A simple guide to *Escherichia coli* (*E. coli*)

This guide explains what *E. coli* is and the ways in which it can cause infection.

**What is *E. coli***?

There are many different types of *Escherichia coli* (*E. coli*) bacteria, most of which are carried harmlessly in the gut. These strains of *E. coli* make up a significant and necessary proportion of the natural flora in the gut of people and most animals. On average, a baby is colonised with *E. coli* within 40 hours of birth, through its food, water or by contact with other people.

However, when strains of *E. coli* are outside their normal habitat of the gut, they can cause serious infections, several of which can be fatal. Potentially dangerous *E. coli* can exist temporarily and harmlessly on the skin, predominately between the waist and knees (mainly around the groin and genitalia), but also on other parts of the body, i.e. a person’s hands after using the toilet.

This guide focuses on those infections caused primarily as a complication of an underlying medical condition or due to a healthcare intervention. These infections can be particularly damaging as the patients may well have a weaker immune system, given that they are already receiving treatment for another medical condition.

**E. coli – background**

Over the last 40 years, *E. coli* strains have become increasingly resistant to many antibiotics. This is largely because the resistance genes can jump between different *E. coli* cells (and other related bacteria), gathering together as linked sets of resistance to several antibiotic types. For example, NDM-1 was recently found to make *E. coli* resistant to one of the most powerful group of antibiotics - carbapenems. Antibiotic-resistant strains can persist in the normal gut flora and are a particular problem in elderly patients who move repeatedly between hospital and the care sector, and are more likely to receive numerous courses of antibiotics.

Because of the universal presence of *E. coli* in the faeces of man and animals, and its survival in moist conditions, a measure of *E. coli* in water (the coliform count) is used as an index of consumable water quality. A high count indicates sewage contamination of water.

**Medical conditions or healthcare interventions that can lead to an *E. coli* infection**

**Bacteraemia (bloodstream infection)**

*E. coli* in the bloodstream is usually a result of acute infection of the kidney, gall bladder or other organs in the abdomen. However, all of the infections listed below can lead to bacteraemia, and the number of *E. coli* bacteraemias reported to the Health Protection Agency surveillance system has increased over recent years to the extent that *E. coli* is now the commonest cause of bacteraemia reported.

**Post-surgical wound infections and abscesses**

*E. coli* is a common cause of infections in surgical wounds, especially those following operations on the abdomen where it is often found mixed with other gut bacteria, but it can also be found in other post-operative sites.
Catheter associated urinary tract infections (CAUTI)

*E. coli* is the commonest organism associated with infection in patients with urinary catheters. In prevalence surveys, CAUTI is generally the commonest HCAI recorded.

Intensive Treatment Unit (ITU) infections

*E. coli* commonly and quickly colonises the mouth and upper respiratory tract of patients undergoing artificial ventilation through an endotracheal tube. From there the organisms can move into the lower respiratory tract to cause ventilator-associated pneumonia.

Sepsis syndrome (septicaemia)

Some *E. coli* bacteraemias develop the severe complication known as the sepsis syndrome, or septicaemia. This triggers a series of clinical events leading to a high temperature, circulatory collapse with low blood pressure, and deranged blood clotting know as disseminated intravascular coagulation. Septicaemia has a high mortality.

Gastrointestinal (diarrhoeal) infections

Although the gut is the main natural habitat of *E. coli*, some strains and types are capable of causing diarrhoeal disease that can be severe and life threatening. The best known of these strains is *E. coli* O157. This and other similar strains produce toxins that cause bloody diarrhoea and, particularly in young children, can cause renal failure and, occasionally, death. A range of animals (including food animals such as cows and sheep) carry these strains harmlessly, but if transmitted to humans severe disease can occur. There is a range of other *E. coli* strains that cause diarrhoea and they probably constitute the commonest cause of travellers’ diarrhoea when people travel abroad and quickly acquire new local strains to which they have no resistance.

Urinary tract infection

*E. coli* is the commonest cause of urinary tract infections. It is responsible for 75-80% of acute urinary infections in women. About 6% of adult women have a urinary infection at any one time and half of these have acute symptoms. Asymptomatic infection is of concern only in pregnant women and young children, in whom it should be treated. Urinary tract infection is the second commonest reason for antibiotic treatment of patients in general practice (after respiratory tract infections).

Intra-abdominal infections

*E. coli* is the commonest cause of acute bile duct and gall bladder infection (cholangitis and cholecystitis). It plays a major role when patients have peritonitis or infections after surgery to any part of the abdomen. In all of these infections, *E. coli* is generally mixed with a large number of other intestinal bacteria.

What can be done to prevent healthcare associated *E. coli* infection?

- Always wash your hands or use an antibacterial hand rub after you have had any physical contact with a patient – whether the patient has diarrhoea or not.
- Encourage patients to wash their hands after using the toilet, as well as before and after eating.
- Infected patients should be isolated and healthcare workers dealing with them should wear gloves and aprons, especially when dealing with bedpans, etc.
- Avoid prescribing broad-spectrum antibiotics, which affect the natural flora of the gut and select for the resistant strains.