



## A Sizzling Problem: *E. coli* O157:H7

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Recent reports of *Escherichia coli* O157:H7 disease, nicknamed “Hamburger Disease”, raise concerns about the safety of processed food and food handling practices, making it an ideal topic for September’s **Bug of the Month**.

There are many different strains of *Escherichia coli*, a gram-negative bacterium which resides in the gastrointestinal (GI) tracts of humans and animals.

*E. coli* O157:H7, nicknamed “Hamburger Disease”, was made famous following a 1982 outbreak of bloody diarrhea across the U.S., which was traced back to contaminated hamburgers sold by a fast food chain.

Several small food-associated outbreaks have also occurred in Canada. A large community-based outbreak occurred in Walkerton, Ontario. It is speculated that the Walkerton outbreak occurred when cattle manure, contaminated with *E. coli* O157:H7 from local farms, washed into the surface water which was sub-optimally treated and consumed by the local community.

### *What’s the culprit?*

*E. coli* O157:H7 produces a toxin known as verotoxin, which causes an illness in humans characterized by abdominal pain and diar-

rhea. In extreme cases, hemorrhagic colitis and hemolytic uremic syndrome (HUS)—characterized by microangiopathic hemolytic anemia, acute renal failure, and thrombocytopenia—may develop.

### *How does E. coli O157:H7 spread?*

This bacteria can be part of the GI flora of healthy cattle. Fecal contamination of beef occurs in the slaughtering process. When the meat is converted into hamburger, the animal feces is then distributed throughout the ground beef. When a steak is grilled, the surface will reach suitably high temperatures, killing any contaminating bacteria. A hamburger, however, may have bacteria in its centre; if the hamburger is not cooked throughout, the bacteria may remain viable and lead to *E. coli* O157:H7 disease.

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It is important to note that *E. coli* O157:H7 disease has been reported to occur through:

- contact with livestock,
- human-to-human contact,
- consuming suboptimally chlorinated drinking water, and
- consuming salami, unpasteurized milk or apple cider, fresh cheese curd, and raw vegetables (*i.e.*, lettuce and alfalfa sprouts).

It is presumed the raw products used for the preparation of these food stuffs were contaminated by animal feces containing *E. coli* O157:H7.

*Approximately 75% of those developing HUS will require blood transfusions, 50% will require hemodialysis, and 5% will die.*

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## *What are the clinical features?*

The incubation period is usually three to eight days and disease is associated with abdominal pain and cramping. Nausea, vomiting, and diarrhea, which may be bloody and characterized by severe colitis, can also occur. Hemolytic uremic syndrome occurs in approximately 2% to 10% of patients, with those at highest risk being children, older adults, and those who are immunosuppressed.

## *How does *E. coli* O157:H7 cause HUS?*

Approximately 75% of those developing HUS will require blood transfusions, 50% will require hemodialysis, 10% will develop hypertension and chronic renal failure, and 5% will die. The exact mechanism whereby the *E. coli* O157:H7 verotoxin causes HUS is unknown; however, it is suspected to be a direct toxin injury, damaging the vascular endothelium and culminating in microangiopathic hemolytic anemia, acute renal failure, and thrombocytopenia.

It is important to note that only a small proportion of patients who ingest *E. coli* O157:H7 actually develop HUS. Infection can range from asymptomatic carriage of the bacteria to abdominal discomfort, bloody diarrhea, or even the more serious HUS.

## How is *E. coli* O157: H7 diagnosed?

If the patient presents with bloody diarrhea, or the diagnosis of *E. coli* O157:H7 disease is otherwise suspected, obtain a stool specimen for culture and clearly indicate your suspicion on the laboratory requisition. Laboratory protocols exist, utilizing special growth media to detect and differentiate this bacterium from other enteric pathogens, such as *Salmonella spp*, *Shigella spp*, *Yersinia spp*, and *Campylobacter spp*, which may cause bloody diarrhea. Always keep a broad differential diagnosis, as conditions other than GI infection may cause bloody diarrhea.

## How is it treated?

There is no evidence to support the role of antibiotic therapy. In fact, antibiotics may actually worsen the HUS and precipitate renal failure. With supportive therapy, most patients recover uneventfully without antibiotics. In many cases, symptoms resolve by the time laboratory results become available. Avoid using anti-diarrheal agents.

Hemolytic uremic syndrome may be life-threatening, requiring blood transfusion, hemodialysis, and life-supporting therapies. If this condition occurs, the patient may require admission into an intensive care unit.

## How can it be prevented?

Table 1 outlines simple measures for the prevention of *E. coli* O157:H7 disease and other infections spread by fecal bacteria. [CME](#)

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Table 1

### Steps to prevent *E. coli* O157:H7

- Regular hand-washing after contact with livestock, using the washroom, changing diapers, and before/after preparing or eating food
- Always wash hands after handling raw meat
- Avoid cross-contamination of food; never place cooked meat in contact with raw meat and always disinfect areas used to prepare the meat
- Ensure cooked meat is grey or brown, not pink, in the centre; there should never be any bloody juices!
- Only drink fruit juice or ciders that have been pasteurized
- Only drink appropriately treated water
- Exercise strict hand hygiene when interacting with persons with diarrhea, particularly when changing diapers of children with diarrhea
- If any patients found to have *E. coli* O157:H7, notify local public health officials so the source and method of acquisition may be determined to prevent the further spread