Geo Architectural Distribution of Carbapenemases Found in Enterobacteriaceae – SMART 2012

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Background: The Study for Monitoring Antimicrobial Resistance Trends (SMART) determines susceptibility of intra-abdominal (IAI) and urinary tract (UTI) gram-negative pathogens from around the world and identifies β-lactamases from Ambler classes A, B, C, and D. This analysis describes regional distribution of carbapenemases found in enterobacteriaceae.

Methods: Of 18,948 Enterobacteriaceae (IAI and UTI) were collected from 55 countries in 2012. Minimum inhibitory concentration (MIC) breakpoints for ertapenem were determined by broth dilution, microplate broth microdilution, and broth microdilution. Susceptibility was determined by interpretive standards from the CLSI.

Results: Regional distribution of carbapenemases found in ertapenem non-susceptible Enterobacteriaceae was worldwide, with specific regional prevalences. In 2012, KPC was by far the most common carbapenemase detected in NA, and EU. OXA-48 was the most common in AP. Although 10 NDM were found in EU, all were from 1 country.-Serbian sites and 3 of 4 Vietnamese sites had discordant β-lactams; isolates encoding carbapenemases were generally adherent to the exception, and carbapenemases were everywhere in 2012 global Enterobacteriaceae.

Conclusions: Although all relatively rare, Enterobacteriaceae encoding carbapenemases were found worldwide, with specific regional prevalences. In 2012, KPC was by far the most common carbapenemase detected in NA, and EU. OXA-48 was the most common in AP. Although 10 NDM were found in EU, all were from 1 country.-Serbian sites and 3 of 4 Vietnamese sites had discordant β-lactams; isolates encoding carbapenemases were generally adherent to the exception, and carbapenemases were everywhere in 2012 global Enterobacteriaceae.

Materials & Methods

18,948 Enterobacteriaceae from KM and UTI were collected from 55 countries in 2012. Both monotherapy susceptibility testing was done following CLSI guidelines (1), using custom validated Microdil microarray cards. Microarray cards were negative for carbapenemases of both Ertapenem and NDM, OXA-48, IMP, VIM, SPM using PCR followed by sequencing.

Introduction

Carbapenemases are enzymes produced by some bacteria causing β-lactam-resistant to other classes of drugs. It is therefore very troubling that Enterobacteriaceae possessing carbapenemases are reported more and more frequently in the literature. Identifying such organisms before they can spread locally, nationally, and internationally is an essential part of the battle to retain the ability of carbapenems as agents of last resort. The Study for Monitoring Antimicrobial Resistance Trends (SMART) tracks susceptibility of enteric gram-negative pathogens of intra-abdominal and urinary tract infections globally, and characterizes the β-lactamases genes in Enterobacteriaceae non-susceptible to carbapenems. This report from SMART describes the regional distribution of carbapenemases genes found in 2012.

Results

Fig. 1. Percentage of Enterobacteriaceae non-susceptible to ertapenem (MIC >0.5 μg/ml), by country and region (red=Asia/Pacific, blue=Europe, green=Latin America, yellow=Middle East/Africa, purple=North America).

Fig. 2. Regional distribution of carbapenemases.

Fig. 3. Distribution of carbapenemases found by country; countries grouped by region.

Fig. 4. Distribution of carbapenemase-positive and -negative isolates among ertapenem non-susceptible Enterobacteriaceae, by ertapenem MIC.

References


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