strain of Lm
  - PFGE subtypes 1,2,3
  - Italian imported Frescolina Marte brand ricotta salata
  - Pasteurized sheep-milk cheese



## **Regulatory action**

- **Domestic recalls for Frescolina Marte brand ricotta salata issued**
- **FDA broadcasted bulletin addressing cross-contamination in cheese**
- **U.S. Import Alert**
  - Deny product admission to US unless demonstrate cheese is not contaminated with Lm
- **Notification of World Health Organization**
- **International recalls**
  - Occurring in at least 12 countries

## Summary of outbreak

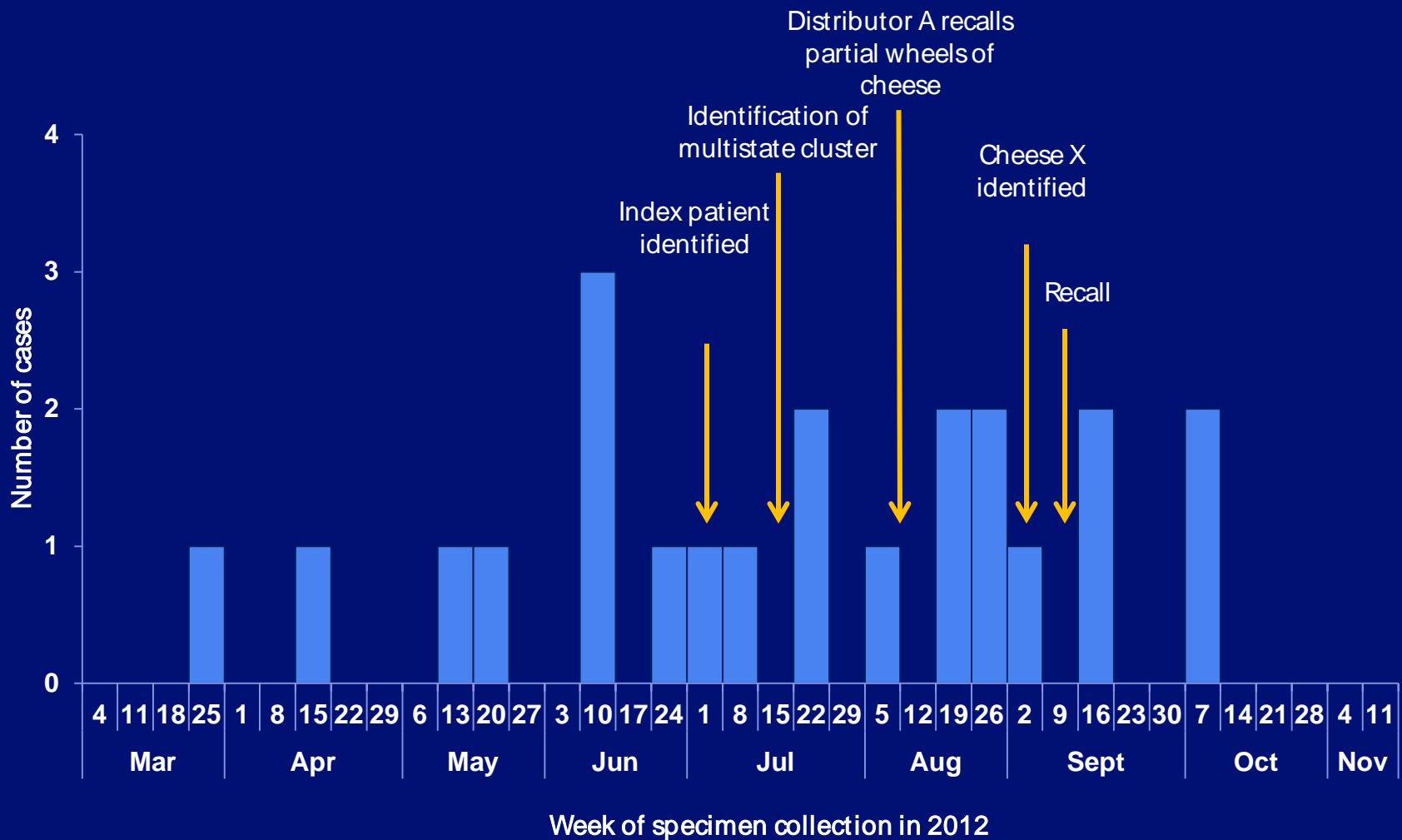
- **22 cases of Lm infection with the outbreak strain reported among residents of 14 jurisdictions**
  - 20 patients were hospitalized
  - 4 patients died (2 deaths attributed to listeriosis)
- **9 cases were pregnancy-associated**
  - 3 patients were newborns
  - 1 fetal loss



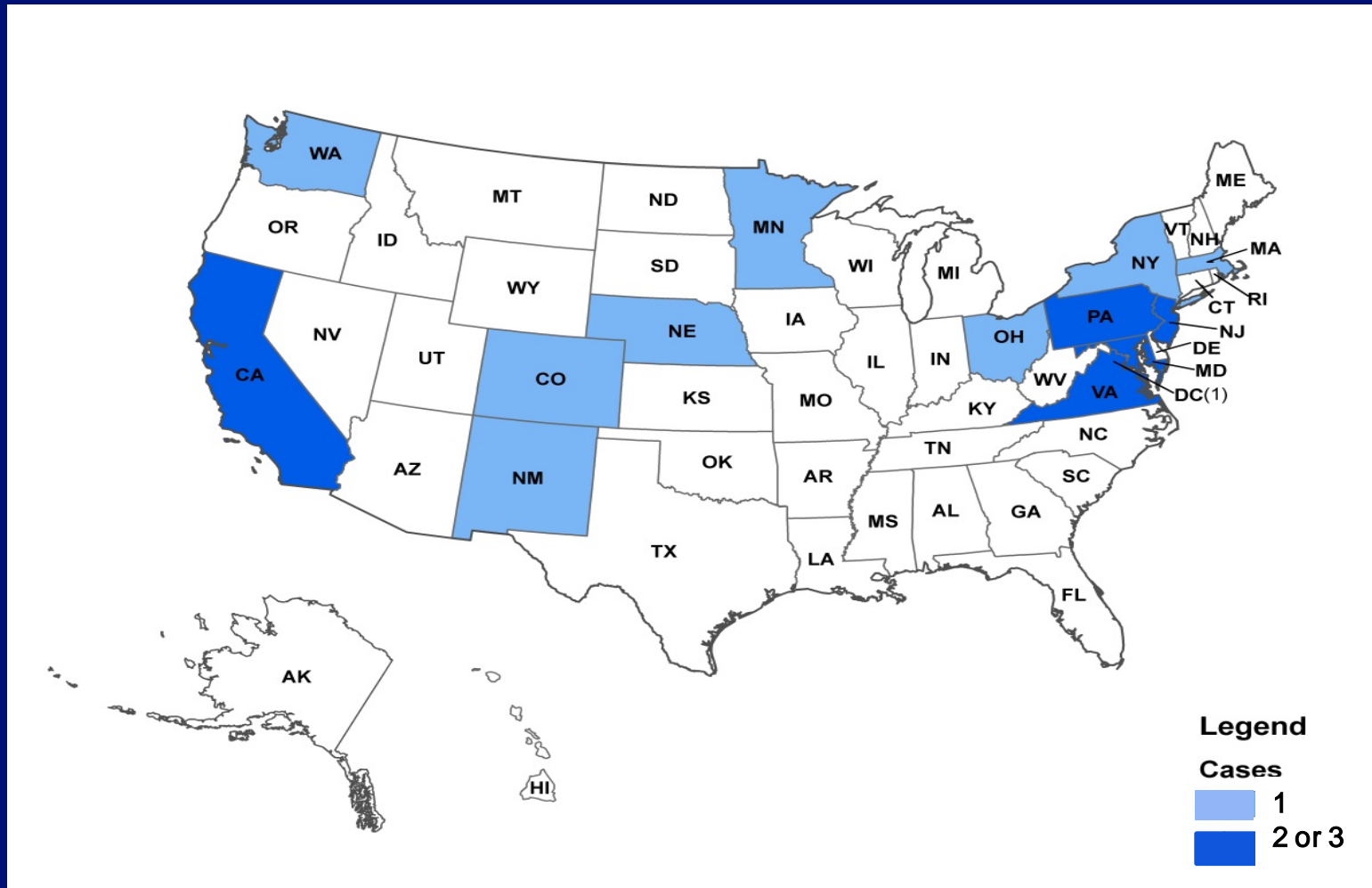
## Summary of outbreak

- **Only 7 patients reported consuming ricotta salata**
- **Of the remaining 15 patients:**
  - 9 consumed cheese
    - 4 consumed another type of cut and repackaged cheese
    - 4 consumed cheese of unknown packaging
    - 1 only consumed cheese sliced at a deli
  - 4 did not consume any soft cheeses
  - 2 were lost to follow up

# Number of persons infected with the outbreak strain of Lm, by date of specimen collection, United States, March–October 2012



# Number of persons infected with the outbreak-associated strain of Lm, by state, United States, March–October 2012



## Cheese X and cross-contaminated cheeses

- Five different cheeses of various textures and pasteurization status contaminated with outbreak strain
  - From at least 6 different locations in 5 states

Cheese type	Pasteurization status	Cheese texture	Packaging	Location
Édel de Cléron	Pasteurized	Soft	Cut and repackaged	Patient refrigerator Grocery Chain A
Blue cheese A	Unpasteurized	Soft	Cut and repackaged	Patient refrigerator
Blue cheese B	Pasteurized	Soft	Partial wheel	Distributor A
Farmstead cheese A	Pasteurized	Semi-hard	Partial wheel	Distributor A
Frescolina Marte brand ricotta salata (Cheese X)	Pasteurized	Semi-firm	Intact wheel	Distributor A
			Intact wheel	Importer A
			Cut and repackaged	Patient refrigerator
			Intact wheel and partial wheel	Restaurant

## Conclusions

- **Current recommendations advise higher-risk patients to avoid**
  - Soft cheeses made with unpasteurized milk
- **The source of this outbreak was**
  - *A semi-firm* cheese made with *pasteurized* milk
- **Cross-contaminated cheeses were**
  - Soft cheeses *and cheeses of other textures*, made with both *pasteurized* milk and unpasteurized milk

*Should we consider revising our recommendations to better protect public health?*

# Acknowledgements

Allegheny Health Department

Michael Gronostaj  
Carol Sandt

Minnesota Health Department

Amy Saupe

Maryland Department of Health

Emily Ricotta

DC Department of Health

Gabrielle Ray

California Department of Health

Katie Wymore  
Akiko Kimura

California Department of  
Agriculture

Stephen Beam

Ohio Department of Health

Marika Mohr

New Mexico Department of Health

Meg Adams-Cameron

Washington Department of Health

Kathryn MacDonald

Oregon Department of Health

Bill Keene

Colorado Department of Health

Shaun Cosgrove

New York City Health Department

HaeNa Waechter

Virginia Department of Health

Seth Levine  
Alison Wellman

Nebraska Department of Health

Manjiri Joshi

Los Angeles County Dept of Health

Roshan Reporter

New Jersey Department of Health

Michelle Malavet

Massachusetts Department of  
Health

Emily Harvey

Food and Drug Administration

V. Brian Garalde  
Pamela LeBlanc  
Susan Lance  
Monica Metz

Centers for Disease Control and  
Prevention

Stacey Bosch  
Patricia M. Griffin  
Kelly Jackson  
Lavin Joseph  
Zuzana Kucerova  
Thai-An Nguyen  
Ashley Sabol  
Ben Silk  
Robert V. Tauxe  
Ian Williams

# Thank you!

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