

Enterohemorrhagic E. Coli (EHEC)

Enterohemorrhagic *Escherichia coli* (EHEC), commonly called *E. coli* O157:H7 is an important cause of foodborne illness in the United States. In addition to bloody diarrhea, individuals can develop hemolytic uremic syndrome with anemia, thrombocytopenia, and acute renal failure, especially in young children and elderly persons. This bacterial strain is most commonly transmitted via the fecal-oral route and typically associated with eating contaminated ground beef in undercooked hamburgers. It is a specific serotype of *E. coli*. The O refers to the cell wall antigen water, while H refers to the flagella antigen. This strain may produce Shiga-like toxin, which catalytically inactivates the 60S ribosomal subunit of eukaryotic cells. This blocks mRNA translation and causes cell death in the mucosal cells of the GI tract. The toxin also enhances cytokine release, which can cause hemolytic uremic syndrome (HUS). Strains of *E. coli* that express Shiga-like toxins gained this ability through lysogeny, meaning infection with a prophage that contained the coding for the toxin. *E. coli* O157:H7 can be differentiated from other *E. coli* strains because it is typically non-sorbitol fermenting, whereas the majority of other *E. coli* strains are sorbitol fermenters. In patients, antibiotics are not part of the treatment of patients with EHEC disease and may possibly increase the risk of subsequent HUS. As toxins may be released by dead and dying bacterial cells, the risk of endotoxin release could add to the patient's already potentially lethal burden



PLAY PICMONIC

Characteristics

O157:H7

O157:H7

Enterohemorrhagic *Escherichia coli* (EHEC), commonly called *E. coli* O157:H7, is an important cause of foodborne illness in the United States. It is a specific serotype of *E. coli*. The O refers to the cell wall antigen water, while H refers to the flagella antigen. This strain may produce Shiga-like toxin, which catalytically inactivates the 60S ribosomal subunit of eukaryotic cells.

Non-Sorbitol Fermenting

Nun-Sorbet Ferns

E. coli O157:H7 can be differentiated from other *E. coli* strains because it is typically non-sorbitol fermenting, whereas the majority of other *E. coli* strains are sorbitol fermenters.

Hamburger Meat

Hamburger

This bacterial strain is most commonly transmitted via the fecal-oral route, and typically associated with eating contaminated ground beef in undercooked hamburgers.

Produces Shiga-like Toxin

She-jello in Mirror

EHEC can produce two varieties of shiga-like toxin, STX1 and STX2. STX1 is identical to the toxin released by *Shigella*, whereas STX2 differs slightly while maintaining the same mechanism of action. This toxin catalytically inactivates the 60S ribosomal subunit of eukaryotic cells. This blocks mRNA translation and causes cell death in the mucosal cells of the GI tract. The toxin also enhances cytokine release, which can cause hemolytic uremic syndrome (HUS).

Gram-negative

Graham-cracker Negative-devil

E. coli is a Gram negative bacteria, which does not stain when crystal violet dye is applied, due to its thin peptidoglycan layer.

Lysogeny

Lasso-jeans

E. coli strains that express Shiga-like toxins gained this ability through lysogeny, meaning infection with a prophage that contained the coding for the toxin.

Inactivates 60S Ribosome

60 S Ribosome Being Hammered

The strain can produce Shiga-like toxin, which is identical to the toxin released by Shigella. This toxin catalytically inactivates the 60S ribosomal subunit of eukaryotic cells. This blocks mRNA translation and causes cell death in the mucosal cells of the GI tract. The toxin also enhances cytokine release, which can cause hemolytic uremic syndrome (HUS).

Disease

Bloody Diarrhea

Red Toilet

EHEC do not invade mucosal cells as readily as Shigella, but EHEC strains produce a toxin that is virtually identical to the Shiga toxin, leading to bloody diarrhea

Hemolytic Uremic Syndrome (HUS)

(HUS) Hemolysing U-rainbow Anemone

Hemolytic uremic syndrome (HUS) is a potentially fatal multisystem disease with microangiopathic hemolytic anemia, thrombocytopenia and acute renal failure. HUS is typically caused by Shiga toxin-producing bacteria, including Shigella and E. coli O157:H7.

Hemolytic Anemia

Hemolysing-RBCs from Anemone

Hemolytic anemia is the destruction of RBCs due to inherited or acquired causes. Hemolytic anemia can cause fatigue, shortness of breath and jaundice due to the excess breakdown of red cells. Hemolytic uremic syndrome (HUS) causes microangiopathic hemolytic anemia, which is the destruction of red blood cells due to vascular endothelial dysfunction and narrowing of blood vessels, which shears through RBCs.

Acute Renal Failure

Kidney

Hemolytic uremic syndrome can cause acute kidney failure. In HUS, Shiga toxin enhances the release of cytokines, which damages endothelial cells in the vasculature and kidneys. This damage can cause the kidneys to fail.

Thrombocytopenia

Trombone-side-toe-peanut

Thrombocytopenia is a relative decrease of platelets in the blood (fewer than 150,000 platelets per microliter of blood). Platelets are needed for hemostasis and if there is thrombocytopenia, excessive bleeding can occur. HUS presents with thrombocytopenia and microangiopathic hemolytic anemia.