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Comparative Activity of Meropenem (MEM) and Other Broad-Spectrum Antimicrobials: Resistance (R) Surveillance Testing Results from the USA MYSTIC Program (2007)

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MYSTIC
Meropenem Yearly Susceptibility Test Information Collection

AMENDED ABSTRACT

Background: The Meropenem Yearly Susceptibility Test Information Collection (MYSTIC) Program is a global R surveillance network in its eleventh year. We report on the activity of MEM against leading pathogens collected from 15 USA medical centers in 2007 actively using carbapenems (CARB).

Methods: Tested isolates (2894) were processed by broth microdilution and included 1392 Enterobacteriaceae (ENT), 454 *P. aeruginosa* (PSA), 189 other non-fermentative bacilli, 508 oxacillin-susceptible staphylococci (OSS), 286 streptococci, and 55 enterococci. Strains meeting CLSI ESBL phenotype criteria were confirmed using Etest, and serine carbapenemase (SC) production (≥2 µg/ml for imipenem [IMP] and MEM) was screened by disk approximation and confirmed by PCR.

Results: Against ENT, CARB had the lowest R rates (1.9–2.9%) followed by cefepime (CPM) and CRO (3.4, 5.7%); fluoroquinolones (FQs) had the highest R rates (17.3-18.3%). MEM was more potent than IMP (16-fold lower MIC_{90}) against ENT. Phenotype/confirmed ESBL rates among *E. coli* (EC), *Klebsiella* spp. (KSP) and *P. mirabilis* were 8.4/6.0%, 24.9/12.0% and 0.8/0.0%, respectively. KPC-type SC were found in KSP (29 strains [9.1%], 4 sites), *Enterobacter* spp. (3 strains [1.8%], 1 site), *Citrobacter* spp. (2 strains [1.7%], 1 site) and EC (1 strain [0.2%]). CPM, tobramycin and MEM (6.6-8.6%) had the lowest R rates against PSA, and IMP and FQs the highest (18.3-22.0%). Against PSA, MEM was 2-fold more potent than IMP (MIC_{90} 8 vs. 16 µg/ml), however, against *Acinetobacter* spp. IMP was more potent. Against OSS all tested agents were ≥93.2% S except CAZ and FQs (82.0-92.2% S). CARB were highly active against ß-haemolytic streptococci (ßHS), but reduced activity was observed against viridans streptococci and *S. pneumoniae*.

Conclusion: CARB demonstrated sustained high activity against ENT, PSA, OSS, and ßHS isolates tested in the USA MYSTIC Program (2007). MEM was active against ESBL-producing strains, however the presence of KPC-type SC in multiple species is a very serious and emergent concern. Continued surveillance of broad-spectrum ß-lactams is warranted in monitoring key R pathogens.

INTRODUCTION

The Meropenem Yearly Susceptibility Test Information Collection (MYSTIC) Program is a global resistance surveillance network monitoring Europe, North America, Latin America and Asia. The primary objective is to assess the in vitro activity of meropenem and other broad-spectrum comparator agents against bacteria isolated from serious infections in hospitals utilizing carbapenems. Fifteen medical centers have been monitored in the United States (USA) by a central laboratory design (JMI Laboratories, North Liberty, Iowa, USA) since 1999 using reference broth microdilution susceptibility testing methods.

The carbapenems (meropenem and imipenem) have consistently been the most active broad-spectrum antimicrobial class against *Pseudomonas aeruginosa* and *Acinetobacter baumannii* strains as well as recently becoming a more important choice for the treatment of infections caused by extended spectrum ß-lactamases (ESBL) in Enterobacteriaceae. Declining carbapenem susceptibility rates due to the spread of carbapenemase-mediated resistance mechanisms especially among Gram-negative bacilli has been observed and is becoming a serious problem. Antimicrobial surveillance studies can help identify resistant clones and then aid in the control and minimization of the spread while providing valuable information to clinicians for selecting empiric or directed therapy for serious infections.

We report the antimicrobial susceptibility testing results for all bacterial isolates collected from the 15 USA medical centers participating in the 2007 MYSTIC Program.

MATERIALS AND METHODS

Specimen collection: The 2007 USA MYSTIC Program continued to monitor the same 15 geographically dispersed medical centers by requesting 200 bacterial isolates from serious infections to be submitted to fill protocol quotas among Enterobacteriaceae, non-fermentative Gram-negative bacilli as well as staphylococci, streptococci and enterococci among Gram-positive species. All isolates were shipped to the central monitoring laboratory (JMI Laboratories) on charcoal transport swabs. A total of 2,894 isolates were processed (range 169 to 222 isolates per site) for a compliance rate of 96.5%. Identification of the strains was performed locally with confirmation at the central laboratory using colonial morphology, biochemical tests (Remel, Lenexa, KS) and/or the Vitek System identification cards (bioMerieux, Hazelwood, MO), as required.

Susceptibility testing: All isolates were tested for susceptibility to meropenem and 10 comparator antimicrobial agents with validated panels (TREK Diagnostics, Cleveland, OH) using CLSI reference quality methods (CLSI M7-A7, 2006). CLSI (M100-S18) criteria were utilized for categorization of susceptibility and resistance. Quality control (QC) was assured utilizing appropriate American Type Culture Collection (ATCC) strains with all QC results observed within published CLSI ranges.

The CLSI ESBL MIC screening criteria (≥2 µg/ml for ceftazidime or ceftriaxone) was applied to *E. coli*, *Klebsiella* spp. and *P. mirabilis* to determine phenotypic ESBL rates. Confirmation of screen-positive isolates was made by using Etest ESBL strips (AB BIODISK, Solna, Sweden). *Klebsiella* spp. isolates with elevated carbapenem MIC results (MIC ≥2 µg/ml) were screened for the presence of either a serine carbapenemase or metallo-ß-lactamase (MßL) using disk approximation methods followed by an Etest MßL strip (imipenem ± EDTA), and/or PCR sequencing. *P. aeruginosa* and *Acinetobacter* spp. isolates demonstrating resistance to carbapenems (imipenem and meropenem MIC, ≥16 µg/ml) and ceftazidime (MIC, ≥32 µg/ml) were further tested for the presence of a MßL.

RESULTS

- Against Enterobacteriaceae isolates the carbapenems demonstrated the lowest resistance rates (1.9 – 2.4%) followed by cefepime (3.4%) and ceftriaxone (5.7%). Meropenem had 16-fold lower MIC_{90} results compared to imipenem (Table 1).
- ESBL-phenotype/ESBL-confirmed rates for *Klebsiella* spp., *E. coli* and *P. mirabilis* isolates were 24.9/12.0, 8.4/6.0 and 0.8/0.0%, respectively. Elevated ESBL-phenotype rates were observed for *Klebsiella* spp. due to the presence of serine carbapenemase-producing isolates exhibiting the same phenotype.
- The fluoroquinolones demonstrated the highest resistance rates among the broad-spectrum agents tested against Enterobacteriaceae (17.3 – 18.3%).
- A total of 35 Enterobacteriaceae isolates from four medical centers were identified that produced KPC carbapenemases, primarily among *Klebsiella* spp. (29 strains, 82.9%), but also among *Enterobacter* spp. (3 strains), *Citrobacter* spp. (2 strains) and *E. coli* (1 strain; Table 2).
- Lowest resistance rates among *P. aeruginosa* were observed for cefepime (6.6%), tobramycin (7.3%) and meropenem (8.6%), and the fluoroquinolones had the highest resistance rates (19.6 – 22.0%; Table 3).
- *P. aeruginosa* and *Acinetobacter* spp. (51 strains) meeting the Senda et al. criteria (≥32 µg/ml for ceftazidime and ≥16 µg/ml for imipenem and meropenem) as possible producers of MßL were all negative by a confirmatory disk approximation test, MßL Etest strip or PCR detection.
- Meropenem was two-fold more potent than imipenem (MIC_{90} 8 vs. 16 µg/ml) and had a lower resistance rate (8.6 vs. 18.3%) against *P. aeruginosa*. The potency of both carbapenems was very similar against *Acinetobacter* spp. isolates (identical MIC_{50} and MIC_{90} results) and had similar susceptibility rates (53.4 – 56.4%; Table 3).

Table 1. Antimicrobial activity of meropenem and nine comparator broad-spectrum agents tested against enteric Gram-negative bacilli tested in the USA MYSTIC Program (2007).

Organism (no. tested)/antimicrobial	MIC (µg/ml) 50%	90%	% susceptible/resistant[a]
All Enterobacteriaceae (1392)[b]			
Meropenem	0.03	0.12	97.5/1.9
Imipenem	0.25	2	97.3/2.4
Ceftriaxone	≤0.25	8	90.5/5.7
Ceftazidime	0.25	8	90.3/7.7
Cefepime	≤0.12	1	95.5/3.4
Piperacillin/Tazobactam	≤8	32	88.7/8.0
Gentamicin	≤4	≤4	90.6/7.5
Tobramycin	≤1	8	88.9/7.8
Ciprofloxacin	≤0.25	>2	80.1/18.3
Levofloxacin	≤0.5	>4	81.6/17.3
Citrobacter spp. (117)			
Meropenem	0.03	0.06	96.6/0.9 (3.4)[c]
Imipenem	0.5	1	96.6/3.4 (3.4)[c]
Ceftriaxone	≤0.25	16	86.3/5.1
Ceftazidime	0.5	>16	81.2/14.5
Cefepime	≤0.12	1	98.3/1.7 (6.0)[d]
Piperacillin/Tazobactam	≤8	32	88.0/6.0
Gentamicin	≤4	≤4	94.0/4.3
Tobramycin	≤1	≤1	92.3/5.1
Ciprofloxacin	≤0.25	0.5	96.6/3.4
Levofloxacin	≤0.5	1	96.6/3.4
Enterobacter spp. (170)			
Meropenem	0.03	0.12	97.6/0.6 (2.9)[c]
Imipenem	0.5	2	97.6/0.6 (2.9)[c]
Ceftriaxone	≤0.25	32	84.1/7.6
Ceftazidime	0.25	>16	78.8/17.1
Cefepime	≤0.12	2	95.3/3.5 (8.2)[d]
Piperacillin/Tazobactam	≤8	64	80.0/9.4
Gentamicin	≤4	≤4	94.1/3.5
Tobramycin	≤1	≤1	91.8/5.9
Ciprofloxacin	≤0.25	2	89.4/8.8
Levofloxacin	≤0.5	2	90.6/7.6
E. coli (465)			
Meropenem	0.03	0.03	100.0/0.0 (0.2)[c]
Imipenem	0.12	0.25	100.0/0.0 (0.2)[c]
Ceftriaxone	≤0.25	≤0.25	93.8/5.4 (7.5)[e]
Ceftazidime	0.25	1	96.6/1.5 (7.1)[e]
Cefepime	≤0.12	0.25	95.9/3.0
Piperacillin/Tazobactam	≤8	≤8	93.3/4.9
Gentamicin	≤4	>8	86.5/12.9
Tobramycin	≤1	8	88.8/6.2
Ciprofloxacin	≤0.25	>2	70.5/29.0
Levofloxacin	≤0.5	>4	70.8/28.4
Klebsiella spp. (317)			
Meropenem	0.03	2	91.5/7.6 (10.1)[c]
Imipenem	0.25	2	90.9/8.5 (10.1)[c]
Ceftriaxone	≤0.25	>32	82.6/10.7 (23.3)[e]
Ceftazidime	0.25	>16	81.7/16.7 (23.0)[e]
Cefepime	≤0.12	16	89.9/7.6
Piperacillin/Tazobactam	≤8	>64	77.9/19.9
Gentamicin	≤4	8	89.6/6.9
Tobramycin	≤1	>8	79.5/16.4
Ciprofloxacin	≤0.25	>2	78.2/20.8
Levofloxacin	≤0.5	>4	78.9/20.2
P. mirabilis (118)			
Meropenem	0.06	0.12	100.0/0.0
Imipenem	1	2	99.2/0.8
Ceftriaxone	≤0.25	≤0.25	100.0/0.0 (0.8)[e]
Ceftazidime	≤0.12	≤0.12	100.0/0.0 (0.8)[e]
Cefepime	≤0.12	≤0.12	100.0/0.0
Piperacillin/Tazobactam	≤8	≤8	100.0/0.0
Gentamicin	≤4	≤4	93.2/5.1
Tobramycin	≤1	2	94.9/4.2
Ciprofloxacin	≤0.25	>2	76.3/20.3
Levofloxacin	≤0.5	>4	82.2/16.9
Indole-Positive *Proteae* (51)			
Meropenem	0.06	0.12	100.0/0.0
Imipenem	2	4	100.0/0.0
Ceftriaxone	≤0.25	0.5	98.0/2.0
Ceftazidime	≤0.12	1	100.0/0.0
Cefepime	≤0.12	≤0.12	98.0/0.0 (2.0)[d]
Piperacillin/Tazobactam	≤8	≤8	100.0/0.0
Gentamicin	≤4	≤4	94.1/3.9
Tobramycin	≤1	2	98.0/2.0
Ciprofloxacin	≤0.25	2	86.3/9.8
Levofloxacin	≤0.5	2	90.2/9.8
Serratia spp. (138)			
Meropenem	0.06	0.12	100.0/0.0
Imipenem	1	2	100.0/0.0
Ceftriaxone	≤0.25	2	97.1/0.7
Ceftazidime	0.25	1	97.8/0.7
Cefepime	≤0.12	0.5	99.3/0.7 (1.4)[d]
Piperacillin/Tazobactam	≤8	≤8	94.2/2.2
Gentamicin	≤4	≤4	94.9/2.2
Tobramycin	2	4	94.2/3.6
Ciprofloxacin	≤0.25	2	89.9/4.3
Levofloxacin	≤0.5	2	94.9/2.2

a. Criteria as published by the CLSI M100-S18.
b. Includes: *Cedecea davisae* (1 strain), *Citrobacter amalonaticus* (1 strains), *Citrobacter braakii* (5 strains), *Citrobacter farmeri* (1 strain), *Citrobacter freundii* (52 strains), *Citrobacter koseri* (30 strains), *Edwardsiella tarda* (1 strain), *Enterobacter aerogenes* (35 strains), *Enterobacter amnigenus* (1 strain), *Enterobacter cloacae* (112 strains), *Enterobacter gergoviae* (1 strain), *Enterobacter intermedius* (1 strain), *Escherichia coli* (465 strains), *Escherichia hermannii* (1 strain), *Hafnia alvei* (2 strains), *Klebsiella oxytoca* (58 strains), *Klebsiella pneumoniae* (222 strains), *Leclercia adecarboxylata* (1 strain), *Morganella morganii* (31 strains), *Pantoea agglomerans* (1 strain), *Proteus mirabilis* (118 strains), *Proteus vulgaris* (2 strains), *Providencia rettgeri* (1 strain), *Providencia stuartii* (2 strains), *Serratia liquefaciens* (5 strains), *Serratia marcescens* (116 strains), *Serratia plymuthica* (1 strain), *Shigella sonnei* (1 strain), Group B *Salmonella* (1 strain), Group D *Salmonella* (1 strain), unspeciated *Citrobacter* (26 strains), unspeciated *Enterobacter* (20 strains), unspeciated *Klebsiella* (37 strains), unspeciated *Morganella* (1 strain), unspeciated *Proteus* (14 strains), unspeciated *Salmonella* (6 strains), and unspeciated *Serratia* (16 strains).
c. Bush group 2f carbapenemase screening concentration of ≥2 µg/ml for meropenem or imipenem.
d. Percentage ESBL phenotypes using a screening concentration of ≥4 µg/ml.
e. ESBL phenotype using CLSI screening criteria of ≥2 µg/ml.

Table 2. Summary of confirmed KPC-type serine carbapenemase-producing Enterobacteriaceae isolates identified in the USA MYSTIC Program (2007).

Site No.	Organism (no.)	State	No. KPC strains/total (%)	MIC range (µg/ml) Meropenem	Imipenem
02	*K. pneumoniae* (15)	New York	15/20 (75.0)	4->32	16->32
04	*Klebsiella* spp.(8)	New York	8/21 (38.1)	4->32	8-32
	E. coli (1)		1/30 (3.3)	4	4
27	*K. pneumoniae* (1)	Ohio	1/20 (5.0)	32	>32
30	*K. pneumoniae* (5)	New Jersey	5/25 (20.0)	8->32	16-32
	E. cloacae (3)		3/12 (25.0)	4-16	4-32
	C. freundii (2)		2/5 (40.0)	8-32	16->32

Table 3. Antimicrobial activity of meropenem and nine comparator broad-spectrum agents tested against non-fermentative Gram-negative bacilli tested in the USA MYSTIC Program (2007).

Organism (no. tested)/antimicrobial agent	MIC (µg/ml) 50%	90%	% susceptible/resistant[a]
P. aeruginosa (454)			
Meropenem	0.5	8	83.3/8.6
Imipenem	2	16	77.5/18.3
Ceftazidime	2	>16	83.3/10.8
Cefepime	4	16	85.7/6.6
Piperacillin/Tazobactam	≤8	>64	89.0/11.0
Gentamicin	≤4	8	86.8/9.9
Tobramycin	≤1	4	91.6/7.3
Ciprofloxacin	≤0.25	>2	74.4/19.6
Levofloxacin	≤0.5	>4	71.6/22.0
Acinetobacter spp. (133)[b]			
Meropenem	4	>32	53.4/36.8
Imipenem	4	>32	56.4/27.8
Ceftriaxone	>32	>32	22.6/57.1
Ceftazidime	>16	0.5	36.1/56.4
Cefepime	16	>16	39.8/47.4
Piperacillin/Tazobactam	>64	>64	36.8/55.6
Gentamicin	8	>8	47.4/45.9
Tobramycin	2	>8	60.9/37.6
Ciprofloxacin	>2	>2	38.3/60.9
Levofloxacin	>4	>4	39.1/59.4
Other Gram-negative bacilli (56)[c]			
Meropenem	0.5	4	92.9/3.6
Imipenem	1	16	87.5/10.7
Ceftriaxone	16	>32	44.6/32.1
Ceftazidime	4	>16	75.0/21.4
Cefepime	4	>16	57.1/33.9
Piperacillin/Tazobactam	≤8	>64	83.9/12.5
Gentamicin	≤4	>8	53.6/42.9
Tobramycin	2	>8	55.4/44.6
Ciprofloxacin	1	>2	58.9/28.6
Levofloxacin	1	>4	76.8/17.9

a. Criteria as published by the CLSI M100-S18.
b. Includes: *Acinetobacter baumannii* (86 strains), *Acinetobacter calcoaceticus* (5 strains), *Acinetobacter haemolyticus* (3 strains), *Acinetobacter lwoffii* (11 strains), and unspeciated *Acinetobacter* (28 strains).
c. Includes: *Achromobacter xylosoxidans* (7 strains), *Aeromonas hydrophila* (3 strains), *Aeromonas sobria* (1 strain), *Agrobacterium radiobacter* (3 strains), *Alcaligenes faecalis* (3 strains), *Alcaligenes xylosoxidans* (6 strains), *Burkholderia cepacia* (5 strains), *Delftia acidovorans* (2 strains), *Ochrobactrum anthropi* (2 strains), *Oligella ureolytica* (1 strain), *Pseudomonas fluorescens* (1 strain), *Pseudomonas oryzihabitans* (2 strains), *Pseudomonas putida* (5 strains), *Pseudomonas stutzeri* (2 strains), *Sphingomonas paucimobilis* (1 strain), unspeciated *Achromobacter* (2 strains), unspeciated *Aeromonas* (1 strain), unspeciated *Alcaligenes* (5 strains), unspeciated *Comamonas* (2 strains), unspeciated *Pseudomonas* (1 strain), and unspeciated *Roseomonas* (1 strain).

Table 4. Antimicrobial activity of meropenem and ten comparator broad-spectrum agents tested against Gram-positive cocci tested in the USA MYSTIC Program (2007).

Organism (no. tested)/antimicrobial agent	MIC (µg/ml) 50%	90%	% susceptible/resistant[a]
S. aureus oxacillin-susceptible (347)			
Meropenem	0.12	0.12	100.0/0.0
Imipenem	0.03	0.06	100.0/0.0
Ceftriaxone	4	4	100.0/0.0
Ceftazidime	8	16	89.3/0.3
Cefepime	2	4	100.0/0.0
Piperacillin/Tazobactam	≤8	≤8	100.0/0.0
Gentamicin	≤4	≤4	98.6/1.2
Tobramycin	≤1	≤1	96.5/2.6
Ciprofloxacin	0.5	1	90.8/7.8
Levofloxacin	≤0.5	≤0.5	92.2/7.8
Penicillin	4	>8	19.0/81.0
CoNS oxacillin-susceptible (161)[b]			
Meropenem	0.12	0.25	100.0/0.0
Imipenem	0.03	0.06	100.0/0.0
Ceftriaxone	2	4	98.1/0.0
Ceftazidime	4	16	88.2/0.6
Cefepime	1	2	100.0/0.0
Piperacillin/Tazobactam	≤8	≤8	100.0/0.0
Gentamicin	≤4	≤4	94.4/1.9
Tobramycin	≤1	2	93.2/3.7
Ciprofloxacin	≤0.25	>2	82.0/16.8
Levofloxacin	≤0.5	4	82.6/16.1
Penicillin	0.5	2	30.4/69.6
Enterococcus spp.(55)[c]			
Meropenem	4	8	-/-
Imipenem	2	4	-/-
Piperacillin/Tazobactam	≤8	≤8	-/-
Gentamicin	≤500	>500	74.5/25.5
Ciprofloxacin	1	>2	65.5/34.5
Levofloxacin	1	>4	65.5/34.5
Penicillin	2	4	100.0/0.0
S. pneumoniae (126)			
Meropenem	≤0.015	0.5	88.1/6.3
Imipenem	≤0.015	0.25	88.1/4.0
Ceftriaxone	≤0.25	1	95.2/0.8
Cefepime	≤0.12	1	96.0/0.0
Levofloxacin	1	1	100.0/0.0
Penicillin	≤0.06	2	63.5/11.1
ß-haemolytic streptococci[d] (114)			
Meropenem	≤0.015	0.06	100.0/-
Imipenem	≤0.015	0.03	-/-
Ceftriaxone	≤0.25	≤0.25	100.0/-
Cefepime	≤0.12	≤0.12	100.0/-
Levofloxacin	≤0.5	1	99.1/0.0
Penicillin	≤0.06	≤0.06	100.0/-
Viridans group streptococci[e] (46)			
Meropenem	0.06	0.25	93.5/-
Imipenem	0.06	0.25	-/-
Ceftriaxone	≤0.25	2	87.0/8.7
Cefepime	0.25	1	91.3/8.7
Levofloxacin	1	>4	87.0/10.9
Penicillin	0.12	2	63.0/6.5

a. Criteria as published by the CLSI M100-S18.
b. Includes: *Staphylococcus auricularis* (2 strains), *Staphylococcus capitis* (7 strains), *Staphylococcus epidermidis* (32 strains), *Staphylococcus haemolyticus* (1 strain), *Staphylococcus hominis* (7 strains), *Staphylococcus kqdarnensis* (1 strain), *Staphylococcus simulans* (1 strain), *Staphylococcus warneri* (4 strains), and unspeciated coagulase-negative staphylococci (106 strains).
c. Includes: *Enterococcus casseliflavus* (1 strain), and *Enterococcus faecalis* (54 strains).
d. Includes: Group A *Streptococcus* (42 strains), Group B *Streptococcus* (51 strains), Group C *Streptococcus* (1 strain), Group G *Streptococcus* (10 strains), and unspeciated beta-haemolytic streptococci (10 strains).
e. Includes: *Streptococcus anginosus* (1 strain), *Streptococcus constellatus* (1 strain), *Streptococcus intermedius* (2 strains), *Streptococcus milleri* (2 strains), *Streptococcus mitis* (12 strains), *Streptococcus mutans* (1 strain), *Streptococcus oralis* (1 strain), *Streptococcus parasanguinis* (1 strain), *Streptococcus salivarius* (2 strains), unspeciated *Streptococcus* (1 strain), unspeciated alpha-haemolytic streptococci (5 strains), and unspeciated viridans group streptococci (17 strains).

- All tested agents had high susceptibility rates (≥93.2%) against the oxacillin-susceptible staphylococci except for ceftazidime and the fluoroquinolones (82.0 – 92.2%; Table 4).
- The carbapenems were highly active against the ß-haemolytic streptococci (MIC_{90} 0.06 µg/ml; 100% susceptible) but a reduced activity was observed for viridans group streptococci (MIC_{90} 0.25 µg/ml; 93.5% susceptible) and *S. pneumoniae* (MIC_{90} 0.5 µg/ml; 88.1% susceptible; Table 4).

CONCLUSIONS

- The carbapenems continue to demonstrate excellent antimicrobial activity against Enterobacteriaceae, *P. aeruginosa*, oxacillin-susceptible staphylococci and ß-haemolytic streptococci among the broad-spectrum agents tested in the MYSTIC Program (2007).
- The fluoroquinolone susceptibility rates were the lowest of all tested broad-spectrum agents and showed a continuing trend of decreasing susceptibility compared to prior USA MYSTIC Program results (1999-2006).
- KPC-producing Enterobacteriaceae, primarily in *Klebsiella* spp., were isolated in or near New York City as well as Ohio, with a significant trend of increasing prevalence.
- Continued surveillance of Enterobacteriaceae (especially *Klebsiella* spp.), *P. aeruginosa* and *Acinetobacter* spp. is becoming more important to monitor the emergence and spread of resistance mechanisms affecting the therapeutic utility of the carbapenem and other ß-lactam class agents.

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