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Carbapenem-Resistant *Escherichia coli* and *Klebsiella pneumoniae* Strains Containing New Delhi Metallo-Beta-Lactamase Isolated from Two Patients in Vietnam

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Emergence of Gram-negative pathogens carrying the New Delhi metallo-beta-lactamase 1 gene (NDM-1) conveying carbapenem resistance is an urgent and global concern. After the first reported case in 2007, multiple countries around the world reported the presence of NDM-1-positive Gram-negative bacteria (1, 2). This novel type of carbapenem resistance enzyme is encoded on a plasmid and easily transmitted among Gram-negative bacteria, including the human intestinal flora (1).

We report two strains of NDM-1-producing bacteria, *Escherichia coli* and *Klebsiella pneumoniae*, isolated from two patients admitted to a surgical hospital in Vietnam in September 2010. These patients had no history of travel outside Vietnam (Table 1). The first case was a 52-year-old man who developed fever and abdominal pain 2 months after a Bricker operation and did not respond to empirical antibiotic therapy (he did not remember the name of the antibiotic used). He was admitted to the surgical hospital in September 2010, and the urine collected at admission from his ureterostomy was positive for *E. coli* (>10E7 CFU) on day 3 after admission. The strain was susceptible only to fosfomycin and colistin (Table 1). The MIC of meropenem was >128 μg/ml (Table 1). The patient was treated with fosfomycin, his infection cleared, and he was discharged after 8 days.

The second case was a 62-year-old man with a history of benign prostatic hyperplasia who was operated on in a provincial hospital in September 2009. One year later, he returned with symptoms of urinary retention (he was unable to urinate) and was catheterized. The patient was transferred to a specialized hospital on 21 October 2010 due to an ongoing urinary tract infection with *K. pneumoniae*. This strain was resistant to meropenem and sensitive to colistin and amikacin (Table 1). Although this patient was infected with this resistant strain, he recovered from infection after 6 days of treatment with a combination of clindamycin and amikacin and was discharged from the hospital at the end of October 2010 with a catheter inserted in his bladder and with a follow-up appointment scheduled. The patient was, however, lost to the follow-up.

We identified the metallo-beta-lactamase in these strains by PCR using the specific primers of bla_{IMP} and bla_{VIM} genes encoding metallo-beta-lactamase (3) and specific primers NDM1-F (5′-atgcacccggtcgcgaagctgag-3′) and NDM1-R (5′-ttcgacccagccattggcggcga-3′) targeting the New Delhi metallo-beta-lactamase 1 gene for PCR (2). The bla_{IMP} and bla_{VIM} genes were absent. However, PCR did show the presence of the NDM-1 gene, which was also confirmed by sequence analysis of the PCR products (GenBank accession no. FN396876.1).

TABLE 1 Key characteristics of the two patients and their NDM-1-positive strains

Parameter	Patient 1	Patient 2
Sex	Male	Male
Age (yr)	52	62
Admission to Vietduc hospital	10 September 2010	12 October 2010
No. of hospitalization days	8	6
Outcome	Alive at discharge	Alive at discharge
Travel abroad	No	No
Reason for admission	Fever and abdominal tenderness, unresponsive to antibiotics	Urinary retention
Medical history	Bricker operation	Prostatic hyperplasia
Microbiology	Urine: *E. coli*	Urine: *K. pneumoniae*
Susceptibility	Resistant to meropenem (>128 μg/ml), ceftazidime (>512 μg/ml), cefotaxim (>128 μg/ml), and ciprofloxacin (>256 μg/ml); susceptible to fosfomycin and colistin	Resistant to meropenem (>8 μg/ml), ceftazidime (>32 μg/ml), cefotaxim (>256 μg/ml), and ciprofloxacin (>328 μg/ml); susceptible to colistin and amikacin

In conclusion, this is the first report of NDM-1-producing *E. coli* and *K. pneumoniae* isolated from patients in Vietnam. These bacteria are a threat to the health care system in Vietnam, where multidrug-resistant (MDR) Gram-negative bacteria are a major concern (4). Therefore, good surveillance of resistance and proper infection control, as well as monitoring the emergence and spread of the resistant strains, are needed to reduce the impact of resistance.

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