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Appendix

Reading and understanding an antibiogram

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Appendix Table 1. Intrinsic resistance in *Enterobacteriaceae*.

Organisms	Ampicillin	Amoxycillin clavulanate	Ticarcillin	Piperacillin	Cefazolin	Cefoxitin	Cefamandole	Cefuroxime	Aminoglycosides	Tetracyclines/tigecycline	PolymyxinBcolistin	Nitrofurantoin
Citrobacter koseri	R	–	R	–	R	R	–	–	–	–	–	–
Citrobacter freundii	R	R	–	–	R	R	–	–	–	–	–	–
Enterobacter cloacae	R	R	–	–	R	R	–	–	–	–	–	–
Enterobacter aerogenes	R	R	–	–	–	–	–	–	–	–	–	–
Escherichia hermannii	R	–	R	–	R	–	–	–	–	–	–	–
Hafnia alvei	R	R	–	–	–	–	–	–	–	–	–	–
Klebsiella spp.	R	–	R	–	R	–	–	–	–	–	–	–
Morganella morganii	R	R	–	–	–	–	–	R	–	R	R	R
Proteus mirabilis	–	–	–	–	R	–	–	–	–	R	R	R
Proteus vulgaris	R	–	–	–	R	–	R	R	–	R	R	R
Proteuspenneri	R	–	–	–	R	–	R	R	–	R	R	R
Providencia rettgeri	R	R	–	–	R	–	–	–	–	R	R	R
Providencia stuartii	R	R	–	–	R	–	–	–	*	R	R	R
Serratia marcescens	R	R	–	–	R	R	R	R	°	–	R	R
Yersinia enterocolitica	R	R	R	–	–	–	R	–	–	–	–	–
Yersinia Pseudotuberculosis	–	–	–				–	–	–	–	R	–

R, resistant. *****_Providencias tuartii_ produces a chromosomal AAC(2')-Ia enzyme and should be considered to be resistant to clinically available aminoglycosides, except amikacin, arbekacin, and streptomycin. Some isolates express the enzyme poorly and can appear to be susceptible to netilmicin *in vitro*, but should be reported as resistant, as mutation can result in overproduction of this enzyme; **°**all *Serratia marcescens* isolates produce a chromosomal AAC(6')-Ic enzyme that affects the activity of clinically available aminoglycosides, except streptomycin, gentamicin, and arbekacin.

Appendix Table 2. Intrinsic resistance in non-fermentative Gram-negative bacteria; non-fermentative Gram-negative bacteria are also intrinsically resistant to benzylpenicillin, cefoxitin, cefamandole, cefuroxime.[1]

Organisms	Ampicillin	Amoxicillin clavulanate	Ticarcillin clavulanate	Piperacillin tazobactam	Cefazolin	Cefotaxime	Ceftriaxone	Ceftazidime	Ertapenem	Imipenem	Meropenem	Ciprofloxacin	Chloramphenicol	Aminoglycosides	Trimethoprim	Hamethoxazole	Fosfomycin	Tigecycline	Polymyxin B/colistin
Acinetobacter baumannii *Acinetobacter calco-aceticus*	R*	R*	–	–	R	R	R	–	R	–	–	–	–	–	R	–	R	–	–
Achromobacter xylosoxidans	R	–	–	–	R	R	R	–	R	–	–	–	–	–	–	–	–	–	–
Burkholderia cepacia complex	R	R	R	–	R	–	–	–	R	R	–	R	R	R°	R	–	R	–	R
Elizabethkingia meningoseptica	R	–	R	–	R	R	R	R	R	R	R	–	–	–	–	–	–	–	R
Ochrobacter anthropi	R	R	R	R	R	R	R	R	R	–	–	–	–	–	–	–	–	–	–
Pseudomonas aeruginosa	R	R	–	–	R	R	R	–	R	–	–	–	R	[#]	R[§]	R[§]	–	R	–
Stenotrophomonas maltophilia	R	R	R	R	R	R	R	R^	R	R	R	–	–	R°	R[$]	–	R	–	–

R, resistant. **Acinetobacter baumannii* may appear to be susceptible to ampicillin-sulbactam, owing to the activity of sulbactam against this species; °*Burkholderiacepacia* and *Stenotrophomonas maltophilia* are intrinsically resistant to all aminoglycosides. Intrinsic resistance is attributed to poor permeability and putative efflux. In addition, most *Stenotrophomonas maltophilia*isolates produce the AAC(6')-Iz enzyme; [#]*Pseudomonas aeruginosa* is intrinsically resistant to kanamycin and neomycin, owing to low-level APH(3')-IIb activity; [§]*Pseudomonas aeruginosa* is typically resistant to trimethoprim and moderately susceptible to sulfonamides. Although it may appear to be susceptible *in vitro* to trimethoprim-sulphamethoxazole, it should be considered to be resistant; ^*Stenotrophomonas maltophilia* may show low ceftazidime MIC values but should be considered to be resistant; [$]*Stenotrophomonas maltophilia* is typically susceptible to trimethoprim-sulphamethoxazole but resistant to trimethoprim alone.

Appendix Table 3. Intrinsic resistance in Gram-negative bacteria other than Enterobacteriaceae and non-fermentative Gram-negative bacteria; Gram negative bacteria other than Enterobacteriaceae and non-fermentative Gram negative bacteria listed are also intrinsically resistant to glycopeptides, lincosamides, daptomycin, and linezolid.[1]

Organisms	Macrolides	Fusidic acid	Streptogramins	Trimethoprim	Nalidixic acid
Haemophilus influenzae	I	R	–	–	–
Moraxella catarrhalis	–	–	–	R	–
Neisseria spp.	–	–	–	R	–
Campylobacter fetus	–	R	R	R	R
Campylobacter jejuni *Campylobacter coli*	–	R	R	R	–

Appendix Table 4. Intrinsic resistance in Gram-positive bacteria; Gram-positive bacteria are also intrinsically resistant to aztreonam, temocillin, polymyxin B/colistin, and nalidixicacid.[1]

Organisms	Fusidic acid	Ceftazidime	Cephalosporins (exceptceftazidime)	Aminoglycosides	Erythromycin	Clindamycin	Quinupristin dalfopristin	Vancomycin	Teicoplanin	Fosfomycin	Novobiocin	Sulphonamides
Staphylococcus saprophyticus	R	R	–	–	–	–	–	–	–	R	R	–
Staphylococcus cohnii Staphylococcus xylosus	–	R	–	–	–	–	–	–	–	–	R	–
Staphylococcus capitis	–	R	–	–	–	–	–	–	–	R	–	–
Other coagulase-negative staphylococci and S. aureus	–	R	–	–	–	–	–	–	–	–	–	–
Streptococcus spp.	R	–	–	R*	–	–	–	–	–	–	–	–
Enterococcus faecalis	R	R	R	R*	R	R	R	–	–	–	–	R
Enterococcus gallinarum Enterococcus casseliflavus	R	R	R	R*	R	R	R	R	–	–	–	R
Enterococcus faecium	R	R	R	R*°	R	–	–	–	–	–	–	R
Corynebacterium spp.	–	–	–	–	–	–	–	–	–	R	–	–
Listeria monocytogenes	–	R	R	–	–	–	–	–	–	–	–	–
Leuconostoc spp. Pediococcus spp.	–	–	–	–	–	–	–	R	R	–	–	–
Lactobacillus spp. (some species)	–	–	–	–	–	–	–	R	R	–	–	–
Clostridium ramosum, Clostridium innocuum	–	–	–	–	–	–	–	R	–	–	–	–

R, resistant. *Low-level resistance to aminoglycosides. Combinations of aminoglycosides with cell wall inhibitors (penicillins and glycopeptides) are synergistic and bactericidal against isolates that are susceptible to cell wall inhibitors and do not display high-level resistance to aminoglycosides; °in addition to low-level resistance to aminoglycosides, *Enterococcus faecium* produces a chromosomal AAC(6') enzyme that is responsible for the loss of synergism between aminoglycosides (except gentamicin, amikacin, arbekacin, and streptomycin) and penicillins or glycopeptides.

Reference

1. Leclercq R, Cantón R, Brown DF, et al. EUCAST expert rules in antimicrobial susceptibility testing. Clin Microbiol Infect 2011;19:141-60.