

**TITLE:** MOLECULAR CHARACTERIZATION OF CARBAPENEM RESISTANT *KLEBSIELLA PNEUMONIAE* ISOLATES RECOVERED FROM SEWAGE TREATMENT PLANT IN BRAZILIAN FEDERAL CAPITAL

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**ABSTRACT:**

Carbapenem-resistant *Klebsiella pneumoniae* (CRKp) has become one of the best-adapted multiresistant bacterial pathogens in healthcare settings worldwide. The emergence of CRKp strains has concerned due to limited therapeutic options to control infections. The spread of CRKp strains to the environment has been reported. This work aimed to evaluate the frequency of carbapenem resistance genes and the susceptibility profile in isolates of CRKp recovered from 12 sewage treatment plants between 2017 and 2018 in the Brazilian federal capital. Samples from raw (RS) and treated sewage (TS) were collected from each STP. Water samples were collected in receiving water bodies on spots located upstream and downstream from the point of TS discharge. The presence of five carbapenemases genes (*bla<sub>KPC</sub>*, *bla<sub>NDM</sub>*, *bla<sub>OXA-48</sub>*, *bla<sub>IMP</sub>* and *bla<sub>VIM</sub>*) and the *bla<sub>KPC</sub>*-carrying transposon (*Tn4401*) was tested in *K. pneumoniae* isolates. Sequencing assays were performed to identify alleles of *bla<sub>KPC</sub>* and *bla<sub>NDM</sub>* genes. A total of 154 CRKp isolates were recovered from all analyzed STP predominating in RS (55.8%) and TS samples (25.3%). None CRKp isolate was recovered from UW samples. The most detected gene was *bla<sub>KPC</sub>* (63.6%), followed by *bla<sub>NDM</sub>* (35.1%). *bla<sub>KPC</sub>* and *bla<sub>NDM</sub>* were simultaneously detected in nine isolates. Alleles *bla<sub>KPC-2</sub>*, *bla<sub>KPC-3</sub>*, *bla<sub>KPC-6</sub>* e *bla<sub>KPC-9</sub>* were identified in 80.8% (21/26), 11.6% (3/26), 3.8% (1/26) and 3.8% (1/26) of the sequenced amplicons, respectively. *bla<sub>NDM-1</sub>* was identified in all (26) sequenced NDM amplicons. The *bla<sub>VIM</sub>*, *bla<sub>OXA-48</sub>* and *bla<sub>IMP</sub>* genes were not detected. In addition, *Tn4401* was detected in all *bla<sub>KPC</sub>*-positive strains. Until now, this study has shown that sewage treatment plants work as a source of dissemination of *K. pneumoniae* isolates carrying carbapenemase genes.

**Keywords:** resistance, carbapenems, wastewater, *Klebsiella pneumoniae*

**Development Agency:** Fundação de Apoio à Pesquisa do Distrito Federal (FAP-DF)