



Discordant Susceptibility Results: Ciprofloxacin and Levofloxacin

Ciprofloxacin and levofloxacin are fluoroquinolone antibiotics with broad gram-negative activity. Quinolones carry many [side effects](#), but are notably the only oral options for [Pseudomonas aeruginosa](#). Concern may arise when susceptibility testing determines levofloxacin-susceptibility despite ciprofloxacin-resistance (Figure 1) or vice-versa. How should clinicians interpret this discordant result?

Ciprofloxacin	2 ug/mL	Resistant
Colistin	<=2 ug/mL	Intermediate ²
Ertapenem	>1 ug/mL	Resistant
Gentamicin	>8 ug/mL	Resistant
Imipenem	>8 ug/mL	Resistant
Levofloxacin	<=0.5 ug/mL	Susceptible
Meropenem	>8 ug/mL	Resistant

Figure 1: Example discordant susceptibilities in *Enterobacter cloacae* isolate

What explanations are there for discordant susceptibilities?

In gram-negative bacteria, DNA gyrase is the primary target for quinolones, but primary and secondary targets can vary between quinolones and bacterial species.¹ Structural differences in levofloxacin lead to enhanced drug binding against the secondary target topoisomerase IV and may allow for activity despite DNA gyrase mutations in several bacterial species.^{3,4,5} A review of 327 clinical *Klebsiella pneumoniae* and *Escherichia coli* isolates found that a specific DNA gyrase mutation was related to increased ciprofloxacin resistance compared to levofloxacin.² Levofloxacin-susceptible and ciprofloxacin-resistant results were identified in 6.7% of *E. coli* isolates.²

In *P. aeruginosa*, ciprofloxacin may retain susceptibility when levofloxacin is resistant. In one study, exposure to levofloxacin was found to be a risk factor for subsequent development of quinolone-resistant *P. aeruginosa*, whereas ciprofloxacin was not. Discordant *P. aeruginosa* susceptibilities may be explained by higher intrinsic ciprofloxacin activity against *P. aeruginosa* compared with levofloxacin.⁶

Lastly, there is a margin of error with all clinical microbiology laboratory susceptibility testing. More information on this can be found in the [amoxicillin-clavulanate and ampicillin-sulbactam susceptibility pearl](#).

Is there outcomes data available?

There are currently no data evaluating treatment outcomes associated with quinolone discordance. Quinolone use in infections with discordant quinolone susceptibilities should take into consideration available alternatives and severity of illness. For example, using levofloxacin for oral stepdown therapy in a patient with a ciprofloxacin-resistant gram-negative bacteremia and no other oral options may be preferred over outpatient intravenous antibiotic therapy.

Key Takeaway: Susceptibility results for ciprofloxacin do not predict levofloxacin and vice versa. Differences in susceptibility may be explained by differences in antibiotic structure and drug potency.

References:

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