Extended-spectrum beta-lactamase producing bacteria

C. koseri is a bacterial species (family) usually found in food, water and soil as well as the gut of mammals. Most bacteria can live within the body without causing any harm, but some can cause symptoms of infection.

How is C. koseri transmitted and who is at risk of infection?

C. koseri is spread through contact, meaning anyone with the bacteria on their skin can easily spread it to others through person-to-person contact, even if they are not infected. There are two groups most at risk of acquiring infections: neonates and debilitated patients.

Neonates

Babies less than 2 months old are at greater risk of developing sepsis and meningitis and are more likely to develop brain abscesses. C. koseri can lead to a severe form of neonatal meningitis in a very small number of cases.

Debilitated Patients

This is generally someone physically very weak, immunocompromised, or over 65 years old. Immunocompromised people are those with a weakened immune system who are unable to fight off infections that would not normally cause harm.

These include those people with pre-existing medical conditions such as:

- Diabetes
- Chronic liver disease
- Chronic obstructive pulmonary disease (COPD)
- Alcoholism
- Lung disease
- Kidney failure.

Cancer patients, and those receiving chemotherapy, solid organ transplant donors and recipients, and hospital patients in general, are also at risk.

As with most antibiotic resistant bacterial species, the risk of infection moves in cycles with the spread of bacteria.

It begins with those who are most vulnerable, before moving to those who care for them. As carers and healthcare professionals leave the care facilities they work in, they take bacteria with them into the community, increasing the risk of spread there. This is why in a health care setting staff wear personal protective equipment (PPE) like aprons and gloves.

Extended-spectrum beta-lactamases (ESBLs) are a group of over 200 enzymes produced by some bacteria.

These enzymes can inhibit (stop) the actions of some antibiotics, making infections much more difficult to treat.

These bacteria are often members of the Enterobacteriaceae family, and some are notably resistant (no longer respond) to the class of antibiotics called carbapenems. These bacteria are therefore also referred to as Carbapenem-Resistant Enterobacteriaceae (CRE).

The Enterobacteriaceae family include bacteria such as E. coli, K. pneumoniae, Proteus species and Citrobacter koseri, which are commonly found in the normal human gut (bowel) but can cause common infections such as urinary tract infections (UTIs) as well as more severe infections including pneumonia (chest infection) and meningitis (infection to the brain lining).

As the prevalence of CREs increases it is important to understand the risk infections can cause. C. koseri infections are important because of their ability to produce some very powerful ESBLs.
What infections can *C. koseri* cause?

Since *C. koseri* can live in a variety of locations within the body, they can cause several infections.

### Common *C. koseri* infections

#### Urinary Tract Infections (UTIs)

- Urinary tract infections are the most common infections caused by *C. koseri*. They happen when bacteria enter the urinary tract, which includes the urethra, bladder, ureters and kidneys.
- UTIs can be symptomless but can also cause symptoms such as a frequent urge to urinate, lower abdominal discomfort, pain when urinating with cloudy or bloody urine, strong smelling urine in small amounts and back or pelvic pain.
- More severe infections could cause fever, chills, nausea and vomiting.

#### Skin Infections

- These are the second most common infection caused by *C. koseri*.
- They occur when bacteria enter the body through a break in the skin, often at wounds, surgical sites or prosthetic devices.
- Infections can cause a variety of symptoms including fever, swelling, redness, pain and fatigue that may appear as flu-like symptoms.

#### Respiratory Tract Infections

- **Bacterial pneumonia** is a lung infection caused by bacteria entering the respiratory tract.
- Patients may experience a cough, fever, sharp chest pain and shortness of breath with a ‘currant jelly’ like sputum or phlegm (spit). The dark colour of the sputum is caused by the inflammation and death of surrounding tissue.
- Infection is confirmed by taking a sputum (spit) or blood sample and sending away to the microbiology lab for testing. Around half of these *C. koseri* lung infections cause bacteraemia and can therefore be life threatening.

You can read more about UTIs, skin infections and respiratory tract infections [here](#).

### Other *C. koseri* infections

#### Bacteraemia

- This is a general term for the presence of bacteria in the blood.
- **Primary bacteraemia** is caused by bacteria directly infecting the bloodstream and **secondary bacteraemia** is caused by bacteria spreading through the blood to cause infection elsewhere.
- **Endophthalmitis** is an eye infection which causes inflammation in the white of the eye and may cause eye pain, redness, discharge, cloudiness of the cornea and blurred vision.

#### Sepsis

- Untreated bacteraemia can cause sepsis which is the body’s response to an infection as the immune system causes an inflammatory response within the body as it goes into overdrive responding to the infection. Sepsis can develop into septic shock, a medical emergency that can kill.
- You can read more about sepsis [here](#).

#### Meningitis

- Very rarely, *C. koseri* causes neonatal meningitis, an inflammation of the membranes that surround the brain and spinal cord as a result of the infection of fluid around them both.
- Most cases occur in a hospital setting and cause a sudden onset of high fever, headache and a stiff neck as well as nausea, vomiting, confusion and light sensitivity.

#### Brain Abscesses

- Alongside meningitis, infections can cause the formation of brain abscesses leading to the death of parts of brain tissue which can then fill with pus and cause damage.

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**Citrobacter koseri** can live in a variety of locations within the body and can cause several infections. The most common of these are urinary tract infections, skin infections and respiratory tract infections.
How can *C. koseri* infections be prevented?

- The transmission of *C. koseri* by person-to-person contact means that limiting contact and hand hygiene is essential in preventing infection.

- Good hand hygiene means making sure to wash your hands with soap for at least 20 seconds after using the bathroom, coughing or sneezing, before touching your eyes, nose or mouth and both before and after working with food or dressing wounds.

- In a care setting, it is especially important to maintain good hand hygiene and restrict person-to-person contact by wearing gloves and gowns as well as washing hands regularly.

- Those patients at risk of infection will be able to discuss prevention methods further with their doctor.

How are *C. koseri* infections diagnosed?

The most reliable way to identify a *C. koseri* infection is to use tests which involve the collection of samples from the patient like blood, sputum, urine or cerebral spinal fluid to check for the presence of bacteria.

In cases where infections have spread to the brain and caused the formation of cavities, CT scans are used.

How are *C. koseri* infections treated?

- *C. koseri* infections that don’t show any resistance to antibiotics can be treated with standard antibiotic treatment regimens as recommended by your doctor.

- This may include the use of aminoglycosides, fluoroquinolones or carbapenems (types of antibiotics).

- The antibiotic resistance sometimes exhibited means that there can be limited antibiotic treatment options. However, some do exist which usually still work effectively, and these include tigecycline, colistin and amikacin (types of antibiotics).

- Some antibiotics may need to be given intravenously (directly into the bloodstream) rather than by oral tablet or capsule.

- It is important to follow your doctor’s advice, whatever treatment regime they advise you to follow. Complete the whole course of treatment as prescribed and don’t miss any doses.

How can *C. koseri* infections affect me?

An infection can have lasting effects, and a better prognosis (outcome) and recovery is associated with early diagnosis and treatment.

However, the success of treatment will depend on age, health status, type and severity of infection as well as the strain of *C. koseri*.

Another important factor to recovery is treatment compliance – which means how well you follow your doctor’s advice to take all your prescribed antibiotics over the weeks or months it could take to recover.