Use of Whole Genome Sequencing to Help Identify Ongoing Environmental Contamination of Listeria at a Food Service Establishment

InFORM Conference
November 19, 2015

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Background

• 10 Lm cases in RI in 2014
  – In recent years, typically 2-6 cases/yr
• 4 cases clustered by time and location
• Epidemiology, exposure interviews, environmental investigations, and laboratory testing used to identify likely source of outbreak
Case 1: 10/23/14
Case 2: 10/29/14
Case 3: 10/31/14
Case 4: 11/12/14

Store 1

Rest. A
Rest. B

6 d
2 d
12 d
Common Foods Reported

• Turkey and ham deli meat from Store 1 (Case 1 and 2)
• Prosciutto
  – Deli meat from Store 1 (Case 1)
  – Deli meat from different Store (Case 2)
  – In Antipasto salad from Restaurant A (Case 3)
• Stuffed clams from Restaurants B and B/C (Cases 1, 2, and 3)
• Date of first visit: 10/29/14
• Samples taken: Deli meat, cheeses, franks, swabs (15 total)
• Positive tests: Swab of deli case seam
• Date of first visit: 11/6/14
• Samples taken: Swabs, raw clams, stuffed clams (30 total)
• Positive sample: unopened container of raw clams
Environmental Visits

- Date of first visit: 11/6/14
- Samples taken: Swabs, stuffed clams (40 total)
- Positive sample: prepared stuffed clam
Date of first visit: 11/7/14

Samples taken: Swabs, prosciutto (opened and unopened) (28 total)

Positive tests: sliced prosciutto
PFGE Results-Clinical

• Cases 1, 2, and 3 had same pattern
  (Asc1: GX6A16.0012, Apa 1: GX6A12.0585)
Case 0

~1 yr

Case 1
10/22/14

Case 2
10/29/14

Case 3
10/31/14

Case 4
11/12/14

Store 1

Rest. A

Rest. B

Rest. A

Rest. A

Rest. B/C

Rest. A

Rest. B

Rest. A
• Listeria found in each of the establishments visited
• 5 total positive samples
  – Sliced prosciutto, prepared stuffed clam, raw clams, deli case swab
  – Prepared green salad from fridge of Case 3
• All other samples negative
  – Slicer swabs, deli meats, un-opened prosciutto from Rest. A, individual salad components from fridge of Case 3
• PFGE results and WGS needed to help make sense of findings
Sliced prosciutto from Rest. A match to clinical specimens

Raw clams (Rest. B) and prepared stuffed clam (Rest. B/C) had different patterns and did not match any clinical specimens

Deli case swab (Store 1) did not match the clinical specimens from this cluster
Whole Genome Sequencing

- 11/21/14 → Learned 3 cases from 2014 and case from 2013 were very closely related (CDC)
- 11/12/14 → Sliced prosciutto sample sent for WGS (FDA)
- 1/16/15 → Learned Lm present in sliced prosciutto was closely related to Lm present in 3 cases from 2014 and case from 2013
Prosciutto sample (Rest. A) no more than 11 alleles different from any of the 4 patient isolates
Summary of Follow-up

- Store 1 → Ensuring cleanability of deli cases; swabbing additional locations
- Restaurant B → Replacing wooden case; ensuring sanitation at seafood processor
- Restaurant B/C → Changing stuffie preparation; removing plastic grass
- Restaurant A → Ensuring sanitation and elimination of Lm; replacing equipment
Conclusions

• Outbreak associated with Rest. A
  – All 3 cases from 2014 and 2013 case reported eating there
    (only known shared exposure by all these cases)
  – Clinical samples and sliced prosciutto sample from Rest. A
    were closely related (PFGE + WGS)
  – Persistent environmental contamination supported
  – Results consistent with slow, spontaneous mutation over time
    in the establishment
• Epidemiological, environmental and laboratory investigation used
  in conjunction to reach conclusions
• WGS critical in supporting these findings and linking the
  establishment to a case in the previous calendar year
Questions?

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