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Bloodstream infection by *mcr-1*-harboring *Escherichia coli* in a cancer patient in southern Brazil



Dear Editor,

The rapid spread of plasmid-mediated *mcr-1* gene has become a worldwide concern since it confers resistance to polymyxins considered as a last resource for treatment of infections caused by multidrug-resistant Gram-negative bacilli.¹ Despite its low frequency in Brazil, the *mcr-1* gene has been reported in *Escherichia coli*² and *Klebsiella pneumoniae*³ clinical isolates. In this study, we report a case of bloodstream infection by *mcr-1*-harboring *E. coli* in southern Brazil.

The presence of *mcr-1* gene was investigated in 340 polymyxin-resistant Gram-negative bacilli clinical isolates (*Enterobacteriaceae*, *Acinetobacter baumannii* and *Pseudomonas aeruginosa*) collected between August 2015 and January 2018 in a university hospital located in Santa Maria, Rio Grande do Sul, Brazil. Among clinical isolates, one *E. coli* harbored the *mcr-1* gene isolated from blood cultures in September 2017. The patient was a 59-year-old woman with malignant neoplasm of middle third of esophagus and intrahepatic cholangiocarcinoma admitted to the hospital for a transthoracic esophagectomy. Four days after the procedure,

the patient was transferred to the Adult Intensive Care Unit (ICU) due to hemodynamic instability and ventilatory discomfort. Empirical treatment with ceftriaxone (1 g 12/12 h) and metronidazole (1.5 mg/day) was initiated. Laboratory tests revealed leukocytosis ($27,115 \pm 7684.20/\text{mm}^3$) with left shift ($8997.75 \pm 1619.14/\text{mm}^3$ immature leukocytes) and increased C-reactive protein ($>25 \text{ mg/dL}$; reference value: $<0.3 \text{ mg/dL}$). *E. coli* isolate was recovered in two blood cultures from different peripheral sites and *Klebsiella pneumoniae* carbapenemase-producing *K. pneumoniae* (KPC-Kp) isolate in a rectal swab culture for epidemiological surveillance. Based on antimicrobial susceptibility testing (Table 1) by the VITEK[®] 2 system (bioMérieux, Marcy-l'Étoile, France), the antibiotic regimen was switched to amikacin (250 mg 12/12 h) and meropenem (1 g 8/8 h). Nine days after transthoracic esophagectomy, the patient had complications such as septic shock, peritonitis, surgical wound dehiscence and died.

Resistance to colistin was verified by broth microdilution according to EUCAST (<http://www.eucast.org>) and confirmed by polymyxin-NP test.⁴ Presence of the *mcr-1* gene was verified by conventional PCR using specific primers⁵ and detected

Table 1 – Antimicrobial susceptibility profile of KPC-Kp, *E. coli* harboring *mcr-1*, transconjugant and *E. coli* J53.

Antimicrobial agent	MIC range (µg/mL)	KPC-Kp	<i>E. coli</i> harboring <i>mcr-1</i>	Transconjugant	<i>E. coli</i> J53
Amikacin	2–64	4	≤2	≤2	≤2
Cefepime	1–64	≥64	≥64	32	≤1
Ceftazidime	1–64	16	≥64	16	≤1
Ceftriaxone	1–64	≥64	≥64	32	≤1
Ciprofloxacin	0.25–128	64	32	≤0.25	≤0.25
Colistin	0.25–128	≥128	64	4	≤0.25
Ertapenem	0.5–8	≥8	≤0.5	≤0.5	≤0.5
Gentamicin	1–16	≥16	≤1	≤1	≤1
Imipenem	0.25–16	8	≤0.25	≤0.25	≤0.25
Meropenem	0.25–16	≥16	≤0.25	≤0.25	≤0.25
Piperacillin/tazobactam	4–128	≥128	≤4	≤4	≤4
Tigecycline	0.5–8	2	≤0.5	≤0.5	≤0.5

only in the *E. coli* isolate, being confirmed by Sanger sequencing. Species identification of the *mcr-1*-positive isolate was confirmed using MALDI-TOF MS system (Bruker Daltonics, Germany). To assess the transfer ability of the *mcr-1* gene, conjugation experiment with azide-resistant *E. coli* J53 was performed. We were able to obtain one tranconjugant carrying *mcr-1* gene and it was selected on Luria-Bertani agar supplemented with 150 µg/mL sodium azide and 2 µg/mL colistin. The transconjugant presented elevated MIC for colistin in comparison with *E. coli* J53.

This study reports the first detection of *mcr-1* gene in Santa Maria, RS, Brazil and emphasizes the need to strengthen hospital infection prevention and control measures to prevent its spreads.

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Conflicts of interest

The authors declare no conflicts of interest.

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REFERENCES

1. Poirel L, Jayol A, Nordmann P. Polymyxins: antibacterial activity, susceptibility testing, and resistance mechanisms encoded by plasmids or chromosomes. *Clin Microbiol Rev.* 2017;30:557–96.

2. Dalmolin TV, Castro L, Mayer FQ, et al. Co-occurrence of *mcr-1* and *blaKPC-2* in a clinical isolate of *Escherichia coli* in Brazil. *J Antimicrob Chemother.* 2017;72:2404–6.
3. Aires CAM, da Conceição-Neto OC, Oliveira TRTE, et al. Emergence of plasmid-mediated *mcr-1* gene in clinical KPC-2-producing *Klebsiella pneumoniae* ST392 in Brazil. *Antimicrob Agents Chemother.* 2017;61, e00317–17.
4. Nordmann P, Jayol A, Poirel L. Rapid detection of polymyxin resistance in Enterobacteriaceae. *Emerg Infect Dis.* 2016;22:1038–43.
5. Liu YY, Wang Y, Walsh TR, 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.

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