

# The Epidemiology of carbapenem resistant *Klebsiella pneumoniae* stratified by multi-locus sequence typing



Sorabh Dhar, Emily T. Martin, John P. McRoberts, Kayoko Hayakawa, Tsilia Lazarovitch, Ronit Zaidenstein, Federico Perez, Robert A. Bonomo, Keith S. Kaye, Dror Marchaim



## Introduction

- In less than a decade, a transposon (Tn4401)-mediated outbreak of *bla*<sub>KPC</sub> producing *Klebsiella pneumoniae* has disseminated worldwide.
- The outbreak was initially clonal in most regions, consisting of a single carbapenem-resistant *K. pneumoniae* (CRKP) clone.
- Multi-locus sequence typing (MLST) identified this strain as ST-258. However, resistance soon emerged in additional MLSTs.
- Study aims were to compare the predictors and outcomes of CRKP ST-258 strains to other MLSTs.

## Materials and Methods

- CRKP from 09/2008 to 09/2009 were analyzed at Detroit Medical Center.
- *bla*<sub>KPC</sub> genes were queried by PCR. ESBL production was determined phenotypically. MLST was conducted according to standard criteria (Pasteur Institute, France). Clonal complexes were defined as exact matches or single locus variants (at least 6/7 shared alleles).

## Results

- Overall 68 unique adult patients with CRKP. 61 of the isolates belonged to the clone complex ST-258, and seven consisted of other clones (3 ST-514, 2 were ST-11, one was ST-13, and one was ST-248).
- 55 (98%) of ST-258 strains were *bla*<sub>KPC</sub> producers vs. five (71%) of non-ST-258 strains. Outcomes did not differ significantly between patients with a ST-258 strain vs. other strains (Table).

## Conclusions

- The epidemiology of CRKP is continually evolving, and consists also now of non-ST-258 circulating new strains that possesses distinct epidemiological features.
- The prevalence of ESBL-non-*bla*<sub>KPC</sub>-producing strains of CRKP should be acknowledged and closely monitored. This analysis also illustrates that we cannot rely solely on the presence of *bla*<sub>KPC</sub> per molecular tests in order to diagnose CRKP on routine basis.

Parameter	ST-258 Positive (n=61) N (%)	ST-258 Negative (n=7) N (%)	OR (CI-95%)	p value
Age, years, mean ± SD	65.43±15.29	63.86±15.25		0.8
<i>bla</i> <sub>KPC</sub> production	55 (98.2)	5 (71.4)	22 (1.7-287)	0.03
Ciprofloxacin non-susceptibility	54 (98.2)	3 (60.0)	36 (2.5-518)	0.02
Necessitate intubation at acute illness	4(11.1)	3(50.0)	0.13 (0.1-0.8)	0.05
Hours to initiation of appropriate antimicrobial therapy, hours, median (IQR)	97 (76.3-123)	72 (24-120)		0.71
In-hospital death	14(26.4)	3(50.0)	0.36 (0.07-2)	0.34