

THE PATHCARE NEWS

A GUIDE TO DIARRHEAGENIC E.COLI



E. coli is the major aerobic commensal organism in the gut and only causes disease following some disruption of gut, e.g. after penetrating injury. However, a number of E. coli strains or pathotypes possessing particular sets of virulence factors are adapted to cause disease in different sites, e.g. uropathogenic E. coli cause UTIs. Similarly, a number of diarrheagenic pathotypes are responsible for diarrhoeal disease.

Diarrheagenic E. coli can only be detected by molecular techniques that target the genes responsible for the production of the specific virulence factors, since culture based methods cannot distinguish diarrheagenic E. coli from commensal E. coli. Previously such molecular methods were only available in research laboratories, but the development of multiplex PCR panels targeting all key virulence genes simultaneously has allowed the detection of diarrheagenic E. coli in routine diagnostic laboratories.

The following five diarrheagenic E. coli pathotypes with their distinctive pathogenic, clinical and epidemiological characteristics are recognised. However, since the genes encoding different virulence factors are frequently present on mobile genetic elements, ongoing selection and combination of genes, may lead to emergence of other pathotypes in future. The large German outbreak of foodborne diarrhoea and haemolytic uraemic syndrome (HUS) in 2011 was due to a strain of Enterohaggative E. coli (EAEC) that had also acquired Shiga toxin.

Type of E.coli	Mechanism of disease	Population at risk	Clinical features
Enterotoxigenic E. coli (ETEC)*	Toxins (heat stable and heat labile- latter similar in effect to cholera toxin)	Children < 2, travellers (local adults develop antibodies to toxins)	Acute watery diarrhoea, varying severity
Enteropathogenic E.coli (EPEC)*	Various proteins that disrupt gut integrity and cause secretion of ions		Typical form causes severe diarrhoea in children, atypical form varying severity all ages, but may also have asymptomatic carriage
Enterohaggative E. coli (EAEC)*	Named from effect of aggregation of cells seen in tissue culture	Immunocompromised at risk of persistent diarrhoea	Acute – chronic diarrhoea of varying severity. May also have asymptomatic carriage
Shiga toxin-producing E. coli (STEC)/ Enterohaemorrhagic E. coli (EHEC)*	Shiga toxin, absorbed systemically, causes cell death, targets renal tubular and endothelial cells		Bloody diarrhoea Haemolytic uraemic syndrome (microangiopathic anaemia, renal failure, thrombocytopenia)
Enteroinvasive E. coli (EIEC)	Invasive disease similar to Shigella		Watery diarrhoea or bloody diarrhoea or dysentery with fever

*Asymptomatic carriage of pathotype can occur

Accurate and rapid detection of the causative agent of diarrhoea, including diarrheagenic *E. coli*, allows for specific directed therapy where indicated, and reduces unnecessary use of antimicrobials, while also providing valuable information regarding epidemiology and infection control.

Treatment

Supportive care with fluid, electrolytes, and nutritional management is the cornerstone of treatment of diarrheal illnesses.

Antibiotics are not routinely recommended for patients with diarrhoea who have a pathogenic *E. coli* identified on stool testing because:

- the disease is usually self-limiting
- antibiotic use selects for resistant organisms and creates adverse effects
- in Shiga toxin-producing *E. coli* (STEC/EHEC) antibiotics are contra-indicated since they cause expression and release of Shiga toxin, increasing the risk and severity of HUS

Antibiotics may be indicated in patients for patients with diarrhoea associated with pathogenic *E. coli* infection other than Shiga toxin-producing *E. coli* (STEC/EHEC) if diarrhoea is:

- severe e.g. with fever, more than six stools per day, volume depletion warranting hospitalization
- bloody
- prolonged (>7 days)

The threshold for treatment may be lower in immunocompromised persons.

Antibiotic options:

- a fluoroquinolone:
 - ciprofloxacin (a single 750mg dose or 500mg twice daily for 3-5 days) OR
 - levofloxacin (500mg as a single dose or given daily for 3-5 days)

OR

- azithromycin:
 - a single 1g dose (for patients without dysentery) OR
 - 500mg daily for 3 days

References

1. UpToDate®. Pathogenic *Escherichia coli* associated with diarrhea. Accessed 12 April 2019.
2. Clements A, Young J, Constantinou N, Frankel G. Infection strategies of enteric pathogenic *Escherichia coli*. *Gut Microbes* 3:2, 71–87; March/April 2012.