Escherichia spp (LTR62805)

Edit Approved By: Solomon, Natalia (06/08/2022) **Revision: 9.00**

Organism

Escherichia spp.

- *E. coli*
- *E. fergusonii*
- *E. hermanii*
- *E. vulneris*

Clinical

- ***E. coli*** colonizes the large intestine of humans. It is the most common pathogen in urinary tract infections. It also causes pneumonia (mostly nosocomial), bacteremia (usually following urinary tract infection), and meningitis (usually in neonates). It has also been associated with septic arthritis, endophthalmitis, peritonitis, brain, liver, or other visceral abscesses, endocarditis, osteomyelitis, and sinusitis. Certain strains of E. coli (enterotoxigenic, enteropathogenic, enteroinvasive, enterohemorrhagic) cause diarrhea.
- ***E. hermanii*** and ***E. vulneris*** have been recovered from wounds and infections at other body sites. ***E. fergusonii*** is usually recovered from stool.

Usual susceptibility pattern

E. coli has variable susceptibility to ampicillin, cephalothin, and TMP-SMX (ampicillin and cephalothin resistance is common). Beta-lactamase production is common in this organism due to plasmid mediated penicillinase, extended spectrum beta-lactamase (ESBL), hyperproduction/expression of chromosomal AmpC beta-lactamase and/or plasmid mediated AmpC beta-lactamase. Resistance to amoxicillin-clavulanate may be due to high level production of penicillinase, hyperproduction of chromosomal AmpC beta-lactamase (cephalothin R/cefoxitin I/R) or to an inhibitor-resistant plasmid mediated beta-lactamase (cephalothin S/I). Carbapenem resistance is rare, but may occur due to acquisition of a plasmid mediated carbapenemase. Impermeability or upregulation of efflux may result in ertapenem resistance, evolving to broad carbapenem resistance if associated with concurrent ESBL or AmpC cephalosporinase. Quinolone and aminoglycoside resistance is increasing. Most isolates remain susceptible to 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.

Escherichia spp., Continued

Susceptibility reporting

	CSF/ Brain	Blood / Endo-vascular Catheter	Sterile Body Site	Urine	Other	Comments
Amikacin		3	3	3	3	3rd line if gent and tobra I/R Disc diffusion
Amoxicillin/ Clavulanate oral				✓	✓*	If Amp S and Amox-Clav I/R – Do Amp and AMC disc diffusion, consult tech 2 with results ***See Special Considerations**
Amoxicillin/ Clavulanate IV		2*	2*		2*	2nd line if ampicillin I/R, cefazolin I/R and ceftriaxone S * Report 1st line if ampicillin I/R and ceftriaxone S and anaerobes, *Enterococcus* or *S. aureus* (MSSA) co-isolated Report same as AMC oral
Ampicillin	*	✓	✓	✓	✓	For *E. hermanii* report as R *Report only in neonates (< 1 month)
Cefazolin		✓	✓	✓*	✓	*E. coli: ≤16 Do not report (offer); ≥32 report as R Other species: Always report if R. If ≤4 offer sens. Refer to Beta-Lactam Resistance Detection Charts.
Cefixime				✓		
Ceftriaxone	✓*	✓*	2*	2*	2*	Always report if I/R, 2nd line if cefazolin I/R * If patient < 1 mo - report cefotaxime instead of ceftriaxone using the same interpretation.
Cephalexin				✓		**For *E. coli* only** Add comment: For uncomplicated lower UTI only #clx1
Ciprofloxacin		✓	✓	2*	✓	Do not report in patients < 18 y 2nd line if cefixime and TMP-SMX I/R. Always report if I/R ***See Special Considerations**
Doxycycline				2		2nd line if cefixime and cipro I/R For patients ≤17 y report 2nd line if cefixime I/R. Disc diffusion If patient <8 y **See Special Considerations**
Ertapenem		3	3	3	3	3rd line if ceftriaxone or ceftazidime I/R If S do not report in patients < 3 months
Fosfomycin				2		**For *E. coli* only** 2nd line if cefixime and cipro I/R. Do not report in patients < 18 y Add comment: For uncomplicated lower UTI only (27402) Disc diffusion **See Special considerations**
Gentamicin	*	✓**	✓**	✓	✓**	* Report only in neonates (< 1 month) ****See Special Considerations**
Imipenem *		3	3	3	3	3rd line if ceftriaxone or ceftazidime I/R
Meropenem	2	3*	3*	3	3*	2nd/ 3rd line if ceftriaxone or ceftazidime I/R ***See Special considerations**
Nitrofurantoin				✓		Add comment: For uncomplicated lower UTI only #f1
Piperacillin/ Tazobactam		3* †	3*		3*	3rd line if AMC IV R and ceftriaxone S * Report if *P. aeruginosa* co-isolated and ceftriaxone S † For bloods report if PTZ I/R and ceftriaxone S **See Special Considerations**
TMP-SMX	*	✓	✓	✓	✓	* Report only at physician request
Tobramycin		2*	2*	2	2*	2nd line if gent I/R ***See Special Considerations**
Tigecycline				*	*	**See Special Considerations**

* Do NOT report Imipenem from the VITEK

Note Stool Isolates: Susceptibility testing is not routinely performed on stool isolates of *E. coli* 0157:H7.

Special considerations

Amoxicillin/ Clavulanate oral:	A MIC of 8/4 µg/mL is at upper limit of susceptibility. This may be adequate to achieve reasonable pharmacodynamics in urine but may not be optimal for non-urinary sites. For all non-urinary sites if MIC 8/4 µg/mL and interpretation is S add comment: "This isolate tests at the upper limit of susceptibility for amoxicillin/clavulanate. Clinical failure may occur despite in vitro susceptibility". #A315
Ciprofloxacin:	For urine cultures add the following comment when **not** reporting ciprofloxacin (patients ≥ 18 y): "Ciprofloxacin is not routinely reported, given the potential for significant adverse events and increasing antimicrobial resistance." &3206
Doxycycline:	If reporting doxycycline on <8 years add the following comments: "Doxycycline can now be prescribed for children <8y for short-course (<21 d) therapy; OTHER tetracyclines are still contraindicated for this age group." **(27664)**
Fosfomycin:	For E. coli only. Use EUCAST disc diffusion breakpoints. EUCAST breakpoints: **Zone** / **Interpretation** ≤ 23 mm / R ≥ 24 mm / S Add comment: "Interpretation is based upon EUCAST breakpoints." **(21178)** Add comment: For uncomplicated lower UTI only **(27402)**

Escherichia spp., Continued

Special considerations (continued)

<table>
<tr><td>Gentamicin/ tobramycin:</td><td>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</td></tr>
<tr><td>Meropenem:</td><td>For blood cultures, sterile body sites (other than CSF), deep wounds and respiratory cultures:

If reporting meropenem as S add comment:
“Meropenem is the preferred agent if carbapenem therapy is required.” #A361</td></tr>
<tr><td>Piperacillin/ tazobactam:</td><td>This antibiotic is frequently used as empiric therapy for polymicrobial infections (i.e. co-infections with S. aureus, Enterococcus, Pseudomonas aeruginosa and/or anaerobes), febrile neutropenia or sepsis syndromes.

Note: Do not report as S if ceftriaxone or ceftazidime I/R (≥2µg/mL) as piperacillin/ tazobactam is not recommended if either an extended spectrum beta-lactamase (ESBL) and/or a cephalosporinase is present.</td></tr>
<tr><td>Tigecycline:</td><td>For E. coli only. This antibiotic reported only on physician request after approval from microbiologist. Send to reference lab for testing. There are no current CLSI breakpoints.

Use EUCAST breakpoints:
<table><tr><th>MIC</th><th>Interpretation</th></tr><tr><td>≤ 0.5 µg/mL</td><td>S</td></tr><tr><td>≥ 1 µg/mL</td><td>R</td></tr></table>
Add comment: “Interpretation is based upon EUCAST breakpoints.” (21178)</td></tr>
</table>

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 Amoxicillin/Clavulanate, fosfomycin, gentamicin, tobramycin and tigecycline - Refer to Special Considerations