Culture-Independent Diagnostic Testing: Where Are We Now?

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Foodborne Diseases Active Surveillance Network (FoodNet)

- Collaboration among CDC, 10 state health departments, USDA-FSIS, and FDA
- Determine the burden of foodborne illness
- Monitor trends in the burden over time
- Population-based active surveillance for 8 pathogens commonly transmitted through food
  - Campylobacter, Listeria, Salmonella, Shiga toxin-producing E. coli (STEC), Shigella, Vibrio, Yersinia, and Cyclospora
- Surveillance for culture-confirmed infections began in 1996, expanded to CIDT+ infections in 2012
Laboratory Surveys

- **Objectives**
  - Supplement case data
  - Assess changes in diagnostic testing practices over time

- **Biannual surveys of all clinical laboratories in FoodNet catchment**
  - 5 questions per pathogen
  - Test methods, brand, reflex culture, specimen submission
Challenges

- **Surveillance**
  - Need to change case definitions?
  - How do we interpret test results?
  - Increased case load? Need to prioritize interviews?
  - How do we interpret changes in incidence?

- **Laboratory**
  - Will clinical laboratories maintain culture? Will they reflex?
  - Increased or decreased specimen submission? Need to change rules?
  - Can SPHLs perform the reflex? How does that affect recovery?
  - How do we track and interpret results?
How have CIDTs affected case reporting?

- **Campylobacter**
- **Cyclospora**
- **Listeria**
- **Salmonella**
- **Shigella**
- **STEC**
- **Vibrio**
- **Yersinia**

The charts show the number of cases reported from 1996 to 2016 for each organism. The y-axis represents the number of cases, and the x-axis represents the years from 1996 to 2016.
Increased case counts for all pathogens since 2012

- **Campylobacter**
- **Cyclospora**
- **Listeria**
- **Salmonella**
- **Shigella**
- **STEC**
- **Vibrio**
- **Yersinia**

No. cases

- **All Cases**
- **CX+**
CIDT adoption varied by pathogen

- **Campylobacter**
- **Listeria**
- **Salmonella**
- **Shigella**
- **Vibrio**
- **Yersinia**
CIDT use increasing among clinical laboratories
Recent increases were driven by syndromic panels

- Antigen-based test
- Locally-developed PCR test
- DNA-based syndrome panel test

**Campylobacter**

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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**Salmonella**

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**Shigella**

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**STEC**

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**Vibrio**

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**Yersinia**

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Increased panel use mirrors increase in polymicrobial detections

**Incidence of Polymicrobial Detections (per 100,000)**

- **CX+ only**
- **CX+ and CIDT+**
- **CIDT+ only**

<table>
<thead>
<tr>
<th>Year</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<tbody>
<tr>
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<td>0.6</td>
<td>0.8</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
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<tr>
<td>CX+ and CIDT+</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
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<tr>
<td>CIDT+ only</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>1.0</td>
<td>1.0</td>
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*-2 pathogens detected in <30 days
†CT, GA, NM, MD, MN, TN and selected counties in CA and CO
Reflex CX done frequently, but not often positive

- Reflex culture positive
- Reflex culture negative
- Reflex culture not performed

**Campylobacter**

**Salmonella**

**Shigella**

**STEC**

**Vibrio**

**Yersinia**
Isolate submission decreasing and while stool increasing

**Isolates**

- Campylobacter
- Salmonella
- Shigella
- STEC
- Vibrio
- Yersinia

**Stool**

Percentage of laboratories
Surveillance Solutions

- Adapt surveillance and revise case definitions to capture CIDT+ cases
  - FoodNet revised definitions in 2012
  - National case definitions updated
    - *Campylobacter*, 2015
    - *Salmonella, Shigella, Vibrio*, 2017
    - STEC, 2018
    - *Listeria* and *Yersinia*, 2019

- Develop models to interpret incidence measures over time
  - Monitor healthcare provider testing practices
  - Estimate laboratory testing volume by test type
Laboratory Solutions

- Consider best approaches for obtaining isolates for species, subtype, and antimicrobial sensitivity characterization
  - Prioritize reflex culture
  - Update specimen submission regulations
- Survey clinical laboratories for testing practices
Unanswered questions require data & partnerships

- Collect epidemiologic and clinical data to better understand
  - Polymicrobial detections
  - Exclusion criteria

- Partner with industry to identify strategies to meet needs of both
  - Anticipate upcoming changes
  - Inform test interpretation
Acknowledgements

FoodNet Sites
  California Emerging Infections Program
  Connecticut Emerging Infections Program
  Colorado Department of Public Health and Environment
  Georgia Department of Public Health
  Maryland Department of Health and Mental Hygiene
  Minnesota Department of Health
  New Mexico Emerging Infections Program
  New York State Department of Health
  Oregon Health Authority
  Tennessee Department of Health

US Department of Agriculture Food Safety and Inspection Service
US Food and Drug Administration
US Centers for Disease Control and Prevention FoodNet Staff
For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.