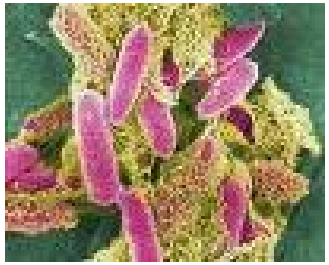
SHIGA-TOXIN PRODUCING *ESCHERICHIA* COLI STEC Update



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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

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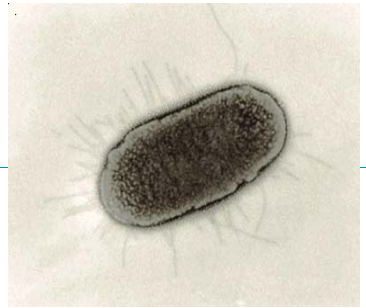
WHAT IS *ESCHERICHIA* COLI?

- 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 posses ability to produce toxin
  - STEC is the type of E.coli are the topic today.



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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 enterohemorrahagic E.coli (EHEC)

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

Signs and Symptoms

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

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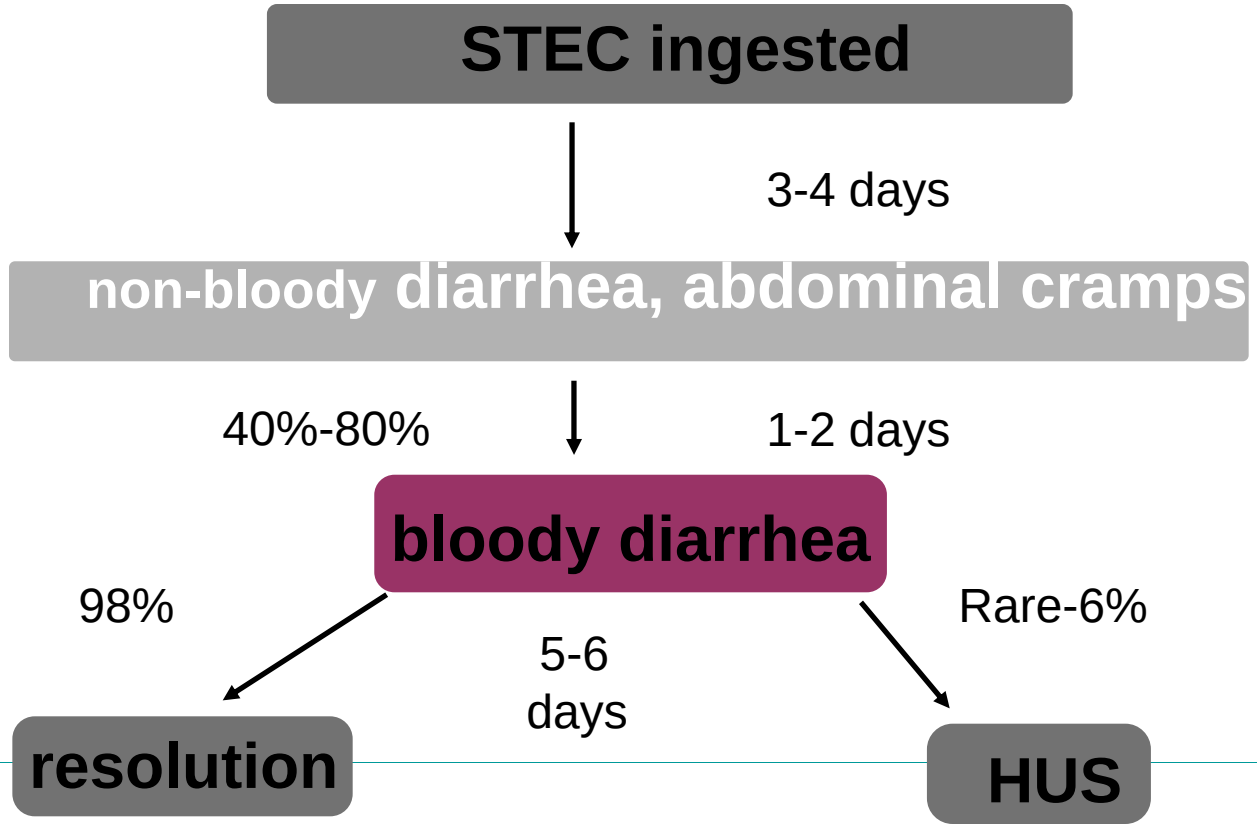
Pathophysiology

- 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**

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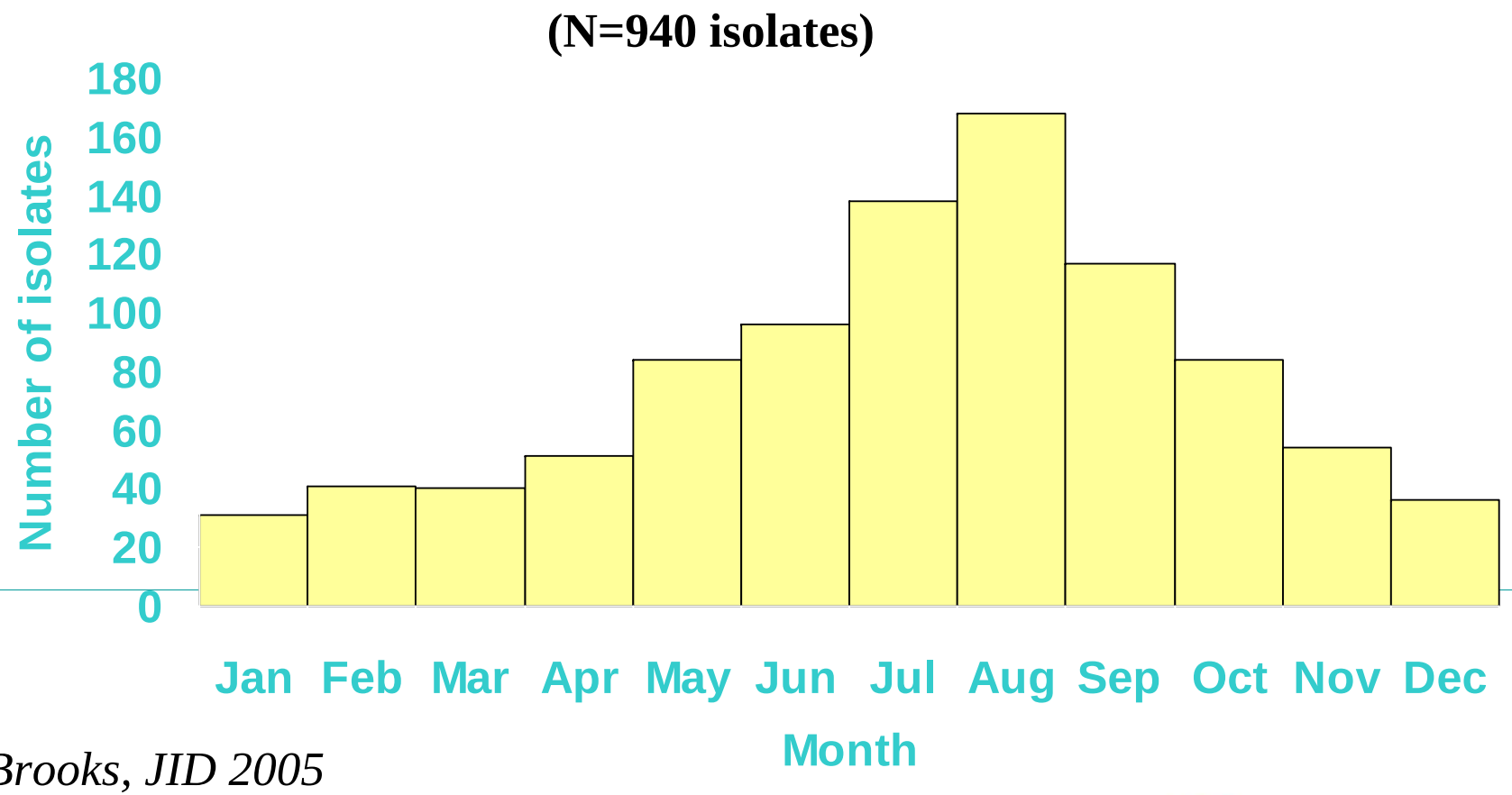
Seasonality of human non-O157 STEC isolates submitted to CDC, 1983-2002



Brooks, JID 2005

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

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VS

STEAK

Ground Beef

Special considerations

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

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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.

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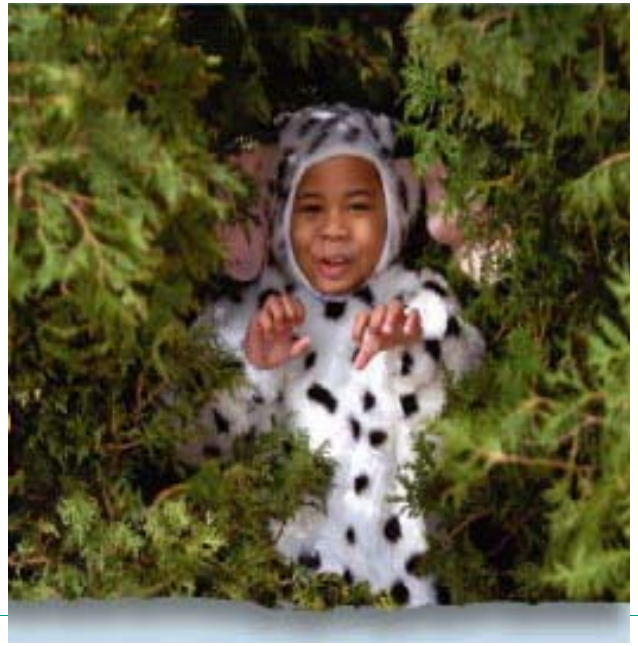
Two Possible Means of Transmission



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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

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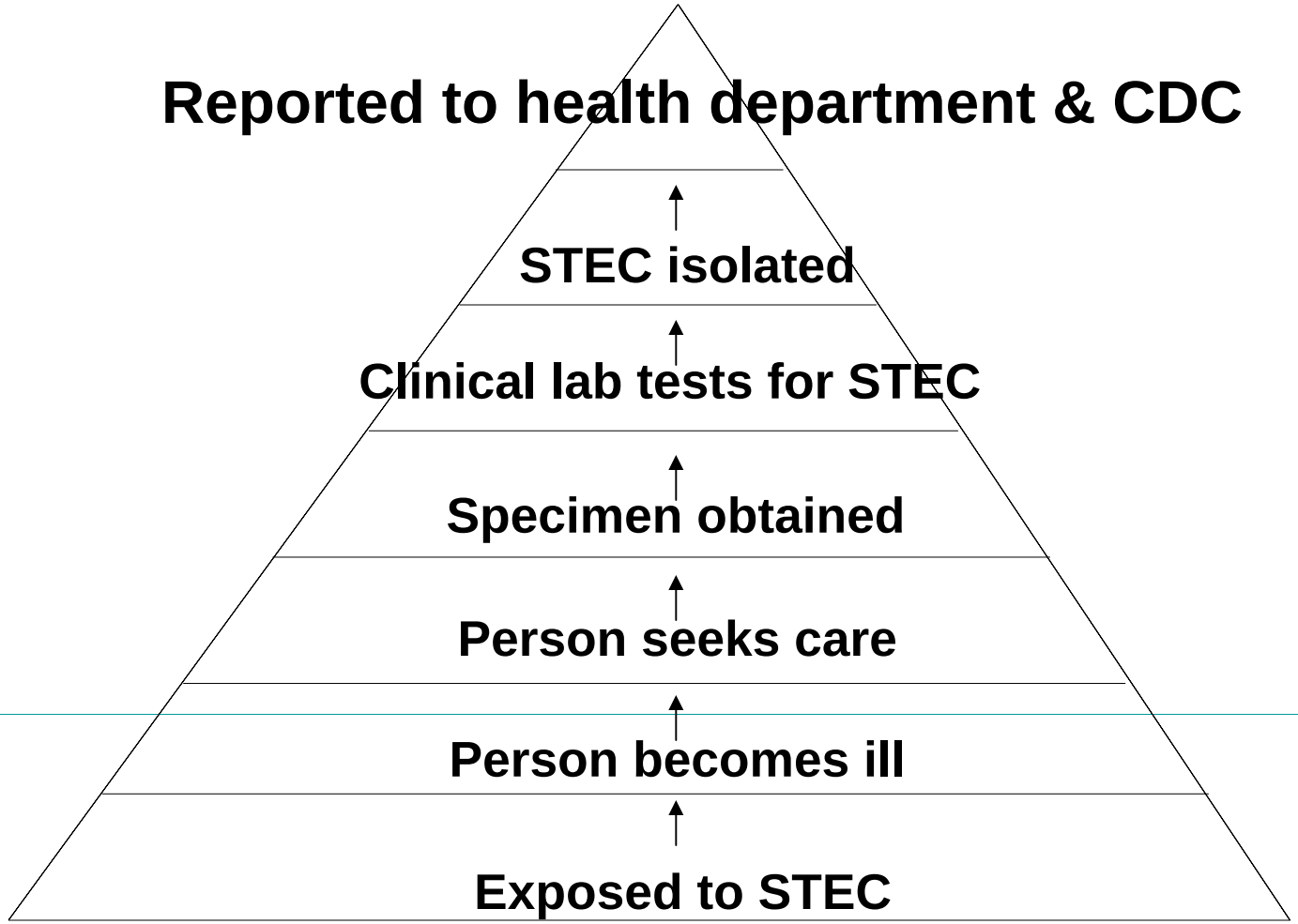
FBI or No FBI?

- 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

Pyramid of Surveillance



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.**

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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)

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

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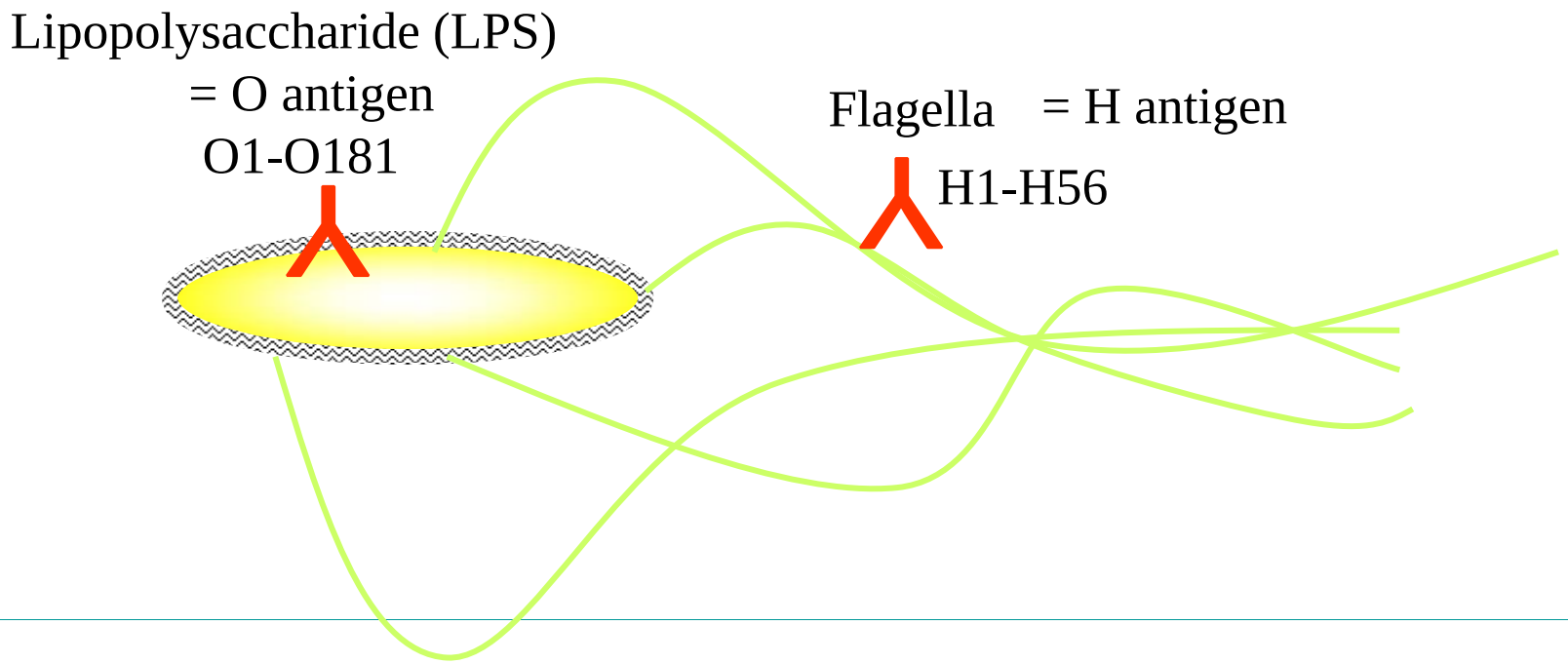
E. coli serotyping



Slide from USDA presentaion

In House PHL Testing

- O157
- O111
- O103
- O121
- O26

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

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Case History Form

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

QUESTIONS

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