AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

Queensland Government

AURA Antimicrobial Use and Resistance in Australia

D15-21769 August 2024

OrgTRx Verification Rules

The purpose of the verification report, issued monthly by the OrgTRx team to each laboratory that contributes data to APAS, is to highlight any clinically important phenotypes for review. For example, CARAlert organisms, or antimicrobial susceptibility phenotypes (resistant or susceptible) that are unusual, rarely reported or thought to be inconsistent with the bacterial/fungal species.

The Verification Rules listed below will trigger the order number and related records to be highlighted in pink (Figure 1) and inserted into the verification report generated by the OrgTRx database on upload of the XML file from each laboratory service.

Specimen Category	Specimen	Primary Site	Specific Site	Organism	Organism No	Antimicrobial	Sensitivity
Tissue / Fluid / Pus / Prosthesis	Urine	? Collection		Acinetobacter baumannii	1	Meropenem	R
Tissue / Fluid / Pus / Prosthesis	Urine	? Collection		Acinetobacter baumannii	1	Amikacin	R
Tissue / Fluid / Pus / Prosthesis	Urine	? Collection		Acinetobacter baumannii	1	Ceftazidime	R
Tissue / Fluid / Pus / Prosthesis	Urine	? Collection		Acinetobacter baumannii	1	Ceftriaxone	R
Tissue / Fluid / Pus / Prosthesis	Urine	? Collection		Acinetobacter baumannii	1	Ciprofloxacin	R
Tissue / Fluid / Pus / Prosthesis	Urine	? Collection		Acinetobacter baumannii	1	Gentamicin	R
Tissue / Fluid / Pus / Prosthesis	Urine	? Collection		Acinetobacter baumannii	1	Piperacillin and enzyme inhibitor	R
Tissue / Fluid / Pus / Prosthesis	Urine	? Collection		Acinetobacter baumannii	1	Sulfamethoxazole and trimethoprim	S

Figure 1 Example of a highlighted record and subsequent results in a verification report

This monthly report should be used as:

- A quality assurance tool
  - Enable review of results issued by the laboratory that may indicate an error has occurred (e.g., in the identification of an isolate, interpretation of the susceptibility test result), or would warrant reference laboratory confirmation of a resistant phenotype.
- An infection control tool
  - Provide an early-warning tool for the emergence of antimicrobial resistance (AMR).

Verification Rules

A number of organism antimicrobial combinations that are noteworthy from an AMR perspective will be triggered by the rules listed below:

Rule 1 CARAlert Organisms

This rule is based on the National Alert System for Critical Antimicrobial Resistances (CARAlert). This version of the document is based on the changes effected on the 1 January 2023 (Table 1).
caralert_laboratory_handbook_-_dec_2022_1.pdf (safetyandquality.gov.au)

Table 1 CARAlert Organisms

Gram Positive Organisms	Gram Negative Organisms	Other
Enterococcus spp. • Linezolid R	*Acinetobacter baumannii complex* *(A. calcoaceticus, A. baumannii, A. dijkshoorniae, A. nosocomialis, A. pittii, A. seifertii)* • Carbapenem (meropenem) R	*Candida auris*
Staphylococcus aureus complex *(S. aureus, S. argenteus, S. schweitzeri)* • Vancomycin I or R • Linezolid R	*Enterobacterales* • Carbapenem (imipenem, meropenem) I or R (*Proteus spp., Providencia spp., Morganella spp., Serratia spp.* have intrinsically higher imipenem MICs) • Colistin R (excluding *Proteus spp.*, *Morganella morganii*, *Providencia spp.*, *Hafnia spp*. *Serratia marcenscens*)	*Mycobacterium tuberculosis* • Multidrug resistant – resistant to at least rifampicin and isoniazid
Streptococcus pyogenes • Penicillin nonsusceptible	*Neisseria gonorrhoeae* • Ceftriaxone R • Azithromycin nonsusceptible • Gentamicin R	
	Neisseria meningitidis • Ciprofloxacin I or R	
	Salmonella spp. • Ceftriaxone/cefotaxime I or R	
	Shigella spp. Resistance displayed to any three of the five antimicrobial groups below is defined as multidrug resistant: • Ampicillin/amoxicillin R • Fluoroquinolones (ciprofloxacin, norfloxacin) R • Trimethoprim-sulfamethoxazole R • 3rd generation cephalosporins (cefotaxime, ceftriaxone, ceftazidime) R • Azithromycin R	
	Pseudomonas aeruginosa • Carbapenem (meropenem) R and piperacillin-tazobactam I or R (excluding isolates from cystic fibrosis patients)	

S =susceptible; I = intermediate (CLSI) or susceptible-dose dependent (EUCAST); R = resistant

Rule 2 Other notable resistance phenotype

This rule identifies other notable resistance phenotypes of interest that are not captured by the CARAlert rules (Table 2).

Table 2 Other notable resistance phenotypes

Gram Positive Organisms	Gram Negative Organisms
Streptococcus pneumoniae • Penicillin R	*Haemophilus influenzae* • 3rd generation cephalosporins (cefotaxime, ceftriaxone, ceftazidime) I or R • Amoxicillin-clavulanic acid R
Viridans group streptococci • Penicillin R • Vancomycin I or R	*Haemophilus influenzae* β-lactamase negative • Ampicillin R and amoxicillin-clavulanic acid S
	Salmonella spp. • Fluoroquinolones (ciprofloxacin or norfloxacin) I or R
	Stenotrophomonas maltophilia • Trimethoprim-sulfamethoxazole R

S =susceptible; I = intermediate (CLSI) or susceptible-dose dependent (EUCAST); R = resistant

Rule 3 Unexpected susceptible phenotype

Identifies isolates of a species that are generally and universally resistant (>90% of all isolates irrespective of origin exhibit a characteristic resistance mechanism). In this scenario a susceptible result should be viewed with suspicion (Table 3).

Table 3 Unexpected susceptible phenotypes

Gram Positive Organisms	Gram Negative Organisms
Enterococcus faecalis • Quinupristin-dalfopristin susceptible	*Stenotrophomonas maltophilia* • Carbapenem susceptible
	Proteus vulgaris, Proteus penneri, Providencia rettgeri, Providencia stuartii, Klebsiella pneumoniae, Citrobacter spp. • Ampicillin susceptible

Rule 4 Unexpected resistant phenotype

Identifies isolates of a species that are universally expected to be susceptible (>99% of all isolates are generally and universally expected to be susceptible irrespective of origin because resistance mechanisms of clinical significance have not been reported). In this scenario a resistant result should be viewed with suspicion (Table 4).

Table 4 Unexpected resistant phenotypes

Gram Positive Organisms	Gram Negative Organisms
Enterococcus faecium • Linezolid R • Quinupristin-dalfopristin R	*Salmonella spp.* • 3rd generation cephalosporins (cefotaxime, ceftazidime) I or R • Fluoroquinolones (ciprofloxacin, norfloxacin) I or R
Enterococcus faecalis • Ampicillin R or penicillin R • Daptomycin I or R • Linezolid R • Vancomycin I or R	*Pseudomonas aeruginosa* • Colistin R
Staphylococcus lugdunensis • Flucloxacillin (oxacillin/cefoxitin) R	
Staphylococcus spp. • Linezolid I or R	

S =susceptible; I = intermediate (CLSI) or susceptible-dose dependent (EUCAST); R = resistant

Rule 5 Pan resistant phenotype

Alerts the laboratory to a pan-resistant organisms to ensure that if significant this isolate may require confirmation and / or additional testing or information regarding treatment of the infection to the requesting clinician (Table 5).

Table 5 Pan resistant phenotype

Gram Positive Organisms	Gram Negative Organisms	Other
Resistant to all antimicrobials tested	Resistant to all antimicrobials tested	Resistant to all antimicrobials tested

Rule 6 Inconsistent antimicrobial susceptibility test results

The table below lists inconsistencies in reported resistances or unexpected results such as vancomycin susceptibilities for gram negative organisms (Table 6).

Table 6 Discrepant antimicrobial susceptibility test result

Gram Positive Organisms	Gram Negative Organisms
Staphylococcus aureus complex (*S. aureus, S. argenteus, S. schwietzeri*) - Flucloxacillin (oxacillin) R and cefoxitin S - Flucloxacillin (oxacillin) S and cefoxitin R	

S =susceptible; I = intermediate (CLSI) or susceptible-dose dependent (EUCAST); R = resistant