First detection of KPC-3-producing *Klebsiella pneumoniae* in Albania

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Carbapenemase-producing Enterobacteriaceae (CPE) represent a significant threat and a global problem when it comes to the detection and treatment of infections [1]. Since their first discovery in 1996 in the United States, CPEs harbouring one of the Ambler class A enzymes, the *Klebsiella pneumoniae* carbapenemases (KPC), have been detected in many geographic regions [2]. They have disseminated rather rapidly, reaching endemic proportions in countries such as Greece, Italy and Israel [3].

We document here for the first time [4] detection of a KPC-3-producing *K. pneumoniae* clinical isolate in Albania.

A 48-year-old man was transferred to the intensive care unit of the University Hospital 'Shefqet Ndroqi' in Tirana, Albania, on 25 March 2014 with the diagnosis of acute descending necrotizing mediastinitis. Five days earlier, the patient was admitted to the emergency department at University Hospital Center of Tirana 'Mother Theresa' for cervical and corporal trauma and then to the otolaryngology service of the same hospital. The initial antibacterial treatment in the University Hospital 'Shefqet Ndroqi' included piperacillin/tazobactam and ciprofloxacin, a combination established as part of the empirical treatment of serious infections in this hospital. Three days later, he was taken to the operating room because his overall situation deteriorated. He underwent right posterolateral thoracotomy for debridement and drainage. On hospital day 7, the therapy was switched to meropenem and moxifloxacin.

A multidrug-resistant (MDR) *Acinetobacter baumannii* (susceptible only to gentamicin and colistin) was isolated from the surgical wound swab on 2 April. Two weeks later, a microbiology sample from the urinary catheter of the patient yielded *K. pneumoniae.* The isolate was resistant to all tested antibiotics except gentamicin by disc diffusion susceptibility testing.

The *K. pneumoniae* isolate was stored and later sent to the University of Antwerp for further investigation. The identification of the strain was confirmed with matrix-assisted laser desorption-ionization time-of-flight mass spectrometry (Bruker Daltonics). Antimicrobial susceptibility testing was determined by using the Etest method (bioMérieux) (Tables 1 and 2). Results were interpreted according to European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines (http://www.eucast.org/clinical_breakpoints/).

The isolate was tested by PCR for the presence of extended-spectrum β-lactamase and carbapenemase genes: $bla_{\text{CTX-M}}$, bla_{SHV}, bla_{TEM}, bla_{KPC}, bla_{NDM}, $bla_{\text{OXA-48}}$, bla_{BIC}, bla_{VIM}, bla_{SIM}, bla_{IMP}, bla_{SPM}, bla_{GIM}, bla_{AIM} and bla_{DIM} [5]. The strain was found to be bla_{SHV} and bla_{KPC} positive. Subsequent sequencing revealed the presence of genes encoding an SHV-11 extended-spectrum β-lactamase and a KPC-3 carbapenemase, respectively. Multilocus sequence typing identified sequence type (ST) 512 (allelic profile: 54-3-1-1-1-1-79), a single locus variant (c176a transversion in the *gap*A locus) of the pandemic clone ST258 (allelic profile: 3-3-1-1-1-1-79) [6,7].

Sporadic occurrences, hospital outbreaks and even more significant spread of KPC-producing Enterobacteriaceae to many health care institutions or nursing homes have been reported from many countries in Europe [2,7]. National experts have recently reported sporadic occurrences of KPC in Albania based on self-assessment, but these cases have not been documented or published in peer-reviewed journals. To our knowledge, this is the first confirmed infection with KPC-producing Enterobacteriaceae in Albania.

KPC-producing Enterobacteriaceae have been a growing threat in the Balkan region, particularly in Greece, during the past several years [8,9]. Italy is also a hot spot for CPEs. In 2012, Pulcrano *et al.* [7] reported the first outbreak of *K. pneumoniae* ST512 producing KPC-3 carbapenemase in southern Italy. Northern Italy has not been spared either, with the multifocal diffusion of KPC-3 detected in the same year [10]. The geographical location of Albania, which neighbours Greece and Italy, may also result in a predisposition to the appearance of CPEs in the country.

The patient had no history of recent travel to these two countries, or of any relatives residing there who might have

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TABLE 1. Antimicrobial susceptibility testing results[a]

Antibiotic tested	Dose (μg)	*Klebsiella pneumoniae* (strain AL03) Zone diameter (mm)	*Acinetobacter baumannii* (strain AL10) Zone diameter (mm)
Ceftazidime	30	6	6
Cefotaxime	30	6	6
Cefoxitin	30	6	6
Cefepime	30	9	10
Imipenem	10	6	13
Meropenem	10	6	6
Gentamicin	10	18	18
Amikacin	30	11	9
Ciprofloxacin	5	6	6

[a]Following European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines.

visited him. No previous hospitalizations, apart from the one preceding the admission in the intensive care unit, or intake of antibiotics have been reported for this patient. During his hospital stay, the patient's clinical status complicated with a gastro-oesophageal fistula, and he underwent a feeding gastrostomy. The patient was discharged 2 months after admission in an improved status.

Antimicrobial susceptibility testing of carbapenems in the University Hospital 'Shefqet Ndroqi' started only in 2013. Until the isolation of the strain in question, three other *K. pneumoniae* isolates had been registered as resistant to carbapenems, but they had not been confirmed by any genetic testing or stored for further testing. Therefore, it is likely that KPC-producing *K. pneumoniae* strains were already circulating in the hospital before our detection. The total number of isolated *K. pneumoniae* in the hospital for the period August 2013 to August 2014 was low, only 19, mainly as a result of the small number of samples.

The nosocomial transmission of *K. pneumoniae,* which has been frequently described, is a plausible explanation for the occurrence of infection in this reported case, although no outbreak investigations of KPC-producing Enterobacteriaceae have been conducted among patients within the hospital.

TABLE 2. Minimum inhibitory concentrations (MIC) of antibiotics tested (K. *pneumoniae* strain AL03)[a]

Antibiotic tested	MIC (mg/L)
Ceftazidime	>32
Cefotaxime	32
Cefepime	64
Piperacillin/tazobactam	>256
Imipenem	>32
Meropenem	>32
Gentamicin	4
Amikacin	64
Colistin	2

[a]Following European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines.

Further efforts are needed and are currently ongoing to assess the actual spread of KPC-producing Enterobacteriaceae and potentially other CPEs in Albania, and specifically at the University Hospital 'Shefqet Ndroqi.' These KPC-producing *K. pneumoniae* ST512 could spread rapidly in Albania and are a threat to the population's health.

Conflict of interest

None declared.

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