Letter to the Editor
Clinical Microbiology

Ann Lab Med 2017;37:172-173
https://doi.org/10.3343/alm.2017.37.2.172
ISSN 2234-3806 • eISSN 2234-3814

ANNALS OF LABORATORY MEDICINE

Colistin Resistance in *Escherichia coli* Isolates From Patients With Bloodstream Infection in Korea

Young Ah Kim, M.D.[1], Dongeun Yong, M.D.[2], Seok Hoon Jeong, M.D.[2], and Kyungwon Lee, M.D.[2]

Department of Laboratory Medicine[1], National Health Insurance Service Ilsan Hospital, Goyang; Department of Laboratory Medicine and Research Institute of Bacterial Resistance[2], Yonsei University College of Medicine, Seoul, Korea

Dear Editor,

Colistin is the last line of defense for carbapenem-resistant *Enterobacteriaceae* (CRE) or *Acinetobacter baumannii* infection [1]. Recently, a plasmid-mediated colistin resistance mechanism (*mcr-1* gene) was identified in human, animal, and environmental isolates in China, and the worldwide spread of the *mcr-1* gene has continuously been reported [2]. This colistin resistance mechanism has mainly been found in isolates linked to community-associated infections or from animals [2]. However, *mcr-1*-encoding plasmid-mediated colistin-resistant *Escherichia coli* isolates were detected in a Danish patient with a bloodstream infection [3]. This possibility raises major public health concern for the emerging threats of CRE, given the limited therapeutic options, clinical severity, and poor outcomes. The aim of this study was to evaluate the recent epidemiology of colistin resistance in bloodstream *E. coli*, including *mcr-1*-mediated colistin resistance in Korea.

Clinical non-duplicated *E. coli* isolates (n=1,193), included in this study, were previously isolated from the blood of patients and stored in skim milk at -70°C until the tests at a tertiary teaching hospital in Seoul, Korea during 2014–2015. To detect colistin-resistant isolates, test organisms were screened on Mueller-Hinton agar (Oxoid, Basingstoke, UK) containing colistin (0, 1, 2, and 4 μg/mL) with the *E. coli* ATCC25922 strain. One isolate was grown on an agar plate with a concentration of 4 μg/mL colistin and the minimal inhibitory concentration (MIC) of colistin, determined by E-test (bioMérieux, Marcy l'E'toile, France) was 6 μg/mL, indicating that the isolate was resistant to colistin, according to the EUCAST resistance criteria (>2 μg/mL) [4]. The *mcr-1* gene was not detected following repeated PCR in this isolate [2]. The overall prevalence of colistin resistance in *E. coli* isolates from the blood was 0.15% (1/644) in 2015 and 0% (0/549) in 2014.

In this study, only one isolate was found to be resistant to colistin, but the resistance was not conferred by the *mcr-1* gene. Although the mechanism underlying resistance in this isolate is currently unclear, lipopolysaccharide (LPS) modification via diverse routes is a well-known mechanism of colistin-resistance in Gram negative bacilli, and polymyxin-resistant mutants of *E. coli* show a higher rate of substitution of the ester-linked phosphate group in the lipid A portion of LPS [5]. Other possible colistin resistance mechanisms are overexpression of efflux pump systems and overproduction of the capsule polysaccharide [5].

In conclusion, the prevalence of colistin resistance in *E. coli* isolates from the blood of patients with bloodstream infection in Korea was very low, and the *mcr-1* gene was not detected. Co-

Received: July 18, 2016
Revision received: August 24, 2016
Accepted: November 29, 2016

Corresponding author: Kyungwon Lee
Department of Laboratory Medicine and Research Institute of Bacterial Resistance, Severance Hospital, Yonsei University College of Medicine, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Korea
Tel: +82-2-2228-2446, Fax: +82-2-313-0956, E-mail: leekcp@yuhs.ac

listin susceptibility appears to be well conserved in *E. coli* causing blood-stream infections in Korea. However, the incidence of community-associated *E. coli* bacteremia continues to rise in Korea [6]. Therefore, the inflow of plasmid-mediated colistin via the *mcr-1* gene should be closely monitored in *E. coli* blood isolates.

Authors' Disclosures of Potential Conflicts of Interest

No potential conflicts of interest relevant to this article were reported.

REFERENCES

1. Li J, Nation RL, Turnidge JD, Milne RW, Coulthard K, Rayner CR, et al. Colistin: the re-emerging antibiotic for multidrug-resistant Gram-negative bacterial infections. Lancet Infect Dis 2006;6:589-601.
2. Liu YY, Wang Y, Walsh TR, Yi LX, Zhang R, Spencer J, et al. Emergence of plasmid-mediated colistin resistance mechanism MCR-1 in animals and human beings in China: a microbiological and molecular biological study. Lancet Infect Dis 2016;16:161-8.
3. Hasman H, Hammerum AM, Hansen F, Hendriksen RS, Olesen B, Agersø Y, et al. Detection of mcr-1 encoding plasmid-mediated colistin-resistant *Escherichia coli* isolates from human bloodstream infection and imported chicken meat, Denmark 2015. Euro Surveill 2015;20(49).
4. The European Committee on Antimicrobial Susceptibility Testing (EUCAST). Breakpoint tables for interpretation of MICs and zone diameters. Version 6.0, 2016. http://www.eucast.org/clinical_breakpoints (Last visited on Nov 2016).
5. Bialvaei AZ, Samadi Kafil H. Colistin, mechanisms and prevalence of resistance. Curr Med Res Opin. 2015;31:707-21.
6. Kang C, Cha MC, Kim SH, Ko KS, Wi YM, Chung DR, et al. Clinical and molecular epidemiology of community-onset bacteremia caused by extended-spectrum β-lactamase-producing *Escherichia coli* over a 6-year period. J Korean Med Sci 2013;28:998-1004.