Citrobacter freundii complex (LTR62253)

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Organism

Citrobacter freundii complex:

- *C. braakii*
- *C. freundii*
- *C. werkmanii*
- *C. youngae*
- *C. murliniae*

Clinical

These organisms may be found in water, soil, food and human/animal gastrointestinal tracts. They are associated with hospital-acquired infections, especially of the respiratory and urinary tracts. Sepsis with *Citrobacter* spp. is often polymicrobial and associated with high morbidity and mortality.

Organisms in this group are important opportunistic pathogens and tend to be more resistant to antibiotics.

Usual susceptibility pattern

These organisms produce a chromosomally mediated inducible cephalosporinase (AmpC) and are resistant to penicillins, and first/second generation cephalosporins. Although they often exhibit in vitro susceptibility to third generation cephalosporins, use of these agents clinically may result in selection of resistant strains. The beta-lactamase produced by these organisms is not inhibited by beta-lactamase inhibitors and as such, beta-lactam/beta-lactamase inhibitor combinations should not be reported. Although extended spectrum beta-lactamase (ESBL) may be found in these organisms, conventional ESBL testing is not reliable, due to interference by the chromosomal cephalosporinase. Testing of cefepime +/- clavulanic acid may detect an ESBL enzyme. Most strains are susceptible to aminoglycosides, TMP-SMX, quinolones, and nitrofurantoin.

Susceptibility method

VITEK2. Additional tests (Disc diffusion or Etest method) are performed using Mueller-Hinton agar incubated in ambient air at 35°C for 16-20 hours.

Note: For Etest use 0.5 McFarland suspension in saline.
For mucoid strains use 1.0 McFarland.

Citrobacter freundii complex, Continued

Susceptibility reporting

	CSF/ Brain	Blood/Sterile Body Site/ Endovascular Catheter	Urine	Other	Comments
Amikacin		3	3	3	3rd line if gent and tobra I/R Disc diffusion
Ampicillin	R	R	R	R	
Cefazolin		R	R	R	
Cefixime			R		
Ceftriaxone	R	R			
Ciprofloxacin		✓	✓	✓	Do not report in patients < 18 y
Doxycycline			2		2nd line if cipro I/R For patients <=17 y report 1st line Disc diffusion If patient <8 y **See special considerations**
Ertapenem		✓	2	2	2nd line if cipro or TMP-SMX I/R If S do not report in patients < 3 months
Gentamicin	*	✓**	✓	✓**	* Report only in neonates (< 1 month) **See Special Considerations
Imipenem *		✓	2	2	2nd line if cipro or TMP-SMX I/R
Meropenem	✓	✓	2*	2*	2nd line if cipro or TMP-SMX I/R * Report 1st line in neonates (< 1 month)
Nitrofurantoin			✓		Add comment: For uncomplicated lower UTI only #f1
TMP-SMX	*	✓	✓	✓	* Report only at physician request
Tobramycin		2*	2	2*	2nd line if gent I/R *See Special Considerations

* Do NOT report Imipenem from the VITEK

Special considerations

Doxycycline:	If reporting doxycycline on patients <8 years add the following comment: "Doxycycline can now be prescribed for children <8y for short-course (<21 d) therapy; OTHER tetracyclines are still contraindicated for this age group." **(27664)**
Gentamicin/ tobramycin:	Organisms testing at upper limit of susceptibility (4µg/mL) may not achieve optimal pharmacokinetics/pharmacodynamics. **For non-urine isolates:** If MIC 4.0 µg/mL add comment: "This isolate tests at the upper limit of susceptibility for gentamicin. Clinical failure may occur despite in vitro susceptibility." #A312 **or** "This isolate tests at the upper limit of susceptibility for tobramycin. Clinical failure may occur despite in vitro susceptibility". #A313 **or** "This isolate tests at the upper limit of susceptibility for both gentamicin and tobramycin. Clinical failure may occur despite in vitro susceptibility".#A314

Interpretation

For Etest, report actual MIC result. For interpretation (S, I, or R) report according to the nearest higher doubling dilution **(Appendix 1)**.

Use **CLSI** interpretive document for **Enterobacterales.**

For Beta-lactam drugs – Refer to Beta-lactam Resistance Detection Charts.
For gentamicin and tobramycin – Refer to Special Considerations