AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

AURA Antimicrobial Use and Resistance in Australia

AURA: A resource for infection prevention and control professionals

The World Health Organization has described antimicrobial resistance (AMR) as one of the greatest threats to human and animal health, as well as to food safety and agriculture.

It threatens the ability to provide safe healthcare in the future. AMR can develop through the use of antimicrobials or exposure to AMR organisms in the environment. Unlike other medications, antibiotics can affect not only your patient but other people and the wider community.

Antibiotic use inevitably leads to resistance, but overuse of antibiotics has accelerated this process.

Enterobacterales, Resistance and Infection Prevention and Control

Resistance in gram-negative organisms can be caused by transferrable plasmids that carry resistance genes such as extended spectrum β lactamases (ESBLs) and carbapenemases (known as carbapenemase producing Enterobacterales, CPE).

Resistance is clinically important because first line antibiotic choices for common infections become limited, leading to treatment failure with subsequent increases in morbidity and mortality related to AMR organisms. Increased length of hospital stay and increased healthcare costs are also potential outcomes.

AMR affects individual patients as well as the wider community. Infection prevention and control actions are critical as part of a multi-faceted approach to limit the spread of resistant organisms.

What is the AURA Surveillance System and why is it important?

The Antimicrobial Use and Resistance in Australia (AURA) Surveillance System monitors and reports on Australia's antimicrobial usage and resistance patterns to inform clinical and public health policy and practice.

The AURA National Coordination Unit (NCU) works with stakeholders to inform action at the local, state and territory, and national levels to prevent and contain the spread of AMR.

The Third Australian report on antimicrobial use and resistance in human health (AURA 2019) gives the most current and comprehensive picture of AMR in Australia.

Infection prevention and control professionals (ICPs) have an important role in containing AMR. This factsheet describes components of the AURA Surveillance System relevant to ICPs that monitor resistance and inform actions and response.

AURA 2019 highlights - *Escherichia coli* and other Enterobacterales

E. coli resistance to multiple agents, such as ceftriaxone and fluoroquinolones has increased

- Multidrug-resistant *E.coli* has increased from 23% in 2014 to 27% in 2017[1]
- Ciprofloxacin and ceftriaxone resistance have increased over the last 5 years[2]
- The dominant Australian ESBL clone - O25b-ST131 - is associated with ciprofloxacin resistance.[3]

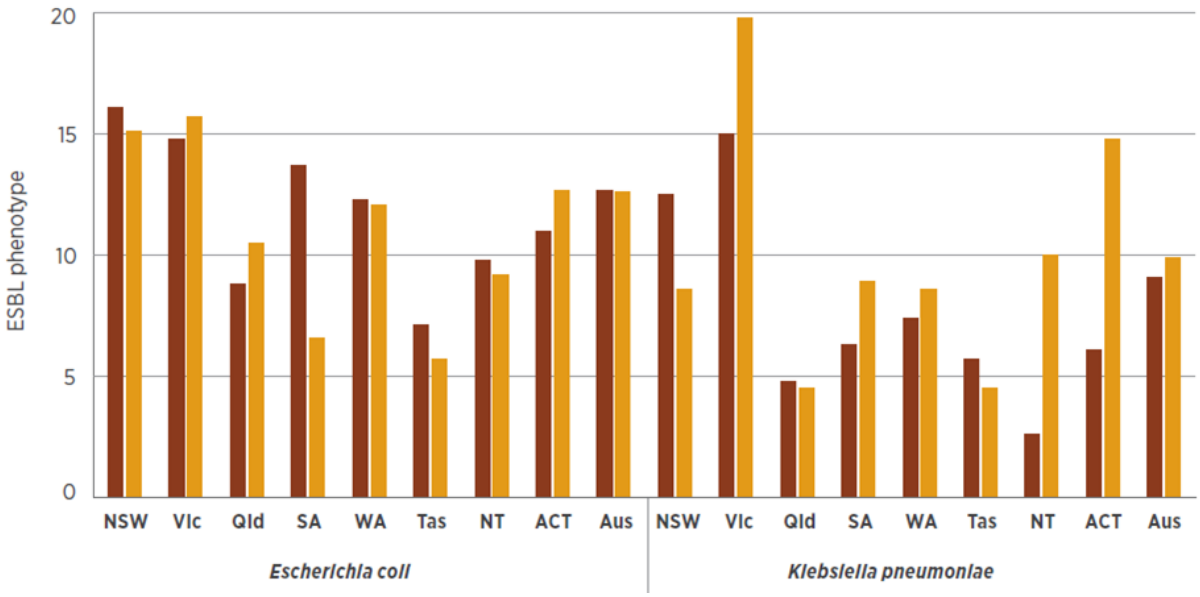
ESBL phenotypes in _E. coli_ and _Klebsiella pneumoniae_ vary by state and territory

- The proportion of ESBL phenotype found in *K. pneumoniae* varied from under 5% in Queensland to approximately 20% Victoria
- There is similar variation in *E.coli* from 5.7% in Tasmania to 15.7% in Victoria. (Figure 1).

The proportion of CPE reported from screening samples varies in each state and territory

- The data highlights the difference in screening for CPE between states and territories. The percentage of screening for CPE varies from 57.2% in Victoria to 31.3% in the ACT[4]
- The *Recommendations for the control of carbapenemase-producing Enterobacteriaceae: a guide for acute care health facilities* (2017) recommend an appropriate screening strategy is selected, based on the epidemiology of CPE.

Figure 1 Percentage of _Escherichia coli_ and _Klebsiella pneumoniae_ with extended-spectrum β-lactamase (ESBL) phenotype, by state and territory and nationally, 2016–2017[5]



Note: ESBL phenotype refers to strains that are resistant to ceftriaxone and/or ceftazidime (MIC >1 mg/L).

CPE is the most common critical antimicrobial resistance seen in bloodstream specimens

- CPE comprised 81% of all critical antimicrobial resistances (CARs) confirmed from blood culture specimens and reported to the National Alert System for Critical Antimicrobial Resistances (CARAlert) in 2017. This high percentage of CPE positive blood cultures highlights the clinical spectrum of CPE infections compared with other CARs[6]
- The identification of a high percentage of CPE positive blood cultures reduces oral therapies available for the treatment of many infections, and hospital-based intravenous therapy is required.

[1] Chapter 4; AURA 2019
[2] Chapter 4; AURA 2019
[3] AGAR Sepsis Outcome Programs 2017 Report (2019)
[4] Chapter 5; AURA 2019
[5] Chapter 4; AURA 2019
[6] Chapter 5; AURA 2019

How the AURA Surveillance System can be used to inform local policy and practice

Compare local and state or territory and national findings

The proportions of CPE identified in screening samples, ESBL phenotypes or multidrug-resistant *E. coli* infections, are available through the AURA Surveillance System. If differences are found with your local setting, examine whether they can be explained by local isolation, screening practices, antibiotic use or a combination of these factors.[7]

Identify differences in CPE types between states or territories

Details of CPE types by jurisdiction are available within the CARAlert dataset and illustrate the different CPE types - travel related, locally endemic, or other factors, within the states and territories. This information can assist in formulating local screening strategies and to inform infection prevention and control plans.[8]

Review changes in resistance over time

Longitudinal data from AURA can be used to track changes over time. There has been variation in infection control precautions over time for a number of multidrug-resistant organisms (MROs), including ESBLs. Reviewing changes in resistance can be used to assess if there is a temporal relationship between changes to infection control practices for MROs in your state or territory and changes in possible transmission of MROs.

Explore other multidrug resistant organism data

AURA data can also be used to review the proportion of vancomycin resistance in *Enterococcus faecium*, or methicillin resistance in *Staphylococcus aureus*. This can be used to compare and contrast local, state or territory and national data to help focus on the most important interventions.

Actions for change

- Sustain core infection control strategies to ensure that standard and transmission-based precautions are used and maintained appropriately
- Implement national or local guidance on CPE
- Review resistance patterns and genes for your local setting in collaboration with local experts such as the microbiology department or infectious diseases physician to assist in identifying emerging resistance patterns
- Reinforce strategies that reduce the risks of catheter-associated urinary tract infections or healthcare-associated intra-abdominal infections
- Discuss current strategies with your Antimicrobial Stewardship (AMS) team to assist in the containment of antimicrobial resistance for your service.

Note: recent taxonomic studies have narrowed the definition of the family Enterobacteriaceae. Some previous members of this family are now included in other families within the order Enterobacterales.

Further Information

AURA Surveillance System https://www.safetyandquality.gov.au/AURA

Preventing and Controlling Healthcare-Associated Infection Standard https://www.nationalstandards.safetyandquality.gov.au/3.-preventing-and-controlling-healthcare-associated-infection

Contact AURA@safetyandquality.gov.au with enquiries

[7] Chapter 4; AURA 2019
[8] Chapter 5; AURA 2019