

The First Case of Multidrug-resistant NDM-1-harboring *Enterobacteriaceae* in Taiwan: Here Comes the Superbacteria!

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Antibiotic resistance of bacteria is commonly seen in daily medical practice. Among the different types of drug resistance, most microbiologists would agree that multidrug-resistant Gram-negative bacteria pose the greatest risk to human health because the speed of increase of drug resistance in Gram-negative bacteria is much faster than that in Gram-positive bacteria. In addition, there are fewer effective new drugs developed specifically against Gram-negative bacteria.¹⁻³

Escherichia coli and *Klebsiella pneumoniae*, belonging to the *Enterobacteriaceae*, are 2 important and frequently encountered pathogens in various nosocomial and community-associated infections in humans. In treating patients with *Enterobacteriaceae* infection, a particular concern is the development of resistance to the carbapenems, including imipenem, meropenem, ertapenem and doripenem, because these drugs are often the last available treatment options for infections due to multidrug-resistant *Enterobacteriaceae*.⁴ Metallo- β -lactamase is one of the carbapenemases that are produced by multidrug-resistant *Enterobacteriaceae*. Recently, the emergence of New Delhi metallo- β -lactamase 1 (NDM-1)-positive *Enterobacteriaceae* has been identified worldwide, and many cases had a history of traveling in India or Pakistan. These bacterial isolates carry a new resistance mechanism that may render most, if not all, currently used β -lactam antibiotics ineffective.⁵

The rapid increase of drug resistance in *Enterobacteriaceae* is mainly attributed to the genes located on plasmids that can subsequently and quickly spread in different bacteria species.⁶ Nowadays, frequent international or intercontinental air travel and migration allow bacterial plasmids to be transported rapidly between countries.⁷ Intimate physical contact between asymptomatic subjects further facilitates the transmission of

the bacteria. In this issue of the *Journal of the Chinese Medical Association*,⁸ Wu et al describe a patient harboring NDM-1-positive *Klebsiella pneumoniae*. Although he was initially a patient with gun-shot injury, the pathogen was detected in his stool. He was clinically asymptomatic and the presence of the bacteria was considered to be due to intestinal colonization. There has been intense debate on the outpatient management of this patient after he was discharged from hospital. A major concern is whether the NDM-1-producing bacteria will transfer the plasmid to other bacteria in the environment and generate new multidrug-resistant bacteria. Close monitoring of this patient is therefore mandatory to prevent a potential outbreak of the infection in the community.

Without appropriate or powerful antibiotics as weapons, what can we do about these "superbacteria" once clinically significant infections occur? First, the spread and potential pandemic resulting from the NDM-1-producing *Enterobacteriaceae* deserve effective monitoring and preventive measures not only by individual countries, but also through international collaboration. The invisible war between bacteria and humans continues to be a major challenge, and the story of superbacteria pandemics will repeat itself again and again. Second, detailed epidemiological, clinical and laboratory information should be gathered and inspected in each potential outbreak. If this emerging public health threat is ignored, the medical community could encounter carbapenem-resistant *Enterobacteriaceae* that will cause uncontrolled community-acquired or nosocomial infections, resulting in inadequate treatment and death. Lastly, since the invasion of NDM-1-positive bacteria to a certain community or country is inevitable, primary care physicians and health care providers, public health personnel



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and clinical microbiologists should cooperate to find the best solution to treat infected subjects. Standard procedures for prevention and care of high-risk and already-infected subjects should be established as soon as possible to minimize the spread of infection, reduce the health care costs, and avoid serious clinical consequences.

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