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【 EDITORIAL 】

# To Use, or Not to Use Carbapenem When Extended-spectrum β-lactamase (ESBL)-producing Bacteria Are Isolated from Sputum Cultures, That Is the Question

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**Key words:** extended-spectrum β-lactamase (ESBL)-producing bacteria, community-acquired pneumonia (CAP), healthcare-associated pneumonia (HCAP), antimicrobial resistance

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Antibiotic resistance is a cause for deep concern in the clinical setting. Challenging plans of action to address antimicrobial resistance (AMR) have recently been proposed (1). Among the many mechanisms of antibiotic resistance, extended-spectrum β-lactamases (ESBLs) are enzymes that have the ability to hydrolyze a broader spectrum of β-lactam antibiotics and cause resistance to oxyimino-cephalosporins (3rd and 4th generation cephalosporins) and aztreonam (monobactams). Although the precise prevalence of ESBLs is not known, it is clearly increasing in many strains of *Escherichia coli*, *Klebsiella pneumoniae* and *Proteus mirabilis* (2), because ESBLs are often located on plasmids and transfer from strain to strain and between individual bacterial species. ESBL-producing bacteria cause various infections, including (but not limited to) urinary tract infections, pneumonia, blood infections, and wound infections.

Pneumonia is the third leading cause of death in Japan (3), and it should be treated with proper antibiotics as soon after its diagnosis as possible. The new pneumonia guidelines of the Japanese Thoracic Society suggest that definitive therapy must be based on the results of bacterial culturing and a susceptibility test (4). Carbapenem is often considered for the treatment of severe infections caused by ESBL-producing bacteria, because such bacteria are always resistant to other antibiotics including fluoroquinolone (5). However, the appropriate treatment for pneumonia in cases in which ESBL-producing bacteria are isolated from sputum culture is poorly understood. In some cases, the detection of ESBL-producing bacteria from sputum cultures alone only indicates colonization.

In this issue of Internal Medicine, Horie et al. reports that the seven community-acquired pneumonias (CAPs) and eight healthcare-associated pneumonias (HCAPs) with ESBL-producing bacteria isolated from sputum cultures were treated with antibiotics other than carbapenems and cephamycins (6). Thirteen patients (87%) successfully improved after days 3-5 with the initial antibiotics; only one had to change CTRX to MEPM. One patient died due to pneumonia. This manuscript tried to address the fact that ESBL is not always the real causative organism in CAP and HCAP. Although the present investigation is associated with some biases and several limitations, the results suggest that clinicians should use caution when making treatment decisions in relation to pneumonia based on the isolation of MDR organisms.

Conventional culture methods cannot identify all of the lung bacteria that can be detected by molecular methods such as the metagenomic sequencing. In the study by Horie et al. (6), they also detected microorganisms other than ESBL-producing bacteria by culture methods, but more bacteria, including causative bacteria, could exist. In the next era, we have to detect the microbiota in the lung and unravel the pathogenesis and the relationships among those populations.

In order to optimize the use of antimicrobial medicines, we have to limit the use of broad spectrum antibiotics such as carbapenem. Even when ESBL-producing bacteria are isolated from sputum cultures in CAP or HCAP patients, antibiotics with activity against ESBL-producing bacteria may not always be necessary. We look forward to more high-quality multicenter randomized control studies, which may solve this problem in the future.

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## References


1. World Health Organization (WHO). Global Action Plan on Antimicrobial Resistance. [Internet]. [cited 2017 Apr. 9]. Available from: http://www.who.int/antimicrobial-resistance/publications/global-action-plan/en/
2. Nakamura T, Komatsu M, Yamasaki K, et al. Epidemiology of *Escherichia coli*, Klebsiella Species, and Proteus mirabilis strains producing extended-spectrum β-lactamases from clinical samples in the kinki region of Japan. Am J Clin Pathol **137**: 620-626, 2012.
3. The Ministry of Health, Labour and Welfare (MHLW). Vital Statistics 2015 in Japan. [Internet]. [cited 2017 Apr. 9]. Available from: http://www.mhlw.go.jp/toukei/saikin/hw/jinkou/geppo/nengai15/index.html
4. The committee for the Japanese Respiratory Society guidelines in management of pneumonia, the Japanese Respiratory Society. The Japanese Respiratory Society guidelines for management of pneumonia 2017. The Japanese Respiratory Society, Tokyo, Japan.
5. Kuroda H, Yano H, Hirakata Y, et al. Molecular characteristics of extended-spectrum β-lactamase-producing *Escherichia coli* in Japan: emergence of CTX-M-15-producing *E, coli* ST131. Diagn Microbiol Infect Dis **74**: 201-203, 2012.
6. Horie H, Ito I, Konishi S, et al. Isolation of ESBL-producing bacteria from sputum in community-acquired pneumonia or healthcare-associated pneumonia does not indicate the need for antibiotics with activity against this class. Intern Med **57**: 487-495, 2018.


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