ROLE OF CLONAL OCCURRENCES OF MULTI-DRUG-RESISTANCE IN THE MYSTIC PROGRAMME (USA; 1999-2003)

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ABSTRACT

The Meropenem-Yearly-Susceptibility-Test-Information-Collection (MYSTIC) Programme was initiated in 1997 by the USA to monitor the emergence of carbapenem-resistant strains of Gram-negative bacilli and to detect emerging resistance patterns to carbapenems and comparator broad-spectrum ß-lactams. The programme collects susceptibility information from a total of 10 hospitals: eight medical centers were found in each of the participating medical centers and one more medical center in New York City. In total, 150 hospitals were included in the MYSTIC Programme (1997-2002).

This study investigated the role of clonal spread of carbapenem-resistant isolates in the MYSTIC Programme. Whole-genome ribotyping (WGR) and pulsed-field gel electrophoresis (PFGE) methods were used to identify clonally related isolates. The isolated bacterial species were Acinetobacter baumannii (150 strains), Pseudomonas aeruginosa (118 strains) and Escherichia coli (118 strains). The overall MDR-A. baumannii (118 strains) and MDR-E. coli (118 strains) rates were 76.0% and 31.0%, respectively. The MDR-A. baumannii rates were grouped into 1) low rates (< 15/100 strains) and 2) high rates (≥ 15/100 strains). Furthermore, the carbapenem use rates were grouped into 1) low rates (< 15 % of all patients) and 2) high rates (≥ 15 % of all patients).

The correlation of carbapenem usage rates to the rates of resistance was significant (p < 0.05). Also, the rate of carbapenem-resistant isolates was directly associated with the rate of resistance in the MYSTIC Programme. Twenty-three medical centres participated over the four monitored years (1999-2003). The overall MDR-A. baumannii (118 strains) and MDR-E. coli (118 strains) rates were 76.0% and 31.0%, respectively. The MDR-A. baumannii rates were grouped into 1) low rates (< 15/100 strains) and 2) high rates (≥ 15/100 strains). Furthermore, the carbapenem use rates were grouped into 1) low rates (< 15 % of all patients) and 2) high rates (≥ 15 % of all patients). The correlation of carbapenem usage rates to the rates of resistance was significant (p < 0.05). Also, the rate of carbapenem-resistant isolates was directly associated with the rate of resistance in the MYSTIC Programme.

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CONCLUSIONS

- Clonal emergence and spread contributed significantly to the carbapenem resistance rates among non-fermentative Gram-negative bacilli observed in the MYSTIC Programme (USA; 1999-2003), in contrast to low correlations reported earlier for broad-spectrum antimicrobial use.
- Epidemic effects were greater with Acinetobacter isolates in the New York City area and less with P. aeruginosa where many unique, non-CLSI MDR strains were detected.
- Poor correlations between carbapenem use and resistance was attributed to varying levels of endemic resistant strains isolated in each institution and the persistence or decline of epidemic clones.
- MDR clones among non-fermentative Gram-negative bacilli have decreased over the monitored/study interval (1999 - 2003) of the MYSTIC Programme, and metallo-ß-lactamases remain extremely rare (one documented occurrence in 1.12 strains; 0.05% of VM). Earlier experiences with P. aeruginosa strains from a participating medical center in Houston, Texas revealed the first USA-based isolation of a metallo-ß-lactamase. This strain also produced a unique OXA-45 class ß of ß-lactamase, not found in this clonal line. These findings are consistent with the persistence of the first metallo-ß-lactamase (blancs) within the MYSTIC Programme medical center and in the USA.

SELECTED REFERENCES


Mutnick AH, Rhomberg PA, Sader HS, Jones RN. (2004). Antimicrobial usage and resistance trend survey for the observed reduction in carbapenem resistance since the vast majority of isolates were clonally related. This reduction in clonal occurrence appears to be responsible for the observed reduction in clonal emergence. This reduction in clonal occurrence appears to be responsible for the observed reduction in clonal occurrence. This reduction in clonal occurrence appears to be responsible for the observed reduction in clonal occurrence.

