



Young Jin Kim , M.D., Ph.D.<sup>1</sup>, Hee Jae Huh , M.D., Ph.D.<sup>2</sup>, and Heungsup Sung , M.D., Ph.D.<sup>3</sup>

<sup>1</sup>Department of Laboratory Medicine, Kyung Hee University Hospital, Kyung Hee University School of Medicine, Seoul, Korea; <sup>2</sup>Department of Laboratory Medicine and Genetics, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea; <sup>3</sup>Department of Laboratory Medicine, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea

## Challenges of Carbapenem-resistant *Pseudomonas aeruginosa* in Infection Control and Antibiotic Management

Infections caused by carbapenemase-producing gram-negative bacteria are recognized as a serious problem because of their high transmission and mortality rates [1]. To combat the transmission and spread of carbapenem-resistant bacteria, the Korean government and private sector have collaboratively established the Korea Global Antimicrobial Resistance Surveillance System (Kor-GLASS) in coordination with the WHO GLASS to monitor antimicrobial resistance in blood isolates from tertiary hospitals nationwide [2]. According to publicly available data from 2016 to 2021, *Pseudomonas aeruginosa* has shown a worrisome trend of increased resistance to imipenem (18.6% to 36.8%) and meropenem (14.7% to 35.1%) [3].

Carbapenemase-producing *P. aeruginosa* (CPPA) can cause various infections, with urinary tract infection (UTI) being a common healthcare-associated infection frequently caused by CPPA [4]. CPPA exhibits resistance to almost all antimicrobial agents, making treatment challenging. Colistin has been used to treat UTIs caused by CPPA; however, its use is restricted by severe side effects, such as nephrotoxicity and neurotoxicity, as well as the absence of standardized commercial susceptibility tests [5]. New-generation  $\beta$ -lactamase inhibitors have been approved in the United States and Europe; however, in Korea, the introduction of new treatments for multidrug-resistant gram-negative bacteria has been limited [5, 6]. Additionally, there is currently no commercially available new  $\beta$ -lactamase inhibitor effective

against metallo- $\beta$ -lactamase [7].

Amidst the concern caused by the recent emergence of New Delhi metallo- $\beta$ -lactamase (NDM)-producing *P. aeruginosa* and Enterobacterales in Korea [8, 9], the increase in the frequency of NDM-producing CPPA isolates from patients with UTI reported by Jeong, *et al.* [10] in this issue of *Annals of Laboratory Medicine* is of great concern. This study sheds light on the increasing frequency of carbapenemase genotypes and identifies risk factors for CPPA UTIs, which are expected to aid in controlling CPPA in the future. The indiscriminate use of carbapenem-class antibiotics has been implicated in the spread of resistant bacteria in previous studies and has now been confirmed as an independent risk factor for UTI and mortality [10]. Although the introduction of new  $\beta$ -lactamase inhibitors in combination with  $\beta$ -lactam antibiotics has shown promise in addressing multidrug-resistant infections, it is important to note that the emergence of resistance has already been reported [11]. The results of Jeong, *et al.* [10] emphasize the need for antibiotic stewardship programs and careful selection of treatment options, particularly for patients exposed to carbapenems and presenting with increased white blood cell counts in the intensive care unit (ICU) setting. These findings can be helpful for ICU healthcare professionals, infection control practitioners, policymakers, and public health officials.

Alongside efforts and institutional support for the timely appli-



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cation of new drugs in the healthcare field, it is crucial to reduce unnecessary carbapenem use and expand antimicrobial stewardship and diagnostic stewardship programs to ensure the judicious use of antibiotics in the required spectrum [12, 13]. Continuous epidemiological monitoring studies, clinical trials for the development and introduction of new antibiotics, and research focused on the development of susceptibility testing methods for the early detection of resistance need to be consistently pursued.

## AUTHOR CONTRIBUTIONS

Kim YJ, Huh HJ, and Sung H wrote and revised the manuscript. All authors reviewed and approved the manuscript.

## CONFLICTS OF INTEREST

None declared.

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### Corresponding author: Heungsup Sung, M.D., Ph.D.

Department of Laboratory Medicine, Asan Medical Center, University of Ulsan College of Medicine, 88 Olympic-ro 43-gil, Songpa-gu, Seoul 05505, Korea  
E-mail: sung@amc.seoul.kr

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