**E. coli 0157:H7**

By Fang Fang

**Disease-** E. coli 0157:H7

**Etiologic agent:** E. coli 0157: H7

**Transmission-** E. coli 0157:H7 can be found in healthy animal digestive tract. The E. coli strains that can cause disease are the result of Shiga toxins produced. E. coli 0157:H7 is most popular strains that are usually related to meat products [1]. Most cases that are related to E. coli 0157:H7 are caused by contaminated food especially ground beef [2, 3]. The improper processing during the slaughtering is the main reason for the beef contamination. As a result, after consumption of the contaminated rare meat can lead to E. coli 0157:H7 infection. Beside animal reservoirs, E. coli 0157:H7 outbreaks are also related to different types of foods such as vegetables, milk, juice and even well water that have been contacted by infected animals [4].

**General characteristics of MO (specific) -** E. coli is a large group of bacteria that can be normal flora living in the digestive tract of human and animals [2]. It is gram-negative rod. Some strains might be pathogenic to human. It is also non-spore forming facultative anaerobe that can be either mobile using flagella or non-mobile. The strain of 0157:H7 can grow in the temperature from 45°F to 114°F. The bacteria prefer neutral pH, but they can survive in pH as low as 4.3 and as high as 10 [5].

**Key tests for identification (specific)-** The presence of E. coli 0157:H7 is confirmed by stool culture since the bacteria usually live in human digestive system. After stool culture, the sample is compared with E. coli 0157:H7 cultured in the lab. There are also some commercial kits such as Bio-Rad RAPID’ E.coli O157:H7 Agar that can be used in the research lab or hospital lab. According to USDA, the test for meat products can be achieved by isolation and use of antibody-coated paramagnetic beads. After the attachment on the beads, the presence of E. coli O157:H7 can be observed under UV light [6].

**Signs and symptoms of disease-**The symptoms of patients infected by E. coli O157:H7 can be complicated. In most cases, patients were reported to have diarrhea with or without blood, vomiting, and severe abdominal pain [2].

**Historical information-**In 1982, this pathogenic strain of E. coli O157:H7 was first identified after two outbreaks in Oregon and Michigan [7]. Later, this microorganism was detected in the stool samples of children with hemolytic uremic syndrome (HUS). In addition, the antibody against this bacteria strain was identified in 1991 from a HUS child’s serum which was stored in 1974 [8]. Although the confirmation of this pathogenic E. coli strain was not until 1982, it was believed to be responsible for several large outbreak in the US in the 1950s [8].

**Virulence factors-**The virulence factors of E. coli O157:H7 are mainly composed of three parts. Shiga toxin that can inhibit the protein synthesis and bind to the glycolipid receptors on the host cells.. Adhesin protein, intimin, works to adhere to the host cells. The presence of pO157 plasmids such as ToxB, KatP and EspP results in the production of catalase, peroxidase and cytotoxin [8, 9].

**Control/Treatment-**The treatment for E. coli O157:H7 infection depends on the severity of the symptoms. In most cases, the patients can recover in 5-10 days without treatment. Although the
pathogenic agent is bacteria, antibiotics are not used since it may cause the rapid release of Shiga toxin from the microorganisms and worsen the symptoms [2]. In addition, antidiarrheal medication will delay the elimination of bacteria from digestive tract. The treatments such as hydration are used to relieve the symptoms [1].

**Prevention/ Vaccine information, new trials?** – Cooking ground beef product such as hamburger thoroughly can reduce the risk of *E. coli* O157:H7 infection dramatically. Clean fruits and vegetables with plenty of water before eating. [2]. There is no approved vaccine for human. However, United Kingdom has approved vaccination for cattle since beef is the most common reservoirs for this pathogenic *E. coli* strain [10]. Scientists are now working on new trials of *E. coli* O157:H7 vaccines to prevent the fecal shedding of this bacteria from poultry animals especially cattle [11, 12].

**Local cases or outbreaks (with incidence figures)**

*E. coli* O157:H7 outbreak related to ground beef. This outbreak happened in Michigan, Ohio, Missouri and Massachusetts with total of 12 cases. This outbreak is caused by the recalled ground beef from Wolverine Packing Company because they have observed the possible contamination of STEC O157:H7.

![Figure 1. The outbreak related to ground beef in 2014. In this outbreak, 12 patients was infected with E. coli 0157:H7 in four states [13].](image-url)
Figure 2. The date of illness onset during the outbreak.

**Global cases or outbreaks (with incidence figures)**

In 2013, UK had an E. coli O157:H7 outbreak with 13 people from England, 4 in Wales, and 1 in Scotland. This outbreak was caused by the consumption of bagged watercress at Sainsburys [14].
Figure 1

Confirmed primary cases infected with STEC O157 PT 2 stx2 of the outbreak MLVA profile, by date of symptom onset, United Kingdom, 17–29 August 2013 (n=17)

MLVA: multiple-locus variable-number of tandem repeats analysis;
PT: phage type; STEC: Shiga toxin-producing *Escherichia coli*;
STX: Shiga toxin.

Figure 3. Confirmed cases infected with *E. coli* O157 of the outbreak MLVA profile, by date of symptom onset, United Kingdom, 17–29 August 2013 (n=17)[15].
Figure 2

Age and sex distribution of confirmed primary cases infected with STEC O157 PT 2 stx2 of the outbreak MLVA profile, United Kingdom, August–September 2013 (n=17)

MLVA: multiple-locus variable-number of tandem repeats analysis; PT: phage type; STEC: Shiga toxin-producing *Escherichia coli*; STX: Shiga toxin.

Figure 4. Age and sex distribution of confirmed primary cases infected with *E. coli* O157 of the outbreak MLVA profile, United Kingdom, August–September 2013 (n=17) [15].

References:


