

***E. coli*: Serotypes other than O157:H7**

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Escherichia coli (*E. coli*) is the predominant nonpathogenic facultative flora of the human intestine [1]. However, several strains of *E. coli* have developed the ability to cause disease in humans. Strains of *E. coli* that cause gastroenteritis in humans can be grouped into six categories: enteroaggregative (EAEC), enterohemorrhagic (EHEC), enteroinvasive (EIEC), enteropathogenic (EPEC), enterotoxigenic (ETEC), and diffuse adherent (DAEC). Pathogenic *E. coli* are serotyped on the basis of their O (somatic), H (flagellar), and K (capsular) surface antigen profiles [1]. Each of the six categories listed above has a different pathogenesis and comprises a different set of O:H serotypes [2].

In Florida, gastrointestinal illness caused by *E. coli* is reportable in two categories: *E. coli* O157:H7 or *E. coli*, other. In 1997, 52 cases of *E. coli* O157:H7 and seven cases of *E. coli*, other (known serotype), were reported to the Florida Department of Health [3].

Enteroaggregative *E. coli* (EAEC) - EAEC has been associated with persistent diarrhea (>14 days), especially in developing countries [1]. The diarrhea is usually watery, secretory and not accompanied by fever or vomiting [1]. The incubation period has been estimated to be 20 to 48 hours [2].

Enterohemorrhagic *E. coli* (EHEC) - While the main EHEC serotype is *E. coli* O157:H7 (see July 24, 1998, issue of the “Epi Update”), other serotypes such as O111:H8 and O104:H21 are diarrheogenic in humans [2]. EHEC excrete potent toxins called verotoxins or Shiga toxins (so called because of their close resemblance to the Shiga toxin of *Shigella dysenteriae* 1This group of organisms is often referred to as Shiga toxin-producing *E. coli* (STEC). STEC organisms can be identified by several methods including the use of DNA probes that identify genes that code for toxins [2]. The diarrhea may range from mild and nonbloody to bloody stools with no leukocytes [2]. STEC strains can cause hemolytic-uremic syndrome.

It appears non-O157 EHEC strains have been present for several decades but simply were not detected until recently [1]. Some studies suggest that 20 to 50% of all EHEC infections are cause by non-O157 serotypes [1] which appear to be less virulent than the O157 serotype. They are less likely to cause bloody diarrhea and hemolytic uremic syndrome, which are potentially life threatening complications of all STEC infections [4]. However, younger patients have a higher risk for serious infection from non-O157 strains and screening for Shiga toxin rather than the O157 antigen has been suggested for this population [5]. The most common non-O157:H7 serotypes associated with disease in humans include O26:H11, O103:H2, O111:NM, and O113:H21 [1].

A very low infectious dose (100 to 200 organisms) is needed to cause illness [1]. Incubation period is three to eight days [2]. Treatment of EHEC illness is mainly that of supportive care [1]. Vaccines are being tested in animals. Cattle are the reservoir of EHEC, but humans may serve as reservoirs for person-to-person transmission. Transmission may also occur by ingestion of contaminated food or water. Non-O157 serotypes have been found in ground pork, chicken, cheese, and ground beef [4].

Enteroinvasive *E. coli* (EIEC) - EIEC strains were first shown to cause diarrhea in volunteer studies conducted in 1971 [6]. The organisms invade the epithelial cells of the intestine and cause a watery diarrhea [2]. In a minority of patients, EIEC may produce an illness that is similar to shigellosis (bacillary dysentery) [1, 2, 7]. Dysentery caused by EIEC usually occurs within 12 to 72 hours

following ingestion of contaminated food and is self-limiting. The illness is characterized by the appearance of blood and mucus in the stools, abdominal cramps, vomiting, fever, chills, and malaise.

Documented outbreaks are usually foodborne or waterborne, although person-to-person transmission is possible [1]. Outbreaks have been associated with the consumption of contaminated hamburger meat and unpasteurized milk. A major foodborne outbreak attributed to EIEC in the United States occurred in 1973. The implicated food was cheese imported from France [7].

Enteropathogenic *E. coli* (EPEC) - EPEC is the oldest recognized category of diarrheogenic *E. coli* [2]. EPEC cause either a watery or bloody diarrhea [8]. EPEC has been linked to infant diarrhea [1]. Sporadic outbreaks of EPEC diarrhea have occurred for half a century in infant nurseries [8]. EPEC is a major cause of infant diarrhea in developing countries [1]. Breastfeeding may protect against disease [1, 2]. Human milk (and colostrum) strongly inhibit the adhesion of EPEC to Hep-2 cells in vitro [1].

Transmission of EPEC is via the fecal-oral route. The incubation period can be as short as nine hours in adults [2]. Achlorhydria may be a risk factor for illness in adults [1].

Enterotoxigenic *E. coli* (ETEC) - ETEC strains elaborate heat-labile toxin (LT), heat-stable toxin (ST), or both toxins [2]. A variety of laboratory techniques can be used to identify ETEC: gene probes designed to detect the toxins or the toxin genes, tissue culturing, or immunochemical tests [9]. ETEC is associated with two major clinical syndromes: traveler's diarrhea, and weanling diarrhea in children in the developing world [1]. The organisms colonize the surface of the small bowel mucosa where they elaborate their enterotoxins. The incubation period is short (14 to 50 hours) [1]. The diarrhea is watery, usually without blood or mucus [2]. Fever may not be present [2, 5]. The disease is usually self-limiting [9]. Infection with ETEC may cause diarrhea which is similar to that caused by *Vibrio cholerae* [2]. Epidemiologic studies have implicated food and water contaminated with feces as the most common vehicles for ETEC infection. DNA probes can be used to detect ETEC in food items [9].

Diffusely Adherent *E. coli* (DAEC) - Little is known of the epidemiology and clinical profile of the illness caused by DAEC. In one study involving hospitalized children between the ages of one month and 14 years, the majority of patients infected with DAEC experienced vomiting [10]. Several studies have implicated DAEC as a cause of diarrhea while other studies have not recovered DAEC strains more frequently from diarrheal patients than from asymptomatic controls [1]. DAEC appears to be more pathogenic in preschool-aged children than in infants and toddlers [2].

References

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