The Dark Side of Leafy Greens:
Investigation of a Multi-State Outbreak of E. coli O145

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Day 1: Thursday, April 15, 2010

- UM ER & University Health Services call Public Health regarding 7 recent cases of bloody diarrhea in young adults, mostly UM students
  - Two cases positive for shiga-like toxin
- Notified MDCH about situation

Shiga Toxin Positive E. coli

- Also called “STEC”
- Characterized by production of enterotoxins, Shiga toxin 1 and/or 2 (STX1 and/or STX2)
  - STX2 is linked to more severe illness, including HUS
- Symptoms include diarrhea, bloody stools, and abdominal cramps, but rarely vomiting and fever
- Incubation period is 2-10 days, most often 3-4 days
Day 1: Continued….

• Students were talking together and discovered that some had eaten food from the same Mexican Restaurant - “P”
• EH dispatched to Restaurant P for investigation
• EH Supervisor’s first day of vacation!

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EH Investigation

• Restaurant P had numerous violations:
  ▫ 1 walk-in cooler holding foods at 48-50°F
  ▫ Improper cooking temps of meats
  ▫ Improper hot holding temps
  ▫ Cross contamination in walk in cooler
  ▫ Improper cooling of black beans
  ▫ Cross contamination during food prep
  ▫ PIC not knowledgeable
• Corrective actions were taken on site

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Food Samples

• Food samples taken for lab testing:
  ▫ Marinated raw chicken
  ▫ Salsa
  ▫ Corn salsa
  ▫ Cilantro
  ▫ Unopened bag of shredded lettuce
  ▫ Sour cream
  ▫ Marinated raw steak
  ▫ Cooked black beans
  ▫ Red pepper, green pepper and onion mix
  ▫ Pico de gallo
Day 2: Friday, April 16, 2010
- MDA notified of cluster of cases
- Washtenaw County Outbreak Team met
- Suspect case reported through www.reportfoodpoisoning.com
  - Ate at Restaurant P
- UM Law School luncheon and leftover burritos
- 2nd EH site visit to Restaurant P
  - Obtained invoices for recent supplier deliveries

Case Count as of Friday, April 16
- 16 Suspect & Probable Cases
  - Suspect and probable cases had eaten food from Restaurant P or had other Mexican food and experienced diarrhea afterward
- 6 shiga-toxin positive cases
- 1 hospitalization

Sat & Sun, April 17-18, 2010
- Stool sample dropped off at MDCH lab in Lansing
- 5 more suspect and probable cases are reported from UM ER to on-call nurse
  - One case ate at Restaurant P in East Lansing, not the Ann Arbor location of Restaurant P
Day 5: Monday, April 19, 2010

• HAN alert sent out
• Outbreak Team met twice
  ▪ Discussed possibility of contaminated food item distributed to area Mexican restaurants due to high number of ill reporting burritos in food history
• Email survey sent to all students in Law School regarding Mexican luncheon on April 8
  ▪ 10 responses – 5 ill & 5 well
  ▪ List of suspect foods created from surveys
    ▪ Lettuce & cilantro were the most frequent items eaten by ill individuals

Recap to Date

• Most ill individuals ate burritos
• More than one Mexican style restaurant has been named in food histories
• Two restaurants of the chain Restaurant P have been named in food histories
• Looking for a food or ingredient unique to burritos and/or Mexican cuisine...

Outbreak Communication

• To name or not to name....
• High volume restaurant
• Case finding
• End of semester at UM
• Email alert to providers to encourage appropriate testing and prompt reporting
• Press release sent out on Monday, April 19
Day 6: Tuesday, April 20, 2010

- Working case definitions:
  - Confirmed: Positive shiga-toxin with exposure to Restaurant P
  - Probable: Symptoms consistent with STEC & exposure to Restaurant P
  - Suspect: Symptoms consistent with STEC & exposure to other Mexican style food
- With these definitions, we had 12 confirmed cases, 10 probable cases & 2 suspect cases

Epi Curve of Cases by Onset Date

Day 8: Thursday, April 22, 2010

- Outbreak Team conference call with MDCH
  - Lab results on humans: STX 2 positive, presumptive E. coli O145
  - Lab results on food: lettuce, mild salsa, black beans, raw steak, leftover burritos from lunch event – all negative
  - Cilantro results still pending
- MDCH indicated Ohio is reporting a cluster of STX 2 positive cases on OSU campus
Day 9: Friday, April 23, 2010

- Outbreak Team conference call with MDCH & MDA
- Food traceback: Reinhart delivers all items to Restaurant P, including meats, produce, spices, etc.
  - Lettuce processed at Freshway in Sydney, OH
  - Cilantro from Bonipak (California), distributed through LaGrasso Brothers (Detroit)
- Ohio now has 5 cases that are STX2 positive, one cases is a PFGE match to MI case

Day 12: Monday, April 26, 2010

- Learn that UM Hospital is the only local lab that can test for E. coli O145
  - Estimates are that only 5% of labs nationally can test for these pathogens (i.e. non-O157 E.coli)
- Conference call with WCPH and Columbus, OH Health Dept.
  - They have 2 PFGE matches to Michigan cases
  - Most OH cases ate deli or wrap sandwiches
  - Cilantro is not a common ingredient in these sandwiches
  - All 8 interviewed ate some type of shredded lettuce...

The Smoking Gun?

Lettuce supplier of shredded romaine for both Restaurant P and Ohio cases is Freshway out of Sydney, OH!
Day 13: Tuesday, April 27, 2010

- Began case-control study with subset of UM students using Survey Monkey
  - Over 30 replies to survey
- Erie County, NY reports to CDC that they had 12 college students ill with bloody diarrhea, with 3 hospitalized
  - Freshway is shredded romaine lettuce supplier for NY cases

Day 15: Thursday, April 29, 2010

- CDC conference call with Michigan, Ohio, New York & FDA
  - Michigan has 9 PFGE matches to outbreak, 2 PFGE divergent & two pending
  - Ohio has 5 PFGE matches to outbreak
  - New York has 2 clusters of cases, 1 PFGE match, also college students
  - FDA went to Freshway in Ohio on 4/28/10 to investigate & collect samples
- Washtenaw County published press release linking MI outbreak to OH & NY

Day 16: Friday, April 30, 2010

- CDC confirms the E. coli serotype causing the outbreak is O145 and is STX2 positive

- CDC releases national case definitions (which do not match the working WCPH case definitions)
  - Under new case definitions, Michigan has: 10 confirmed, 3 probable & 15 suspect cases
Day 19: Monday, May 3, 2010
- FDA & Arizona state officials initiate an investigation at the lettuce farm in Yuma, AZ.
- However, all lettuce production has already been stopped at farm due to growing season & has been moved to Salinas Valley, California.

Day 20: Tuesday, May 4, 2010
- Preliminary results from Michigan case-control study show strong statistical association with lettuce
  - No other food items are associated
- Information is shared with CDC outbreak working group via email
- CDC encouraged WCPH and MDCH to strengthen study by finding more controls
  - The search for controls: the beauty of email lists

Day 21: Wednesday, May 5, 2010
- New York lab announces isolation of E. coli O145 STX2 from shredded romaine lettuce sample
  - The lot code on the positive bag of lettuce in NY was identical to the one WCEH sent to MDCH for testing!
- E.coli cases from different states with matching PFGE patterns and a common food and supplier
- Statistical evidence from case-control study
- FDA "encouraged" Freshway to draft a press release for a voluntary recall
Day 22: Thursday, May 6, 2010

- Freshway issues press release detailing voluntary recall of romaine lettuce (“Best if used by May 12”)

National Case Count

As of May 20, 2010, a total of 26 confirmed and 7 probable cases related to this outbreak have been reported from 5 states since March 1, 2010. The number of ill persons identified in each state with this strain is: MI (11 confirmed and 2 probable), NY (5 confirmed and 2 probable), OH (8 confirmed and 3 probable), PA (1 confirmed), and TN (1 confirmed).

One year later...

- Numerous FOIA requests from lawyers
- 2 additional laboratories in Washtenaw County can detect shiga toxin
- FDA findings on the Yuma, AZ farm:
  - 6 potential STEC sources
  - 3 Concentrated Animal Feeding Operations (CAFOs)
  - 1 housing development with co-located sewage treatment facility
  - 1 recreational vehicle park with multiple septic leach systems
  - Seasonal grazing of sheep on nearby fields
Down on the Farm

• Non-O157 STEC Stx2 found in irrigation canal at RV park, but did not match the outbreak strain
• STEC found in growing fields of suspect farm
• RV park showed evidence of direct drainage into the lateral irrigation canal used for the farm

Final Questions

• Did the various violations at the restaurant allow for optimal conditions to spread the E. coli O145?
• How many other cases occurred nationwide, but were missed due to the lack of testing capacity by 95% of labs?
• Why did we see illnesses mainly at college campuses but not elsewhere?

Lessons Learned

• Clear, open & honest communication with your state & local partners is key!
  • Prompt phone call from UM ER gave us a critical head start
  • Frequent conference calls to make sure everyone has the latest information
  • Partnership with UM OSEH allowed WCPH to have access to students’ emails for the case control study
  • MDCH Lab and Epi coordination with CDC and other states; lead on case-control study
Lessons Learned

- Communication (continued):
  - MDA provided the traceback information which confirmed that Freshway was the lettuce supplier.
  - Our open discussion with Columbus Health Department led to the discovery that Freshway was the common produce supplier of implicated meals

- And most importantly:
  Don’t have a national outbreak of a rare strain of bacteria that only 5% of labs in the U.S. can detect!

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