There are various strains of *E. coli* germs (bacteria). Many strains are usually harmless and live in the gut of healthy people. However, some strains are a cause of common infections such as urine infections and gut infections (gastroenteritis). A strain called VTEC O157 is an uncommon cause of infection, but it can be serious. It can lead to a severe gut infection with bloody diarrhoea. Also, the poison (toxin) released by VTEC O157 can cause other serious diseases such as haemolytic uraemic syndrome (HUS) and thrombotic thrombocytopenic purpura (TTP). The majority of people fully recover from a VTEC O157 infection. However, in a few people, it can be fatal.

**What is E. coli?**

*E. coli* (more correctly called *Escherichia coli*) is a germ (bacterium). There are many strains (subtypes) of *E. coli*. Many strains live in the gut of healthy humans and animals. They usually do no harm there and are one of the normal bugs (bacteria) found in the gut. However, some strains of *E. coli* can cause various infections and diseases (see below).

Recently, there has been concern that some strains of *E. coli* can produce small proteins (enzymes) called extended-spectrum beta-lactamases (ESBLs). These enzymes are significant because, when they are produced by the bacteria, they can make the bacteria resistant to certain antibiotic medicines called cephalosporins (common antibiotics used in many hospitals). This means that the bacteria can continue to multiply, causing more severe infection and becoming more difficult to treat.

**What infections and diseases can be caused by E. coli?**

These include the following:

**Urinary tract infections (UTIs)**

For example, cystitis, kidney infections and other 'urine infections'. These are the most common infections caused by *E. coli*. About 9 in 10 UTIs are caused by strains of *E. coli*. Many of the strains are those that live harmlessly in the gut, but can cause a UTI if they get into the bladder or other parts of the urinary tract. For details see separate leaflets called Cystitis (Urine Infection) in Women, Urine Infection in Men, Urine Infection in Older People, Kidney Infection (Pyelonephritis), and Urine Infection in Children.

**Infection of the gut (gastroenteritis)**

This is commonly due to various strains that do not normally live in the gut. Gastroenteritis can cause symptoms of diarrhoea, being sick (vomiting), high temperature (fever) and tummy (abdominal) pain. The source of the infecting strains is often from contaminated food ('food poisoning') or from other people who have the infection. Traveller's diarrhoea is often caused by a strain of *E. coli*. See separate leaflets called Gastroenteritis in Children, Gastroenteritis in Adults and Traveller's Diarrhoea for further details.

**Intra-abdominal infections**

These are infections that occur inside the abdomen, often when a part of the gut is damaged or perforated. This allows the normally harmless *E. coli* germs (bacteria) that live in the gut to get into the abdomen and cause infection. For example, the following can occur after a burst appendix or following a stab wound to the abdomen:

- Inflammation of the thin layer of tissue lining the abdomen (the peritoneum). This is called peritonitis.
- An abdominal collection of pus (an abscess).
Other infections
Other infections that are sometimes caused by strains of *E. coli* include:

- Inflammation of lung tissue (pneumonia).
- Inflammation around the brain (meningitis).
- Infected bones.
- Infected joints.
- Skin and soft tissue infections (especially in people who have diabetes).

So, in fact, practically any area of the body can be infected with *E. coli*, although some areas are only rarely infected.

Other diseases
Other diseases associated with *E. coli* include haemolytic uraemic syndrome (HUS) and thrombotic thrombocytopenic purpura (TTP). These are rare but serious diseases that occur as a result of a poison (toxin) that some strains of *E. coli* make. The most important toxin-releasing strain is called 'vero cytotoxin-producing *Escherichia coli* O157'. This is sometimes called VTEC O157 or *E. coli* O157.

The rest of this leaflet is just about VTEC O157.

What is VTEC O157?
VTEC strains of *E. coli* make poisons (toxins) that can cause severe illness. The toxins are called vero cytotoxins (VTs). There are various VTEC strains that can cause disease in humans but the most important one is VTEC O157. Although VTEC O157 is uncommon, it has caused several outbreaks of disease in recent years in the UK.

What are the symptoms of infection with VTEC O157?
VTEC O157 can cause a range of symptoms - from none at all to a severe life-threatening illness. It can take anywhere between 1 and 14 days to develop symptoms once you are infected, but most commonly it takes 3-4 days.

Infection of the gut (gastroenteritis)
Some people infected with VTEC O157 have typical symptoms of gastroenteritis. That is, diarrhoea with or without being sick (vomiting), tummy (abdominal) cramps and high temperature (fever). Sometimes there is some blood mixed in with the diarrhoea. This can last a few days and clear within a week or so, just like many other cases of gastroenteritis.

Haemorrhagic colitis
A number of people infected with VTEC O157 develop a very inflamed large bowel (colon) which bleeds a lot. This causes very bloody (haemorrhagic) diarrhoea and abdominal pains (which can be severe). Often there is no fever with haemorrhagic colitis. Symptoms can be bad for several days and then usually gradually lessen (subside). Symptoms typically clear completely within two weeks. In effect, it is like a severe bout of gastroenteritis. The infection can be particularly severe, and sometimes even fatal, in young children and the elderly.

Haemolytic uraemic syndrome (HUS)
Between 1 and 2 in 10 people infected with VTEC O157 develop HUS in addition to gastroenteritis or haemorrhagic colitis. HUS is a condition that is triggered by the poison (toxin) made by VTEC O157. It causes kidney failure, a type of anaemia called haemolytic anaemia (anaemia caused by damage to the red blood cells), and thrombocytopenia (lowered platelets which can lead to spontaneous bleeding). HUS usually develops about 7 to 10 days after the diarrhoea. It most commonly develops in young children or the elderly. Severe illness can develop and about 1 in 10 children who develop HUS will die of the condition.
Thrombotic thrombocytopenic purpura (TTP)

Some people (mainly adults) infected with VTEC O157 develop TTP. This can cause serious problems in the blood, kidneys and brain. Some people can die of this condition.

Asymptomatic carriage

This means that some people can ‘carry’ the VTEC O157 in their gut for a time but without having any symptoms. However, if you carry the germs (bacteria) in your gut you will pass it out with your stools (faeces) for a time. Therefore, even if you do not have symptoms, you can pass on the bacteria to others if your hygiene is not good.

How do you get VTEC O157?

VTEC O157 is found in the gut and stools (faeces) of many animals, including cattle and sheep. You can become infected by eating food that is contaminated with VTEC O157, including undercooked meat. There have also been some outbreaks of infection linked to handling or petting such animals on farms or in sanctuaries.

VTEC O157 is an uncommon germ (bacterium) to contaminate food but, when it does, the consequences can be serious. A number of outbreaks of disease caused by VTEC O157 have been reported in recent years. Outbreaks have been reported where the contaminated food has been:

- Beef and beef products, such as undercooked beefburgers.
- Milk (usually unpasteurised).
- Yoghurt.
- Cooked meats.
- Meat pies.
- Cheese.
- Dry-cured salami.
- Raw vegetables.
- Unpasteurised apple juice.

If you have been infected with VTEC O157, you will pass it out with your stools, sometimes for several weeks, even after symptoms have gone. Therefore, some people pass on the germs (bacteria) to others if their hygiene is poor. For example, not washing hands after going to the toilet, and then preparing food for others.

Swimming in contaminated water has also resulted in small outbreaks of VTEC O157. Drinking water that has not been treated to remove bacteria can also be a source of infection.

How is VTEC O157 infection diagnosed?

If infection with VTEC O157 is suspected then a sample of your stools (faeces) is usually taken. Tests in the laboratory can confirm the presence of VTEC O157 germs (bacteria). A blood test may also be able to look for VTEC O157 infection by detecting antibodies that your body has made against the bacteria.

What is the treatment for VTEC O157 infection?

There is no cure for infection with VTEC O157. However, in most cases, it causes either infection of the gut (gastroenteritis) or haemorrhagic colitis, which is like severe gastroenteritis but with bleeding (haemorrhage). These illnesses usually clear away by themselves as your immune system clears the germs (bacteria). The main treatment is to make sure that you do not become lacking in fluid in the body (dehydrated). So, it is important to drink plenty and some people may need a 'drip' to correct low body fluid. For details of what fluids to drink and how much, see the leaflets dealing with gastroenteritis in children and in adults, mentioned above.

Antibiotic medicines are not usually used to treat this infection. Indeed, there is some concern that giving antibiotics to children who have gastroenteritis or colitis caused by VTEC O157 may increase their risk of developing HUS. You should also avoid taking any anti-diarrhoeal medicines such as loperamide if you have VTEC O157. One of the reasons for this is that they may also possibly increase the risk of HUS. Medicines known as ‘non-steroidal anti-inflammatory drugs’, such as ibuprofen, should also be avoided because they may have effects on your kidney function if you have VTEC O157. Paracetamol can be used to help with pain relief or high temperature (fever).
Preventing the spread of infection to others

VTEC O157 is highly infectious. It only takes a few germs (bacteria) to cause illness. If you are infected with VTEC O157, or your child is, in order to reduce the chance of passing on the infection to others, the following are recommended until symptoms go:

- Wash your hands thoroughly after going to the toilet. Ideally, use liquid soap in warm running water, but any soap is better than none. Dry properly after washing. If your child is infected and wears nappies, be especially careful to wash your hands after changing nappies and before preparing, serving, or eating food.
- If a potty has to be used for an infected child, wear gloves when you handle it and dispose of the contents into a toilet. Then wash the potty with hot water and detergent and leave it to dry.
- Don’t share towels and flannels.
- Don’t prepare or serve food for others.
- If clothing or bedding is soiled, first remove any stools (faeces) into the toilet. Then wash in a separate wash at as high a temperature as possible.
- Regularly clean the toilets that you use, with disinfectant. With hot water and detergent, wipe the flush handle, toilet seat, bathroom taps, surfaces and door handles at least once a day. Keep a cloth just for cleaning the toilet (or use a disposable one each time).
- You or your child should stay off work, school, nursery, college, etc, until your doctor advises you that it is safe to return. Avoid contact with other people as far as possible during this time.
- If you work with vulnerable people such as young children, the unwell or the elderly, or you work with food, you should inform your employer that you have VTEC O157. Your doctor should also speak to public health authorities so that a decision can be made as to when it is safe for you to return to work. You may be asked to provide further stool samples to confirm that the infection has cleared. The same applies to young children who attend nurseries and schools. Further tests may also be required to determine when it is safe for them to return. Consult your doctor.

If you have come into contact with someone who has confirmed VTEC O157 and you work with vulnerable people as described above or if you handle food, you should also inform your employer and get advice from your doctor. You may need to stay away from work until the results of a stool test are available to ensure that you do not have the infection.

Children under the age of 5 years who have confirmed VTEC O157 should not swim in swimming pools or share paddling pools with other people until they have been tested to show that their infection has cleared.

What is the outlook (prognosis)?

As mentioned above, the problems that can occur if you are infected with VTEC O157 can range from no symptoms at all, to a life-threatening illness. Many infected people get a nasty gut infection, but then fully recover. Typically, symptoms will clear within two weeks, except in those people who develop HUS or TTP. These complications can last much longer.

Some people have died from VTEC O157 infection in recent years, usually as a result of HUS or TTP. For example, in 1997 it caused the death of 20 people in Scotland.

Can VTEC O157 infection be prevented?

Proper storage, preparation, and cooking of food, as well as good hygiene, help to prevent VTEC O157 infection (and other gut infections). In particular, always wash your hands and dry them thoroughly, and teach children to wash and dry theirs:

- After going to the toilet (and after changing nappies or helping an older child to go to the toilet).
- Before preparing or touching food or drinks.
- After handling raw food.
- Before eating.
- After working, feeding or playing with pets and other animals, including farm animals.
After gardening.

If you smoke, you should also wash your hands before smoking. The simple measure of washing and drying hands regularly and properly is known to make a big difference to the chance of developing many infections, including VTEC O157.

To reduce your chance of VTEC O157 infection, you should also avoid eating undercooked meat and drinking unpasteurised milk or untreated water. Also avoid swimming in water that may be contaminated, such as ponds, streams or lakes.

Further help & information
HUSH (Haemolytic Uraemic Syndrome Help)

Further reading & references

- The management of acute bloody diarrhoea potentially caused by vero cytotoxin-producing Escherichia coli in children; Public Health England (July 2011)
- Escherichia coli (E. coli): guidance, data and analysis; Public Health England, August 2014
- Gastroenteritis; NICE CKS, August 2014 (UK access only)

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