SA Pathology State-wide Cumulative Antibiogram: Gram-Negative Blood Culture Isolates (2020)

Organism	No. of isolates	Antibiotics						Broad-spectrum or restricted antibiotics				
		Ampicillin/ Amoxicillin	Amoxicillin-clavulanate	Ceftriaxone	Piperacillin-tazobactam	Gentamicin	Sulfamethoxazole-trimethoprim	Ceftazidime	Cefepime	Meropenem	Ciprofloxacin	Amikacin
		%S	%S	%S	%S	%S	%S	%S	%S	%S	%S	%S
Escherichia coli	1,019	55	77	92	98	94	76	94	94	100	91	99
Klebsiella pneumoniae	139	0	91	94	95	98	89	94	96	99	94	99
Pseudomonas aeruginosa	132				94	98		95	95	98	92	100
Enterobacter spp.	83				34	100	93	81	99	100	99	100
Proteus mirabilis	69	83	97	100	100	80	86	100	93	100	100	100
Klebsiella oxytoca	52	0	87	81	83	98	98	94	96	100	98	100
Serratia spp.	34			100	100	100	100	100	100	100	100	100

KEY

<70% of isolates sensitive
70-90% of isolates sensitive
> 90% of isolates sensitive
Not recommended to be used in children without specialist advice
<80% of isolates tested, not clinically effective or intrinsically resistant
Broad spectrum & restricted antimicrobials

Prepared by S.Harch/M.Warner, December 2021

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INTERPRETATIVE COMMENTARY

1. *E. coli* is the most frequently isolated Gram-negative blood culture pathogen, outnumbering other bacterial species by almost 10-fold. Most *E. coli* (~90%) isolates were ceftriaxone susceptible and half (55%) were ampicillin/amoxicillin susceptible.

2. Extended spectrum β-lactamase (ESBL) enzymes were present in ~5% *E. coli* and ~5% *K. pneumoniae* isolates. These isolates may have additional antimicrobial resistance mechanisms (e.g. gentamicin) due to the carriage of resistance genes in addition to ESBL on a plasmid.

3. In general, a single dose of gentamicin in appropriately selected patients, will provide excellent empiric antimicrobial coverage in the setting of a Gram-negative bacteraemia. Please refer to Therapeutic Guidelines (1) for dosage recommendations.

4. *Enterobacter* spp frequently carry a chromosomal inducible AmpC β-lactamase. The SA Pathology testing method results in ceftriaxone resistance being over-represented in this antibiogram. Cefepime, a fourth-generation cephalosporin, is generally stable in the presence of an AmpC β-lactamase and is a reasonable therapeutic option for bacteraemia due to *Enterobacter* spp.

5. Recent nomenclature changes has seen *Enterobacter aerogenes* renamed as *Klebsiella aerogenes*. It is important to be aware of this change due to intrinsic antimicrobial resistance discussed above.

6. *Klebsiella* spp are intrinsically resistant to ampicillin/amoxicillin usually due to the chromosomal SHV-1 β-lactamase. *Klebsiella oxytoca* may also carry a chromosomal K1 beta-lactamase which is characterised by ceftriaxone and aztreonam resistance. This contributes to the differences in resistance profiles between *K. oxytoca* and *K. pneumoniae* above.

7. Although most *P. aeruginosa* isolates retain piperacillin-tazobactam, cefepime and ceftazidime susceptibility, in managing sepsis initial empiric combination therapy with two antipseudomonal agents (including gentamicin) is recommended. Please refer to Therapeutic Guidelines (1). Dosage of β-lactams for *P. aeruginosa* assumes high dosage regimens (e.g. piperacillin-tazobactam 4.5gm 6-hourly, cefepime 2gm 8-hourly).

References:

1. Therapeutic Guidelines: Antibiotics 2021, www.tg.org.au

Notes:

- Percentages are only shown when more than 80% of isolates were tested for each organism.
- Susceptibility testing method: EUCAST 2019 Clinical breakpoints.

Disclaimer

The antibiograms displayed on this page are intended to provide data on local antimicrobial susceptibilities. Consult clinical prescribing guidelines for advice on treatment of particular medical conditions.

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