

Molecular characterization of multidrug-resistant and extended-spectrum beta-lactamase-producing *Klebsiella pneumoniae* isolated from swine farms in Malaysia

ABSTRACT

Aims: The high prevalence of multidrug resistance (MDR) and extended-spectrum β -lactamase (ESBL)-producing *Klebsiella pneumoniae* associated with nosocomial infections has caused serious therapeutic challenges. The objectives of this study were to determine the genotypic and phenotypic characteristics of *K. pneumoniae* strains isolated from Malaysian swine farms and the transferability of ESBL genes by plasmids. **Results:** A total of 50 *K. pneumoniae* strains were isolated from 389 samples, which were collected from healthy and unhealthy pigs (swine rectum and oral cavities), healthy farmers (human rectum, urine, and nasal cavities), farm's environment, and animal feeds from seven Malaysian swine farms. Antimicrobial susceptibility analysis of these 50 *K. pneumoniae* strains showed that the majority (86%) were resistant to tetracycline, while 44% and 36% of these strains were MDR and ESBL producers, respectively. PCR and DNA sequencing of the amplicons showed the occurrence of blaTEM (15/18), blaSHV (15/18), blaCTX-M-1 group (7/18), and blaCTX-M-2 group (2/18), while only class 1 integron-encoded integrase was detected. Conjugation experiments and plasmid analysis indicated that the majority of the ESBL genes were plasmid encoded and the plasmids in 11 strains were conjugative. Genotyping by pulsed-field gel electrophoresis and repetitive extragenic palindrome-polymerase chain reaction (REP-PCR) showed that these 50 strains were genetically diverse with 44 pulsotypes and 43 REP-PCR subtypes. **Conclusions:** ESBL-producing *K. pneumoniae* strains showed high resistance to tetracycline as this antibiotic is used for prophylaxis and therapeutic purposes at the swine farms. The findings in this study have drawn attention to the issue of increasing MDR in animal husbandry and it should be taken seriously to prevent the spread and treatment failure due to antimicrobial resistance.

Keyword: *Klebsiella pneumoniae*; PFGE; REP-PCR; Multidrug resistance; Resistance genes; Swine