The Emergence of Colistin-resistant *Klebsiella pneumoniae* Strains from Swine in Malaysia

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**Highlights**

- 28.3% *K. pneumoniae* strains showed co-resistance to colistin and β-lactam antibiotics. Eleven out of 13 colistin-resistant strains were resistant to at least one carbapenem antibiotic.

- All the MDR and ESBL producers carried ESBL encoding genes such as *bla*<sub>SHV</sub>, *bla*<sub>TEM</sub> and *bla*<sub>CTX-M-1</sub>.

- All 3 colistin-resistant strains had transferable plasmids and *bla*<sub>MCR-1</sub>.

**Abstract**

**Objective**

Colistin is the last line therapy for infections caused by multidrug resistant Gram negative bacteria. The objective of the study was to determine the phenotypic and
genotypic characteristics of colistin-resistant *K. pneumoniae* isolated from swine samples in Malaysia.

Methods

A total of 46 swine *K. pneumoniae* strains isolated from 2013 to 2015 in Malaysia were analyzed for the production of ESBLs and carbapenemase. The resistance traits and the genetic diversity of these strains were characterized by PCR, conjugation, plasmid analysis and pulsed field gel electrophoresis.

Results

Nineteen out of 46 strains were multidrug resistant while 13 were resistant to colistin. A majority of the colistin-resistant strains harbored *bla*<sub>TEM</sub> gene (92.3%), followed by *bla*<sub>SHV</sub> (69.23%), *bla*<sub>CTXM-1</sub> (38.46%) and *bla*<sub>MCR-1</sub> (23.08%). All 3 colistin-resistant strains had transferable plasmids and colistin-resistant gene, *bla*<sub>MCR-1</sub>. Genotyping by PFGE showed high genetic diversity among the *K. pneumoniae* and the colistin-resistant *K. pneumoniae* strains were heterogenous.

Conclusion

To the best of our knowledge, this is the first report of colistin-resistant *K. pneumoniae* among swine strains associated to *mcr-1* plasmid in Malaysia. Due to emergence of β-lactam, carbapenem and colistin resistance, the use of colistin in animal husbandry and agriculture should be avoided to prevent treatment failure.

Keywords

Colistin

genetic diversity

*Klebsiella pneumoniae*

multidrug resistance

swine

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