

Please read this bit first

The HPCSA and the Med Tech Society have confirmed that this clinical case study, plus your routine review of your EQA reports from Thistle QA, should be documented as a "Journal Club" activity. This means that you must record those attending for CEU purposes. Thistle will **not** issue a certificate to cover these activities, nor send out "correct" answers to the CEU questions at the end of this case study.

The Thistle QA CEU No is: **MT00025**.

Each attendee should claim **THREE** CEU points for completing this Quality Control Journal Club exercise, and retain a copy of the relevant Thistle QA Participation Certificate as proof of registration on a Thistle QA EQA.

Cycle 20 Organism 4

The causative organism was **Citrobacter species**.

General Description

Citrobacter species belong to the family Enterobacteriaceae. Members of the genus *Citrobacter* are named for their ability to use citrate as their sole source of carbon. Of the dozen species, *Citrobacter freundii*, *Citrobacter diversus*, and *Citrobacter amalonaticus* are linked to human disease. They are differentiated by their ability to convert tryptophane to indole, ferment lactose, and utilize malonate. *C. freundii* produces H₂S and may be confused with *Salmonella* species.

Clinical significance

The urinary tract is the most frequent site from which *Citrobacter* is cultured, often in association with an indwelling catheter. These bacteria may also be cultured from the respiratory tract, mostly as colonizing organisms. These organisms may be found in intra-abdominal infections and can cause soft tissue infections and osteomyelitis. Invasive procedures may play a role in *Citrobacter* bacteraemia.

C. diversus has caused frequent nosocomial outbreaks of neonatal meningitis. In several instances the outbreaks have accompanied by high rates of intestinal colonization in

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Page 1 of 2

infants by the organism and by carriage of the bacteria on the hands of health care workers.

Antibiotic Susceptibility

C. freundii strains, like strains of *Enterobacter* and *Serratia*, have inducible ampC genes encoding resistance to the beta-lactam antibiotics. In addition, like members of these other genera, isolates of *Citrobacter* may be resistant to multiple other antibiotics as a result of plasmid-encoded resistant genes. The antimicrobial agents of choice in treating *Citrobacter* infections are the carbapenems and fluoroquinolones.

References

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2. Shih CC, Chen YC, Chang SC, *et al.* 1996. Bacteraemia due to *Citrobacter* species: Significance of primary intra-abdominal infection. *Clin Infect Dis.* **23**:543-549.
3. Drelichman V, Band JD. 1985. Bacteremias due to *Citrobacter diversus* and *Citrobacter freundii*: Incidence, risk factors, and clinical outcome. *Arch Intern Med.* **145**:1808-1810.
4. Williams WW, Mariano J, Spurrier M, *et al.* 1984. Nosocomial meningitis due to *Citrobacter diversus* in neonates: New aspects in the epidemiology. *J Infect Dis.* **150**:229-235.
5. Bush K. 2001. New beta-lactamases in gram-negative bacteria: Diversity and impact on the selection of antimicrobial therapy. **32**: 1085-1089.

Questions

1. What methods are used to isolate *Citrobacter species*?
2. How would you differentiate *C. freundii* and *C. diversus* from each other?
3. How would you differentiate *C. freundii* and *Salmonella* species from each other?
4. Why are certain strains of *C. freundii* resistant to the beta-lactam antibiotics?

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Page 3 of 2