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Screening of Emerging Resistant Mechanisms (KPC, NDM, OXA-48-like and mcr) in Enterobacteriaceae with MicroScan Automated System

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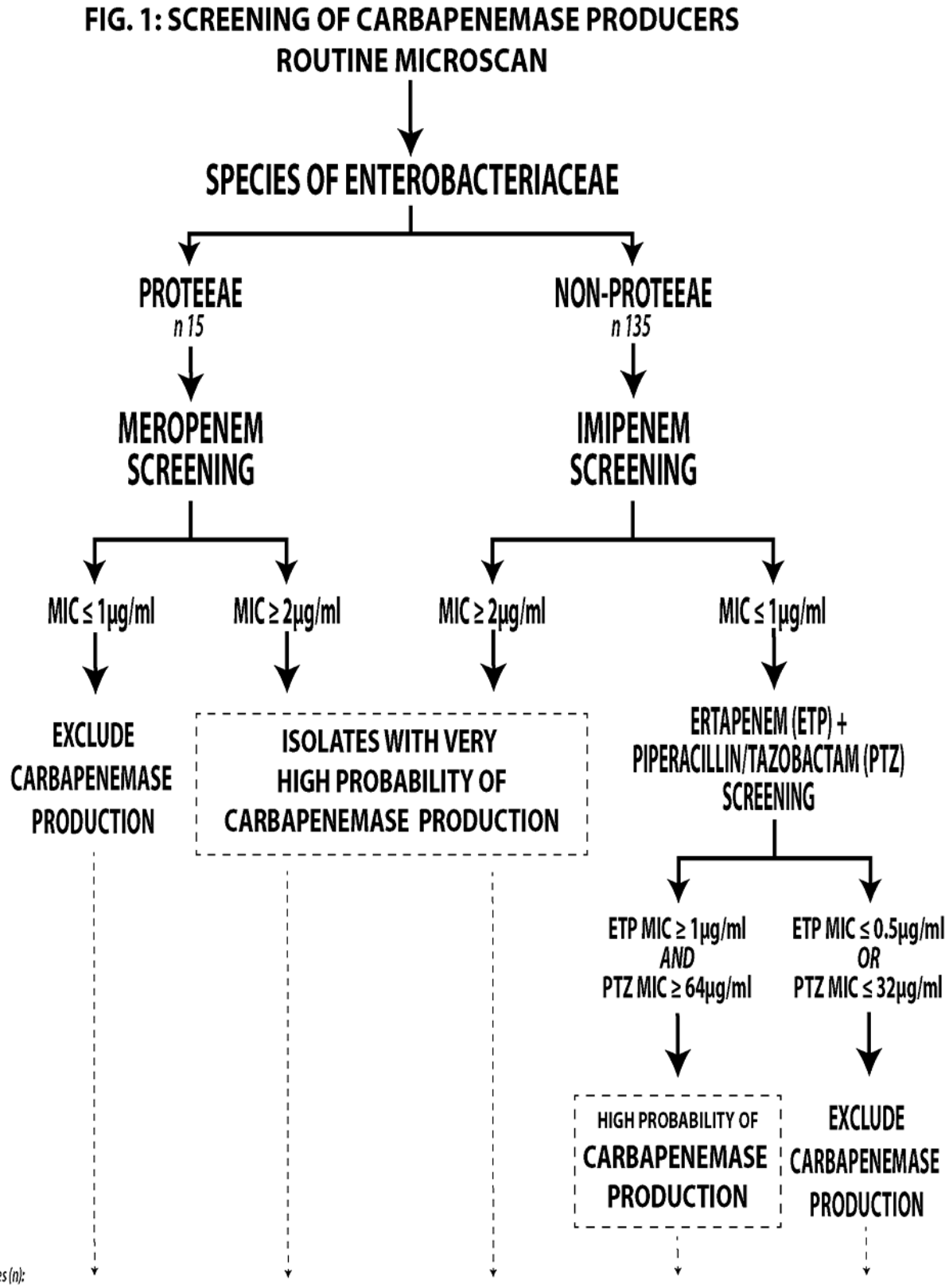
Background: Several reports have questioned the ability of some automated antimicrobial susceptibility testing systems to identify carbapenemase producers. Moreover, new mechanisms of resistance have emerged, as the plasmidic-mediated mcr-1 gene, conferring colistin (COL) resistance, for which the efficiency of these systems remains unknown. We evaluated the ability of MicroScan to detect carbapenemase- and mcr-1 producing *Enterobacteriaceae (Ent)*.

Methods A panel of *Ent* (*n* 150) was included: 65 carbapenemase producers (Class A, 24; Class B, 25; Class D, 16), 54 mcr producers (all non-clonal *E. coli,* except 1 *K. pneumoniae*), 3 dual producers (NDM + mcr) and 28 nonproducers. The genotypes of the isolates were considered as the gold standard (PCR/DNA sequencing for *bla* and *mcr*). MicroScan MICs were determined using Neg Combo Panel 66 read by the MicroScan WalkAway 96 plus (Beckman Coulter Inc). Reference COL MICs were performed by microdilution (BMD). Test results were interpreted by the 2017 CLSI guidelines. For COL, we used the CLSI epidemiological cutoff values (ECV) of ≤2 and ≥4 mg/L to separate wild-type and mcr producers bacterial populations.

Results: given the CLSI criteria for suspected carbapenemase producers, the sensitivity and specificity were: 80/90% imipenem, 88/90% meropenem, 94/87% ertapenem, 97/85% for at least one carbapenem non-susceptible, respectively. We propose an algorithm that is highly sensitive (96%) and specific (88%) for carbapenemase screening based on the hierarchical and combined use of MicroScan MICs (Fig. 1). All mcr-1 isolates displayed COL MICs by MicroScan above the ECV (MIC_{50}/MIC_{90} ≥8 mg/L). Essential and categorical agreements with BMD were 96%.

Conclusion: Microscan resulted suitable for carbapenemase and mcr detection. The use of a strategy based on the hierarchical and combined use of MicroScan MICs will enable routine labs to identify with high confidence levels those isolates suspected of producing carbapenemases.

FIG. 1: SCREENING OF CARBAPENEMASE PRODUCERS



no. of isolates (n):					
Class A (24)	*0*	*1*	*22*	*0*	*1#*
Class B (28)	*0*	*10*	*16*	*1*	*1#*
Class D (16)	*1#*	*0*	*5*	*10*	*0*
Nonproducers (82)	*3*	*0*	*7**	*3**	*69*

#False negative: P. stuartii OXA-163; K. pneumoniae KPC-2 (ST1005): E. intermedius VIM-2.
**False positive: 6 E. cloacae (5 AmpC Hyperproducers, 1 ESBL), 3 K. pneumoniae and 1 S. marcescens ESBL producers*

Acknowledgments/References:

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