# *Klebsiella pneumoniae* carrying carbapenemase genes detected in two Manila hospitals

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Carbapenem-resistant *Klebsiella pneumoniae* was isolated from three different patients admitted to two Manila hospitals between 2012 to 2013, according to a study by Chou et al. [*Microb Drug Resist* 2016 Mar 31. Epub ahead of print]

Prior to this 2016 study by researchers from Baylor College of Medicine and St. Luke's Medical Center, the Department of Health had detected carbapenem-resistant *Klebsiella* in only 0.7 percent of 24,684 isolates; carbapenemase gene testing was not previously reported. Organisms carrying metallo-beta-lactamases such as New-Delhi metallo-beta-lactamase-1 (NDM-1) – which can hydrolyze all beta-lactams except aztreonam – have since generated serious concern worldwide. In particular, NDM-1 is considered a global health threat because $bla_{NDM-1}$, the gene that encodes NDM-1, is found on more diverse mobile genetic elements than other metallo-beta-lactamase genes. A similar gene, $bla_{NDM-7}$, encodes NDM-7, which is an even more efficient carbapenem hydrolyzer than NDM-1.

The emergence of carbapenem-resistant *K pneumoniae* was noted during a passive surveillance of antimicrobial resistance in two teaching hospitals in Manila, thus the researchers sought to determine which beta-lactamase and/or carbapenemase genes were present in the resistant isolates.

**Four isolates of carbapenem-resistant K pneumoniae detected**

One isolate, ARPG-315, did not carry a carbapenemase gene but did carry other beta-lactamase genes: $bla_{DHA-1}$, $bla_{OXA-1}$ and $bla_{SHV-1}$. This organism was obtained from a 23-year-old male admitted for acute lymphocytic leukemia who received induction chemotherapy and whose recovery was complicated by recurrent gluteal abscesses and prolonged neutropenia. The abscesses were treated by incision and drainage and, after resolution of the neutropenia, the patient was discharged home in good health.

The carbapenemase gene encoding NDM-7 was detected in *K pneumoniae* isolated from a 70-year-old female who required intubation and placement of a lumbar drain after a subarachnoid hemorrhage. Initially, the patient developed ventilator-associated pneumonia caused by a carbapenem-susceptible *K pneumoniae* and

was treated with meropenem. Subsequently, she developed a lumbar shunt infection and another episode of ventilator-associated pneumonia, this time caused by carbapenem-resistant *K pneumoniae* (ARPG-379 and ARPG-383). The infection resolved with the addition of colistin and amikacin to her treatment regimen. However, she later experienced a neurological decline and, at her family's request, was discharged from the hospital in poor neurological condition.

Finally, the gene encoding NDM-1 was detected in carbapenem-resistant *K pneumoniae* (ARP-664) obtained from a 92-year-old male who was admitted for a gastrostomy tube exchange. Post-operatively, the patient developed respiratory failure and ventilator-associated pneumonia caused by *Pseudomonas aeruginosa*, which was treated with meropenem. Subsequently, although he did not exhibit signs of active genitourinary infection, a urine culture grew carbapenem-resistant *K pneumoniae.* This was interpreted as colonization, thus no antimicrobial agent was administered. The patient's respiratory function gradually worsened and he died on day 46.

**Implications for monitoring and treatment**

Upon comparison with existing databases, two of the carbapenem-resistant *K pneumoniae* isolates from the Manila patients were further identified as follows:

- ARPG-379, which contained the gene encoding NDM-7, was identified as the *K pneumoniae* organism ST273.
- ARP-664, which contained the gene encoding NDM-1, was identified as the *K pneumoniae* organism ST656.

According to Chou et al, "Little is known about ST656, and [ARP-664] is the first report of ST656 carrying a carbapenemase gene."

Currently of greater concern is ST273; one of the few prior reports of *K pneumoniae* carrying $bla_{NDM-7}$ was an outbreak involving seven patients. "Given the concerns of its high epidemic potential, *K pneumoniae* ST273 and $bla_{NDM}$ must be closely monitored and rapidly reported," the researchers concluded. "Surveillance will provide guidance on the utility of new antimicrobial agents to treat multidrug-resistant gram-negative infections."