



EMERGENCE OF CARBAPENEM-RESISTANT ENTEROBACTERIACEAE: OVERVIEW OF A MAJOR PUBLIC HEALTH CHALLENGE

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Introduction. Antimicrobial resistance (AMR) is a global public-health emergency, which threatens the advances obtained by modern medical care during the past century. Carbapenemase-producing *Enterobacteriaceae* (CPE) has been steadily spreading worldwide during the last decade. CRE are often a cause of invasive infections associated with prolonged hospital stays, high treatment costs, treatment failures and high mortality, due to delays in the administration of effective treatment and the limited availability of treatment options. The challenge of the next few years will be the race between the creation of effective novel molecules and the spread of carbapenemases worldwide.

Material and methods. Here, in this paper we revised current research materials published in online medical databases as Medline (PubMed) and Scopus, the websites of the WHO, CDC and focuses on bacterial resistance to carbapenems, discusses the mechanisms by which this occurs and prevention measures.

Results. AMR has become a major source of concern for public health and infections caused by CPE are difficult to treat. CPE represent the most serious threat, challenge of contemporary medicine because of the number of different resistance mechanisms, concomitant resistance to all alternative antimicrobials, high mortality and the ability to spread rapidly across worldwide. A major reason for the rapid spread of AMR through bacterial populations is that genes conferring resistance are carried on plasmids or on other highly movable genetic elements that are independently replicated and passed between bacterial cells and species.

The resistance of clinically isolated CRE may result either from expression of carbapenemases or by combined effects of b-lactamases with no intrinsic carbapenemase activity and decreased outer membrane permeability.

The most clinically relevant carbapenemases encountered in *Enterobacteriaceae* belong to either Ambler class A (KPC-type), or Ambler class B (metallo-beta-lactamases (MBLs) such as IMP-, VIM- and NDM-types) or Ambler Class D (OXA-48-like enzymes).

A precise identification of carbapenemase production and type is important for the follow up of the spread of carbapenemase producers the timely identification of outbreaks and their prevention and the choice of treatment.

The majority of analyzed studies indicate that stronger hygiene and infection prevention measures, hand hygiene, appropriate aseptic technique, consistent maintenance of clean, hygienic medical facilities, equipment and practices along with surveillance, monitoring and evaluation measures can limit the spread of CPE.

Conclusions. The emergence of carbapenem-resistant *Enterobacteriaceae* has become a substantial global health problem. This review highlighted that in *Enterobacteriaceae*, carbapenemases represent the most important mechanism of resistance, since the carbapenemase genes are mostly plasmid-encoded, associated with multi- or pan-drug resistance and are highly transferable, at least within the enterobacterial species, making them potentially responsible for outbreaks.

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