Clark County Health District
We're In Your Neighborhood

Epidemiology Newsletter

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Office of Epidemiology
625 Shadow Lane
PO Box 3902
Las Vegas, NV 89127
Phone: (702) 383-1378
Fax: (702) 383-4936
e-mail: rbell@cchd.co.clark.nv.us

Shiga toxin-producing *Escherichia coli*

In the past two decades, Shiga toxin-producing *Escherichia coli* (STEC) have been increasingly recognized as important human pathogens. *E. coli O157:H7* is the serotype that was first found to be associated with enterohaemorrhagic diseases, but since the early 1980's, more than 100 other pathogenic STEC serotypes have been identified. Similar to O157 strains, these other serotypes may be associated with hemolytic uremic syndrome (HUS) and can be fatal.[1] The World Health Organization (WHO) reports that approximately 25% of reported HUS cases are associated with non-O157 STEC.[2]

Recent research indicates that treatment of children with *E. coli O157:H7* infection with antibiotics may increase the risk of HUS. In-vitro experiments have shown that various antibiotics can cause *E. coli* to release Shiga toxin. In vivo, it is theorized that this may make the toxin more available for absorption, thus inducing HUS. [3] A similar mechanism may also exist with other STEC.

WHO reports that in laboratories that test routinely for STEC in stool samples, STEC are found more often than *Shigella spp.* but less frequently than *Campylobacter* or *Salmonella spp.* Depending on the laboratory and geographical location, 20 to 70 percent of STEC are non-O157.[4]

A 1998 study determined that non-O157 STEC were as prevalent as O157 serogroups in Nebraska.[5] The Utah State Public Health Laboratory has been screening for non-O157 for three years. Table 1 is a synopsis of their findings.[6] For the past two years, the proportion of STEC in Utah that were non-O157 has been close to 40%.

The presence of blood in the stools may be a symptom of an STEC infection but it is not a reliable clinical indicator, since the diarrhea caused by STEC can range from mild and non-bloody, to stools that are mostly blood. Additionally, bloody stools can be characteristic of *Shigella* and *Salmonella* infections.

Table 1: Comparison of O157 and Non-O157 STEC by year - State of Utah Public Health Laboratory.

STEC serotype	Number of cases		
	1998	1999	2000*
O157:H7	75	36	49
O157:nm	0	0	5
Total O157 STEC	75	36	54
Unknown		14	14
O?:nm	8		1
O111:nm	4		6
O111:H8		1	
O26:H11		2	5
O121:H9	1		
O121:H19		2	3
O rough:nm			2
O118:H16		1	
O165:nm		1	
O49:nm		1	
O103:H2		1	
TOTAL non-O157 STEC	13	23	31
Overall Total	88	59	85
% non-O157 STEC	14.8%	39.0%	36.5%
* up to 12/11/00			

Prior to prescribing antibiotic treatment for diarrheal illness, the following should be considered:

- Previous studies have indicated that antibiotic treatment of *E. coli O157:H7* infections does not improve outcomes, and may induce HUS.[7,8]
- Ruling out *E. coli O157:H7* with a standard stool culture, does not rule out other STEC (which may cause HUS).

- Other enteric pathogens such as *Salmonella* and *Campylobacte*r are increasingly developing antibiotic resistance.
- Parasitic and viral pathogens are causative agents for many diarrheal illnesses, and antibiotic treatment would not ameliorate symptoms in these infections.
- If diarrheal illness is due to *Salmonella spp.* antibiotics will usually not shorten the course of illness, and may lengthen the period of shedding of the bacteria.[9]

In general, STEC infections are under-recognized because clinicians often do not request stool testing, and when stool testing is requested, few laboratories (including those in Clark County) routinely screen for non-O157 STEC. Currently non-0157 STEC infections are not reportable illnesses. Consequently, there are no statistics available for Clark County on the proportion of STEC that are non-O157. HUS is a notifiable syndrome but reporting of clinical diagnoses in Clark County is poor.

Non-O157:H7 STEC are phenotypically similar to commensal, non-pathogenic *E. coli*, and therefore cannot be detected using the same methodology as is used for O157:H7 STEC. Typically, non-culture methods such as polymerase chain reaction (PCR) or enzyme immunoassay (EIA) are used for detection of Non-O157:H7 STEC.[10] These types of tests are usually only performed at reference laboratories. Associated Pathologists Laboratories will accept special requests to test for non-O157 STEC that will be referred to an out-of-state reference laboratory. Any requests for non-O157 testing should be brought to the attention of Penny Williams or Elaine Jones at Associated Pathologists Laboratories.

REFERENCES:

[1] World Health Organization, *Zoonotic Non-O157 Shiga Toxin-Producing Escherichia Coli (STEC). Report of a WHO Scientific Working Group Meeting*, June 1998, Berlin Germany.

[2] Ibid.

[3] Wong CS, Jelacic S, Habeeb RL, Watkins SL, Tarr PI, *The risk of the Hemolytic-Uremic Syndrome After Antibiotic Treatment of Escherichia coli*. New England Journal of Medicine 2000; 342:1930-6.

[4] World Health Organization, 1998, op. Cit. (see reference 1)

[5] Fey PD, Wicker RS, Rupp ME, Safranek TJ, Hinrichs SH, *Prevalence of Non-O157:H7 Shiga Toxin-Producing Escherichia coli in Diarrheal Stool Samples from Nebraska*, Emerging Infectious Diseases (CDC), 6(5), 2000.

[6] Utah State Public Health Laboratory, *Shiga Toxin-Producing Escherichia coli Statitics, 1998-2000*.

[7] Wong CS, Jelacic S, Habeeb RL, Watkins SL, Tarr PI, 2000, op. Cit. (see reference 3)

[8] Neill MA, *Treatment of Disease Due to Shiga Toxin-Producing Eschericia coli: Infectious Disease Management*, In: Kaper JB, O'Brien AD, eds. *Escherichia coli O157:H7 and other Shiga Toxin-Producing E. coli Strains.* Washington, DC: ASM Press, 1998:357:63.

[9] Feigin RD, Cherry JD, eds., *Textbook of Pediatric Infectious Diseases, Edition 4*, 1998, (p. 1328) WB Saunders Co. Philadelphia.

[10] Fey PD, Wicker RS, Rupp ME, Safranek TJ, Hinrichs SH, 2000. op. Cit. (see reference 5).