

THE PATHCARE NEWS

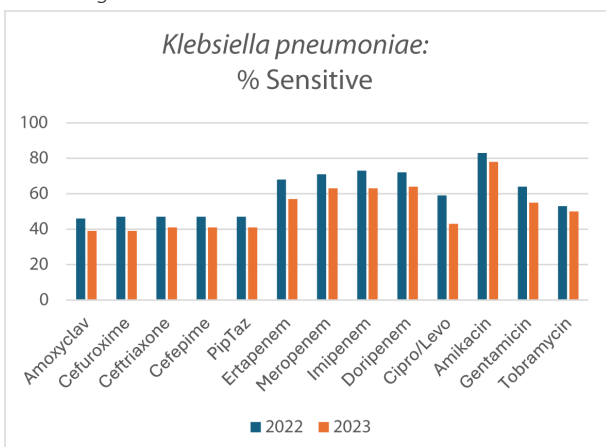
WESTERN CAPE ANTIMICROBIAL SURVEILLANCE DATA FOR ORGANISMS CAUSING BLOOD-STREAM INFECTIONS (BSI’S) THAT ARE FREQUENTLY ASSOCIATED WITH HOSPITAL-ACQUIRED INFECTIONS (HAI’S): 2022 AND 2023

This update is a report of the PathCare susceptibility data for key surveillance organisms isolated from blood culture samples, taken from patients in the Western Cape, over the 2-year period, 1 January 2022 to 31 December 2023. The term “ESKAPE” pathogens was first described in 2008(1,2). This acronym describes a group of Gram-positive and Gram-negative bacteria that frequently develop resistance to multiple antibiotic classes, thereby “escaping” the therapeutic effects of last-line antibiotics such as carbapenems, polymyxins, β -lactam/ β -lactamase inhibitors and glycopeptides. This group includes multidrug resistant organisms (MDRO’s) such as *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter species*. Infection rates with these organisms are generally higher in the hospital setting, especially critical-care wards, due to prolonged hospital stays, broad-spectrum antibiotic use, and multiple invasive procedures, but may also occur in at-risk patients not admitted to hospital, especially those recently managed at a healthcare facility or exposed to broad-spectrum antibiotic therapy (3).

Surveillance of antimicrobial resistance (AMR) is one of the key pillars of South Africa’s antimicrobial resistance AMR National Strategic Framework, developed as a guideline to aid the management of antimicrobial resistance to mitigate rises in resistant antibiotic infections and improve patient outcomes (4). The continued rise of AMR in healthcare facilities is very concerning and underscores the urgent need for continued antibiotic stewardship. It highlights the importance of taking appropriate samples for culture, prior to the administration of broad-spectrum antibiotics to enable targeted therapy and de-escalation to narrow-spectrum antibiotics, where appropriate.

Klebsiella pneumoniae

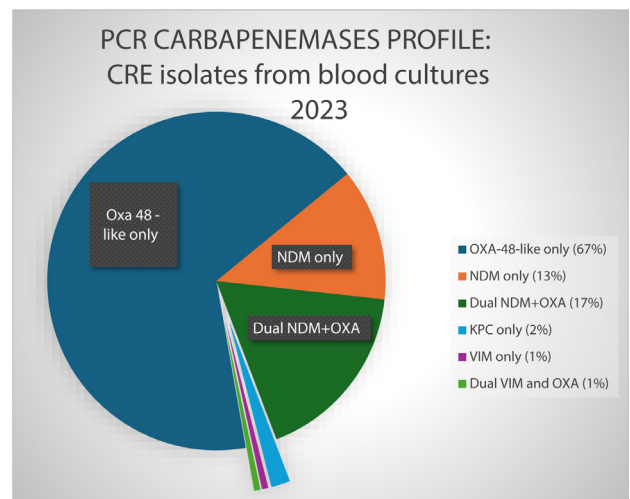
Klebsiella pneumoniae is one of the most common pathogens isolated from BSI’s, causing both hospital-acquired pneumonia and hospital-acquired urinary tract infections (UTI’s). The proportion of ESBL-producing *K. pneumoniae* (represented by resistance to ceftazidime) increased to 57% in 2023 from 53% in 2022. The rise in carbapenem resistant Enterobacterales (CRE) is of great concern with ertapenem resistance of 44% in 2023 (32% in 2022). The subset of *K. pneumoniae* isolates exhibiting resistance to carbapenems were also tested for susceptibility to the following agents: tigecycline (63% susceptible); colistin/polymyxin B (97% susceptible); ceftazidime-avibactam (75% susceptible). In units with high CRE rates, consider the profile of carbapenemases detected and cumulative antibiogram to guide empiric choices. Combination antibiotic therapy may be required for empiric therapy in critically-ill patients to ensure that at least one agent has activity against the causative organism.



Carbapenemase-producing Enterobacterales (CPE) from blood culture isolates:

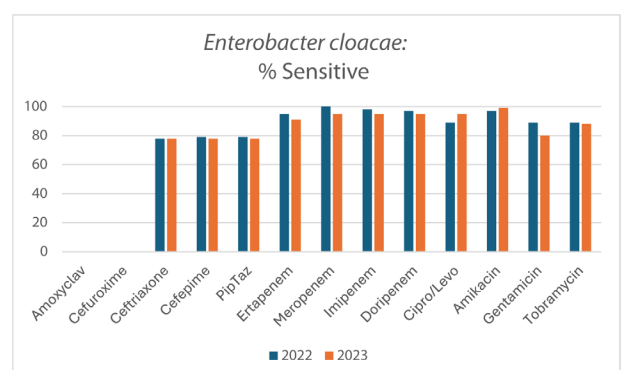
The profile of carbapenemase enzymes detected in CRE isolates from BSIs in 2023 is displayed in diagram 1. In the Western Cape there is still a predominance of OXA-48-like enzymes at 67% of isolates, 13% are NDM positive, but of concern is the dual enzyme NDM plus OXA positive isolates which formed 17% of the CRE blood culture isolates in 2023. This dual enzyme combination is increasingly reported in South Africa (5).

DIAGRAM 1:



Enterobacter species

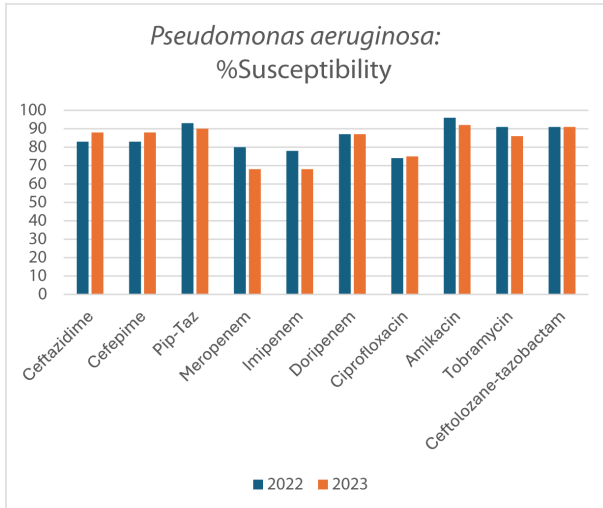
Most of the *Enterobacter species* isolated from blood cultures belonged to the *Enterobacter cloacae* complex, which cause similar infections to *Klebsiella pneumoniae*. It carries the AmpC chromosomal gene rendering it intrinsically resistant to amoxicillin-clavulanate and cefturoxime. Exposure to third-generation cephalosporins can select for de-repressed mutants that confer resistance to cefotaxime/ceftriaxone and ceftazidime, but may retain susceptibility to ceftazidime. However, often the concurrent acquisition of ESBL genes render these organisms ceftazidime resistant. The prevalence of ESBL-positive *Enterobacter cloacae* was 20% for 2023. Ertapenem resistance was 9% in 2023 (compared to 5% in 2022).



Pseudomonas aeruginosa

Pseudomonas aeruginosa are Gram-negative bacteria that cause ventilator-associated pneumonia (VAP), catheter-associated UTIs, wound and soft tissue infections and central-line associated blood stream infections (CLABSIs). AMR may emerge from different mechanisms, often concurrently, such as over-production of beta-lactamases, hyper-expression of efflux pumps or loss of outer membrane porin permeability. Even though they are not classified as part of the Enterobacterales group, *P. aeruginosa* may acquire mobile genetic elements encoding for carbapenemases, such as VIM or OXA. In 2023 the susceptibility for carbapenems ranged from 68% for imipenem and meropenem to 87% for doripenem. The novel agent, ceftolozane-tazobactam, retained its susceptibility of 91%, similar to 2022.

In critically-ill patients where infection with a multi-drug resistant strain is suspected (previous antibiotic exposure or admission to a critical care unit), then it may be reasonable to consider empiric combination therapy and a high-dose strategy to ensure at least one active agent against the organism. Amikacin susceptibility in 2023 was 92% and may thus be considered as part of the empiric regimen. Colistin/polymyxin B is regarded as a last-resort agent for pan-resistant strains. The subset of multi-resistant *Pseudomonas aeruginosa* strains tested in 2023 were all susceptible to this agent.



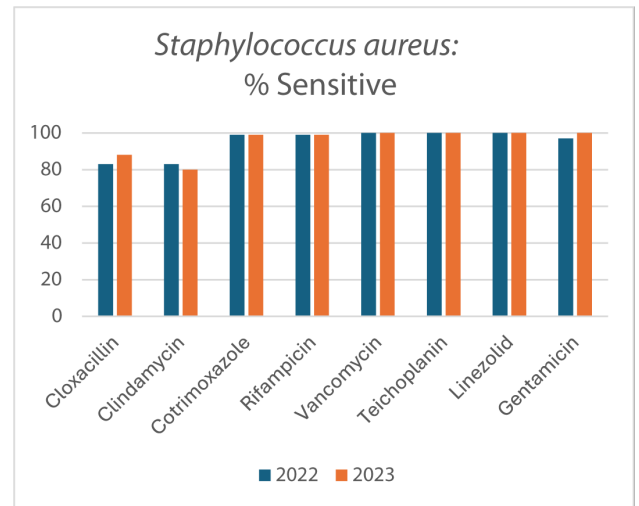
Acinetobacter baumannii

Acinetobacter species, most notably *Acinetobacter baumannii*, cause HAIs such as VAP and commonly acquire resistance to multiple antibiotics including carbapenems. Over the 2022/2023 period there were very few *Acinetobacter baumannii* and *Acinetobacter* species isolates cultured from blood cultures in the Western Cape, which did not meet the criteria required for antibiogram reporting as per breakpoint guideline recommendations. Recent reports from other provinces in South Africa over the past few years, consistently describe carbapenem resistance levels of 80%, and colistin resistance has been reported with increased frequency and it remains an organism of great concern in health-care facilities (6).

Staphylococcus aureus

Staphylococcus aureus is a frequent cause of both community and hospital-acquired infections. In the hospital setting, it may be associated with post-operative wound infections, CLABSIs, prosthetic joint or other device-related infections and hospital-acquired pneumonia. A persistent *S. aureus* BSI, despite appropriate therapy, should prompt further investigations for infective endocarditis or deep-seated collections, or interventions such as central line removal, or surgical drainage and debridement.

In 2023 12% of *S. aureus* blood culture isolates were resistant to cloxacillin (methicillin) and classified as MRSA. These isolates are resistant to all other beta-lactam agents with the exclusion of the novel cephalosporin, ceftaroline. The subset of MRSA isolates all tested sensitive to vancomycin, teicoplanin, linezolid, daptomycin. MRSA trends in the 2021/2022 period showed similar trends of decreasing levels of resistance, which is also noted in the SASCM private sector surveillance data from 2019- 2023 where the proportion of MRSA isolates has decreased consistently from 31% to 17% (7,8).



Enterococcus faecium

Enterococcus species isolated from blood cultures in 2023, were predominantly *Enterococcus faecalis* isolates (85%) and less frequently *Enterococcus faecium* (15%). Enterococci cause UTIs, infective endocarditis and may form part of polymicrobial abdominal or skin infections. All patients with Enterococcal bacteraemia warrant further investigations for endocarditis. *E. faecium* is mostly associated with HAIs and are usually resistant to multiple antibiotic classes, severely limiting antibiotic choices to agents such as vancomycin, teicoplanin, linezolid, tigecycline or daptomycin. Vancomycin resistant Enterococci (VRE) have emerged globally and have been reported in South Africa (9). No isolates in this survey tested resistant to vancomycin.

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Authored by: Dr Victoria Howell, PathCare Microbiologist