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

Nov 7, 2017
2017 InFORM Meeting

Robert V Tauxe, M.D., M.P.H.

Director
Foodborne, Waterborne and Environmental Diseases,
Centers for Disease Control and Prevention,
Atlanta, GA
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

October-November 1998: Busy months at the Foodborne and Diarrheal Disease Branch, CDC
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
By Dec 21:
- Since 1997, recurrent concerns of dripping cooling unit in cold room where franks were removed from casings and packed
- July
- Routine monitoring of environmental swabs went from 25% to 92% positive for "psychrophilic" organisms after this event, and stayed high

USDA looking hard for more retail samples to culture, advising holding shipments

Dec 21:
- CDC recommended to company that they recall products from that plant

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 telling consumers to look for 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

Paul Mead, Eileen Dunne, Lou Graves, Martin Weidmann, Mary Patrick, Susan Hunter, Ellen Salehi, Farzad Mostashari, Allen Craig, Brian Sauders, Peggy Hayes, Wallace DeWitt, Phyllis Sparling, Patty Griffin, Dale Morse, Larry Slutsker and Bala Swaminathan


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