



RESEARCH ARTICLE

## Pathogenic determinants of clinical *Klebsiella pneumoniae* strains associated with their persistence in the hospital environment

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### Abstract

**Background:** *Klebsiella pneumoniae* is considered an opportunistic pathogen associated with nosocomial infections occurring mainly in pediatric patients, such as premature infants placed in intensive care units. The aim of this study was to characterize *K. pneumoniae* strains isolated from different clinical sources based on their resistance to antibiotics and the presence of virulence factors associated with their persistence in the hospital environment.

**Methods:** Fifty clinical strains of *K. pneumoniae* isolated from urine, blood, catheters, and cerebrospinal fluid sources were characterized. Susceptibility testing of antibiotics was performed by the Kirby-Bauer method (Clinical Laboratory Standards Institute, 2010). The ability to form a biofilm was determined by the 96-well microplate method. Capsule and fimbrial structures were visualized by transmission electron microscopy (TEM). Adherence was evaluated on A549 and HT29 cells. Assessment for the presence and expression of the *ecpA*, *fimH*, and *mrkA* genes was performed by PCR and RT-PCR.

**Results:** Clinical strains of *K. pneumoniae* were isolated from 48% of urine, 24% of blood, 18% of catheters, and 10% of cerebrospinal fluid. Ninety-two percent of the strains showed resistance to cefpodoxime, whereas few strains showed resistance to imipenem and meropenem (4 and 2%, respectively). The extended spectrum-type beta-lactamase (ESBL) phenotype was identified in 97% of the strains positive for resistance to third-generation cephalosporins. In addition, 88% of the strains were multidrug resistant. All strains were able to form biofilms. Capsule and fimbrial structures were visualized by TEM. Based on our adhesion assays, the A549 cell line was more

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