

Please read this section first

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The Thistle QA CEU No is: **MT-18/063**

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MICROBIOLOGY LEGEND

CYCLE 44 ORGANISM 4

Citrobacter freundii

Citrobacter freundii is a species of facultative anaerobic gram-negative bacteria of the family Enterobacteriaceae. The bacteria have a long rod shape with a typical length of 1–5 µm. Most *C. freundii* cells generally have several flagella used for locomotion, but some do not and are non-motile. *C. freundii* is a soil organism, but can also be found in water, sewage, food and in the intestinal tracts of animals and humans. The genus *Citrobacter* was discovered in 1932 by Werkman and Gillen. Cultures of *C. freundii* were isolated and identified in the same year from soil extracts.

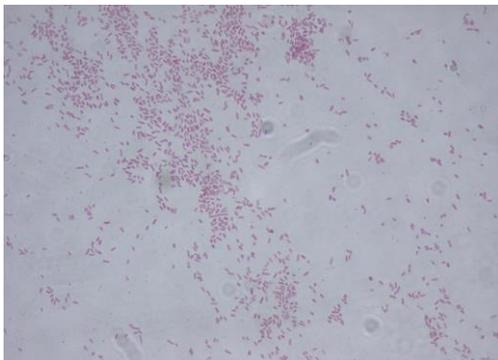


Figure 1: Gram negative bacilli *Citrobacter freundii*

Clinical significance

These bacteria can be found almost everywhere in soil, water, wastewater, etc. They can also be found in human and animal intestines. *Citrobacter freundii* is an opportunistic microbe, and often causes major opportunistic infections, i.e. the bacterium does not produce any disease-symptoms in healthy humans; it only afflicts those who have a weak and debilitated immune system. People who have a weakened immune system tend to develop infections of the urinary tract, respiratory tract, and the blood. Pancreatic, hepatic, and biliary diseases are also commonly caused by *C. freundii*.

Signs and Symptoms

Citrobacter freundii causes:

- Urinary tract infections which triggers:
 - A burning sensation during
 - Urination, increased urge to urinate,
 - Offensive smelling urine,
 - Scanty urination,
 - Blood in the urine
 - Fever
 - Burning or pain in the lower back and / or pelvis.
- Abnormal inflammatory changes in the intestine, sometimes even resulting in necrotic changes.
- Neonatal meningitis. The meninges or coverings of the brain get inflamed due to bacterial infiltration. *C. freundii* has the capacity to break through the blood-brain barrier (comprising of the brain capillary endothelium and the choroid plexus epithelium). It can invade and replicate in the brain too.

Common clinical features and *Citrobacter freundii* symptoms include:

- High grade fever
- Projectile vomiting
- Seizures.
- Peritonitis and tunnel infection due to *Citrobacter freundii* have also been reported. This has most frequently been seen in hospitalized and immune-compromised patients who have been kept on ventilators and urinary catheter.

Diagnoses

Patients with *Citrobacter* infections can be identified and confirmed only by culture. *Citrobacter* species can grow in various culture medium. All species identified as *Citrobacter* ferment glucose with production of gas. With few exceptions the organisms are motile and utilize citrate. Different species can be differentiated by biochemical tests. The interpretation of antimicrobial susceptibility testing follows the criteria used for *Enterobacteriaceae*.

Treatment

Citrobacter freundii infection is usually treated with antibiotics like fluoroquinolones, carbapenems and cephalosporins. The treatment plan depends up on the vulnerability of the microbe to the antibiotics and the site of the infection. Conversely, there is a growing alarm over the levels of resistance of *C. freundii* to a number of antibiotics. Supportive treatment is given as well to hasten cure.

Prognosis

The overall prognosis for *Citrobacter freundii* infection is moderate. Untreated and neglected cases show extremely poor prognosis and almost always result in death. *Citrobacter* bacteremia commonly

develops in elderly patients (65 %) and in hospitalized patients (77 %). The outcome for *C. freundii* urinary tract infection is good; whilst that for peritonitis is rather moderate to poor.

The mortality rate of *Citrobacter freundii* meningitis is incongruously high, with the death rate of the patient ranging from 25 % to 50 %. Furthermore, serious neurological problems are known to persist in 75 % of the survivors.

References

1. <http://www.citrobacterfreundii.com/Citrobacter-Freundii-Symptoms.html>
2. <https://ehealthwall.com/citrobacter-freundii/>
3. https://en.wikipedia.org/wiki/Citrobacter_freundii

Questions

1. Discuss the lab diagnosis of *C. freundii*.
2. Discuss the signs and symptoms of *C. freundii* in disease.
3. Discuss the treatment of *C. freundii*.