Foodborne Outbreak Investigation: Norovirus

Epidemiology & Case Study

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National FBI

- Why is FBI important?

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Estimated annual number of illnesses</th>
<th>90% Credible Interval</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norovirus</td>
<td>5,461,731</td>
<td>3,227,078–8,309,480</td>
<td>58</td>
</tr>
<tr>
<td><em>Salmonella</em>, nontyphoidal</td>
<td>1,027,561</td>
<td>644,786–1,679,667</td>
<td>11</td>
</tr>
<tr>
<td><em>Clostridium perfringens</em></td>
<td>965,958</td>
<td>192,316–2,483,309</td>
<td>10</td>
</tr>
<tr>
<td><em>Campylobacter spp.</em></td>
<td>845,024</td>
<td>337,031–1,611,083</td>
<td>9</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>241,148</td>
<td>72,341–529,417</td>
<td>3</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>91</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Top pathogens (morbidity)

<table>
<thead>
<tr>
<th>Disease</th>
<th>2012 Cases (n)</th>
<th>Incidence Rate per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonellosis</td>
<td>248</td>
<td>12.0</td>
</tr>
<tr>
<td>Campylobacteriosis</td>
<td>192</td>
<td>9.3</td>
</tr>
<tr>
<td>Giardiasis</td>
<td>28</td>
<td>1.4</td>
</tr>
<tr>
<td><em>E. Coli</em> O157, STEC non-O157, Shiga toxin positive feces</td>
<td>28</td>
<td>1.4</td>
</tr>
<tr>
<td>Shigellosis</td>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>5</td>
<td>0.2</td>
</tr>
<tr>
<td>Cryptosporidiosis</td>
<td>8</td>
<td>0.4</td>
</tr>
<tr>
<td>Listeriosis</td>
<td>0</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Norovirus

- Group of related non-enveloped RNA viruses
- **Symptoms**: watery non-bloody diarrhea, nausea, vomiting, abdominal cramps, low-grade fever
  - Studies have shown asymptomatic infection can occur in as many as 30% of infections
- **Incubation period**: 12-48 hours (commonly 24-48h)
- **Infectious period**: Few hours before onset to 72 hours *after symptom resolution*
- **Transmission**: fecal-oral
Important Contributory Factors to Outbreak Spread

- Environmental persistence
  - Withstands freezing and temps up to 140 °F
    - Check your ice machine!
  - Resists many common cleaners & disinfectants (e.g. quaternary ammonium compounds)

- Short incubation period

- High Infectivity
  - Low infectious dose: 10-100 viral particles are sufficient to cause infection
  - Viral shedding can begin before symptom onset
  - Viral shedding can occur up to 2 weeks after symptoms stop, but it is unclear how viral shedding after 72h post-recovery contributes to infectivity

- Immunity is short-lived (a few months) and strain-specific
FBI Outbreak Overview

- Notification: EHS, public, laboratories, healthcare providers
- Most are local outbreaks
- Key players:
  - Epidemiologists, communicable disease investigators
  - Public health laboratories
  - Environmental health specialists
  - Possibly regulatory agencies, public information officer
  - Food handlers & establishments
Case Study: FBI at Country Club

• Jan 27, 9am: Communicable Disease Section (CDS) receives notification from Environmental Health Services (EHS) of potential foodborne outbreak among attendees at retirement party
  – Tuesday, Jan 24, 7pm: party held at country club, ~50 attendees, 13 ill; menu, symptoms, onsets dates unknown
• Friday, Jan 27, 1pm: received attendee linelist
  – Began calling attendees, starting with initial complainants, to interview with general FBI questionnaire
  – *Simultaneously*, EHS inspectors are inspecting food facility, asking for menus, identifying ill foodhandlers
  – DPH Lab is notified that we may be submitting specimens for testing a yet unknown organism
Case Study: FBI at Country Club

• **Jan 27, 3pm:** Call from EHS reveals
  • identified several ill foodhandlers (FHs) at the Country Club
  • collecting food specimens from facility (none left from banquet, but some prepared by same FHs)
  • will obtain contact info for people who were ill

• **Jan 27, 3:30pm:** CDS receives linelist of foodhandlers
  • Symptoms started **Jan 21-22**
  • Interviews begin of FHs and attendees
Case Study: FBI at Country Club

• Preliminary analysis of initial interviews reveals:
  – Estimated incubation period 24-48h
  – Symptoms were predominantly nausea, vomiting, diarrhea
  – Age range 40-64 years
  – 2 people sought medical care

• Preliminary case definition:
  – Vomiting and/or diarrhea >1x in 24 hour period after attending retirement banquet at County Club or having contact with ill person from Country Club

• Result: CDS decides to test FHs, attendees for Salmonella, Campylobacter, Shigella, E. coli O157 and norovirus

• DPH Lab orders more media for testing food specimens
Case Study: FBI at Country Club

• Fri, Jan 27, 5pm:
  – EHS closes kitchen at Country Club until they are re-inspected and FHs tested by DPH
  – CDS cannot interview or deliver stool kits to FHs because they have left for the day!
  – Stool kits delivered to attendees living close to DPH

• Mon, Jan 30:
  – CDS continues interviewing cases (FHs, attendees) who return calls, coordinate specimen collection
  – More data leads to hypothesis revision, coordination w/ DPH Lab: will not test for *E. coli* O157 b/c of media needs, unlikely given symptomology & incubation period
    • No bloody diarrhea
    • Incubation period is 24-48 h from data (*E. coli* O157 2-10 days, avg 3-4 days)

• Mon, Jan 30, 4pm: positive results on 2 specimens—norovirus
Case Study: FBI at Country Club

• Mon, Jan 30 cont’d:

  – Epi curve

Gastroenteritis at Country Club, January 20XX

Index case works w/ill coworker at 2nd job
Staff member vomits in Pro Shop
Banquet, 7pm
DPH notified

Day
0
1
2
3
4
5
6
7
8
9

1/11/2012
1/12/2012
1/13/2012
1/14/2012
1/15/2012
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1/23/2012
1/24/2012
1/25/2012
1/26/2012
1/27/2012
1/28/2012
1/29/2012
1/30/2012
1/31/2012

Staff
Attendee
Case Study: FBI at Country Club

• Tues, Jan 31:
  – EHS has given cleaning/disinfection recommendations to facility for norovirus before allowed to re-open
  – Staff recommended to stay home for 48h post last sx

• Wed, Feb 1:
  – DPH Lab notifies us of positive results for norovirus G2 among most recently ill FH, couple attendees
  – Bacteriological testing continues for final results
  – CDS clears ill FHs to return to work via EHS
Case Study: FBI at Country Club

• Wed, Feb 1, cont’d:
  – No additional cases have been identified (last onset was Jan 27)
  – Preliminary etiology identified (bacteriological testing pending)

• Thurs, Feb 2:
  – EHS re-inspected facility and allowed to re-open
  – DPH Lab finalized bacteriological testing: all negative for Salmonella, Campylobacter, Shigella, E. coli O157
  – Food specimens all tested for fecal contamination: negative
Case Study: FBI at Country Club

• Data:
  – CDS interviewed 37 people: 28 attendees, 9 staff
    • 22 cases
    • 0 deaths, 0 hospitalizations
    • 0 secondary cases
    • 11 lab-confirmed cases
    • No significant food item association observed

• Key factors contributing to this outbreak:
  – Employees may work at multiple facilities
  – Employees may become ill at work—known or unknown
  – Prompt cleaning & disinfection is key
  – Employee restriction from working while ill, and sometimes after
Questions?

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