

Then and Now: The changing landscape of enteric disease surveillance, outbreak detection and response

The 1998-99 outbreak of listeriosis linked to ready-to-eat meats

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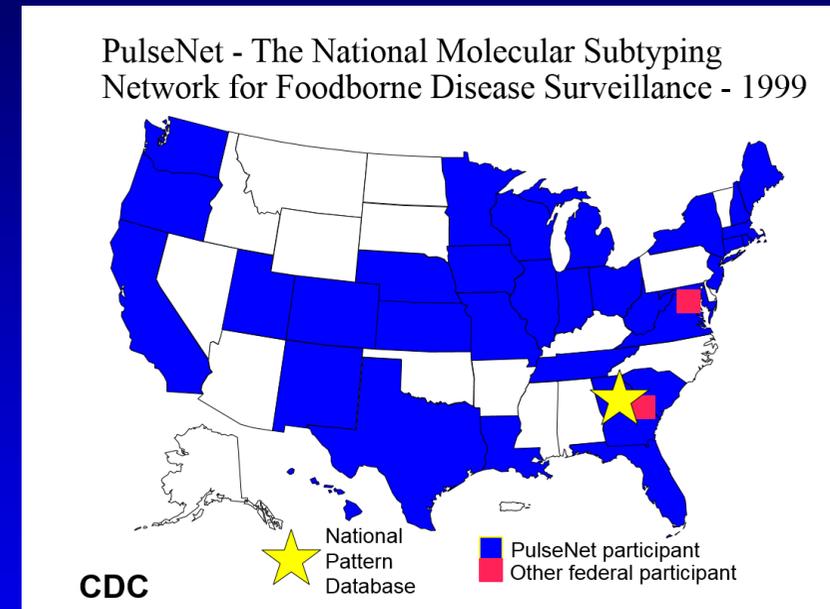
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October-November 1998: Busy months at the Foodborne and Diarrheal Disease Branch, CDC

- Laboratory team: Rolling out PFGE to the States for *E. coli* O157, and developing protocols for other pathogens like *Listeria monocytogenes*
- Tracking/investigating
 - TX: *V parahaemolyticus* O3K6 in Galveston oysters- Texas Legislation hearings
 - HI: *S Enteritidis* PT4 from roadside cracked eggs
 - MA: *S Typhimurium* among many school children visiting a farm serving raw milk
 - MN: *S Typhimurium* in raw frozen chicken Kiev, cases identified in MN, distributed to 24-48 states
 - 2 outbreaks of acute GI illness on cruise ships
 - Multi-state: Burrito Associated Regurgitation Factor (BARF) outbreaks in schools, traced to a burrito factory
 - TN: 4 cases of Lm
 - NY: 6 cases of Lm in Monroe County, match by ribotyping
 - Asked for them to be sent to CDC to try PFGE
 - Then heard of cases in CT and Ohio



Initial investigation

- Developed a “trawling questionnaire” from old CC study, and MN template
- Nov 12: launched survey of all LM cases in NY, TN, CT, OH
- Asked all 1998 strains of Lm to be referred to CDC for PFGE
- Nov 20: 18 strains match by PFGE, similar with ribotyping
- By Dec 15, 39 cases with PFGE pattern “E”
 - First Case-Case analysis of questionnaires:
 - with PFGE pattern “E”, 16 (89%) of 18 had eaten frankfurters in 4 weeks before onset
 - other PFGE patterns, 8 (32%) of 19 = **OR 17.3 (2.4 – 160), p<0.0004**
 - Every case reported eating franks cooked
 - 14 of 16 remembered a brand name, and 11 reported brands made by Company S
 - 1 had the opened package in their fridge: Plant A number in Michigan
 - 1 matching isolate in NY from deli meat from a home with febrile gastroenteritis; also from Plant A
- CDC sent EISO to visit Plant A, along with state and FSIS

MMWR™

MORBIDITY AND MORTALITY WEEKLY REPORT

- 1085 Multistate Outbreak of Listeriosis — U.S.
- 1086 HIV Testing Among Populations at Risk for HIV Infection — Nine States
- 1091 Haff Disease Associated with Eating Buffalo Fish — United States, 1997
- 1094 Influenza Vaccination Status of Persons Aged 65–79 Years — Allegheny County, Pennsylvania, February–March 1997
- 1097 Self-Reported Physical Inactivity by Degree of Urbanization — U.S., 1996
- 1100 Notices to Readers



Multistate Outbreak of Listeriosis — United States, 1998

Since early August 1998, 40 illnesses caused by a single strain of *Listeria monocytogenes* (LM) have been identified in 10 states: Ohio (13 cases); New York (12); Tennessee, Massachusetts, and West Virginia (three each); Michigan (two); and Con-

- By Dec 21:
 - Since early August 1998, 40 illnesses caused by a single strain of *Listeria monocytogenes* (LM) have been identified in 10 states: Ohio (13 cases); New York (12); Tennessee, Massachusetts, and West Virginia (three each); Michigan (two); and Connecticut (one).
 - July 21, 1998, the first case of listeriosis was reported in Ohio.
 - Routine surveillance for listeriosis is limited to hospital-based systems.

- USDA issued recall of RTE meats

- Dec 21:

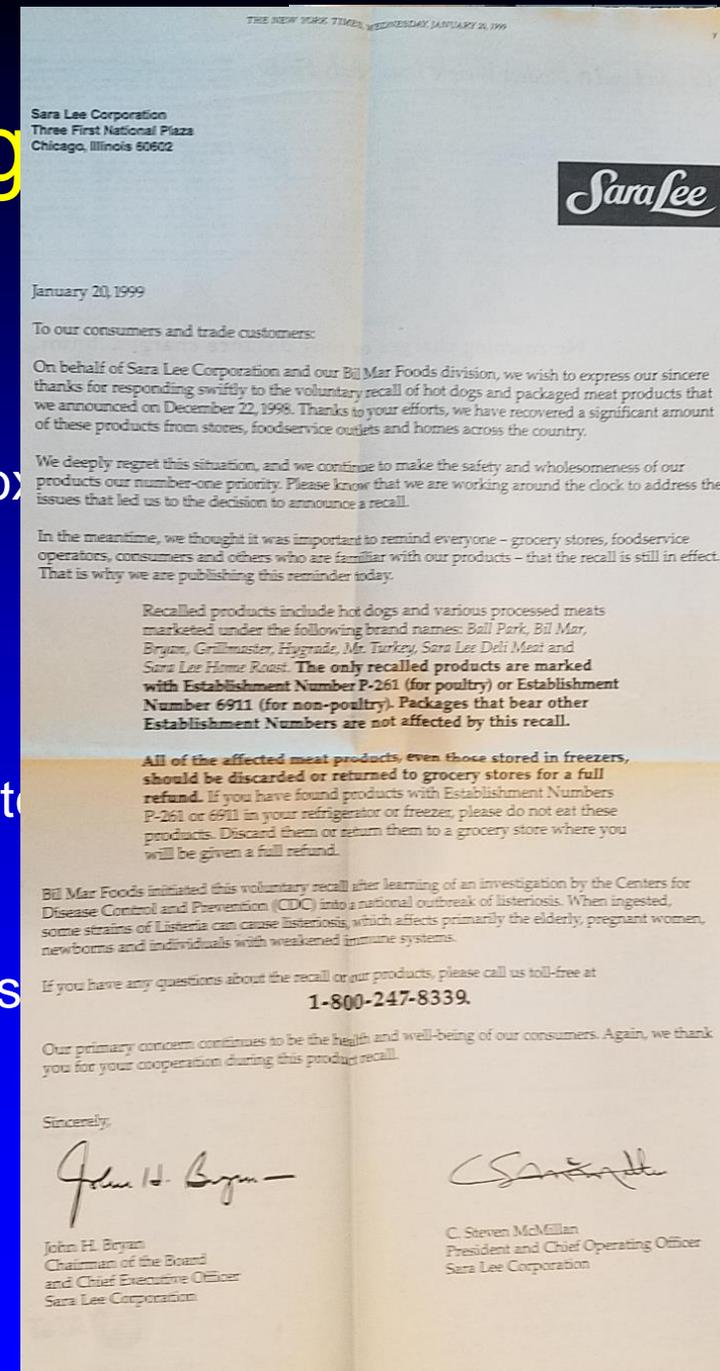
- Dec 22: Company S recalled specific production lots of RTE meats

- Dec 25:

- CDC published first account in MMWR, linking illness and deaths to products
- Unopened product yielded *Listeria monocytogenes* (PFGE pattern “E”)

Getting the message

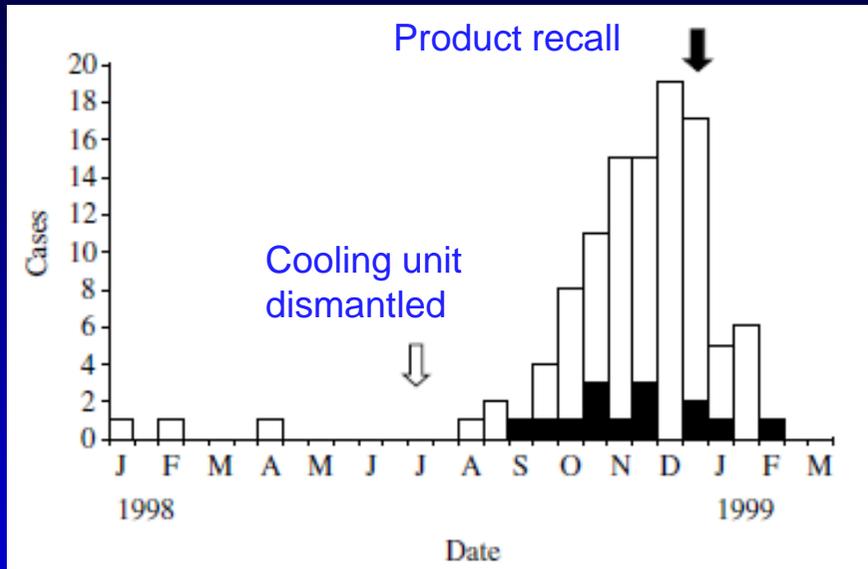
- Very little reaction in the press
 - It was the holiday period
 - Other news crowded the headlines:
 - December bombing of Iraq (Operation Desert Fox)
 - Impeaching President Clinton
 - (Trial began Jan 7, 1999; acquitted Feb 12)
 - No USDA press release
- Jan 8 CDC issued second MMWR report, explicitly to recall and discard recalled product
- Jan 20: Company bought full page in 80 newspapers
- Jan 22: USDA issued a press release



Product investigations and efforts

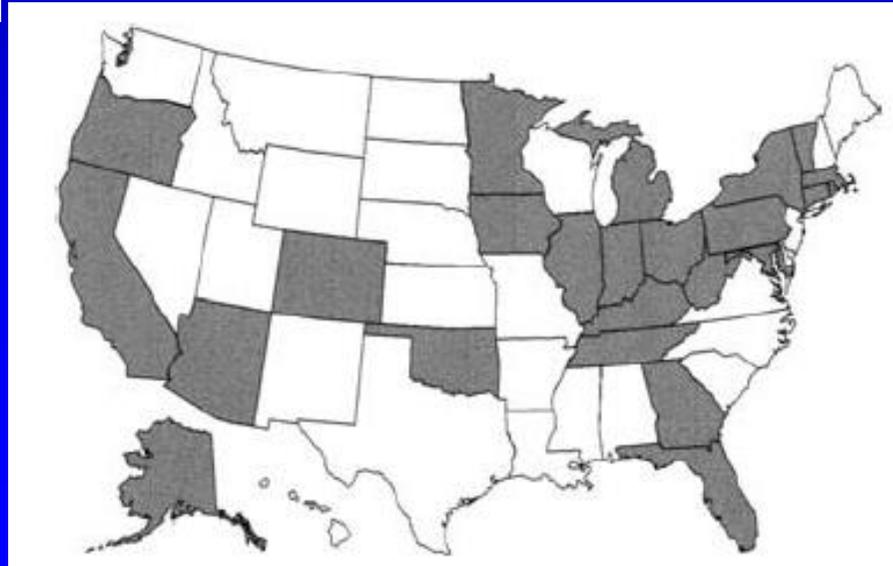
- 15 packages of Plant A meat products cultured
 - 6 packages yielded the outbreak strain (Serotype 4b) 1 unopened
 - 3 packages yielded another strain (Serotype 1/2 a), not seen in any humans in 1998-99
- 1 package of from another Plant, sliced at same time as a Plant A meat
- Jan 6: CDC and FSIS met with the American Meat Institute to discuss
 - Findings of outbreak
 - How new technology (PFGE) means more outbreaks would be found and traced to source
 - Critical need for in-plant monitoring and sanitation
 - Concern that cooking by itself had not been protective
 - Need for second step to reduce risk after in-plant cooking in plant

Outbreak summary



- 104 cases, 24 states. 14 deaths and 4 stillbirths/spontaneous abortions
- *L. monocytogenes* 4b, of 3 rare and related PFGE patterns
- 13 pregnancy associated cases
- For adult cases: median age = 70y

- Outbreak started slowly after cooling unit dismantled
- Outbreak stopped after recall and cleanup at plant
- Cases occurred after recall date
 - Adult cases: Median 5 days
 - Perinatal cases: Median 25 days



Lessons learned

- Molecular subtyping critical to detection and investigation of large multistate OB
- Standard interviews, and case-case analysis successful
 - France immediately made *Listeria* notifiable, with PFGE, routine standard questionnaire, and began finding many outbreaks
 - Led to US 2004 “*Listeria* initiative”
 - Has since become standard for listeriosis in US
- *Listeria monocytogenes* may differ in virulence
- Collaborative traceback and in-plant evaluation a success
- Action based on strong epi and traceback, not on positive product
- Need for aggressive in-plant monitoring and sanitation
- Processed meats must be made inherently safer
- Sharing findings with entire industry helped jump start this
- Communication with press and public vital

Lasting impact of this and subsequent processed meat outbreaks of listeriosis

- Listeria infections since made notifiable in all 50 states
- PFGE protocols for *Listeria* adopted throughout PulseNet, after E. coli O157
- Standard questionnaire and case-case analysis of clusters became routine
- Highlighted need for systematic risk assessment
- Processed meats reformulated with listeria growth inhibitors
- In plant monitoring and sanitation (HACCP) the new norm for processed meats
- Action based on strong epi and traceback now common
- CDC started advising public directly in outbreaks

Thank you

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Nothing to disclose

The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of the Centers for Disease Control and Prevention



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