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Abstract (oral session)

The role of plasmids in successful Klebsiella pneumoniae ST258 and ST512 clones producing KPC-3 identified in Italy

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Objectives: Nosocomial infections sustained by carbapenem-resistant Klebsiella pneumoniae (KP) are a global health problem. Active surveillance has been maintained in 2011 in 10 hospitals of Rome, demonstrating that the increasing carbapenem resistance in KP was associated to the production of the carbapenemase KPC-3 in two major clones:ST512 and ST258. The entire plasmid content of these strains was investigated by high-throughput sequencing to ascertain the contribution of plasmids to the success of these clones. Methods: Full sequencing of plasmids was performed applying the 454-Genome Sequencer FLX procedure on libraries obtained on total plasmid DNA purified from two archetypal ST258 and ST512 strains. Contigs with at least 15-fold coverage obtained by GS-FLX gAssembler software were assembled by the PCR-based gap closure method. Results: Up to four different plasmids were identified within the strains. The IncFIIk-FIBk plasmid, carrying KPC-3 was identified in both strains and was very similar to plasmid pKpQIL identified in KP ST258 strains from Israel (GU595196). With respect to the former pKpQIL a composite transposon IS26-aphA1-IS26, conferring kanamycin resistance was acquired in the pKpQIL from the ST258 strain identified in Italy. Both strains contained another IncFIIk-FIB-like plasmid, we named pKPN-IT, which was highly related to plasmid pKPN3 identified in KP from USA, conferring resistance to arsenic, copper and silver. Plasmid pKPN-IT showed a Fec-like iron(III) dicitrate transport system, a glutation ABC-transport system, a class 1 integron carrying trimethoprim and streptomycin resistance genes (dfrA12, orfE, aadA2) and the chloramphenicol and macrolide resistance genes (catA1, mphA). One ST258 strain also carried an IncA/C plasmid carrying the AmpC CMY-2 beta-lactamase. Other novel plasmids belonging to untypable groups were also identified within these strains. Conclusion: The presence of multiple resistance and putative virulence plasmids within KP-KPC-3 clones endowed the strains with a formidable set of resistance genes against toxic compounds, metals and antimicrobial drugs. The presence of the iron(III) uptake system is likely involved in the capacity of the bacterium to acquire iron in the human host. Our study contributes to the description of the characteristics of KP clones that currently represent a serious potential risk for nosocomial settings.