Enterotoxigenic *Escherichia coli*: Traveler’s Diarrhea Comes Home

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(See the article by Beatty et al. on pages 329–334)

The article in this issue of *Clinical Infectious Diseases* by Beatty et al. [1] on an outbreak of diarrhea due to enterotoxigenic *Escherichia coli* (ETEC) further documents the emergence of ETEC as a significant diarrheal pathogen in the United States. The main contribution of the article by Beatty and colleagues is that it describes one of the largest foodborne outbreaks ever reported in the United States (an estimated 3600 persons became ill). ETEC is the most common cause of traveler’s diarrhea, which is often related to travel to developing countries (commonly referred to as “Montezuma’s revenge,” “Bali belly,” “Tijuana trot,” and “Turista”). Recent data, however, suggest that Americans no longer have to travel to developing countries to become exposed to this toxin-mediated, cholera-like infection [2, 3].

ETEC was first recognized as a cause of human illness in the 1960s [4]. The non-invasive organism colonizes the small intestine without causing mucosal damage. ETEC causes acute, self-limited, secretory diarrhea mediated through the action of heat-stable and heat-labile enterotoxins. The duration of illness is typically 3–5 days, and the illness usually resolves without antimicrobial treatment, but symptoms can persist for 2–3 weeks without complications or sequelae [5–7].

Contaminated water and food have been implicated as vehicles for transmission of ETEC infection [2, 3, 8]. Food sources reported for ETEC-related diarrhea include fresh fruits and vegetables (especially lettuce), parsley, basil, scallops, shrimp, crab meat, tuna paste, prepared salads, and soft cheeses. ETEC infections, as was reported in this outbreak, are always associated with poor hygiene and sanitation. Contaminated seafood and salads are frequently implicated as vehicles of infection in outbreaks of ETEC infection. In this outbreak, multiple prepared salads (potato, macaroni, and egg) were implicated as vehicles of infections, although the exact route of contamination was never determined. Unlike *E. coli* O157:H7, ETEC is uncommonly found in meat products. To cause infection, a high infective dose of >10⁶ colony-forming units is required [9]; therefore, food and water must be heavily contaminated for outbreaks to occur. Waterborne outbreaks attributed to ETEC have been particularly problematic on cruise ships. In one series of outbreaks reported on cruise ships, contaminated water and ice cubes caused thousands of infections because of a failure to adequately chlorinate water after bunkering [10].

Because it is difficult to detect and isolate this organism, ETEC infections in the United States are often undiagnosed; therefore, outbreaks may go unrecognized. ETEC is not identified by standard assays used in routine bacterial stool cultures [11], and laboratory isolation requires molecular diagnostic techniques, such as PCR and toxin assays that are not widely available. Consequently, because of the cost, most clinical laboratories and local and state public health departments do not routinely perform these tests to detect ETEC in diarrheal specimens. As a result, sporadic infections and outbreaks of ETEC infection—in which routine bacterial stool culture results are negative—may be misclassified as viral gastroenteritis. In this study, the authors used an ELISA of IgG and IgM antibodies to *E. coli* lipopolysaccharide to assist in their outbreak investigation and to find additional cases [1]. Similar to other enteric pathogens, multiple antimicrobial resistances have been reported [2, 3]. Fortunately, significant resistance to fluoroquinolones, the most commonly prescribed class of medications for traveler’s diarrhea, has not been reported.

The finding that immunity develops after exposure to ETEC strains has spurred research and development of ETEC vaccines. There are several candidate vaccines that have been developed to prevent ETEC infection; these are currently being evaluated in clinical trials [11, 12]. Effective vaccines will not only be of benefit to travelers, but they have the potential to reduce the burden of diarrheal illness globally, because diarrheal disease due to ETEC is the
leading cause of death among children aged <5 years in developing countries.

This study by Beatty et al. [1] documents one of the largest outbreaks of ETEC infection ever reported in the United States and highlights the need to shed new light on prevention and control issues. Studies of this type provide important information about the etiologies of outbreaks and about ways to prevent future outbreaks. To improve the epidemiology and enhance the prevention of ETEC infection, major public health measures are now needed, including the development of simple, inexpensive diagnostic tests that can be widely used and the development of an effective, affordable multivalent ETEC vaccine. This vaccine would be used in developing countries and for the prevention of “traveler’s diarrhea” abroad and at home.

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References