Foodborne Diseases

September 23, 2020
1. Summarize food and waterborne disease sources and transmission including:
   - Protozoal diseases
   - Viral diseases
   - Bacterial diseases

2. Provide overview of reporting for food and waterborne diseases
The Centers for Disease Control and Prevention (CDC) estimates that each year:

- 1 in 6 (48 million) Americans become ill with a foodborne or waterborne pathogen

Of these individuals:

- 128,000 are hospitalized and 3,000 people die due to their illness
Foods Often Associated with Illness

- **Foods from animals:**
  - Raw or undercooked meat, poultry and eggs
  - Unpasteurized milk, cheeses
  - Raw shellfish

- **Fruits and vegetables:**
  - Raw sprouts
  - Unpasteurized fruit juices
  - Uncooked items (e.g., salads, cut fruit)
Food Contamination Contributing Factors

- Fecal contamination (human or animal waste)
- Cross-contamination from other contaminated items
- Inadequate cooking methods
- Unhygienic practices of food handlers
- Favorable growing conditions:
  - Warm temperatures
  - Moist environments
  - Prolonged holding periods
Most food and waterborne diseases are caused by enteric pathogens

Exposure to pathogen is by ingestion

Common gastrointestinal symptoms:
- Nausea
- Vomiting
- Diarrhea
- Fever
Prevention of Enteric Diseases

- Practice good hand-hygiene
- Exclude or restrict food handlers according to Food Code
- Exclude ill workers/attendees from institutional, school and daycare settings
- Sanitize high contact and contaminated areas
- Avoid cross contamination during food prep
- Wash produce before eating
- Thoroughly cook beef, pork and poultry
- Avoid unpasteurized foods
- Refrain from swimming while symptomatic
- Avoid swallowing recreational water
- Avoid drinking untreated water
Pathogens

Caused by bacteria, viruses and protozoa
Common Foodborne Pathogens

- Clostridium botulinum
- Campylobacter
- Clostridium perfringens
- Cyclospora
- E. coli
- Hepatitis A
- Listeria
- Norovirus
- Salmonella
- Shigella
- Staphylococcus
- Vibrio
Pathogens

Protozoa
Giardiasis

- **Giardia lamblia**
  - Passed in stool
  - Cyst can survive outside the intestines for months
  - Only 10 cysts needed for infection
  - Increased incidences in June to October

www.cdc.gov/parasites/giardia
Giardiasis cont'd

- **Reservoir**
  - Humans and animals
  - Infected can shed 1-10 billion cysts a day

- **Risk Factors**
  - Contact with infected person/animals
  - Recreational activities in lakes, stream, rivers etc.
  - Drinking unfiltered or untreated water
  - International travel
Giardiasis cont'd

- **Incubation Period**
  - 3-25 days, average 7-10 days

- **Durations**
  - 1 to 2 weeks or longer

- **Clinical Symptoms**
  - Watery, foul-smelling diarrhea
  - Abdominal cramps
  - Excessive gas/bloated feeling
  - Greasy stool that can float
  - Weight loss
Public Health Significance

- World-wide distribution, sporadic in West Virginia
- Prevalence higher in poor sanitation areas and childcare centers
- Community-wide outbreaks from water supply and recreational water contamination
Cryptosporidiosis

- Cryptosporidium parvum
  - Oocyst formation (increased resistance to disinfection)

- Reservoir
  - Humans and animals
  - Infected shed over 10 million organisms per bowel movement

www.cdc.gov/parasites/crypto/
Cryptosporidiosis cont'd

- **Risk Factors**
  - Contact with infected person
  - Contact with infected animals (especially ruminants)
  - Contact with lake, stream or river water
  - International travel
  - Drinking unfiltered or untreated water

![Cow Image](image-url)
Incubation Period
- 1-12 days, average 7 days

Duration
- 1 to 2 weeks
- Symptoms can come and go for up to 30 days

Clinical Symptoms
- Watery diarrhea
- Abdominal cramps
- Fever
- Vomiting
- Weight loss
Public Health Significance

- World-wide distribution, sporadic in West Virginia
- Prevalence higher in poor sanitation areas and childcare settings
- Community-wide outbreaks from water supply and recreational water contamination
Cyclosporiasis

- *Cyclospora cayetanensis*
  - Formation of an oocyst outside host
  - Common in tropical/subtropical areas
  - Increased incidences May to August

- Reservoir
  - Humans

- Incubation Period
  - 1 week

www.cdc.gov/parasites/cyclosporiasis/
Cyclosporiasis cont'd

- **Duration**
  - Several weeks to months

- **Risk Factors**
  - International travel
  - Consuming contaminated food or water
  - United States outbreaks have been linked to fresh produce
Clinical Symptoms
- Watery diarrhea
- Nausea
- Loss of appetite
- Abdominal cramps
- Weight loss
- Excessive gas
- Fatigue
Cyclosporiasis continued

- **Public Health Significance**
  - Not endemic in the United States
  - Infection occurs from travel to endemic areas
  - Outbreaks associated with imported fresh produce
Pathogens

Viruses
Hepatitis A

- **Hepatitis A virus**
  - Hepatovirus
  - Occurs throughout world
  - Endemic in poor countries
  - Vaccine preventable

- **Reservoir**
  - Humans

www.cdc.gov/hepatitis/hav/
Hepatitis A cont'd

- **Risk Factors**
  - Foreign travel
  - Consumption of contaminated food or water
  - Childcare or healthcare settings
  - Men who have sex with men (MSM) contact
  - Intravenous drug use
  - Hemophilia or other clotting factor disorder
  - Contact with infected person

- **Incubation Period**
  - 15 to 50 days, average 28 days
  - Infectious period two weeks before to two weeks after onset of symptoms
Hepatitis A cont'd

- **Duration**
  - Variable, two weeks to three months
  - Does not become chronic

- **Clinical symptoms**
  - Sudden onset
  - Watery diarrhea
  - Nausea
  - Abdominal discomfort
  - Loss of appetite
  - Jaundice
  - Children less than 6 years are often asymptomatic
Hepatitis A cont'd

- Public Health Significance
  - Endemic in developing countries
  - Reportable within 24 hours
  - Vaccination for children, travelers and high-risk people
  - How we USED to think of Hep A in the US:
    - Sporadic cases associated with sexual contacts
    - Outbreaks foodborne related, typically related to ill food handlers
    - WV: < 10 cases per year
  - How we NOW see Hep A
    - Nationwide outbreak starting in 2016
    - Cases associated with homeless and drug users
    - WV: Outbreak declared in 2018; > 2200 cases in 2018
Norovirus

- **Norovirus**
  - Virus in family *Caliciviridae*
  - Can occur at any time, more common in winter

- **Reservoir**
  - Humans

- **Transmission Mode**
  - Fecal-oral, contaminated food or water

[www.cdc.gov/norovirus](http://www.cdc.gov/norovirus)
Norovirus cont'd

- **Incubation Period**
  - 12-48 hours

- **Duration**
  - 24 to 72 hours

- **Risk Factors**
  - Close personal contact with infected persons
  - Consuming contaminated food or drinks
  - Contact with contaminated surfaces
Norovirus cont'd

- Clinical Symptoms
  - Nausea
  - Acute onset of vomiting
  - Watery diarrhea
  - Abdominal pain
  - Headache
  - Malaise
  - Fever (low grade)
Norovirus cont'd

- Public Health Significance
  - Leading cause of acute gastroenteritis in children
  - Leading cause of foodborne outbreaks in United States
  - Can be shed in stool for 2 weeks after asymptomatic
Pathogens

Bacteria
Shigellosis

- **Shigella** (4 serogroups)
  - *S. sonnei* (most common species in the United States)

- Reservoir
  - Humans

- Transmission Mode
  - Fecal-oral (person to person, water and foodborne)

[www.cdc.gov/shigella/](http://www.cdc.gov/shigella/)
Shigellosis cont'd

- **Risk Factors**
  - International travel
  - Childcare settings
  - MSM sexual contact
  - Consuming contaminated food or water

- **Incubation Period**
  - 12-96 hours – Typically 1 to 3 days

- **Duration**
  - 5 to 7 days
Shigellosis cont'd

- **Clinical Symptoms**
  - Diarrhea (sometimes bloody)
  - Fever
  - Nausea
  - Cramps

- **Public Health Significance**
  - 95% of Shigella infections are asymptomatic
  - Easily transmitted from person-to-person
  - Low infective dose need for transmission (10 cells)
  - Can rapidly develop antimicrobial resistance
Shiga toxin-producing *E. Coli* (STEC)

- **Escherichia coli**
  - Produces Shiga toxins
  - Many serotypes

- **Reservoir**
  - Cattle, humans, deer

- **Transmission Mode**
  - Ingestion of food contaminated with ruminant feces
  - Person-to-person

www.cdc.gov/coli/index.html
Shiga Toxin-producing *E. Coli* (STEC) cont'd

- **Risk Factors**
  - Consuming undercooked or raw meats
  - Consuming contaminated raw vegetables and drinks
  - Exposure to contaminated environments and animals
  - Exposure to contaminated recreational water sources
Shiga Toxin-producing *E. Coli* (STEC) cont'd

- **Incubation Period**
  - 1-8 days

- **Duration**
  - 5 -10 days

- **Clinical Symptoms**
  - Severe bloody diarrhea
  - Vomiting
  - Abdominal pain
  - Lack of fever
  - Hemolytic Uremic Syndrome (HUS)
Shiga Toxin-producing *E. Coli* (STEC) cont'd

- **Public Health Significance**
  - Transmission from fecal contaminated food or water
  - Asymptomatic infections are common
  - Outbreaks associated with beef, produce, petting zoos
  - Infectious dose is very low (only a few bacteria)
Campylobacteriosis

- **Campylobacter jejuni or C. coli**
  - One of the most common causes of diarrheal illness in the United States
- **Reservoir**
  - Animals, commonly poultry and cattle
- **Transmission Mode**
  - Food and waterborne

www.cdc.gov/foodsafety/diseases/campylobacter/
Campylobacteriosis cont'd

- **Risk Factors**
  - Contact with infected animals
  - Contact with raw or undercooked beef or poultry
  - Consumption of unpasteurized juices and milk
  - Contact with contaminated water sources
Campylobacteriosis cont'd

- **Incubation Period**
  - 1 to 10 days, usually 2 to 5 days

- **Clinical Symptoms**
  - Diarrhea
  - Abdominal pain
  - Malaise
  - Vomiting
  - Nausea
  - Fever
  - Asymptomatic infections are common
Public Health Significance

- Responsible for 5-14% diarrheal illnesses world wide
- Asymptomatic infections are common
- Outbreaks associated with undercooked poultry and unpasteurized dairy
Salmonellosis

- **Salmonella**
  - Multiple serotypes
  - Cause about 1 million illnesses in the United States a year
  - Higher incidence in summer
  - Normal intestinal flora of poultry

- **Reservoir**
  - Domestic and wild animals

www.cdc.gov/salmonella
Transmission Mode
- Ingestion of food contaminated with ruminant feces
- Person-to-person

Risk Factors
- Exposure to infected animals, especially poultry and reptiles
- Consuming contaminated food (meats, vegetables)
- Contact with raw meats and contaminated surfaces (food preparation, animal cages, etc.)
Salmonellosis cont'd

- Incubation Period
  - 6-48 hours

- Duration
  - 4-7 days

- Clinical Symptoms
  - Diarrhea
  - Fever
  - Nausea
  - Vomiting (sometimes)
Salmonellosis cont'd

- **Public Health Significance**
  - Commonly associated with foods of animal origin
  - Has been responsible for large multi-state outbreaks
  - Approximately 40,000 cases reported to CDC a year
  - Some people can become asymptomatic “shedders”
# Reportable Enteric Diseases

<table>
<thead>
<tr>
<th>Report Immediately</th>
<th>Reportable in 24 hours</th>
<th>Reportable in 72 hours</th>
<th>Reportable in 1 week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected Outbreak or Cluster</td>
<td>Shiga toxin-producing <em>E. coli</em> (STEC)</td>
<td>Campylobacteriosis</td>
<td>Legionella</td>
</tr>
<tr>
<td>botulism</td>
<td>Hepatitis A</td>
<td>Vibrio Infections (non-cholera)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cholera</td>
<td>Listeriosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Typhoid fever</td>
<td>Cryptosporidiosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cyclosporiosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Giardiasis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shigella</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Salmonella</td>
<td></td>
</tr>
</tbody>
</table>
2018 Enteric Surveillance Data

WV Cases of Reportable Enteric Illnesses
2018

Number Reported

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Number Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campylobacter</td>
<td>442</td>
</tr>
<tr>
<td>Salmonella</td>
<td>247</td>
</tr>
<tr>
<td>Legionella</td>
<td>107</td>
</tr>
<tr>
<td>Giardia</td>
<td>105</td>
</tr>
<tr>
<td>STEC</td>
<td>79</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>71</td>
</tr>
<tr>
<td>Shigella</td>
<td>21</td>
</tr>
<tr>
<td>Vibriosis</td>
<td>10</td>
</tr>
<tr>
<td>Listeria</td>
<td>6</td>
</tr>
<tr>
<td>Cyclospora</td>
<td>5</td>
</tr>
<tr>
<td>Botulism (food)</td>
<td>1</td>
</tr>
</tbody>
</table>
5-Year Enteric Diseases Trends

Reported Enteric Cases, 2014-2018*

*Excludes Hep A
Investigating a Reported Case Outline

- What to do when you receive a positive lab report
  - Check WVEDSS to see if the case has already been reported
  - Gather materials for the investigation
  - Read the protocol
  - View the case definition
  - WVEDSS form
  - Additional resources
    - www.dhhr.wv.gov/oeps/disease/Pages/default.aspx
If You Suspect an Outbreak...

- Notify Division of Infectious Disease Epidemiology (DIDE) immediately
- Track case information on a line list
- Perform descriptive epidemiology
- Conduct an environmental assessment
- Implement control and prevention measures
- Communicate findings
Traci Hudson, MS
Food and Waterborne Disease Epidemiologist
West Virginia Department of Health and Human Resources
Bureau for Public Health
Office of Epidemiology and Prevention Services
Division of Infectious Disease Epidemiology
350 Capitol Street, Room 125
Charleston, WV 25301-3715
Phone: 304-558-5358
Fax: 304-558-8736
Traci.D.Hudson@wv.gov