Letter to the Editor

Putative horizontal transfer of carbapenem resistance between *Klebsiella pneumoniae* and *Kluyvera ascorbata* during abdominal infection: A case report

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To the Editor—The emergence of KPC-producing *Enterobacter* has led to the development of serious infections related to high levels of mortality and morbidity worldwide.1,2 The rapid spread of KPCs is linked to multiple elements, such as plasmid-borne genes and the dissemination by international travelers; these bacteria are frequently multidrug resistant, causing untreatable infections.3,4 *Kluyvera* spp is a genus of gram-negative rods of the Enterobacteriaceae family.5 Although it is a commensal of the human gut microbiota,6 *Kluyvera* spp has the potential to cause septic shock, urinary tract infections, catheter-associated bloodstream infections, and abdominal infections.7 Here, we report a case of a plasmid-mediated horizontal transfer from a *Klebsiella pneumoniae* isolate to a *Kluyvera ascorbata* isolate during abdominal infection. The patient approved the data submission.

A 43-year-old male patient was admitted to the Hepatobiliary and Pancreatic Surgical Division from a hospital in the South Region of Brazil in October 2016. He was asymptomatic but had an incidental type 1 biliary cyst that was discovered during ultrasonography. Magnetic resonance imaging (MRI) with cholangiopancreatography was performed for adequate evaluation and showed an abnormal pancreaticobiliary junction, as well. In November 2016, the patient underwent a cholecystectomy and total resection of the cyst, with closure of distal part of the main bile duct inside the pancreas, accompanied by Roux-en-Y hepaticojejunostomy to provide proper biliary drainage. The pathology report showed no malignancy in surgical specimen. After 48 hours, the patient was evaluated with postoperative pancreatitis and signs of sepsis, therefore piperacillin/tazobactam treatment was started. The patient continued to present clinical deterioration and needed parenteral nutrition; he was consequently transferred to the intensive care unit (ICU). Blood cultures were negative and abdominal computerized tomography (CT) showed abdominal collections. CT-guided drainage of pancreatic fluid was performed and cultures were negative. Nevertheless, antimicrobial treatment with meropenem was started and continued for 14 days without resolution. A second CT-guided drainage procedure was performed at the end of December, and the bacteriological culture yielded a multidrug susceptible *Enterococcus faecalis*; a *Kluyvera ascorbata* resistant to ampicillin and second-generation cephalosporin but susceptible to carbapenem, and multidrug-resistant *Klebsiella pneumoniae*, including resistance to tigecycline and carbapenem. Antibiotics were adjusted to vancomycin, meropenem, and ertapenem plus polymyxin B with clinical improvement but without complete bacterial clearance. After 17 days, a third CT-guided drainage was performed, and the bacterial culture yielded *K. ascorbata* isolate resistant to carbapenem. A fourth CT-guided drainage was performed after 15 days, and the culture yielded *K. ascorbata* susceptible to carbapenem and *K. pneumoniae* resistant to carbapenem. Antibiotic treatment was adjusted to polymyxin B, tigecycline, and sulfamethoxazol-trimetoprim, and the patient was evaluated with signs of controlled infection. After 14 days, the antibiotic treatment was suspended, and a final CT showed no signs of abdominal collections. The patient was discharged and was followed as an outpatient.

In this case, 2 isolates were collected: 1 from the second CT, named *K. pneumoniae* KpOT1, and 1 from the third CT, named *K. ascorbata* KaOT2. Both were resistant to meropenem. They were forwarded to a molecular investigation of carbapenemase genes through conventional PCR, and both were *bla*KPC-2 positive. Conjugation experiments were performed using the azide-resistant *E. coli* J53 as the receptor strain. One transconjugant was obtained from each isolate; both presented an increase in the minimum inhibitory concentration (MIC) for meropenem, from <0.0625 µg/mL to 2 µg/mL (KpOT1 transconjugant) and 1 µg/mL, (KaOT2 transconjugant), confirming the transferability of the plasmids. The susceptibility profiles of KpOT1, KaOT2, and the transconjugants are shown in Table 1.

To better analyze the *bla*KPC-2 carrying plasmids, the whole genomes from both strains were sequenced using the Illumina

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The scaffold βKluyvera sul1 KpOT1 belonged to the sequence 247. Klebsiella pneumoniae producing has only been isolated once, from a Case Rep Infect Dis 1106. <720. 5884. sp. nov. and tet(A) producing 0000-0001-7374-0788 pneumoniae catB4 producing KPC-2 carbapenemase in ascorbata Klebsiella pneumoniae et al. 338. 2005;123:334 and Kluyvera Kβ Finance Code β2. Brasil (CAPES) during abdominal infection. and once in China from Pathogenic Isolates and the Transconjugants TKp and TKa 2. et al. 60. Am J Clin was located on an IncN plasmid. The carbapenemase βK. pneumoniae K. pneumoniae Kβ was found in this scaffold. The IncN plasmid was also found in the gene was flanked by the insertion sequences IS606. and related to the clonal complex 258, which is distributed worldwide. 7. 11. Other resistance genes were identified in both isolates (Table 1). This whole-genome shotgun sequencing project has been deposited in the DDBJ/ENA/GenBank (accession no. RHFM00000000 for Klebsiella pneumoniae OT1 and accession no. RHFN00000000 for Kluyvera ascorbata OT2). The versions described in this article are versions RHFM01000000 and RHFN01000000.

This clinical case highlights the possibility of plasmid-mediated horizontal transfer between species during infections. Furthermore, KPC-2–producing K. ascorbata has only been isolated once, from a rectal swab in a surveillance study in Israel 12 and once in China from a patient’s biliary drainage. 13 We suggest that the carbapenem-susceptible K. ascorbata recovered in the fourth CT-guided drainage procedure could be related to a different clone or a heteroresistance event, but we cannot confirm this hypothesis. As far as we know, this is the first report of a KPC-2–carrying plasmid transference from a multidrug-resistant Klebsiella pneumoniae ST 437 to a Kluyvera ascorbata during abdominal infection.

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