The etiologic agent *E. coli* 0157:H7 have several transmissions that can be spread around to animals and humans. In humans this serotype of *E. coli* “is transmitted to humans primarily through consumption of contaminated foods,” mainly undercooked meat like raw beef and milk. With contaminated food products, it can also cause “cross-contamination during food preparation.” Known contaminated foods that have caused outbreaks of infections besides beef are fruits and vegetables “whereby contamination may be due to contact with feces from domestic or wild animals at some stage during cultivation or handling.” Another mode of human transmission is person to person contact through the oral – fecal route if “infected people do not wash their hands after using the toilet.” People that visit farms and come into direct contact with farm animals that carry the pathogen can also become infected.

*E. coli* have many reservoirs, cattle and small “domesticated ruminants constitute a primary animal reservoir of EC O157:H7” like poultry. The bacterium can also be in vegetables, surface water, fruit and dairy products. Animal manure can also harbor the pathogen where it can contaminate water supply of both humans and domesticated animals.

*E. coli* O157:H7 is a Gram-negative bacillus (rod) bacteria in the Enterobacteriaceae family. *E. coli* O157:H7 produce a toxin called Shiga toxin that can be deadly in humans and is similar to toxins produced by *Shigella dysenteriae*. *E. coli* that produce Shiga toxins are also referred as (STEC). *E. coli* O157:H7 grow with an optimum temperature of 37°C and can grow in temperatures of between 7°C to 50°C. It is a facultative anaerobe, which means it can grow with or without the presence of oxygen.

Because the reservoirs are mostly animals, vegetables and food, humans are not normally carriers. For clinical cases, *E. coli* O157:H7 can be diagnosed by finding the organism in fecal samples. To determine the source of infection, food and environmental testing may be done. It can be difficult sometimes to test and identify the pathogen because “they also closely resemble commensal *E. coli* except in verocytotoxin production.” Verocytotoxin by itself does not mean that it is the pathogen *E. coli* O157:H7. Selective and differential media are used to help identify it. It lacks the “β-glucuronidase activity and the inability of most strains to rapidly ferment sorbitol.” What is usually used is 1% sorbitol containing MacConkey agar with cefixime and either rhamnose or potassium tellurite to identify them. For testing to see if a food is contaminated, hemorrhagic colitis agar is used to identify if the pathogen is present. Because
other strains of *E. coli* and other bacteria can grow on these media, enrichment for *E. coli* 0157:H7 must be done especially for samples from food and the environment. This is done by culturing them in a liquid enrichment medium, or immunomagnetic separation (IMS) can be used to “concentrate the members of serogroup O157 before plating.”\(^6\) In IMS, there are magnetic beads that are coated with an antibody to the antigen of O157 which bind to *E. coli* 0157:H7. After growing on the media plates, suspected colonies of *E. coli* 0157:H7 are then confirmed by biochemical tests. There are a variety biochemical tests that can be done which include the ELISA test, agglutination, PCR and “immunoblotting or Vero cell assay can be used to detect the verocytotoxin or its genes.”\(^6\)

The incubation period for *E. coli* 0157:H7 after exposure is usually 3-4 days, but may be as short as 1 day or as long as 10 days. A symptom usually begins slowly “with mild belly pain or non-bloody diarrhea that worsens over several days,”\(^5\) and then bloody diarrhea occurs with nausea and vomiting. There can be little to no fever among an infected person. A person who has been infected will also have haemolytic-uraemic syndrome (HUS) which on average develops 7 days after the first symptoms and includes a decrease in urine production, “dark or tea-colored urine, and facial pallor.”\(^2\)

In 1885 the bacterium *Escherichia coli* was discovered by German bacteriologist Dr. Theodore von Escherich. The most dangerous strain known of *E. coli* is the *E. coli* 0157:H7, which was recognized as a pathogen after 2 hemorrhagic colitis outbreaks in 1982 and 1983. In the 1\(^{st}\) outbreak there were 26 clinical cases in Oregon and 19 of the 26 were hospitalized. In the 2\(^{nd}\) outbreak 3 months after the 1\(^{st}\) outbreak, there were 21 cases in Michigan where 14 were hospitalized. Etiologists found that the vehicles of the infections were from undercooked hamburgers from the same fast food restaurant and “*E. coli* O157:H7 was isolated from patients and a frozen ground beef patty.”\(^7\) After *E. coli* O157:H7 was determined to be a human pathogen; stool samples from children with hemolytic uremic syndrome were observed and found that the stools “contained a substance that was toxic to Vero (African green monkey kidney) tissue culture cells.”\(^7\) It was found that the verocytotoxin was produced by O157:H7 the prominent serotype causing infection.

*E. coli* 0157:H7 are also named VTEC because they have the “ability to produce one or more exotoxins.”\(^9\) These exotoxins have cytopathic effects on vero cells. One toxin the pathogen produce is very similar to the same toxin produced by *Shigella dysenteriae*. Even though transmission is usually through the oral route, the pathogen does not cause disease by the gut mucosa, “but by the direct action of verotoxin on certain cells.”\(^9\) the toxin binds to a specific glycolipid receptor found on endothelial cells of both blood vessels and kidneys. Once it attaches the verotoxins “inhibit intracellular protein synthesis, thereby causing cell death.”\(^9\)
Antibiotics are typically not used and are controversial to treat an infection caused by *E. coli* 0157:H7, because antibiotics seem to not “reduce symptoms prevent complications or decrease shedding, and they may increase the risk of HUS.” There have been studies have shown that some antibiotics “may increase the risk of complications.” The use of antidiarrheal agents in hemorrhagic colitis is also discouraged because it may increase the risk of HUS. People who acquire the disease usually recover without specific treatment in 5 to 10 days, by staying hydrated and limited diet.

There are currently no vaccines for humans against *E. coli* 0157:H7, however “at least two promising vaccines for *E. coli* O157:H7 are awaiting licensing approval from the Center for Veterinary Biologics (CVB) at APHIS.” The vaccines that are waiting for approval are not for humans but for livestock. The vaccines under consideration are not engineered to prevent the disease in the animals but to decrease the amount of pathogen significantly in the pre-harvest environment,” and presumably in the meat that winds up on consumers’ plate.” The best prevention from becoming infected with the disease is simpler than it seems. One way is to cook meat thoroughly and not eat raw or undercooked meat. Keep good hygiene by washing your hands before and after cooking food. After diapering infants, contact with cows, sheep, goats and their living environment, you should wash your hand thoroughly.

**Local cases:**

The latest outbreak of *E. coli* 0157:H7 in the United States was in 2013. There were 4 states where the outbreak occurred with 32 people whom contracted the disease. In Texas there was 1 case, Washington had 3, Arizona had 1, and California had the most people infected with 27.

**Latest case count Map:**
Latest epidemic curve:

Number of Persons

<table>
<thead>
<tr>
<th>Date</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep-29</td>
<td>1</td>
</tr>
<tr>
<td>Oct-06</td>
<td>2</td>
</tr>
<tr>
<td>Oct-13</td>
<td>3</td>
</tr>
<tr>
<td>Oct-20</td>
<td>7</td>
</tr>
<tr>
<td>Oct-27</td>
<td>4</td>
</tr>
<tr>
<td>Nov-01</td>
<td>2</td>
</tr>
<tr>
<td>Nov-10</td>
<td>1</td>
</tr>
</tbody>
</table>

Date of Illness Onset

*latest Case map and epidemic curve credit CDC*  

Global cases:
E. coli 0157:H7 Outbreak has occurred throughout the world with the most outbreaks documented in Canada, U.K. and USA. The largest outbreak to have occurred was in Japan in 1996.

<table>
<thead>
<tr>
<th>Year</th>
<th>Place</th>
<th>No. of people sick</th>
<th>Contamination source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>Montana, USA</td>
<td>243</td>
<td>Undercooked ground beef</td>
</tr>
<tr>
<td>1996</td>
<td>Sakai, Japan</td>
<td>5,727</td>
<td>Poorly washed white radish sprouts</td>
</tr>
<tr>
<td>1996</td>
<td>Scotland, UK</td>
<td>496</td>
<td>Undercooked ground beef</td>
</tr>
<tr>
<td>2000</td>
<td>Walkerton, Canada</td>
<td>&gt;2,000</td>
<td>Contaminated drinking water</td>
</tr>
<tr>
<td>2002</td>
<td>Pennsylvania, USA</td>
<td>51</td>
<td>Petting infected dairy animals</td>
</tr>
</tbody>
</table>

*Table credit University of Florida IFAS Extension*

**Works Cited and References:** DA= date accessed


   http://www.cfsph.iastate.edu/Factsheets/pdfs/e_coli.pdf


   http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3298063/


   http://edis.ifas.ufl.edu/pdffiles/SS/SS19700.pdf