

SHIGA-TOXIN PRODUCING *ESCHERICHIA COLI* STEC Update



Roshan Reporter, MD, MPH

Rita Bagby, PS-PHN

Leticia Martinez, PS-PHN



Objectives

At the conclusion of this presentation the participant should be able to:

- Know the clinical signs and symptoms of the disease caused by Shiga toxin-producing *Escherichia coli* (STEC)
- Know the epidemiology of STEC infection in Los Angeles County.
- Know the case management of patients with STEC infection.
- Identify laboratory tests used to diagnose Shiga toxin-producing *Escherichia coli* infections



2

WHAT IS *ESCHERICHIA COLI*?

- Gram Negative Bacteria
- Sources can be: Urine, Resp, Blood, and Stool
- Considered normal flora in intestines of many mammals including humans
- **Some** *E. coli* causes GI disease
 - These are pathogenic *E. coli*; they possess ability to produce toxin
 - STEC is the type of *E. coli* are the topic today.



3

What are Shiga Toxin-producing *E. coli* ?

- Certain bacteria produce a toxin called shiga toxin: some *E. coli* can do this
- These *E. coli* are called “Shiga toxin-producing” *E. coli*, or STEC.
- You may hear them called verocytotoxic *E. coli* (VTEC) or enterohemorrhagic *E. coli* (EHEC)



4

INCUBATION

The incubation period is usually 3-4 days after the exposure, but may be as short as 1 day or as long as 10 days



5

Signs and Symptoms

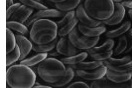
- Diarrhea (blood is common)
- Abdominal cramps (usually severe)
- Little or no Fever (less than 101F)



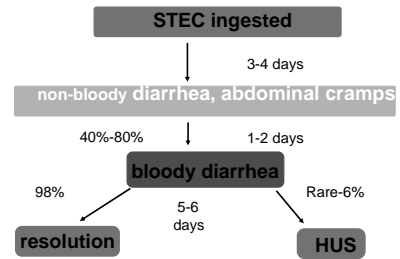
6

Pathophysiology

- Infection
 - Body's response
 - Organism is replicating and producing toxin
- Effects of toxin(s)
 - Adheres to cell
 - Epithelial intestinal
 - Endothelial Blood vessels
 - Renal Endothelial cells
 - Red blood cells



Sequence of events in STEC infection



Major modes of Transmission

- Food
 - cattle products, e.g., beef, raw milk
 - food contaminated with cattle or human feces e.g., lettuce, spinach, and cookie dough.
- Water
 - Drinking water
 - Recreational water
- Animal contact
 - contact with farm animals, e.g. petting zoos
 - contact with farm animals' environment
- Human contact
 - With the feces of infected persons



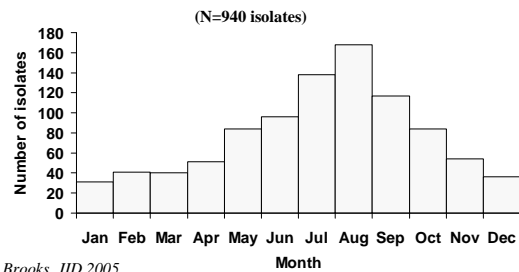
Transmission



Modes of transmission in non-O157 STEC outbreaks, U.S., 1990-2007 (N = 23)

Mode	No. outbreaks
Food	11
Person-to-person	6
Lake water	3
Animal contact	2
Undetermined	1

Seasonality of human non-O157 STEC isolates submitted to CDC, 1983-2002



Public Health Implications

- As infectious as *Shigella*
 - Low infectious dose (10-100)
 - SOS assessment critical
 - If congregate setting, assess for other ills
- Increased morbidity/mortality
 - Hemolytic Uremic Syndrome (HUS)
 - Thrombotic thrombocytopenic purpura (TTP)
- Outbreaks
 - Local
 - National



15



VS



STEAK

Ground Beef



Special considerations

- Hamburger vs steak
- Pre washed vs washed
- Aged cheese vs fresh/soft cheese
- Pasteurized vs unpasteurized



15

PHN Observations/Considerations

- Food preferences
- Food at home
- Kitchen technique
- Animal exposure
- SOS
- Patient Education/comprehension
- Remember the focus should be on the case and identifying any potential source.



16

Two Possible Means of Transmission



17

Prevention

- Wash your hands
- Cook meats thoroughly.
- Avoid unpasteurized milk/milk products
- Avoid swallowing un-chlorinated water
- Be cautious around animals
- Wash produce
- Avoid cross-contamination



18

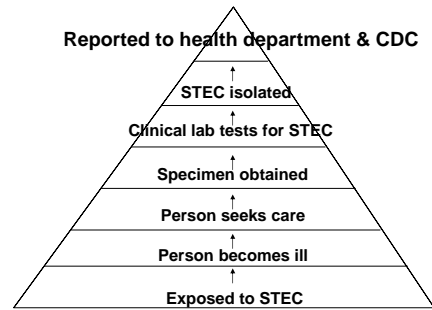
FBI or No FBI?

- Focus on the incubation period
- Ground Beef: Well cooked vs uncooked
- Vegetarian
- Kitchen technique
- Food Preferences
- FBI should be based on your best assessment of the situation

19



Pyramid of Surveillance



20



Milestones in STEC Follow-up

- 1994 *E. coli* O157 infection made reportable
- 1995 Commercial Shiga toxin enzyme immunoassay (EIA) introduced
- 2000 Non-O157 STEC infections made nationally reportable
- 2009 CDC recommending that all diarrheal stool should be cultured for STEC and tested for the detection of Shiga toxins.

21



Testing for STEC using the Shiga toxin EIA

- Clinical lab processes stool specimen in broth
 - Tests broth for Shiga toxin using EIA
 - Positive test is reportable
- Clinical lab should send Shiga toxin-positive broth to Public Health lab
 - PH lab isolates STEC
 - PHL serotypes
 - If unable to serotype, will refer (State or CDC)

22



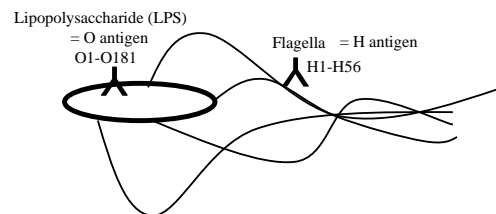
Challenges related to use of the Shiga toxin EIA

- After adopting the EIA, some clinical labs stopped testing for *E. coli* O157 using selective media
 - *E. coli* O157 outbreaks could be missed
- Some clinical labs discard Shiga toxin-positive specimens without obtaining an isolate, so
 - simply report “Shiga toxin positive” to doctor
 - serogroup not determined
 - *E. coli* O157 strains not identified and sub-typed for outbreak detection
 - Non-O157 outbreaks less likely identified

23



E. coli serotyping



Slide from USDA presentation

24



In House PHL Testing

- O157
- O111
- O103
- O121
- O26

25



Top Non-O157 Serotypes (CDC)

- O26 22% of non-O157 STEC
- O111 16% of non-O157 STEC
- O103 12% of non-O157 STEC
- O121 9% of non-O157 STEC
- O45 7% of non-O157 STEC
- O145 5% of non-O157 STEC

26



Case History Form

- Why was it changed?
- Why is it better than the old form?
- What is new?
- What stayed the same ?

27



28

