Communicable Disease & Immunization Update

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STEC Infections

Shiga toxin producing *E. coli* (STEC) is a relatively new term that provides an inclusive label for all *E. coli* infections that produce verocytotoxins, also called Shiga toxins. The toxins produced by STEC were named based on their similarity to Shiga toxins produced by *Shigella dystenteriae.* Not all STEC have been associated with human disease; however, many cause diarrheal illness that can be severe. Severe infections can lead to hemolytic uremic syndrome (HUS) which can cause kidney failure and death.

STEC are generally labeled by an "O" antigen found on the body of the *E. coli* bacterium, and an "H" antigen found on the flagella. The STEC that has previously been the cause of most serious disease and outbreaks is *E. coli* O157:H7; however, there are at least 150 other strains. In the United States, six non-O157 serogroups (O26, O45, O103, O111, O121, and O145) account for the majority of reported non-O157 STEC infections. Non-O157:H7 strains are generally thought to cause less severe illness, although last spring's outbreak in Europe was a non-O157 strain.

In Pierce County we have seen an increase in STEC cases to 21 (preliminary) in 2011, from an average number of 13 cases per year since 2005. This is in part due to more laboratories now performing Shiga toxin testing which detects the non-O157cases previously missed. In 2011, eight STEC cases in Pierce County were non-O157, and two additional cases were Shiga toxin positive only (either not cultured or were culture negative).

TRANSMISSION

STEC infection occurs via contaminated foods, including undercooked ground beef, unpasteurized juice, raw milk, and raw produce, (e.g., lettuce, spinach, and sprouts); through ingestion of contaminated water; through contact with animals or their environment; and directly from person to person (e.g., in childcare settings). The incubation period of *E. coli* O157 is usually 3–4 days, with a range of 1 to 8 days. The organism has a low infectious dose (<100 organisms). The reservoir of these organisms is generally cattle and other ruminants. Deer have also been implicated. Outbreaks caused by contaminated produce are thought to be due to use of contaminated irrigation water or animals that have grazed in orchards or fields.

SIGNS AND SYMPTOMS

Persons with STEC experience diarrhea and abdominal cramps. After 1–2 days of diarrhea, 80% of patients with *E. coli* O157:H7 develop bloody diarrhea (this is usually the impetus for a medical visit). Approximately 45% of non-O157 STEC patients develop bloody diarrhea. Fever is usually absent or transitory only. STEC infections may also cause headache, body aches and malaise. Most people recover without treatment; however about 6% of O157 cases and less than 2% of non-O157 cases will develop hemolytic uremic syndrome (HUS), which is characterized by renal failure, thrombocytopenia, and hemolytic anemia with microangiopathy. Young children and seniors are at higher risk for HUS.

LABORATORY DIAGNOSIS

Rapid diagnosis is important for appropriate care of the patient, to implement infection control measures to prevent secondary cases, and to promptly search for a source of infection. Most O157 STEC isolates can be readily identified in the laboratory when grown on sorbitol-containing selective media. Labs Northwest and St. Joseph Hospital laboratory routinely culture stool specimens for O157 STEC; however, many clinical laboratories do not. In addition, routine stool cultures cannot test for non-O157 STEC. Instead, non-O157 is identified by use of enzyme immunoassay (EIA) or polymerase chain reaction (PCR) to detect Shiga toxin or the genes that encode the toxins. Labs NW routinely does the Shiga toxin test in addition to culture. Providers should be aware of what their lab is using, as specific orders may be needed if STEC is suspected.

Shiga toxin testing should not be done without culture. In multiple studies, for reasons that are unknown, EIAs failed to detect Shiga toxin in a subset of positive *E. coli* cultures. In addition, all STEC isolates are sent to the Washington State Public Health lab for final identification and genetic "fingerprinting" by pulse-gel field electrophoresis (PFGE). Comparisons of PFGE patterns at the state lab and through uploaded images to CDCs PulseNet are useful to link cases together, identify outbreaks and provide evidence as to the source of infection (see figure).

2011 EUROPEAN OUTBREAK

Last spring, Europe saw the largest outbreak of STEC in history. The outbreak peaked in May and as of July 4, 2011 there were 3,816 cases including 845 cases of HUS (22%). Fifty-four people died. The vast majority of cases occurred in Germany, but people in 13 countries were affected. Most had traveled to Germany including six persons from the United States. The outbreak strain was identified as an enteroaggregative Shiga toxin-producing *E. coli* O104: H4. This particular organism includes a virulence profile that combines two different *E coli*—enterohaemorrhagic shigatoxin producing *E coli* and enteroaggregative *E coli.* It also has an extended spectrum β-lactamase (ESBL) antibiotic resistance profile. Enterohemorrhagic *E. coli* can be traced to an animal (usually cattle) source, whereas enteroaggregative E. coli has been found only in humans.

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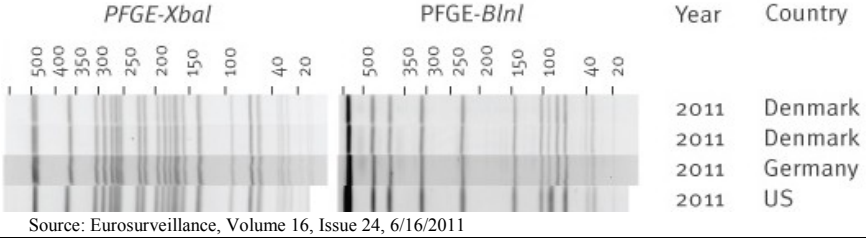
Figure–Pulse-Field Gel Electrophoresis Patterns of HUSEC041 Clone Causing Outbreak of *E. coli* O104:H4 Infections and HUS, Europe 2011



Source: Eurosurveillance, Volume 16, Issue 24, 6/16/2011

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The clinical characteristics were different from previously described STEC outbreaks. First of all, the proportion of patients who developed HUS was much higher (22% vs. 6% overall). It has been proposed that the trait of increased adherence by enteroaggregative *E. coli* could have facilitated increased absorption of toxin, leading to increased risk of HUS. Adult women were more at risk for HUS, whereas young children are usually at highest risk for the complication. In addition, the median incubation was longer at 8 days, unlike 3–4 days which is described in previous outbreaks. The clinical description also includes severe neurological symptoms after about 3–10 days in roughly 50% of patients with HUS, even though clinical and laboratory markers of HUS were improving.

The source was ultimately linked to fenugreek sprouts and seeds, which accounted for the relatively low number of child cases and high number of female cases (aversion to sprouts being protective here). Sprouts have frequently been implicated in outbreaks of enteric disease; usually salmonellosis but frequently *E. coli.* In 1996, radish sprouts were implicated in an outbreak in Japan that resulted in 2,764 culture-confirmed cases. Seeds can become contaminated pre-harvest and sprouting conditions (moist and temperate) facilitate bacterial growth. Sprouts are generally eaten raw and rinsing them is not sufficient to remove bacteria prior to consumption.

TREATMENT

Generally, treatment is supportive only. Antibiotics should not be used, as there are conflicting studies as to whether antibiotics increase the risk for HUS, especially in children. Young children should be monitored closely for hematologic changes suggesting development of HUS. Severe cases of HUS are generally treated with renal dialysis and plasmapheresis. Eculizumab, a monoclonal antibody therapy first approved for atypical HUS (not *E. coli* related) was successfully used for severe cases during the German outbreak and received FDA approval in September for treatment of HUS.

CONSUMER EDUCATION

Meat products, especially hamburger should be cooked to the proper temperature (155º for hamburger) to kill bacterial contamination. Kitchen hygiene and good hand washing should be observed to prevent contaminating the environment or other foods with raw meat juices. Lettuce and other produce that is consumed raw should be washed thoroughly under running water. Sprouts should probably not be consumed by young children and immune compromised persons.

Several STEC cases in Washington State this past year were linked to consumption of unpasteurized milk. Washington is one of 30 states where it is legal to sell raw milk as long as it is labeled as such and with a health warning. Raw milk and cheese may be purchased at local food cooperatives, health food stores and farmers' markets. Dairies that are legally providing unpasteurized products for sale are WSDA inspected and consumers may mistakenly infer a guarantee of safety. In the animal environment, nothing ensures safety from pathogens other than a "kill step" — pasteurization. Providers who care for young children should counsel parents about the dangers of raw milk. Pregnant women and immune compromised persons should also avoid unpasteurized dairy products.

REPORTING

Patients with severe diarrhea should have a stool culture, and if the clinician suspects a STEC infection, Shiga toxin testing and specific culture for enterohemorrhagic *E. coli* should be performed. All suspected and confirmed cases of STEC should be reported immediately to the Health Department at (253) 798-6410.

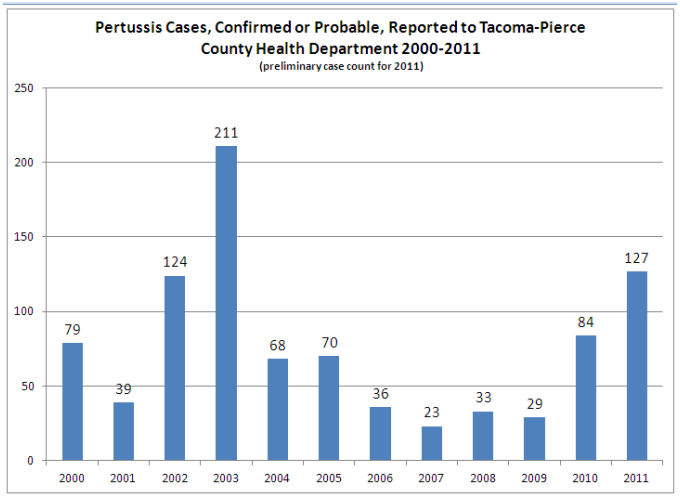
SOURCES

1. Washington State Dept of Health; Shiga Toxin-Producing *Escherichia coli* (STEC): A Review of Reported Washington Cases and 2011 Laboratory Survey Results. EpiTrends Newsletter, June 2011. www.doh.wa.gov/ehsphl/epitrends/11-epitrends/11-06-epitrends.htm
2. Frank, et al. Epidemic Profile of Shiga-Toxin-producing *E. coli* O104:H7 outbreak in Germany. NEJM, 365:19, Nov 10, 2011; pp 1771-1780.
3. Scheutz, et. al. Characteristics of the enteroaggregative Shiga toxin/verotoxin-producing *Escherichia coli* O104:H4 strain causing the outbreak of haemolytic uraemic syndrome in Germany, May to June 2011. Eurosurveillance, 16;24, June 16, 2011. www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19889

Pertussis Update

Preliminary case counts for 2011 show pertussis cases continuing to increase (see chart, numbers are preliminary for 2011). Incidence in Pierce County and in Washington State overall had been very low until June of 2010 when we started to see an increase in reported cases. Two school based outbreaks in 2010 and 2011 drove case counts higher. For 2011, ten infants age 3 months or younger were reported with pertussis. All infants recovered.

On January 10, Public Health Seattle King County reported an increase in pertussis cases. Since December 1, 28 confirmed cases have been reported in King County, with nearly 1/3 in infants.



Pertussis is most dangerous for very young, unimmunized infants. In 2011, two infants in Washington State died. During the 2010 pertussis epidemic in California, ten infants died. Pertussis activity in California has decreased from rate of 23.4/100,000 in 2010 to 7.4/100,000 in 2011 with no deaths.

Immunizing household contacts and caregivers of newborns with Tdap is recommended to prevent infant cases. In October, CDC issued recommendations to immunize pregnant women with Tdap if they have not already received one. The immunization should be given after 20 weeks gestation. This is preferable to the previous recommendation to give Tdap immediately postpartum to confer immunity to the mother before the newborn arrives. In addition, the newborn may receive protection against disease through maternal antibody in the early months of life. There are questions about whether maternal antibody will interfere with the infant immune response to immunization, but it is felt that the benefits of early protection (when infants are most vulnerable for severe complications) outweigh the risk of less than optimal immune protection later in childhood.

Free Tdap vaccinations are available for uninsured, low income contacts of newborns. Go to www.tpchd.org/pertussis.

Medical Provider Educational Event "Celebrate the Miracle of Vaccines"

When: Monday, March 1, 2012
5:00 p.m.–8:30 p.m.
Dinner Provided
Where: University of Washington Tacoma
Milgard Assembly Hall

Audience: Physicians, ARNPs, PAs, Office Managers, Pharmacists

- **Keynote Speaker: Kathleen Neuzil, MD, MPH** of PATH, an international global health non-profit will be speaking on PATHs work on meningitis in Africa and rotavirus in Nicaragua.
- **Jay Rosenbloom, MD, FAAP, PhD**
  Communicating with parents about the importance of vaccines
- **Survivors of Vaccine Preventable Disease Panel**
  Survivors and physicians share their experiences with polio, meningitis, influenza and rotavirus
- **Local Vaccines for Children Program Update and Vaccine Preventable Disease Trends in Pierce County**

Immunization Trainings for Medical Office Staff

These two sessions will get staff up to speed on storage and handling, paperwork and administration of vaccines. A complimentary dinner is provided. Plan to attend one or both of these free, informative trainings.

Session A: Monday, February 13, 2012, 5:00 p.m.–8:00 p.m., University of Washington Tacoma, Philip Hall Milgard Assembly Room
Topics:
- How vaccines work: basic immunology
- Review of vaccine preventable diseases
- Recommended child and adult vaccine schedules

Session B: Thursday, February 23, 2012, 5:00 p.m.–8:00 p.m., University of Washington Tacoma Philip Hall Milgard Assembly Room
Topics:
- Storage and handling of vaccines
- Avoiding common errors
- Administration techniques
- Storage and handling

For more information, go to www.tpchd.org. Call (253) 697-4010 to register.

REPORTED CASES OF SELECTED DISEASES
FOR MONTH ENDING DECEMBER 2011 (PRELIMINARY)

ENTERIC DISEASE	This Month	2011 to Date	Yr to date 1/10-12/10
Campylobacter	10	125	103
Cryptosporidium	1	40	33
Giardia lamblia	2	40	42
Salmonella	1	51	72
Shigella	0	2	7
Shiga toxin producing *E.coli* (STEC)	0	21	11
HEPATITIS			
Hepatitis A (Acute)	0	2	2
Hepatitis B (Acute)	0	1	2
Hepatitis C (Acute)	1	1	2
Hepatitis B (Chronic)	5	73	95
Hepatitis C (Chronic)	73	753	793
INVASIVE DISEASE/BACTERIAL			
Haemophilus influenzae	0	1	0
Listeria monocytogenes	0	0	4
Meningococcal Disease	0	1	3
SEXUALLY TRANSMITTED DISEASES	(military not reported)		
Chlamydia	340	3,829	3,603
Gonorrhea	45	403	188
Syphilis-Primary, Secondary & Early Latent	3	34	14
Syphilis, Late & Late Latent	0	13	7
TUBERCULOSIS	1	25	15
VACCINE PREVENTABLE DISEASE			
Measles	0	0	0
Mumps	0	0	3
Rubella	0	0	0
Pertussis	0	127	84
OTHER DISEASES			
Botulism (wound)	0	0	1
Dengue Fever	0	0	3
Legionella	0	5	1
Malaria	0	0	3
Meliodosis	0	1	0
Rabies Prophylaxis	0	19	26
Tularemia	0	1	0
Typhoid Fever	0	0	1
West Nile Virus	0	0	0
Yersiniosis	0	1	1

Please remember to report communicable diseases to the Health Department. Accurate reporting helps to stop the spread of communicable diseases and helps us to gain knowledge about the health of our community.

Provider and laboratory reporting of specific communicable diseases is required by law.

24-hour Reporting Line
(253) 798-6534

Confidential Fax Line for Case Reports
(253) 798-7666