Identification of Two Novel Carbapenemase Gene Variants from a Carbapenem-Resistant Aeromonas Veronii Environmental Isolate

Authors : Rafael Estrada, Cristian Ruiz Rueda

Abstract : Carbapenems are last-resort antibiotics used in clinical settings to treat antibiotic-resistant bacterial infections. Thus, the emergence and spread of resistance to carbapenems is a major public health concern. Here, we have studied a carbapenem-resistant Aeromonas veronii strain previously isolated from a water sample from Sam Simeon Creek (Hearst San Simeon State Park, CA). Analysis of this isolate using disk-diffusion, CarbaNP, eCIM and mCIM assays revealed that it was resistant to amoxicillin-clavulanic acid and all carbapenems tested and that this isolate produced a potentially novel carbapenemase of the Metallo- β -lactamase family. Whole genome sequencing analysis revealed that this A. veronii isolate carries a novel variant of the blac_{pha} class β -carbapenemase gene that was closely related to the blac_{pha7} gene of Aeromonas jandaei. This isolate also carried a novel variant of the bla_{oxa} class D carbapenemase gene that was most closely related to the bla_{oxa}-912 gene found in other Aeromonas veronii isolates. Finally, we also identified a novel class C β -lactamase gene moderately related to the blaF_{ox-17} gene of Providencia stuartii and other blaF_{ox} variants identified in Klebsiella pneumoniae, Escherichia coli and other Enterobacteriaceae. Overall, our findings reveal that environmental isolates are an important reservoir of multiple carbapenemases and other β -lactamases of clinical significance.

Keywords : β -lactamases, carbapenem, antibiotic-resistant, aeromonas veronii

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