

Critical Antimicrobial Resistances (CARs) are defined as resistance mechanisms, or profiles, known to be a serious threat to the effectiveness of last-line antimicrobial agents. CARs have been detected across Australia; they can result in significant morbidity and mortality in healthcare facilities, and in the community.

OBJECTIVE

CARAlert was established by the Commission in March 2016 as part of the Antimicrobial Use and Resistance in Australia (AURA) Surveillance System. CARAlert collects surveillance data on priority organisms with critical resistance (Table 1).

The roles of CARAlert at the national level include collecting and analysing data to identify trends and timely communication of information concerning critical resistances to states and territories, to complement current local reporting of results. It is intended that states and territories will use the data to identify local issues, and respond to potential and proven outbreaks of CARs.

METHODS

Originating laboratories undertake routine tests of an isolate to identify whether it is potentially a CAR; if suspected as a CAR, the isolate is referred to a confirming laboratory.

The confirming laboratory advises the originating laboratory of the test result for reporting back to the general practice or hospital that cared for the patient from whom the specimen was collected.

These reports occur before the confirming laboratory enters the details of the resistance and organism into the CARAlert web portal.

Alerts are reported to the Commission, and weekly to nominated state and territory health personnel, who also have direct access to results for their jurisdiction.

RESULTS

- Between 1 January and 31 December 2017, 1,514 CARs have been entered into the system. Isolates were referred from 74 originating laboratories from all states and territories (Table 1)
- Azithromycin non-susceptible *Neisseria gonorrhoeae* were the most frequently reported CAR of all CAR types (730, 48%), followed by carbapenemase-producing Enterobacteriaceae (CPE) either alone (528, 35%) or in combination with ribosomal methyltransferases (RMT) (32, 2%)
- Sixty-three percent (351/560) of CPE were from people aged 60 years and older
- There was significant variation in the proportion of carbapenemase types seen by state and territory (Box 1); there was an outbreak of OXA-48 producing *Escherichia coli* ST38 detected in Queensland, and largely confined to one institution, where 80 cases were reported between May 2017 and July 2017
- Carbapenemases were found in 21 species of Enterobacteriaceae representing ten genera. *E. coli* contributed to 34% (189/560) of all species,

Table 1. Number of critical antimicrobial resistances reported to CARAlert, by state and territory, 1 January 2017 to 31 December 2017

Critical antimicrobial resistance	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	OS	Unk	2017	Trend*
Azithromycin non-susceptible (LLR < 256 mg/L) <i>Neisseria gonorrhoeae</i>	272	322	61	22	43	3	3	1	3	0	730	
Carbapenemase-producing Enterobacteriaceae	132	126	198	5	28	5	2	25	5	2	528	
Daptomycin non-susceptible <i>Staphylococcus aureus</i>	27	43	18	4	27	0	0	0	0	0	119	
Ceftriaxone non-susceptible <i>Salmonella</i> species	6	13	13	1	2	0	0	0	0	0	35	
Carbapenemase and ribosomal methyltransferase-producing Enterobacteriaceae	8	20	2	0	1	0	0	0	1	0	32	
Multidrug-resistant <i>Shigella</i> species	6	15	1	2	1	1	0	1	0	0	27	
Ribosomal methyltransferase-producing Enterobacteriaceae	4	8	5	1	1	1	0	1	1	1	23	
Multidrug-resistant <i>Mycobacterium tuberculosis</i>	0	0	4	1	0	2	0	0	2	0	9	
Linezolid non-susceptible <i>Enterococcus</i> species	3	2	0	0	1	0	0	0	0	0	6	
Azithromycin non-susceptible (HLR > 256 mg/L) <i>Neisseria gonorrhoeae</i>	1	2	1	0	0	0	0	0	0	0	4	
Linezolid non-susceptible <i>Staphylococcus aureus</i>	0	0	1	0	0	0	0	0	0	0	1	
Ceftriaxone non-susceptible <i>Neisseria gonorrhoeae</i>	0	0	0	0	0	0	0	0	0	0	0	
Vancomycin non-susceptible <i>Staphylococcus aureus</i>	0	0	0	0	0	0	0	0	0	0	0	
Total (as at 31 January 2018)	459	551	304	36	104	12	5	28	12	3	1,514	

* Trend = monthly trend, 17 March 2016 to 31 December 2017

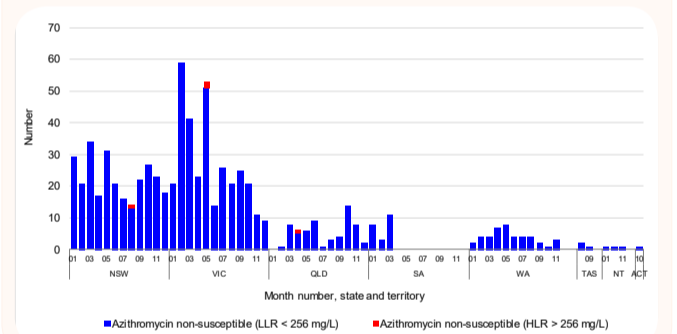
RESULTS (CONTINUED)

with 54% (103/189) containing OXA-48-like carbapenemases

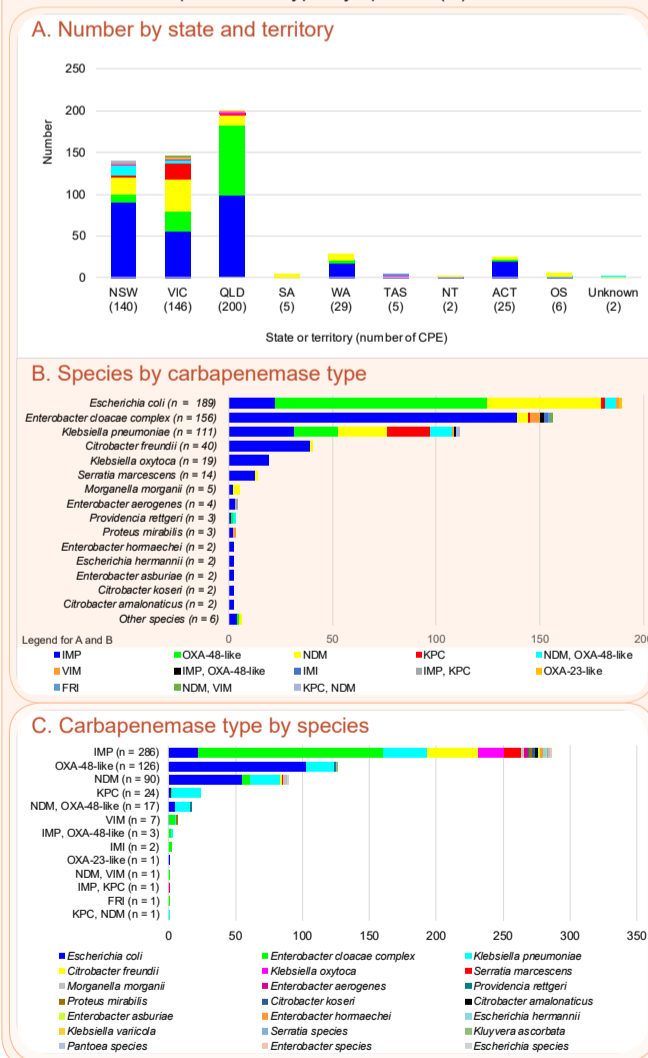
- Eight carbapenemase types were reported; three types - IMP (51%), OXA-48-like (23%) and NDM either alone (17%) or in combination with OXA-48-like (3%), accounted for 93% of all confirmed carbapenemases

- There was a large increase in the number of reports of azithromycin non-susceptible *N. gonorrhoeae* originating from Victoria in February 2017 and May 2017 (Figure 1)

Figure 1. *Neisseria gonorrhoeae*, number reported by state and territory, and month of collection, 2017



Box 1. Carbapenemase-producing Enterobacteriaceae, number by state and territory (A), species by carbapenemase type (B), and carbapenemase type by species (C), 2017



- Daptomycin non-susceptible *S. aureus* were reported from five states/territories. One linezolid non-susceptible *S. aureus* was reported, but no vancomycin non-susceptible strains

- Four (0.5%) *N. gonorrhoeae* with high-level azithromycin non-susceptibility (MIC \geq 256 mg/L) were confirmed from three states and territories; no ceftriaxone non-susceptible strains were confirmed
- Ceftriaxone non-susceptible *Salmonella* species were reported throughout the year in low numbers. Resistance was due to presence of either AmpC (50%, 16/32), ESBL (38%, 12/32), or AmpC+ESBL (13% 4/32)
- An increase in the number of multidrug-resistant *Shigella sonnei* was seen in December 2017 (37%, 10/37), with 6/10 originating from Victoria
- MDR *Mycobacterium tuberculosis* were reported in low numbers.

CONCLUSIONS

- CARAlert has improved the timely identification of CARs nationally. It will support a systematic and coordinated approach to the identification of CARs and appropriate responses.
- Over time, the data will increasingly be useful to inform safety and quality improvement programs. CARAlert will also provide valuable guidance and assist in regular review of the list of CARs in Australia.