Shiga Toxin-Producing *Escherichia coli*

STEC

- Shiga toxin-producing *E. coli* (STEC) cause disease by making a potent toxin known as Shiga toxin due to its similarity to the toxins produced by *Shigella dysenteriae*
  - by definition they must produce one or both of the following two toxins: Stx1 and Stx2
- also known as enterohemorrhagic *E. coli* (EHEC) or verocytotoxic *E. coli* (VTEC)
- most commonly identified STEC in North America is *E. coli* O157:H7
  - estimated 70,000 infections with *E. coli* O157 each year in the U.S.
- non-O157 STECs are contributors to disease as well
  - they are less publicly acknowledged due to diagnostic limitations and inadequate surveillance

The Organism

- gram-negative
- nonsporeforming
- rod-shaped
- enteric
- important pathogenic serotypes
  - O157
  - O26
  - O111
  - O103
  - O45
  - O121

Sources / Reservoirs

- cattle are the most important reservoir for human infection
- ruminant animals other than cattle also carry STEC
  - goats
  - sheep
  - deer and elk
- humans may serve as a reservoir for person-to-person transmission

Mode of Transmission

- the infectious dose is very low, probably similar to that of *Shigella*
- ingestion of fecally contaminated foods
  - outbreaks have been caused by:
    - beef
      - usually inadequately cooked ground beef
    - produce
      - melons, lettuce, coleslaw, apple cider, alfalfa sprouts, etc.
    - unpasteurized milk
- direct person-to-person contact
  - mainly in families, child care centers, and custodial institutions
- waterborne transmission
  - contaminated drinking or recreational waters

Signs and Symptoms

- severe cramping and diarrhea
  - may range from mild and non-bloody to stools that are virtually all blood
- fever
  - either low-grade or absent
- occasional vomiting may occur
- illness is usually self-limited and lasts for an average of 8 days, but STEC may cause severe damage to the lining of the intestine
  - they are the primary cause of hemorrhagic colitis
  - approximately 8% of cases progress to hemolytic uremic syndrome (HUS)
    - the most common cause of acute renal failure in children

Incubation Period

- median of 3 – 4 days
- range of 2 – 10 days

Diagnosis and Treatment

- diagnosis is achieved through laboratory testing of stool specimens
  - O157 can be identified by most laboratories
  - it is difficult to identify other strains due to a current lack of research
- Stx toxins can be detected using:
  - specific antibody testing
  - gene studies
  - enzyme-linked immunosorbent assay (ELISA)
- hydration is the most important and effective treatment for STEC infection
- antibiotics and antidiarrheal medications are not recommended and may even increase the risk of HUS

Prevention

- wash your hands thoroughly
  - after using the bathroom or changing diapers
  - before preparing or eating food
  - after contact with animals or their environments
- cook meats thoroughly
  - ground beef and meat that has been needle-tenderized should be cooked to a temperature of at least 160°F/70°C
- prevent cross contamination in food preparation areas by thoroughly washing hands, counters, cutting boards, and utensils after they touch raw meat
- avoid raw milk, unpasteurized dairy products, and unpasteurized juices
- avoid swallowing water when swimming or playing in recreational waters
  - lakes, ponds, streams, swimming pools, and backyard "kiddie" pools.