

Carbapenem-resistant Enterobacteriaceae

Carbapenem-resistant [Enterobacteriaceae](#) (CRE) are strains of [bacteria](#) within the Enterobacteriaceae family that have developed resistance to carbapenem [antibiotics](#). Carbapenems are a class of broad-spectrum antibiotics that are typically used as a last resort for treating serious infections caused by multidrug-resistant bacteria.

CRE is a significant public health concern because it limits treatment options for infections caused by these bacteria, making them difficult to treat effectively. The resistance mechanism in CRE involves the production of enzymes called carbapenemases, which can break down and inactivate carbapenem antibiotics, rendering them ineffective.

The most common carbapenemases produced by CRE are the *Klebsiella pneumoniae* carbapenemase (KPC), the New Delhi metallo-beta-lactamase (NDM), and the OXA-48-like enzymes. These enzymes can be encoded by mobile genetic elements, such as plasmids, which can easily transfer the resistance genes between bacteria, contributing to the spread of resistance.

CRE infections can occur in both healthcare settings and the community. In healthcare settings, CRE can cause various types of infections, including urinary tract infections, bloodstream infections, pneumonia, and intra-abdominal infections. CRE infections are of particular concern in intensive care units (ICUs) and long-term care facilities.

Preventing the spread of CRE involves strict infection control measures, such as hand hygiene, proper disinfection practices, and the appropriate use of antibiotics. Surveillance programs are essential for early detection of CRE cases, allowing prompt implementation of infection control measures.

Treating CRE infections is challenging due to the limited number of effective antibiotics. In some cases, combination therapy with multiple antibiotics may be required. However, the emergence of extensively drug-resistant (XDR) strains, which are resistant to almost all available antibiotics, poses a significant threat to public health.

Research and development efforts are ongoing to discover and develop new antibiotics and alternative treatment strategies to combat CRE and other multidrug-resistant bacteria. Additionally, strategies focused on antibiotic stewardship, infection prevention, and the prudent use of antibiotics are crucial to reducing the emergence and spread of CRE.

Carbapenem-resistant Enterobacteriaceae in neurosurgery

- [First characterization of four repeat regions with the *bla*_{NDM-1} carried on an IncFII plasmid in *Enterobacter hormaechei*](#)
- [Molecular epidemiological analysis and research on resistance and virulence of carbapenem-resistant *Klebsiella pneumoniae* in a tertiary hospital from 2016 to 2023](#)
- [Efficacy and safety of eravacycline versus tigecycline for complicated intra-abdominal infections in the ICU: a multicenter, single-blind, parallel randomized controlled trial study protocol](#)
- [Carbapenem-resistant *Klebsiella oxytoca* transmission linked to preoperative shaving in emergency neurosurgery, tracked by rapid detection via chromogenic medium and whole genome sequencing](#)
- [Correlation between intestinal CRE colonization and consequent systemic infection in](#)

[hospitalized patients in China](#)

- [Pharmacodynamic target attainment at infection site during treatment of post-neurosurgical ventriculitis caused by carbapenem-resistant klebsiella pneumoniae with ceftazidime-avibactam-based regimens: a case report](#)
 - [The occurrence of the carbapenemase gene, bla\(NDM-5\), on a transmissible IncX3 plasmid in multidrug-resistant Escherichia coli isolated from a farm dog](#)
 - [Molecular characteristics of carbapenem-resistant Raoultella ornithinolytica](#)
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Post-[neurosurgical infections](#) are common complications of [neurosurgery](#), and serious infection can threaten the life of patients. In recent years, the increase in multidrug-resistant bacteria, especially [carbapenem-resistant Enterobacteriaceae](#) (CRE), has proved fatal to patients.

Although there are a few cases of CRE meningitis and few clinical trials have been carried out, it has attracted increasing attention with the increasing probability of its occurrence, especially considering that there are few successful cases. An increasing number of studies are also looking for the risk factors and clinical symptoms of CRE [intracranial infection](#). In terms of treatment, some new antibiotics are gradually being used in the clinic, but due to the complicated drug-resistant mechanism of CRE and the obstruction of the [blood-brain barrier](#) (BBB), the therapeutic effect is still very poor. In addition, [obstructive hydrocephalus](#) and [brain abscesses](#) caused by CRE meningitis are still important causes of patient death and are also difficult to treat ¹⁾.

Case reports

a case of brain abscess caused by CR-Kp successfully treated with combined antibiotics. A 26-year-old male patient was admitted to our hospital due to a high fever and headache. His past medical history includes a surgical intervention due to an acute subdural hematoma, performed at an external healthcare center. After the current diagnosis of cerebral abscess, he underwent two surgeries. During the procedure, multiple cerebral abscesses were drained and capsulotomies were performed under ultrasound guidance. The combination of meropenem and vancomycin was started. The contents of the abscesses were sent to the microbiology and pathology laboratory. On the 3rd day of treatment, the medical team was informed that CR-Kp grew in an abscess culture. The patient's treatment was changed to meropenem + colistin + tigecycline. The patient developed electrolyte disturbances during the follow-up and this was considered an adverse effect of colistin. On the 41st day of treatment, colistin was discontinued, fosfomycin was added, and meropenem and tigecycline were maintained. Treatment was discontinued on the 68th day when the patient was discharged. The general condition of the patient, who has been followed up for two years, is satisfactory. The treatment of CR-Kp infections should be individualized, and the pharmacokinetics and pharmacodynamics of antibiotics should be considered in each case ²⁾.

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Li C, Zhou P, Liu Y, Zhang L. Treatment of Ventriculitis and Meningitis After Neurosurgery Caused by

Carbapenem-Resistant Enterobacteriaceae (CRE): A Challenging Topic. Infect Drug Resist. 2023 Jun 15;16:3807-3818. doi: 10.2147/IDR.S416948. PMID: 37342434; PMCID: PMC10278654.

²⁾

Tunckale T, Kavak C, Safak B, Gonen A, Erdem I. A case report of brain abscess caused by carbapenem-resistant *Klebsiella pneumoniae*. Rev Inst Med Trop Sao Paulo. 2023 Mar 24;65:e23. doi: 10.1590/S1678-9946202365023. PMID: 36995876; PMCID: PMC10041964.

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