

# Carbapenem-Resistant Enterobacteriaceae (CRE)

**Enterobacteriaceae** are a family of bacteria (including *E. coli*, *Klebsiella* and *Enterobacter*) that are found in the gastrointestinal tract and can cause infections both in community and healthcare settings.

Carbapenem-resistant Enterobacteriaceae (CRE) are non-susceptible to at least one of the carbapenem antibiotics by one of several mechanisms, such as:



- ◆ Carbapenemase production
  - ◇ *Klebsiella pneumoniae* carbapenemase (KPC)
  - ◇ New Delhi Metallo-beta-lactamase (NDM)
  - ◇ Verona Integron-Encoded Metallo-beta-lactamase (VIM)
  - ◇ Imipenemase Metallo-beta-lactamase (IMP)
- ◆ A combination of beta-lactamase production plus a porin mutation

**CRE infections** typically occur in ill patients and in people with exposure to healthcare settings, and can be found in any part of the body.

The main risk factors for CRE acquisition are **healthcare exposure** and **exposure to antimicrobials**. Other healthcare-related risk factors include:

- ◆ Poor functional status
- ◆ Exposure to intensive care units
- ◆ Mechanical ventilation
- ◆ Indwelling devices, such as urinary catheters or central venous catheters



In healthcare settings, CRE are usually transmitted from person to person often via the hands of healthcare personnel or via contaminated medical equipment and devices.

## Strategies to eliminate CRE transmission:

- ⇒ **Adhere to proper hand hygiene**
- ⇒ **Recognize colonized and infected patients early**
- ⇒ **Place colonized or infected patients on contact precautions**
- ⇒ **Use antimicrobials wisely**
- ⇒ **Remove devices, such as central lines and urinary catheters, when they are no longer needed**



CRE are epidemiologically important because:

- √ Treatment options are very limited
- √ Infections are associated with high mortality rates ( $\geq 40\%$  in some studies)
- √ Carbapenemases can be transmitted between Enterobacteriaceae and other bacteria
- √ Enterobacteriaceae are common causes of infections in both the community and healthcare settings

The Centers for Disease Control and Prevention (CDC) provides guidance and recommendations to healthcare facilities for the detection and prevention of transmission of CRE in the “**2012 Carbapenem Resistant Enterobacteriaceae Toolkit**”: <http://www.cdc.gov/hai/organisms/cre/cre-toolkit/index.html>

For more information, visit CDC’s website:

<http://www.cdc.gov/hai/organisms/cre/>

and the Colorado Health Department’s website:

<https://www.colorado.gov/cdphe/carbapenem-resistant-enterobacteriaceae-cre>



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