

**Intrinsic (Natural) Resistance**

Antimicrobial resistance can be classified as either intrinsic or acquired. Intrinsic resistance may be related to inherent or natural characteristics in a bacteria and may be used for recognition of a bacterial species, and results of in vitro susceptibility testing is not relevant to report as treatment options. The most relevant drug related natural resistance in a group or species is listed below:

<b>BACTERIA</b>	<b>NATURAL RESISTANCE</b>
Enterobacteriaceae	
Enterobacteriaceae in general	Penicillinase stable penicillins, Macrolides, Fucidin, Rifampicin, Glycopeptides
Enterobacteria, group 2 K. pneumoniae, K oxytoca, C. diversus, Esch. hermannii	Aminopenicillins, Carboxypenicillins
Enterobacteria, group 3 E. cloacae, E. aerogenes, C. freundii, S. marcescens, M. morgani, Prov. rettgeri, P stuartii, Hafnia alvei (except P. vulgaris AMC S)	Aminopenicillins, Amoxicillin+Clavulanate, 1 <sup>st</sup> gen Cephalosporins
Citrobacter freundii	Aminopenicillins, Amoxicillin+Clavulanate, 1 <sup>st</sup> gen Cephalosporins, Cefoxitin,
Citrobacter koseri (diversus)	Aminopenicillins, Carboxypenicillins
Enterobacter aerogenes, E cloacae	Aminopenicillins, Amoxicillin+Clavulanate, Cefoxitin, 1 <sup>st</sup> gen Cephalosporins, Nitrofurantoin
Klebsiella pneumoniae, K. oxytoca	Aminopenicillins, Carboxypenicillins
Morganella morgani	Aminopenicillins, Amoxicillin+Clavulanate, 1 <sup>st</sup> and 2 <sup>nd</sup> gen Cephalosporins, Cefoxitin, Polymyxins, Tetracyclines, Nitrofurantoin, Fosfomycin
Proteus mirabilis	Polymyxins, Tetracyclines, Nitrofurantoin
Proteus vulgaris, P. penneri	Aminopenicillins, Carboxypenicillins Cefuroxime, Polymyxins, Tetracyclines, Nitrofurantoin
Providencia rettgeri	Aminopenicillins, Polymyxins, Tetracyclines, Nitrofurantoin, Amoxycillin+Clavulanate.
Providencia stuartii	Aminopenicillins, Amoxicillin+Clavulanate, Polymyxins, Tetracyclines, Nitrofurantoin, Gentamicin, Tobramycin, Netilmicin
Salmonella spp.	1 <sup>st</sup> and 2 <sup>nd</sup> gen Cephalosporins, Cefuroxime (active in vitro, not active in vivo) Aminoglycosides (in vivo)
Serratia marcescens	Aminopenicillins, Amoxicillin+Clavulanate, 1 <sup>st</sup> and 2 <sup>nd</sup> gen Cephalosporins Polymyxins
Shigella spp.	1 <sup>st</sup> and 2 <sup>nd</sup> gen Cephalosporins, Aminoglycosides (in vivo)
Yersinia enterocolitica	Aminopenicillins, Carboxypenicillins, Amoxicillin+Clavulanate, 1 <sup>st</sup> and 2 <sup>nd</sup> gen Cephalosporins, Cefoxitin
Gram positive cocci in general	Aztreonam, Nalidixic acid, Polymyxins
Staphylococci	
Staphylococcus spp. in general	Nalidixic acid, Polymyxins
S. saprophyticus	Novobiocin, Fosfomycin
Penicillin resistant staphylococci (Oxa S)	Penicillin, Aminopenicillins, Ureidopenicillins, Carboxypenicillins
Methicillin resistant staphylococci	All beta-lactams
Micrococcus spp.	Nitrofurantoin, Mupirocin
Streptococci/enterococci	
Streptococcus spp.	Polymyxins, Nalidixic acid, Aminoglycosides (low level)
Enterococcus faecalis	Cephalosporins, Clindamycin, Mupirocin, Aminoglycosides (low level - HLR test), Novobiocin, Trim+Sulfa (in vivo)
E. faecium	Cephalosporins, Aminoglycosides (low level - HLR test), Nitrofurantoin, Trim+Sulfa (in vivo)
E. gallinarum/casseliflavus	Vancomycin (MIC 4-16 µg/ml)
Arcanobacterium spp.	Bacitracin, Mupirocin, Optochin

# Detection of resistance mechanisms using Neo-Sensitabs™ and Diatabs™

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Pediococcus/Leuconostoc Lactobacillus/Erysipelothrix	Glycopeptides
Non fermenters	
Acinetobacter baumannii/calcoaceticus	Aminopenicillins, 1 <sup>st</sup> and 2 <sup>nd</sup> gen Cephalosporins, Chloramphenicol, Trimethoprim, Fosfomycin, Nitrofurantoin
Achromobacter xylosoxidans	Aminopenicillins, 1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> gen Cephalosporins, Aminoglycosides, Aztreonam
Alc denitrificans	Cefotaxime
Burkholderia cepacia	Aminopenicillins, Ureidopenicillins, Carboxypenicillins, Amoxicillin+Clavulanate, 1 <sup>st</sup> and 2 <sup>nd</sup> gen Cephalosporins, Quinolones, Aminoglycosides, Polymyxins, Nitrofurantoin, Fosfomycin, Chloramphenicol, Imipenem, Trimethoprim
Elisabethkingia meningoseptica	Aminoglycosides, Carboxypenicillins, 1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> gen. Cephalosporins, Polymyxins, Tetracyclines, Chloramfenicol, Ticarcillin+Clavulanate, Quinolones, Imipenem
Ochrobactrum anthropi	Ureidopenicillins, Carboxypenicillins, Ticarcillin+Clavulanate, 3 <sup>rd</sup> gen. Cephalosporins, Aztreonam, Ertapenem
Pseudomonas aeruginosa	Aminopenicillins, Amoxicillin+Clavulanate, 1 <sup>st</sup> and 2 <sup>nd</sup> gen. Cephalosporins, Cefotaxime, Ceftriaxone, Chloramfenicol, Nalidixic acid, Trim+Sulfa, Tetracyclines, Nitrofurantoin
Stenotrophomonas maltophilia	Ureidopenicillins, Carboxypenicillins, 1 <sup>st</sup> and 2 <sup>nd</sup> gen Cephalosporins, Imipenem, Cefotaxime, Aztreonam, Aminoglycosides, Tetracyclines (except Minocycline) Fosfomycin
Listeria	Oxacillin, Cephalosporins, Aztreonam, Polymyxins, Nalidixic acid, Clindamycin, Fosfomycin
Neisseria/Branhamella	
Branhamella catarrhalis	Lincomycin, Clindamycin, Trimethoprim
Gonococci, meningococci	Lincomycin, Clindamycin, Polymyxins, Trimethoprim, Vancomycin
Campylobacter/Helicobacter	
Campylobacter spp.	Vancomycin, Trimethoprim, Polymyxins, Lincomycin, Novobiocin, Aztreonam
Helicobacter pylori	Vancomycin, Polymyxins, Nalidixic acid, Trimetoprim, Sulfonamides
Corynebacterium in general	Fosfomycin, Mupirocin, Polymyxins, Nalidixic acid
C. jeikeium/urealyticum	All Penicillins, 1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> gen. Cephalosporins, Amoxicillin+Clavulanate., Imipenem, Meropenem, Aminoglycosides, Chloramphenicol, Nalidixic acid, Trim+Sulfa, Polymyxins, Fosfomycin, Mupirocin, Macrolides
<b>Anaerobes</b> in general	Aminoglycosides, Aztreonam (except Fusobacteria), Trimethoprim, Nalidixic acid
Bacteroides fragilis group	Aminoglycosides, Vancomycin, Aminopenicillins, 1 <sup>st</sup> , and 2 <sup>nd</sup> gen. Cephalosporins, Polymyxins, Glycopeptides, Fosfomycin, Aztreonam, Oxgall
Clostridium spp.	Kanamycin, Trimethoprim, Aztreonam, Polymyxins, Fosfomycin
Fusobacteria spp.	Nalidixic acid, Vancomycin, Macrolides (low level)
Porphyromonas spp	Polymyxins, Fosfomycin, Aminoglycosides
Prevotella spp.	Glycopeptides, Fosfomycin, Aminoglycosides
Actinomyces/Propionibacterium	1 <sup>st</sup> , and 2 <sup>nd</sup> gen. Cephalosporins, Polymyxins, Metronidazole
Mobiluncus spp.	Metronidazole
Peptostreptococcus/Eubacterium	Polymyxins, Fosfomycin
Veillonella spp.	Macrolides (low level), Glycopeptides

### References:

- 1) Livermore DM et al. Interpretative reading: recognizing the unusual and inferring resistance mechanisms from resistance phenotypes. J Antimicrob Chemother. 2001; 48 Suppl 1:87-102.
- 2) Communiqué January 2008: Société Française de Microbiologie (CA-SFM)