Characterization of Enterobacter and Citrobacter spp. Isolates from United States Hospitals by Whole Genome Sequencing Analysis and Activity of Ceftazidime-Avibactam and Comparator Agents

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INTRODUCTION

• Analysis of ESKAPE Enterobacteriaceae isolates that demonstrate excellent inhibitory properties against isolates belonging to Arthrobacter aures, and some class A β-lactamases
• Ceftazidime-avibactam given by the United States Food and Drug Administration (US FDA) for treating infections caused by extended-spectrum β-lactamases
• Inhibitory and solvent effects for complicated intra-abdominal infections when combined with meropenem
• The majority of isolates screened for Ceftazidime-avibactam and Clavulanate resistances were collected using whole genomics analysis from 410 Enterobacter aerogenes  and Citrobacter spp. isolates collected in US hospitals during 2016

MATERIALS AND METHODS

• A total of 410 Enterobacter aerogenes and Citrobacter spp. isolates collected during 2016 from 82 US hospitals
• Ceftazidime alone and with Avibactam were tested against a collection of 410 Enterobacter aerogenes and Citrobacter spp. isolates
• Isolates were screened for β-lactamaseencoding genes by whole genome sequencing on a MiSeq (Illumina, San Diego, California)
• CTX-M (25 positive results; Figure 1)

RESULTS

• Among 410 (26% of all isolates) screened for genes encoding β-lactamases, there were 70 (22.9% for this species) of the 318 (20.9%) isolates screened for genes encoding β-lactamases, there were 70 (22.9% for this species) isolates resistant to cephalosporins did not carry acquired β-lactamases
• Enterobacter aerogenes
• Among 410 isolates collected
• 410 (20.9%) isolates screened for genes encoding β-lactamases, there were 70 (22.9% for this species)
• Ceftazidime had limited activity against isolates screened for
• Ceftazidime had limited activity against isolates screened for
• Avibactam is a diazabicyclooctane β-lactamase inhibitor that demonstrates excellent inhibitory properties against

CONCLUSIONS

• The most commonly isolated β-lactamase-encoding genes detected were
• Ceftazidime-avibactam displayed activity against 408 out of 410 (99.5%) isolates tested

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REFERENCES


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Table 1: Activity of ceftazidime-avibactam and ceftazidime tested against all isolates screened for the presence of β-lactamase encoding genes

Figure 1. Genes encoding broad-spectrum β-lactamases detected among 410 Enterobacter aerogenes and Citrobacter spp. isolates collected during 2016 in US hospitals showing elevated MIC values for ceftazidime (≥8 mg/L) and/or carbapenem (≥2 mg/L)

Figure 2. Activity of ceftazidime-avibactam and comparator agents against isolates producing β-lactamases