

Guideline

Subject: **Selective Reporting of Antimicrobials**
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Scope

The Guidelines contains recommendations to support Quality Reporting of Antimicrobials in the Australian context.

This document is intended only as a guide for laboratories and it is not compulsory for laboratories to follow these recommendations. There is no clear, universally agreed definition of ideal selective reporting and many factors contribute to the decisions that laboratories and health care institutions make about what is best for local prescribing practice. Hence these guidelines are not intended to be used by laboratory accrediting bodies for the purpose of laboratory assessments.

A Working Group of Pathologists was convened by the RCPA and formed its definitive recommendations in 2019. Please note that this document focuses on the most commonly isolated aerobic bacteria, and the recommendations and guidelines are not intended to cover all circumstances. Conclusions and recommendations should be based on all evidence available to the reporting pathologist, including past results, history and any consultations with the referring clinician.

Membership and affiliations of the members of this Working Group is listed under *Authority and Development*. Where no reference is provided, the authority is the consensus of the Working Group.

Introduction

Antimicrobial use selects for and induces multi-drug resistance therefore limiting the available future therapeutic options for the patient. Multi-drug resistant organisms may be transmitted from person to person in the health-care setting and in the community. Emerging evidence suggests antimicrobial effects on the human microbiome that go beyond infectious consequences and may be long-lasting. Antimicrobial use causes *C. difficile* disease.

Literature shows that selective reporting can influence prescribing practice and has been associated with local decrease in antimicrobial resistance. A recent European survey has shown the main barrier to implementation of selective reporting is lack of guidelines (Pulcini et al.)

A 2017 RCPAQAP audit of antimicrobial reporting in Australian and New Zealand laboratories identified significant opportunities for improvement and standardization of 'cascade' or 'selective' reporting of antimicrobials. In particular, for a fully susceptible *Escherichia coli* in blood culture 65% of laboratories (55/84) over-reported at least one antimicrobial. Importantly, 15% (10/65) of laboratories that tested meropenem reported the result. A significant proportion of laboratories (12%, 10/84) reported antimicrobials generally considered inappropriate for treatment of bacteraemia on blood culture isolates.

Objectives

The objectives of these guidelines are to:

- Support appropriate and judicious use of antibiotics within a patient safety framework.
- Minimize overuse of broad-spectrum antibiotics and facilitate Antimicrobial Stewardship by providing laboratory guidelines for antibiotic reporting.
- Provide a framework for reporting antibiotics in the setting of various combinations of antimicrobial resistance profiles.
- Encourage reporting of agents appropriate for body site of infection.
- Encourage reporting of agents appropriate for age and pregnancy status.
- Encourage standardised reporting of antimicrobials across Australian laboratories.
- Provide suggested comments to add to reports regarding the selection of appropriate antibiotics.
- Recognize that the extent of implementation of these recommendations will depend on many factors including local LIS capabilities, available resources, local resistance antibiograms, demographic of the population being serviced by the laboratory, local empiric treatment protocols and stewardship policies.

Key Reporting strategies

Where possible, avoid reporting of carbapenems and fluoroquinolones in view of their broad spectrum and propensity to induce multi-drug resistance.

Where possible, avoid reporting of antimicrobials with strong association with *C. difficile* (fluoroquinolones, ceftriaxone, amoxicillin-clavulanate & clindamycin).

Aim to always report:

- narrow spectrum agents,
- at least one oral and one intravenous (IV) agent, and
- at least one agent for patients with penicillin allergy: ideally the laboratory should be notified of penicillin allergy (eg. on request slip) before extensive reporting of broad-spectrum antimicrobials.

Laboratories are encouraged to report susceptibility results only when the isolate(s) are likely to be significant.

Routine susceptibility reporting for specific sites aims to be in step with treatment recommendations from Therapeutic Guidelines; Antibiotic wherever possible.

Situations where suppression of all susceptibility results may be appropriate include: isolates from indwelling catheter urine samples, or poor quality sputum/urine/skin swab samples.

Laboratories are encouraged to report intrinsic resistances in order to help prevent inappropriate use of ineffective antimicrobials. Intrinsic resistance profiles are available in relevant EUCAST and CLSI documents.

Note: these guidelines are not intended to recommend particular susceptibility testing methodologies. This document is intended to guide the reporting of tested antimicrobials and is to be used in conjunction with other guidelines that cover susceptibility testing methods. Laboratories using the Calibrated Dichotomous Sensitivity (CDS) method are encouraged to use this RCPA document as a guide to Selective Reporting where appropriate and otherwise to follow recommendations from Therapeutic Guidelines: Antibiotic.

To reduce complexity of the tables, not all antibiotic resistance combinations are included here and consultation with a Clinical Microbiologist and/or Infectious Diseases Physician is likely to be required for extensively resistant isolates or those with unusual profiles. The main aim of these guidelines is to standardise reporting of the more common isolates to reduce prescribing of broad-spectrum antibiotics when they are not required.

This guideline recommends that laboratories aim to have in place systems to ensure that clinicians that request results for antimicrobials that are not routinely reported are able to obtain those results in a timely manner after discussion with an appropriately qualified person.

Authority and development

This section provides details of the committee involved in developing this guideline and the process by which it was developed.

Guideline developers

This guideline was developed by an expert committee, with assistance from relevant stakeholders.

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Consultation

In August 2018, a Draft Guideline was sent to all RCPA Microbiology Fellows for feedback and 16 responses were received. The Draft was also referred to the Australasian Society for Infectious Diseases and the New Zealand Microbiology Network for comments.

The New Zealand Microbiology Network plans to use these current guidelines as a framework for development of New Zealand-specific guidelines that take into account local needs and prescribing practices. The main principles of Selective Reporting will likely be similar in New Zealand.

Abbreviations for reported antibiotic

Code	Antibiotic	Code	Antibiotic	Code	Antibiotic	Code	Antibiotic
AMC	Amoxicillin-clavulanate	CIP	Ciprofloxacin	GEN	Gentamicin	PEN	Penicillin
AMI	Amikacin	CLA	Clarithromycin	IMI	Imipenem	PIP	Piperacillin
AMO	Amoxicillin	CLIN	Clindamycin	LEV	Levofloxacin	RIF	Rifampicin
AZI	Azithromycin	COT	Cotrimoxazole	LZD	Linezolid	SYN	Quinupristin-Dalfopristin
AZTR	Aztreonam	CRO	Ceftriaxone	MER	Meropenem	TEI	Teicoplanin
BENPEN	Benzylpenicillin	CTN	Colistin	MET	Metronidazole	TET	Tetracycline
CAZ	Ceftazidime	DAP	Daptomycin	MIN	Minocycline	TIC	Ticarcillin
CAZ-AVI	Cefatzidime-avibactam	ERY	Erythromycin	MOX	Moxifloxacin	TIG	Tigecycline
CEC	Cefaclor	ETP	Ertapenem	MUP	Mupirocin	TIM	Ticarcillin -clavulanate
CEX	Cefalexin	FEP	Cefepime	NAL	Nalidixic Acid	TOB	Tobramycin
CFT-TZP	Ceftolozane-tazobactam	FLU	Flucloxacillin	NIT	Nitrofurantoin	TRI	Trimethoprim
CFU	Cefuroxime (oral)	FOS	Fosfomycin	NOR	Norfloxacin	TZP	Piperacillin-tazobactam
CFZ	Cefazolin	FUS	Fusidic acid	OFL	Ofloxacin	VAN	Vancomycin
CHL	Chloramphenicol						

Key

S=susceptible, R=Resistant, I=Intermediate

O=additional options, if possible laboratories to avoid reporting, always report if I/R

^Additional reporting to appropriate combination above

E=EUCAST, C=CLSI

WT/NWT=Wild type/Non wild-type

X=intrinsic resistance, laboratories may choose to report resistance in comment form

PART A: GRAM NEGATIVE ORGANISMS

All sites:

If possible, suppress TET if age <8 or pregnant unless I/R.

If possible, suppress CIP/NOR if age <14 years unless I/R.

Fermentative Gram-negative bacilli (Enterobacteriaceae, new taxonomy: Enterobacterales)

Always report AMC/GEN/CFZ/CRO/CAZ/FEP/CIP/COT/TZP/MER/ETP/FOS/CTN if I/R for all sites

Urine:

Always report TRI/NOR/NIT if I/R

Resistance profile	AMO	CEX	CFZ ^c	CRO	GEN	TRI	COT	NIT ^E	AMC	TZP	NOR/CIP	AMI	TOB	MER	ETP	FOS
All S	S	S			S	S		S								
AMO I/R	I/R	S			S	S		S	O							
AMO and AMC I/R	I/R	S			S	S		S	I/R							
AMO and CEX I/R	I/R	I/R	S/I/R	S ^d	S	S		S	S							
AMO and CEX and AMC I/R	I/R	I/R	S/I/R	S ^d	S	S		S	I/R							
AMO and AMC and TRI and NIT I/R	I/R	I/R	S/I/R	S ^d	S	I/R	S/I/R	I/R	I/R		S					
GEN R/I [^]												S/I/R	S/I/R			
CRO I/R or ESBL/AmpC	R		R	I/R	S/I/R	S/I/R	S/I/R		O	O	S			S	O	
NOR/CIP I/R and ESBL/AmpC	R		R		S/I/R	S	S		O	O	I/R			S	S/I/R	O
NOR/CIP and COT and CRO I/R	R			I/R	S/I/R	I/R	I/R	S/I/R	I/R	O	I/R			S	S/I/R	S/I/R
If no oral agents (AMC,CIP,COT,NIT all I/R)	As for BC															
MER R	As for BC (TIG not generally appropriate for treatment of UTI)															

^cCLSI ^d Report CRO if not able to report CFZ or if CFZ is I/R ^EEUCAST: Nitrofurantoin for E. coli only

Enterobacteriales (continued)

Blood culture/Sterile site:

Resistance profile	AMO	CFZ ^c	CRO	GEN	COT	AMC	TZP	CIP	AMI	TOB	MER	ETP	TIG	CTN	FOS	CAZ-AVI
All S	S	S	S ^a	S	S			S ^o								
AMO I/R	I/R	S	S ^a	S	S	S	O	S ^o								
AMO and AMC I/R	I/R	S	S ^a	S	S	I/R		S								
AMO and CFZ I/R	I/R	I/R	S	S	S	S		S ^o								
AMO and CFZ and AMC I/R	I/R	I/R	S	S	S	I/R		S								
GEN I/R ^									S/I/R	S/I/R						
CRO I/R or ESBL/AmpC	R	R	I/R	S/I/R	S/I/R			S			S	O				
CIP I/R and ESBL/AmpC	R	R	I/R	S/I/R	S/I/R			I/R			S	S/I/R				
CIP and TZP and CRO I/R	R	R	I/R	S/I/R	S/I/R		I/R	I/R			S	S/I/R				
ESBL/AmpC and AMC,CIP,COT all I/R	R	R	I/R	S/I/R	I/R	I/R		I/R			S	S/I/R				
MER R [^]											R	R	O ^b	O	O	O

^a Report CRO if not able to report CFZ ^b Not generally appropriate for treating bacteraemia ^cCLSI

CSF:

	AMO	CRO	MER	CIP	AZTR
CRO=S	S/I/R	S			S/I/R ^o
CRO=I/R	I/R	I/R	S		S/I/R ^o
If MER=I/R	R	R	I/R	Report MIC ^o	S/I/R ^o

Enterobacteriales (continued)

Non-sterile site, non-urine (swabs, respiratory etc):

Resistance profile	AMO	CFZ ^c	CRO	GEN	COT	AMC	TZP	CIP	AMI	TOB	MER	ETP	TIG	CTN	FOS	CAZ-AVI
All S	S	S	S ^a	S	S											
AMO I/R	I/R	S	S ^a	S	S	S										
AMO and AMC I/R	I/R	S	S ^a	S	S	I/R		S								
AMO and CFZ I/R	I/R	I/R	S	S	S	S										
AMO and CFZ and AMC I/R	I/R	I/R	S	S	S	I/R		S								
GEN I/R [^]									S/I/R	S/I/R						
CRO I/R or ESBL/AmpC	R	R	I/R	S/I/R	S/I/R		O	S			S ^o	O				
CIP I/R and ESBL/AmpC	R	R	I/R	S/I/R	S/I/R		O	I/R			S	O				
CIP and TZP and CRO I/R	R	R	I/R	S/I/R	S/I/R		I/R	I/R			S	O				
ESBL/AmpC and AMC,CIP,COT all I/R	R	R	I/R	S/I/R	I/R	I/R		I/R			S	S/I/R				
MER R [^]											R	R	O	O	O	O

^a Report CRO if not able to report CFZ ^cCLSI

Enterobacterales (continued)

PD fluid:

	CFZ ^c	CRO	CAZ or FEP	GEN	CIP	MER
All	S/I/R	S ^d	S	S/I/R		
If CRO=I/R	R	I/R	S/I/R	S/I/R	S/I/R	S/I/R

^d Report CRO if not able to report CFZ or if CFZ is I/R ^cCLSI

ESCHAPPM: AMO, AMC, CFZ, CEX always intrinsically resistant.

Laboratories may choose to suppress CRO/CAZ/TZP if S for ESCHAPPM for all sites.

Laboratories may choose to report FEP if S for ESCHAPPM if CRO=S.

*Suggested comment for ESCHAPPM organisms: "Resistance to third generation cephalosporins or piperacillin/tazobactam may develop during therapy for infection with these organisms."

i.e. *Enterobacter aerogenes* (now *Klebsiella aerogenes*), *Enterobacter cloacae* complex, *Serratia marcescens*, *Hafnia alvei*, *Citrobacter freundii* complex, *C.braakii*, *C.murilinae*, *C.werkmanii*, *C.youngae* (not *C.koseri*, *C.farmeri* *C.sedlakii*, *C.rodentium* or *C.amalonaticus*), *Acinetobacter*, *Yersinia enterocolitica*, *Aeromonas* spp. *Providencia*, *Proteus* not *mirabilis*, *Morganella morganii*.

ESBL:

Laboratories may choose to suppress CRO/CAZ/TZP/AMC if S for all sites.

**If non-ESCHAPPM but CRO/CAZ are I/R laboratories may choose to add suggested comment: "This organism likely produces either an extended spectrum beta lactamase (ESBL) or an AmpC beta lactamase and treatment failure may occur with ceftriaxone, ceftazidime, cefepime, amoxicillin-clavulanate or piperacillin-tazobactam despite in vitro results."

Enteric pathogens

All sites: *Salmonella/Shigella* spp.: Report AMO/CRO/CIP/COT/MERO if I/R

Salmonella spp:

	AMO	CRO	CIP/NOR	COT	AZI## ^c	MER	GEN	CEX/CFZ
Faeces#	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R ^o		R ^c	R ^c
Blood/non-urine	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R		R ^c	R ^c
Urine	S/I/R	S/I/R	S/I/R	S/I/R				R ^c
All sites if CRO I/R	I/R	I/R	S/I/R	S/I/R	S/I/R	S	R ^c	

Faeces: Recommend perform susceptibility testing on all isolates but ideally do not report susceptibility results unless requested or typhoidal *Salmonella* (*S. Typhi* or *S. Paratyphi*).

MIC interpretations available for *S. Typhi* only

^cCLSI

Suggested comment (faecal isolates):

“Antibiotic therapy of non-typhoidal *Salmonella* enteritis is not generally advisable as it is usually not clinically beneficial and may prolong carriage. Antibiotic therapy may be indicated in certain patients such as infants, patients who are severely ill (e.g. requiring hospital admission), septicaemic, immunosuppressed or have prosthetic vascular grafts. If susceptibility results are required please contact the laboratory within 3 days.”

Shigella spp:

	AMO	CRO	CIP/NOR	COT	AZI MIC	GEN	TET	MER
Faeces			S	S/I/R				
Faeces if CIP I/R	S/I/R	S	I/R	S/I/R	O	R ^c	O	
Faeces if CIP I/R and COT I/R	S/I/R	S	I/R	I/R	WT/NWT	R ^c	O	
All sites if MDR (not urine)	I/R	I/R	I/R	I/R	WT/NWT	R ^c	I/R	S

Suggested comment:

“Treatment of *Shigella* is indicated for patients with severe disease, to shorten the duration of symptoms. *Shigella* is easily transmitted from person-to-person and treatment reduces disease transmission, so for public health reasons treatment may be recommended for: children younger than 6 years; people who are institutionalised; men who have sex with men; people who are immunosuppressed; and food handlers. Note the approach varies between states and territories.”

Enteric pathogens (continued)

All sites:

Aeromonas/Plesiomonas/Vibrio/Yersinia spp.: Report TZP/CAZ/FEP/MERO if I/R

Aeromonas/Plesiomonas spp:

	CIP	COT	TET ^c	MER ^c
Faeces##	S/I/R	S/I/R	S/I/R ^o	
All sites	S/I/R	S/I/R	S/I/R ^o	
All sites if MER R	S/I/R	S/I/R	S/I/R ^o	R

^cCLSI

Faeces: Perform susceptibility testing on all isolates but ideally do not report susceptibility results unless requested.

Suggested comment:

“*Aeromonas/Plesiomonas* gastroenteritis is usually self-limiting and most infections do not require antibiotic therapy. If susceptibility results are required please contact the Clinical Microbiologist.

Aeromonas strains may produce carbapenemases which can be difficult to detect in the routine laboratory.”

Vibrio spp:

	CIP	COT	TET	AZI	MER
Faeces##	S/I/R	S/I/R	S/I/R	S/I/R ^o	
All sites	S/I/R	S/I/R	S/I/R	S/I/R ^o	
All sites if MER R	S/I/R	S/I/R	S/I/R	S/I/R ^o	R

^oadditional options, if possible laboratories to avoid reporting, always report if I/R

Enteric pathogens (continued)

Campylobacter spp:

	CIP	AZI	TET
Faeces###	S/I/R	S/I/R	S/I/R ^o
Blood	S/I/R	S/I/R	S/I/R ^o

^oadditional options, if possible laboratories to avoid reporting, always report if I/R

Faeces: Recommend perform susceptibility testing on all isolates but ideally do not report susceptibility results unless requested.

Suggested comment for faecal isolates:

“Campylobacter enteritis is usually a self-limited illness. Antibiotic therapy is indicated in severe or prolonged cases. Therapy may also be justified in the third trimester of pregnancy, or in immunocompromised people, infants or the frail elderly. If susceptibility results are required, please contact the laboratory within 3 days.”

Pseudomonas aeruginosa

All sites: report CIP, MER, TZP, CTN, CAZ or FEP if I/R

CSF:

	CAZ	MER	GEN	CIP
All	S/I/R	S/I/R		Report MIC ^o
GEN I/R	S/I/R	S/I/R	I/R	Report MIC ^o

^oadditional options, if possible laboratories to avoid reporting, always report if I/R

Blood cultures/sterile sites/non-urine:

	GEN	CRO^x	CAZ	CIP	TZP	TOB	AMI	FEP	MER	CTN	CAZ-AVI	CFT-TZP
GEN S	S	R	S/I/R	S/I/R	S/I/R							
GEN I/R	I/R	R	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R					
MER and CAZ and FEP and TZP & CIP & GEN I/R	I/R	R	I/R	I/R	I/R	S/I/R	S/I/R	I/R	I/R	S/I/R ^o	S/I/R ^o	S/I/R ^o
Cystic fibrosis^F	S/I/R	R	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R ^o		

^oadditional options, if possible laboratories to avoid reporting, always report if I/R ^xintrinsic resistance, laboratories may choose to report resistance in comment form

^FOption for sputum isolates from patients with cystic fibrosis/bronchiectasis:

Susceptibility testing is not routinely performed for *P. aeruginosa* isolates from sputum of patients with cystic fibrosis/bronchiectasis.

Susceptibility testing of mucoid isolates may be unreliable and results often do not affect management. If susceptibility testing is required please contact the laboratory within 3 days.

Pseudomonas aeruginosa (continued)

Urine:

	GEN	CRO^x	CAZ	CIP/NOR^c	TZP	TOB	AMI	MER	TRI
GEN S	S	R	S/I/R	S/I/R	S/I/R				R
GEN I/R	I/R	R	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R		R
CAZ&TZP&CIP I/R	S/I/R	R	I/R	I/R	I/R			S	R
MER and CAZ and FEP and TZP & CIP & GEN I/R	As for Blood cultures, and consider FOS MIC								R

^cCLSI ^xintrinsic resistance, laboratories may choose to report resistance in comment form

Acinetobacter spp.

All sites: report GEN, COT, CIP, MER, TZP, FEP, CAZ if I/R

CSF:

	MER
All	S/I/R

All sites except CSF:

	CIP	COT	GEN	MER	MINO	TIG	CTN	AMI
All sites except CSF	S/I/R	S/I/R	S/I/R					
CIP & COT I/R	I/R	I/R	S/I/R	S/I/R	S/I/R ^{o,c}	Report MIC ^o		
MER&CIP&COT&GEN I/R	I/R	I/R	I/R	I/R	S/I/R ^{o,c}	Report MIC ^o	S/I/R ^o	S/I/R

^oCLSI ^oadditional options, if possible laboratories to avoid reporting, always report if I/R

Additionally, if *A. baumannii/pitti/nosocomialis/calcoaceticus*:

	AMO	AMC	CRO	ERT	FOM	TRI
All sites:	R	R	R	R	R	
Urine:	R	R	R	R	R	R

Stenotrophomonas maltophilia

	COT	GEN^x	MER^x	TET^x	MIN^c	CAZ^{c,o}	TRI^x
All sites	S/I/R	R	R	R			
COT I/R urine	I/R	R	R	R	S/I/R	S/I/R	R
COT I/R BC	I/R	R	R	R		S/I/R	
COT I/R other	I/R	R	R	R	S/I/R	S/I/R	

^cCLSI ^oadditional options, if possible laboratories to avoid reporting, always report if I/R ^xintrinsic resistance, laboratories may choose to report resistance in comment form

For isolates that are COT I/R consider testing TIG, CIP, MOX by MIC method but no formal breakpoints are available and no data to support relationship between susceptibility results and clinical outcome are available.

***Burkholderia cepacia* complex**

Comment: Currently no consensus exists for susceptibility testing or optimal therapy for *B. cepacia* complex

	CAZ^c	COT^c	CIP^{e,x}	GEN^x	TZP^x	MER^c	MINO^{c,o}	TRI^x	FOM^x	CTN^{o,x}
Urine	S/I/R	S/I/R	R	R	R			R	R	R
All other sites	S/I/R	S/I/R	R	R	R				R	R
COT I/R	S/I/R	I/R	R	R	R		S/I/R		R	R
COT & CAZ I/R	I/R	I/R	R	R	R	S/I/R	S/I/R		R	R
COT & CAZ & MER I/R	I/R	I/R	R	R	R	I/R	S/I/R		R	R

^cCLSI ^eEUCAST ^oadditional options, if possible laboratories to avoid reporting, always report if I/R ^xintrinsic resistance, laboratories may choose to report resistance in comment form

For isolates that are COT I/R consider testing MOX by MIC method but no formal breakpoints are available and no data to support relationship between susceptibility results and clinical outcome are available.

***Burkholderia pseudomallei*^c**

	CAZ	IMI^M	COT	TET	AMC
All sites	S/I/R	S/I/R	S/I/R	S/I/R	S/I/R

^cCLSI ^MLaboratories may choose to report meropenem MIC instead of imipenem result

Neisseria gonorrhoeae

Report AZI if I/R

	BENPEN	CRO	CIP
All	S/I/R	S/I/R	S/I/R
CIP I/R	S/I/R	S/I/R	I/R

Neisseria meningitidis

Report CIP/RIF only if I/R (prophylaxis only)

	PEN	CRO
All	S/I/R (Report MIC)	S/I/R

Haemophilus influenzae/parainfluenzae

All sites: report CEC if I/R, report RIF only if I/R (prophylaxis only)

BC/sterile sites:

	AMO	AUG	COT	TET	CFU	CEC ^c	CRO	TZP	CIP
AMO S	S		S/I/R				S		
AMO R	R	S/I/R	S/I/R	S/I/R			S/I/R		
BLNAR^c	R	R	S/I/R	S/I/R	R	R	S/I/R	R	S/I/R

CSF:

	AMO	AUG	CFU	CEC ^c	CRO	TZP	MER
AMO S	S				S		
AMO R, CRO S	R				S		
BLNAR^c	R	R	R	R	S/I/R	R	
CRO I/R	R				I/R		S/I/R

Sputum/Non-invasive:

	AMO	AUG	COT	TET	CFU	CEC ^c	CRO	TZP	CIP
AMO S	S		S/I/R	S/I/R	S/I/R				
AMO R	R	S/I/R	S/I/R	S/I/R	S/I/R				
BLNAR^c	R	R	S/I/R	S/I/R	R	R	S/I/R	R	S/I/R
CFU&COT&TET I/R	R	S/I/R	I/R	I/R	I/R		S/I/R		S/I/R

^cCLSI

Moraxella catarrhalis

If beta-lactamase positive report AMO=R for all sites

	AMC	COT	CRO	TET	ERY
Blood cultures	S/I/R	S/I/R	S/I/R	S/I/R	
Other sites*	S/I/R	S/I/R		S/I/R	S/I/R

*For non-invasive isolates the following comment can be used as an alternative to routine susceptibility testing:

“Routine susceptibility testing is not performed for *M. catarrhalis* since this organism is usually susceptible to amoxicillin-clavulanate, erythromycin, cotrimoxazole and doxycycline. Amoxicillin resistance rates are very high. Doxycycline is not recommended in children. If susceptibility testing is required (eg. antibiotic allergy, suspected treatment failure) please contact the laboratory within 3 days.”

Pasteurella spp.

	PEN	CRO[°]/CTX^E	TET	COT	CIP^E
All sites	S/I/R	S/I/R	S/I/R	S/I/R	
TET & COT I/R	S/I/R	S/I/R	I/R	I/R	S/I/R [°]

[°]CLSI ^EEUCAST [°]additional options, if possible laboratories to avoid reporting, always report if I/R

HACEK

	PEN	CRO	COT	CIP	MER
All sites	S/I/R	S/I/R	S/I/R		
COT I/R	S/I/R	S/I/R	I/R	S/I/R	
CRO I/R	S/I/R	I/R	S/I/R	S/I/R	S/I/R

Other Non-Fermentative, Non-fastidious Gram-negative bacilli

Commonly colonizing flora only: only perform susceptibility testing after approval of Clinical Microbiologist.

	AMO ^{X,E}	AMC ^{X,E}	CRO ^{X,E}	CAZ	COT	GEN	TZP	CIP	MER
All sites				S/I/R	S/I/R	S/I/R		S/I/R	
CAZ&CIP&COT I/R				I/R	I/R			I/R	S/I/R
<i>E. meningoseptica</i>	R	R	R	R	S/I/R	S/I/R		S/I/R	R ^{X,E}
<i>A. xylooxidans</i>	R		R		S/I/R	S/I/R		S/I/R	
<i>O. anthropi</i>	R	R	R	R	S/I/R	S/I/R	R	S/I/R	

^Xintrinsic resistance, laboratories may choose to report resistance in comment form

Eye Swabs

	CHL	OFL	CIP	GEN
<i>P. aeruginosa</i>	R ^X	S/I/R	S/I/R	S/I/R
<i>Enterobacteriaceae</i>	S/I/R	S/I/R	S/I/R	S/I/R
<i>H. influenzae</i>	S/I/R	S/I/R	S/I/R	

^Xintrinsic resistance, laboratories may choose to report resistance in comment form

PART B: GRAM POSITIVE ORGANISMS

All sites:

If possible, suppress TET if age <8 or pregnant unless I/R.

If possible, suppress CIP/NOR if age <14 years unless I/R.

Staphylococcus spp.

All Sites: Report TEI COT CIP RIF FUS DAP LZD TET MUP if I/R

For CNS in BCs avoid routinely reporting susceptibilities unless present in multiple BCs or in another sterile site. Reporting of susceptibility results may also be appropriate in other situations (eg. neonates, samples from central lines). Suggested comment: "Coagulase negative Staphylococci are part of the normal microbiome of the human skin. Culture of these organisms usually represent contamination at the time of collection but may be clinically significant if present in multiple cultures or in patients with foreign bodies in situ (eg. central line, prosthesis) or in those with clinical evidence of endocarditis."

Methicillin Susceptible *Staphylococcus* spp.:

	PEN	FLU	CFZ ^F	CLIN	ERY	CEX ^F	TRI	NIT ^C	NOR ^C	CIP
CSF	S/I/R	S								
Blood/sterile site/PD fluid	S/I/R	S	S							
Non-urine	S/I/R	S	S	S/I/R	S/I/R					
Urine	S/I/R	S				S	S/I/R	S/I/R		
Urine: TRI & NIT I/R	S/I/R	S				S	I/R	I/R	S/I/R	
Urine: NOR & CIP I/R	S/I/R	S				S	S/I/R	S/I/R	I/R	I/R

^F May be reported as a comment: "Flucloxacillin-susceptible staphylococci are susceptible to cefazolin and cephalexin."

Methicillin Resistant *Staphylococcus* spp.:

	PEN ^X	FLU ^X	CFZ ^X	CEX ^X	CLIN	ERY	AMC ^X	TRI	NIT ^C	NOR ^C	CIP	VAN	COT	TET
CSF	R	R	R									S		
Blood/sterile site/PD fluid	R	R	R									S		
Non-urine	R	R	R	R	S/I/R	S/I/R	R					S	S/I/R	S/I/R
Urine	R	R	R	R			R	S/I/R	S/I/R			S		
Urine: TRI & NIT I/R	R	R	R	R			R	I/R	I/R	S/I/R		S	S/I/R	
Urine: NOR & CIP I/R	R	R	R	R			R	S/I/R	S/I/R	I/R	I/R	S		
Urine: TRI&NIT&NOR&CIP I/R	R	R	R	R			R	I/R	I/R	I/R	I/R	S	S/I/R	

^X intrinsic resistance, laboratories may choose to report resistance in comment form

Staphylococcus spp. (continued)

S. saprophyticus:

	AMO ^E	CEX	VAN	TRI	NIT
Blood/sterile site/PD fluid: AMO S	S				
Blood/sterile site/PD fluid: AMO R	R		S		
Urine: AMO S	S	S/I/R		S/I/R	S/I/R
Urine: AMO R	R	S/I/R		S/I/R	S/I/R

^EEUCAST

Streptococcus groups A, B, C and G

All sites: report ERY, CLI if I/R

	PEN	BENPEN	CRO	CFZ	ERY	CLIN	COT ^E	TRI ^E	NIT
CSF		S	S						
Blood/PDF		S		S					
Sterile site		S		S	S/I/R ^O	S/I/R ^O			
Swab – Group A,C,G*	S				S/I/R	S/I/R	O		
Swab – Group B*		S			S/I/R	S/I/R	O		
Urine – Group A,C,G*	S						S/I/R ^O		
Urine – Group B*		S					S/I/R ^O	S/I/R ^O	S/I/R ^O

^EEUCAST ^Oadditional options, if possible laboratories to avoid reporting, always report if I/R

*Optional comment instead of performing susceptibility testing: “Penicillin/Cefazolin resistance in beta-haemolytic Group A, B, C, G streptococci is very rare or not yet reported. If the patient has an immediate-type penicillin allergy please contact lab within 3 days to arrange susceptibility testing.”

Streptococcus pneumoniae

All Sites: Report BENPEN, ERY, CLIN, COT, TET, CRO, MOX, LZD, VAN if I/R

	BENPEN#	AMO	CRO#	ERY*	CLIN	TET	COT	VAN	MOX	MER
CSF if CRO=S	S/I/R		S					S		
CSF** if CRO=I/R	I/R		I/R					S	S	S
Blood/sterile site	S/I/R	S/I/R	S							
Blood/sterile site	I/R	S/I/R	S			S/I/R	S/I/R ^o			
Blood/sterile site	I/R	I/R	I/R			S/I/R	S/I/R ^o	S		
Blood/sterile site	I/R	I/R	S	I/R		I/R	I/R		S	
Respiratory/non-urine, AMO=S	S/I/R	S		S/I/R	S/I/R					
Respiratory/non-urine, AMO=I/R	S/I/R	I/R		S/I/R	S/I/R	S/I/R	S/I/R			
Respiratory/non-urine, AMO=I/R & ERY=I/R & COT I/R	S/I/R	I/R	S	I/R	S/I/R	S/I/R	I/R		S	
Urine	S/I/R	S/I/R					S			
Urine	I/R	S/I/R	S/I/R				I/R			

^oadditional options, if possible laboratories to avoid reporting, always report if I/R

#Report MIC for CSF/Blood/sterile site isolates

*Add comment: "Erythromycin result can be used to determine susceptibility to azithromycin, clarithromycin."

**For CSF isolates with CRO MIC>2mg/L consider testing and reporting RIF for use in combination therapy.

***Enterococcus* spp.**

All sites: Report LZD, DAP, TEIC, CIP if I/R

	AMO	VAN	CRO^x	High Level GEN^H	LZD	DAP*	TIG^E	NIT	CIP	High Level Streptomycin
Blood	S/I/R	S	R	S/R						If High level GEN R
Blood – VAN R	S	R	R	S/R	S/I/R	S/I/R				If High level GEN R
Blood – AMO I/R and VAN I/R	I/R	I/R	R		S/I/R	S/I/R				
Sterile site/PDF	S/I/R	S	R							
Sterile site/PDF – VAN R	S/I/R	R	R		S/I/R	S/I/R	S/I/R			
Non-urinary	S/I/R	S	R							
Non-urinary – VAN R	S/I/R	R	R		S/I/R	S/I/R ^o				
Urine	S		R					S/I/R		
Urine – AMO or NIT I/R	S/I/R	S	R					S/I/R	S/I/R ^o	
Urine – VAN I/R	S/I/R	I/R	R		S/I/R			S/I/R	S/I/R ^o	

^EEUCAST ^xintrinsic resistance, laboratories may choose to report resistance in comment form

* Do not report DAP for respiratory isolates.

^H When susceptible, high level gentamicin result may be reported as a comment:

For serious infections (eg. endocarditis), gentamicin is likely to have synergistic activity when used with penicillin for this isolate.

Viridans group Streptococci

	BENPEN	CRO	VAN	High level GEN^H	ERY	CLIN
CSF/PD fluid/Sterile site	S	S				
CSF/PD fluid/Sterile site – PEN I/R	I/R	S/I/R	S			
Blood	S (Report MIC if endocarditis)	S		S/R if endocarditis		
Blood – PEN I/R	I/R (Report MIC if endocarditis)		S	S/R if endocarditis		
Urine*	S	S				
Urine – PEN I/R	S/I/R	S/I/R	S			
Other sites*	S				S/I/R	S/I/R
Other sites – PEN I/R	I/R	S/I/R	S		S/I/R	S/I/R

*Optional comment instead of performing susceptibility testing for non-sterile site isolates (*S. milleri* only): “Routine susceptibility testing for *S. milleri* group is not routinely performed as penicillin resistance is rare. The treatment of choice is benzylpenicillin or amoxicillin. Vancomycin and ceftriaxone may be used if penicillin allergic. If an oral agent is required in a patient with penicillin allergy, please contact lab within 3 days to arrange susceptibility testing.”

^H When susceptible, high level gentamicin result may be reported as a comment:

For serious infections (eg. endocarditis), gentamicin is likely to have synergistic activity when used with penicillin for this isolate.

Aerococcus urinae/sanguinicola

	AMO^E	BENPEN	NIT	CIP	VAN	MER
Urine*	S/I/R		S/I/R	S/I/R	S/I/R	
Non-urine	S/I/R	S/I/R		S/I/R ^o	S/I/R	
Sterile site	S/I/R	S/I/R		S/I/R ^o	S/I/R	S/I/R ^o

^EEUCAST ^oadditional options, if possible laboratories to avoid reporting, always report if I/R

*Optional comment instead of performing susceptibility testing: “*Aerococcus urinae/sanguinicola* is usually susceptible to amoxicillin and vancomycin. Susceptibility results for Nitrofurantoin and Ciprofloxacin are more variable. If the patient has penicillin allergy please contact the Microbiology laboratory within 3 days to request susceptibility testing.”

Listeria monocytogenes

	BENPEN	COT	CRO^x	MER
All sites	S/I/R	S/I/R	R	
Penicillin allergy	S/I/R	S/I/R	R	S/I/R ^o

^oadditional options, if possible laboratories to avoid reporting, always report if I/R ^xintrinsic resistance, laboratories may choose to report resistance in comment form

***Corynebacterium* spp.**

Commonly colonizing flora only: Unless known pathogen (eg. *C. diphtheriae*, *C. urealyticum*) only perform susceptibility testing after approval of Clinical Microbiologist.

	BENPEN	VAN	CRO^c	MER^c	CIP	COT	TET	CLIN	ERY^c
CSF	S/I/R	S/I/R	S/I/R						
CSF – CRO I/R	S/I/R	S/I/R	I/R	S/I/R					
Blood	S/I/R	S/I/R			S/I/R ^o				
Urine	S/I/R	S/I/R			S/I/R	S/I/R ^o			
All other sites	S/I/R	S/I/R				S/I/R ^o	S/I/R ^o	S/I/R	S/I/R
All other sites – COT & CLIN I/R	S/I/R	S/I/R			S/I/R ^o	I/R	S/I/R ^o	I/R	S/I/R

***Bacillus* spp. (not *B. anthracis*)**

Common contaminants: Only perform susceptibility testing after approval of Clinical Microbiologist.

	BENPENPEN	AMO	VAN	MER	CIP	CLIN	TET	COT
CSF	S/I/R		S/I/R					
CSF – PEN I/R	I/R		S/I/R	S/I/R				
Blood/Sterile site	S/I/R	S/I/R	S/I/R		S/I/R			
Urine	S/I/R	S/I/R						S/I/R ^o
All other sites	S/I/R	S/I/R				S/I/R	S/I/R ^o	S/I/R ^o
All other sites – AMO I/R	S/I/R	I/R	S/I/R		S/I/R ^o	S/I/R	S/I/R ^o	S/I/R ^o

Other Gram-positive organisms

Suggested comments for non-sterile sites:

***A. schaalii* (29, 30):**

“*A. schaalii*: the literature suggests that this organism usually appears susceptible to amoxicillin, ceftriaxone and vancomycin in vitro but resistant to ciprofloxacin, metronidazole & cotrimoxazole. If susceptibility testing is required (eg. penicillin allergy) please contact the laboratory within 3 days.”

***Turicella otitidis* (4, 31, 32):**

“*Turicella otitidis* is usually susceptible to Penicillin but susceptibility results for Erythromycin & Clindamycin are highly variable. If susceptibility testing is required (eg. penicillin allergy) please contact the laboratory within 3 days.”

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