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RCPA
The Royal College of Pathologists of Australasia

Guideline

Subject:	**Selective Reporting of Antimicrobials in Australia**
Approval Date:	February 2019, April 2021
Review Date	April 2023
Review By:	Selective Reporting of Antimicrobials Working Party
Number:	2/2019

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First published: February 2019, 1st edition (version 1.0)
Revised: April 2021, 2nd edition (version 2.0)

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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 *Clostridioides difficile* disease. Evidence is emerging for increased rate of adverse events associated with certain antimicrobials: for example, the FDA has issued several alerts for fluoroquinolone use (including tendinitis and tendon rupture, mental health side effects, hypoglycemic coma and aortic aneurysm or dissection) thus emphasising the importance of risk-benefit analysis for antimicrobial choices.

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.

The authors 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.

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.

Key Reporting strategies

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

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 (e.g. on request slip) before extensive reporting of broad-spectrum antimicrobials
- susceptibility results only when the isolate(s) are likely to be significant.
-

Avoid reporting:

- carbapenems and fluoroquinolones in view of their broad spectrum and propensity to induce multi-drug resistance
- antimicrobials with strong association with *C. difficile* (fluoroquinolones, ceftriaxone, amoxicillin-clavulanate & clindamycin).
- Susceptibility results for isolates from indwelling catheter urine samples,
- susceptibility results for poor quality sputum/urine/skin swab samples.
- susceptibility results for colonising flora or contaminants

Where doubt about the clinical significance of an isolate exists, the report may include a comment such as “Susceptibility results available on consultation with a clinical microbiologist”.

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 who request results for antimicrobials that are not routinely reported, can obtain these 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.

Expert committee

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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 National Antimicrobial Susceptibility Testing Committee and the New Zealand Microbiology Network have adapted Version 1 of these guidelines for development of New Zealand-specific guidelines that take into account local needs and prescribing practices – please see separate guidelines. The main principles of Selective Reporting are 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 (CLSI) or susceptible, increased exposure (EUCAST)
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

Since version 1 of this guideline, susceptibility category “I” has been removed from the tables since isolates in this category are “susceptible, increased exposure” by EUCAST definitions and therefore can be grouped with isolates in susceptibility category “S” for the purposes of selective reporting decisions for other antimicrobials. Laboratories in Australia using CLSI are variably reporting “I” as S/I/R and therefore may choose to consider the “I” category as either “S” or “R” for the purposes of selective reporting decisions for other antimicrobials.

For all sites, unless I/R:
Suppress TET if age <8 or pregnant.
Suppress CIP/NOR if age<14 years (except for *P. aeruginosa* infection).

PART A: GRAM NEGATIVE ORGANISMS

Fermentative Gram-negative bacilli (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	CRO	GEN	TRI	COT	NIT[e]	AMC	TZP	NOR/ CIP	AMI	TOB	MER	ETP	FOS
All S	S	O			S	S		S								
AMO R	R	S			S	S		S	O							
AMO and AMC R	R	S			S	S		S	R							
AMO and CEX R	R	R	S/R	S[d]	S	S		S	S							
AMO and CEX and AMC R	R	R	S/R	S[d]	S	S		S	R							
AMO and AMC and TRI and NIT R	R	R	S/R	S[d]	S	R	S/R	R	R		S					
GEN R ^												S/R	S/R			
CRO R or ESBL/AmpC	R		R	R	S/R	S/R	S/R		O	O	S			S	O	
NOR/CIP R and ESBL/AmpC	R		R		S/R	S	S		O	O	R			S	S/R	O
NOR/CIP and COT and CRO R	R			R	S/R	R	R	S/R	R	O	R			S	S/R	S/R
If no oral agents (AMC,CIP,COT,NIT all R)	As for BC															
MER R	As for BC (TIG not generally appropriate for treatment of UTI)															

[d] Report CRO if not able to report CFZ or if CFZ is I/R by CLSI or R by EUCAST. Note: EUCAST Clinical Breakpoint Table v 11.0 allows reporting of Cefazolin for *E. coli* and *Klebsiella spp.* (except *K. aerogenes*) only for infections originating from the urinary tract. [e] EUCAST: Nitrofurantoin for E. coli only

Enterobacterales Urine (continued):

For reports from patients over age 75 where no specific urinary symptoms are mentioned in the clinical notes consider adding comment: “Asymptomatic bacteriuria is common in the elderly: treatment of asymptomatic bacteriuria in the elderly is not generally recommended except in specific circumstances (e.g. prior to certain endourological procedures) as treatment is associated with increased adverse events and there is no evidence of clinical benefit. Please see 2019 IDSA guidelines and 2015 Cochrane Review.”

For specimens from indwelling catheters in adult patients consider adding comment: “Screening for and treatment of asymptomatic bacteriuria in patients with an indwelling catheter is not generally recommended. Please see 2019 IDSA Guidelines.”

Enterobacterales (continued)

Blood culture/Sterile site:

Resistance profile	AMO	CFZ[c]	CRO	GEN[g]	COT	AMC	TZP	CIP	AMI[g]	TOB[g]	MER	ETP	TIG	CTN	FOS	CAZAVI
All S	S	S	S[a]	S	S			SO,								
AMO R	R	S	S[a]	S	S	S	O	SO,								
AMO and AMC R	R	S	S[a]	S	S	R		S								
AMO and CFZ R	R	R	S	S	S	S		SO								
AMO and CFZ and AMC R	R	R	S	S	S	R		S								
GEN R ^									S/R	S/R						
CRO R or ESBL/AmpC	R	R	R	S/R	S/R			S			S	O				
CIP R and ESBL/AmpC	R	R	R	S/R	S/R			R			S	S/R				
CIP and TZP and CRO R	R	R	R	S/R	S/R		R	R			S	S/R				
ESBL/AmpC and AMC,CIP,COT all R	R	R	R	S/R	R	R		R			S	S/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 [c] CLSI

[g] For EUCAST add comment “For systemic infections, aminoglycosides must be used in combination with other active therapy.”

CSF:

	CRO	MER
CRO=S	S	
CRO=R	R	S
If MER=R	Seek expert advice	

Enterobacterales (continued)

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

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

[a] Report CRO if not able to report CFZ [c]CLSI

[g] For EUCAST add comment “For systemic infections, aminoglycosides must be used in combination with other active therapy.”

Enterobacterales (continued) PD fluid:

	CFZ[c]	CRO	CAZ or FEP	GEN[g]	CIP	MER
All	S/R	S[d]	S	S/R		
If CRO=R	R	R	S/R	S/R	S/R	S/R

[d] Report CRO if not able to report CFZ or if CFZ is I/R [c] CLSI

[g] For EUCAST add comment "For systemic infections, systemic aminoglycosides must be used in combination with other active therapy."

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. muriliniae, C. werkmanii, C. youngae* (not *C. koseri, C. farmeri C. sedlakii, C. rodentiium* or *C.amalonaticus*), *Acinetobacter spp.,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/R	S/R	S/R	S/R	S/R[o]		R[c]	R[c]
Blood/non-urine	S/R	S/R	S/R	S/R	S/R		R[c]	R[c]
Urine	S/R	S/R	S/R	S/R				R[c]
All sites if CRO R	R	R	S/R	S/R	S/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

[c] CLSI

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/R				
Faeces if CIP R	S/R	S	R	S/R	O	R[c]	O	
Faeces if CIP R and COT R	S/R	S	R	R	WT/NWT	R[c]	O	
All sites if MDR (not urine)	R	R	R	R	WT/NWT	R[c]	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/R	S/R	S/R[o]	
All sites	S/R	S/R	S/R[o]	
All sites if MER R	S/R	S/R	S/R[o]	R

[c]CLSI

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/R	S/R	S/R	S/R[o]	
All sites	S/R	S/R	S/R	S/R[o]	
All sites if MER R	S/R	S/R	S/R	S/R[o]	R

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

Enteric pathogens (continued)

Campylobacter spp:

	CIP	AZI	TET
Faeces###	S/R	S/R	S/R[o]
Blood	S/R	S/R	S/R[o]

[O] additional 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, GEN, CTN, CAZ or FEP if I/R

CSF:

	CAZ	MER
All	S/R	S/R
If MER R	Seek expert advice	

Blood cultures/sterile sites/non-urine:

	GEN[C]	CRO[X]	CAZ	CIP	TZP	TOB[h]	AMI[h]	FEP	MER	CTN	CAZ-AVI	CFTTZP
GEN S	S	R	S/R	S/R	S/R							
GEN R	R	R	S/R	S/R	S/R	S/R	S/R					
MER and CAZ and FEP and TZP & CIP & GEN R	R	R	R	R	R	S/R	S/R	R	R	S/R[o]	S/R[o]	S/R[o]
Cystic fibrosis[F]	S/R	R	S/R	S/R	S/R	S/R	S/R	S/R	S/R	S/R[o]		

[C]CLSI only [O] additional options, if possible laboratories to avoid reporting, always report if I/R [X] intrinsic resistance, laboratories may choose to report resistance in comment form

[h] For EUCAST add comment when reporting amikacin/tobramycin susceptible: “For *P. aeruginosa* there is insufficient evidence for use of gentamicin. For systemic infections with *P. aeruginosa*, amikacin/tobramycin must be used in combination with other active therapy.”

[F] Option 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[C]	CRO[X]	CAZ	CIP/NOR[c]	TZP	TOB	AMI	MER	TRI
GEN S	S	R	S/R	S/R	S/R				R
GEN R	R	R	S/R	S/R	S/R	S/R	S/R		R
CAZ&TZP&CIP R	S/R	R	R	R	R			S	R
MER and CAZ and FEP and TZP & CIP & GEN R	As for Blood cultures, and consider FOS MIC								R

[C]CLSI [X] intrinsic resistance, laboratories may choose to report resistance in comment form

For EUCAST add optional comment: “For *P. aeruginosa* there is insufficient evidence for use of gentamicin.”

Acinetobacter spp.

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

CSF:

	MER
All	S/R
If MER R	Seek expert advice

All sites except CSF:

	CIP	**COT**	**GEN**	**MER**	**MINO**	**TIG**	**CTN**	**AMI**
All sites except CSF	S/R	S/R	S/R					
CIP & COT R	R	R	S/R	S/R	S/R[o,c]	Report MIC[o]		
MER&CIP&COT&GEN R	R	R	R	R	S/R[o,c]	Report MIC[o]	S/R[o]	S/R

[C]CLSI [O] additional 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/R	R	R	R			
COT R urine	R	R	R	R	S/R	S/R	R
COT R BC	R	R	R	R		S/R	
COT R other	R	R	R	R	S/R	S/R	

[C]CLSI [O] additional options, if possible laboratories to avoid reporting, always report if I/R [X] intrinsic 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/R	S/R	R	R	R			R	R	R
All other sites	S/R	S/R	R	R	R				R	R
COT R	S/R	R	R	R	R		S/R		R	R
COT & CAZ R	R	R	R	R	R	S/R	S/R		R	R
COT & CAZ & MER R	R	R	R	R	R	R	S/R		R	R

[C]CLSI [E]EUCAST [O] additional options, if possible laboratories to avoid reporting, always report if I/R [X] intrinsic 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/R	S/R	S/R	S/R	S/R

[C]CLSI [M] Laboratories may choose to report meropenem MIC instead of imipenem result

Neisseria gonorrhoeae

Report AZI if I/R

	BENPEN	**CRO**	**CIP**
All	S/R	S/R	S/R
CIP R	S/R	S/R	R

Neisseria meningitidis

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

	PEN	**CRO**
All	S/R (Report MIC)	S/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/R				S		
AMO R	R	S/R	S/R	S/R			S/R		
BLNAR[C]	R	R	S/R	S/R	R	R	S/R	R	S/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/R	R	
CRO R	R				R		S/R

[C]CLSI

Sputum/Non-invasive:

	AMO	AUG	COT	TET	CFU	CEC[C]	CRO	TZP	CIP
AMO S	S		S/R	S/R	S/R				
AMO R	R	S/R	S/R	S/R	S/R				
BLNAR[C]	R	R	S/R	S/R	R	R	S/R	R	S/R
CFU&COT&TET R	R	S/R	R	R	R		S/R		S/R

[C]CLSI

Moraxella catarrhalis

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

	AMC	COT	CRO	TET	ERY
Blood cultures	S/R	S/R	S/R	S/R	
Other sites*	S/R	S/R		S/R	S/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 (e.g. antibiotic allergy, suspected treatment failure) please contact the laboratory within 3 days."

Pasteurella spp.

	PEN	CRO[C]/CTX[E]	TET	COT	CIP[E]
All sites	S/R	S/R	S/R	S/R	
TET & COT R	S/R	S/R	R	R	S/R[O]

[C]CLSI [E]EUCAST [O] additional options, if possible laboratories to avoid reporting, always report if I/R

HACEK

	PEN	CRO	COT	CIP	MER
All sites	S/R	S/R	S/R		
COT R	S/R	S/R	R	S/R	
CRO R	S/R	R	S/R	S/R	S/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/R	S/R	S/R		S/R	
CAZ&CIP&COT R				R	R			R	S/R
E. meningoseptica	R	R	R	R	S/R	S/R		S/R	R^{X,E}
A. xylosoxidans	R		R		S/R	S/R		S/R	
O. anthropi	R	R	R	R	S/R	S/R	R	S/R	

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

Eye Swabs

	CHL	OFL	CIP	GEN
P. aeruginosa	R^{X}	S/R	S/R	S/R
Enterobacteriaceae	S/R	S/R	S/R	S/R
H. influenzae	S/R	S/R	S/R	

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

PART B: GRAM POSITIVE ORGANISMS

Staphylococcus spp.

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

For Coagulase Negative Staphylococci in blood cultures avoid routinely reporting susceptibilities unless present in multiple blood cultures or in another sterile site. Reporting of susceptibility results may also be appropriate in other situations (e.g. 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 (e.g. 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/R	S								
Blood/sterile site/PD fluid	S/R	S	S							
Non-urine	S/R	S	S	S/R	S/R					
Urine	S/R	S				S	S/R	S/R		
Urine: TRI & NIT R	S/R	S				S	R	R	S/R	
Urine: NOR & CIP R	S/R	S				S	S/R	S/R	R	R

[F] May be reported as a comment: “Flucloxacillin-susceptible staphylococci are susceptible to cefazolin and cephalexin.”

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/R		S/R	S/R
Urine: AMO R	R	S/R		S/R	S/R

[E]EUCAST

Staphylococcus spp. (continued)

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/R	S/R	R					S	S/R	S/R
Urine	R	R	R	R			R	S/R	S/R			S		
Urine: TRI & NIT R	R	R	R	R			R	R	R	S/R		S	S/R	
Urine: NOR & CIP R	R	R	R	R			R	S/R	S/R	R	R	S		
Urine: TRI&NIT&NOR&CIP R	R	R	R	R			R	R	R	R	R	S	S/R	

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

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/R[O]	S/R[O]			
Swab – Group A,C,G*	S				S/R	S/R	O		
Swab – Group B*		S			S/R	S/R	O		
Urine – Group A,C,G*	S						S/R[o]		
Urine – Group B*		S					S/R[o]	S/R[o]	S/R[o]

[E]EUCAST [O] additional 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/R		S					S		
CSF if CRO=R**	R		R					S		S
Blood/sterile site	S/R	S/R	S							
Blood/sterile site	R	S/R	S			S/R	S/R[O]			
Blood/sterile site	R	R	R			S/R	S/R[O]	S		
Blood/sterile site	R	R	S	R		R	R		S	
Respiratory/non-urine, AMO=S	S/R	S		S/R	S/R					
Respiratory/non-urine, AMO=R	S/R	R		S/R	S/R	S/R	S/R			
Respiratory/non-urine, AMO=R & ERY=R & COT R	S/R	R	S	R	S/R	S/R	R		S	
Urine	S/R	S/R					S			
Urine	R	S/R	S/R				R			

[O] additional 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.

For ceftriaxone-resistant isolates, alternative options include moxifloxacin or linezolid – seek expert advice.

See e.g. Therapeutic Guidelines and Sanford Guide to Antimicrobial 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/R	S	R	S/R						If High level GEN R
Blood – VAN R	S	R	R	S/R	S/R	S/R				If High level GEN R
Blood – AMO R and VAN R	IR	R	R		S/R	S/R				
Sterile site/PDF	S/R	S	R							
Sterile site/PDF – VAN R	S/R	R	R		S/R	S/R	S/R			
Non-urinary	S/R	S	R							
Non-urinary – VAN R	S/R	R	R		S/R	S/R[o]				
Urine	S		R					S/R		
Urine – AMO or NIT R	S/R	S	R					S/R	S/R[o]	
Urine – VAN R	S/R	R	R		S/R			S/R	S/R[o]	

[E]EUCAST [X] intrinsic 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 (e.g. 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 R	R	S/R	S			
Blood	S (Report MIC if endocarditis)	S		S/R if endocarditis		
Blood – PEN R	R (Report MIC if endocarditis)		S	S/R if endocarditis		
Urine*	S	S				
Urine – PEN R	S/R	S/R	S			
Other sites*	S				S/R	S/R
Other sites – PEN R	R	S/R	S		S/R	S/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] High level gentamicin result may be reported as a comment:
If susceptible: For serious infections (e.g. endocarditis), gentamicin is likely to have synergistic activity when used with penicillin for this isolate.
If resistant: gentamicin is unlikely to have synergistic activity when used with penicillin for this isolate.

Aerococcus urinae/sanguinicola

	AMO[E]	BENPEN	NIT	CIP	VAN	MER
Urine*	S/R		S/R	S/R	S/R	
Non-urine	S/R	S/R		S/R[o]	S/R	
Sterile site	S/R	S/R		S/R[o]	S/R	S/R[O]

[E]EUCAST [O] additional 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/R	S/R	R	
Penicillin allergy	S/R	S/R	R	S/R[O]

[O] additional options, if possible laboratories to avoid reporting, always report if I/R [X] intrinsic resistance, laboratories may choose to report resistance in comment form

Corynebacterium spp.

Commonly colonizing flora only: Unless known pathogen (e.g. *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/R	S/R	S/R						
CSF – CRO R	S/R	S/R	R	S/R					
Blood	S/R	S/R			S/R[o]				
Urine	S/R	S/R			S/R	S/R[O]			
All other sites	S/R	S/R				S/R[O]	S/R[O]	S/R	S/R
All other sites – COT & CLIN R	S/R	S/R			S/R[O]	R	S/R[O]	R	S/R

Bacillus spp. (not *B. anthracis*)

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

	BENPEN	AMO	VAN	MER	CIP	CLIN	TET	COT
CSF	S/R		S/R					
CSF – PEN R	R		S/R	S/R				
Blood/Sterile site	S/R	S/R	S/R		S/R			
Urine	S/R	S/R						S/R[O]
All other sites	S/R	S/R				S/R	S/R[O]	S/R[O]
All other sites – AMO R	S/R	R	S/R		S/R[O]	S/R	S/R[O]	S/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 (e.g. penicillin allergy) please contact the laboratory within 3 days."

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