

Carbapenem Resistant Enterobacteriaceae (CRE)

Enterobacteriaceae are a family of gram-negative bacilli that occur naturally in the gastro-intestinal tract. These organisms can spread outside the gastro-intestinal tract and cause serious infections such as bacteraemia, pneumonia, urinary tract and wound infections. Clinically important genera include *Escherichia*, *Klebsiella*, *Enterobacter*, *Serratia*, *Citrobacter*, *Proteus* and *Morganella*. The occurrence of antimicrobial resistance in these and other gram-negative bacteria is increasingly reported world-wide and has become a major threat to the provision of healthcare.

The carbapenem group of antibiotics (**imipenem, meropenem, doripenem, ertapenem**) are considered last resort antibiotics as they offer broad spectrum antibiotic cover, enabling safe and effective treatment for severe infections. Carbapenem-resistant *Enterobacteriaceae* (CRE) occur due to the acquisition of carbapenemase enzymes (i.e. carbapenemase-producing *Enterobacteriaceae* or CPE) or less commonly arise via other mechanisms (e.g. porin loss). Within the *Enterobacteriaceae* family, carbapenemases have been found most commonly in *Escherichia coli* and *Klebsiella pneumoniae*, although they have also been reported in other gram-negative bacteria, such as *Pseudomonas* and *Acinetobacter* species.

Carbapenemase-producing *Enterobacteriaceae* (CPE) are a significant infection prevention and control risk to Health Care Facilities (HCFs) compared to the remainder (i.e. non-carbapenemase mediated) CRE for two reasons. Firstly, the genes encoding carbapenemase production are found on mobile genetic elements together with genes that code for resistance to other classes of antibiotics, such as fluoroquinolones (e.g. ciprofloxacin) and aminoglycosides (e.g. gentamicin). This makes Carbapenemase-producing *Enterobacteriaceae* difficult to treat. Secondly, Carbapenemase-producing *Enterobacteriaceae* can more efficiently be transmitted between patients within a HCF and have caused a number of HCF outbreaks locally and overseas.

Following the detection of CPE by a screening test (Carba NP test), the presence of a particular carbapenemase is confirmed by molecular techniques.

Currently the 5 most important carbapenemases globally include:

KPC	<i>Klebsiella pneumoniae</i> carbapenemase
NDM	New-Delhi metallo- β -lactamase
VIM	Verona integron-encoded metallo- β -lactamase
OXA 48 like	Oxacillinases
IMP	Imipenemase

The strict adherence to standard precautions and the adoption of transmission-based contact precautions when CRE colonisation or infection is identified is essential to prevent these organisms causing outbreaks and becoming endemic in HCFs. In addition, the importance of regular routine cleaning and disinfection (when required) of the environment and shared equipment is critical to the prevention of transmission of microorganisms.