Antimicrobial Susceptibility of *Enterobacterales* Causing Infections in Intensive Care Unit Patients: The Role of New β-Lactamase Inhibitor Combinations

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Objectives

To evaluate the susceptibility of contemporary *Enterobacterales* isolates from ICU and non-ICU patients to 4 new β-lactamase inhibitor combinations: ceftazidime-avibactam (CAZ-AVI), ceftolozane-tazobactam (C-T), meropenem-vaborbactam (MEM-VAB), and imipenem-relebactam (IMI-REL).

Materials and Methods

- The isolate number was updated since the submission of the abstract, as additional isolates were tested.
- 7,281 isolates (1,435 from ICU and 5,846 from non-ICU patients) were consecutively collected in 63 US medical centres in 2021.
- Isolates were tested by CLSI reference broth microdilution.
- EUCAST interpretive criteria were applied.
- The predominant infection was pneumonia among ICU (55.1%) and UTI among non-ICU (52.8%) patients.

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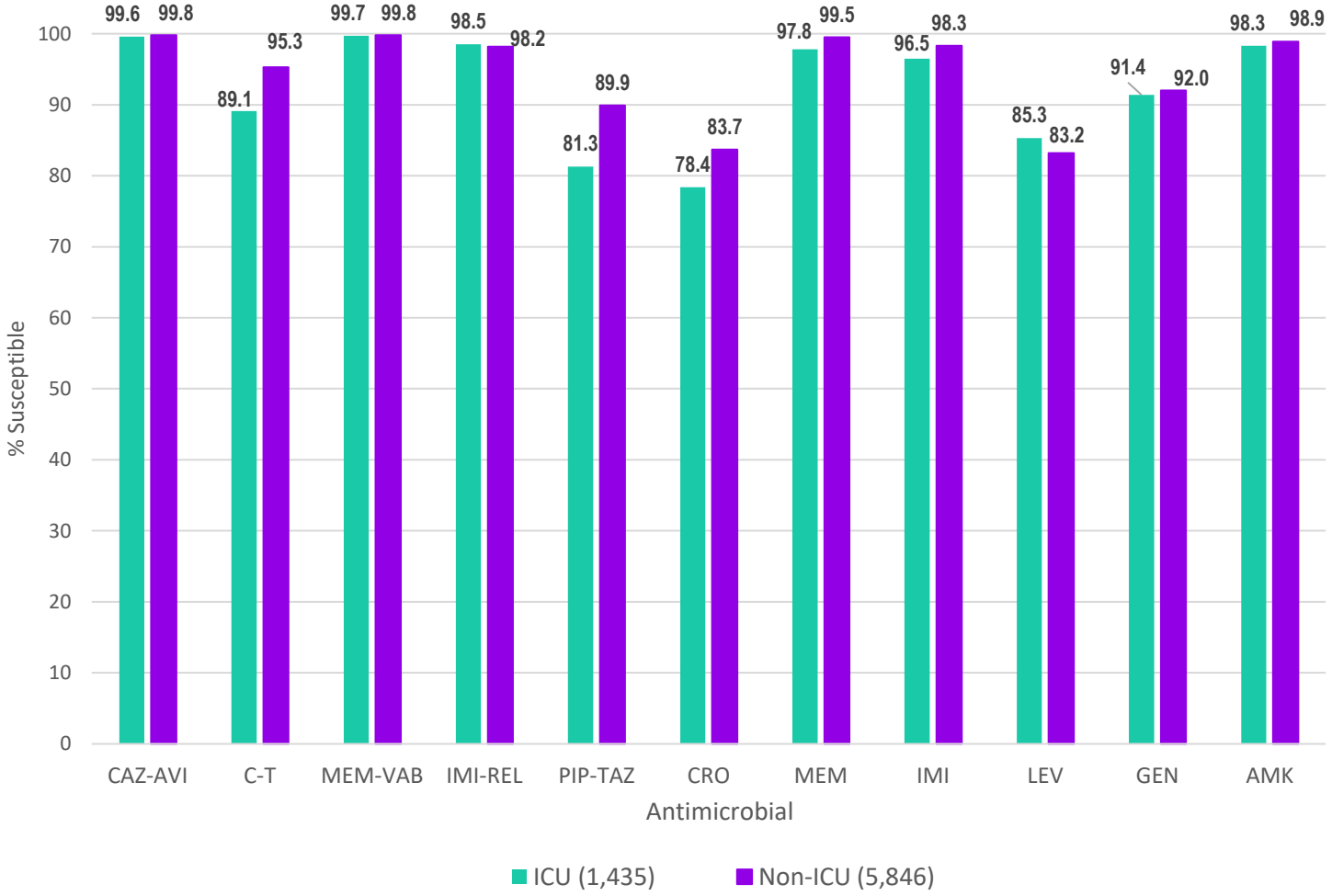
Results

Figure 1. Antimicrobial Susceptibility of Enterobacterales from ICU and non-ICU patients



- CAZ-AVI (99.6-99.8%S) and MEM-VAB (99.7-99.8%S) were the most active compounds against ICU and non-ICU isolates, with almost complete activity.
- IMI-REL (98.2-98.5%S) was slightly less active than CAZ-AVI and MEM-VAB due to limited activity against *P. mirabilis* and indole-positive Proteae.
- C-T showed limited activity against *E. cloacae* complex, carbapenem-susceptible ESBL-phenotype, CRE, and MDR *Enterobacterales.*
- The most active comparator agents were amikacin, meropenem, and imipenem.
- Susceptibilities of *Enterobacterales* to C-T, PIP-TAZ, and ceftriaxone (CRO) were slightly lower among ICU compared to non-ICU isolates.

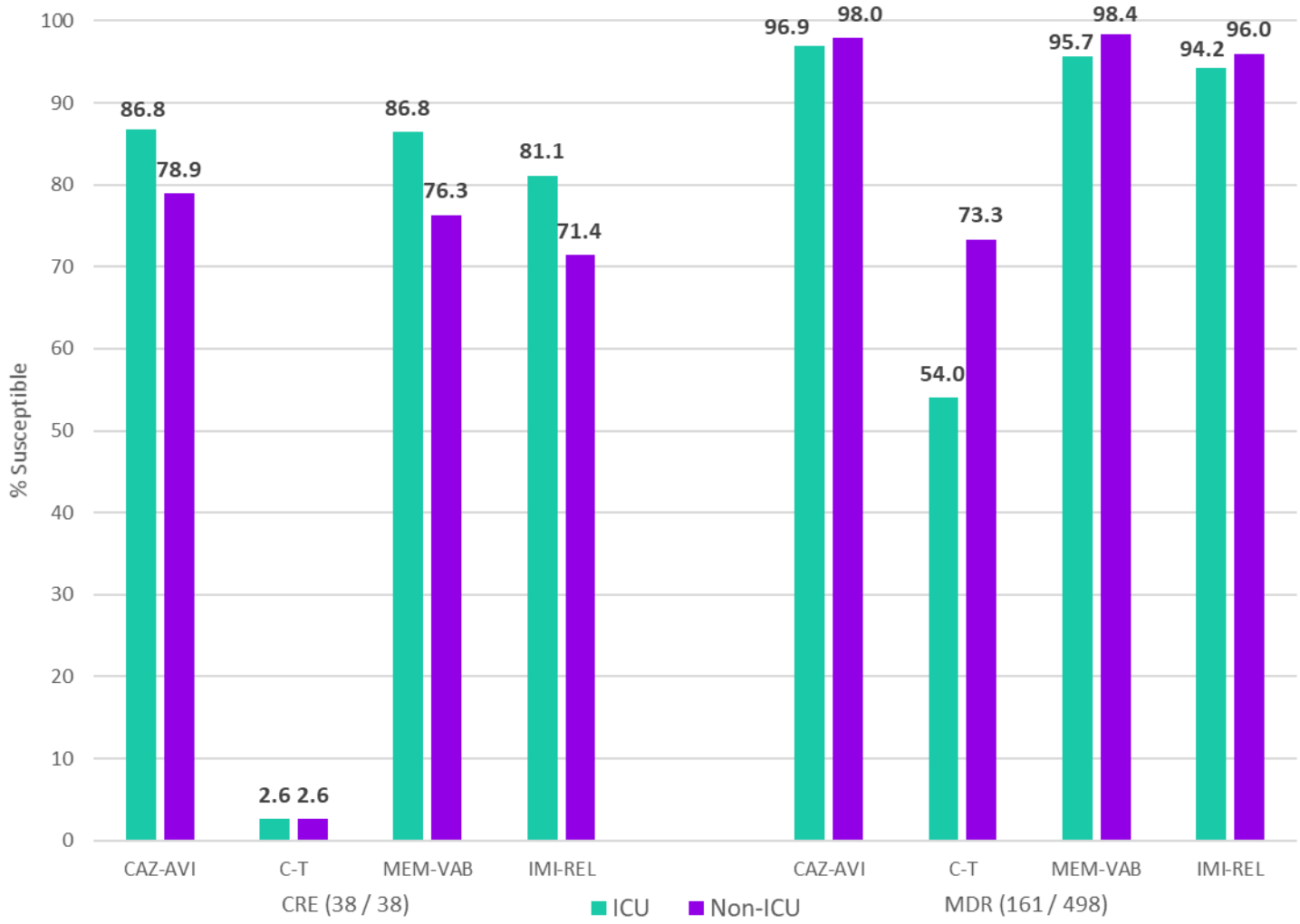
Abbreviations: CAZ-AVI, ceftazidime-avibactam; C-T, ceftolozane-tazobactam; MEM-VAB, meropenem-vaborbactam; IMI-REL, imipenem-relebactam; PIP-TAZ, piperacillin-tazobactam; CRO, ceftriaxone; MEM, meropenem; IMI, imipenem; LEV, levofloxacin; GEN, gentamicin; AMK, amikacin.

Results

- Gentamicin and amikacin exhibited similar activity against ICU and non-ICU isolates.
- Levofloxacin was slightly more active against ICU (85.3%S) than non-ICU (83.2%S) isolates.
- The occurrence of CRE, MDR, and XDR phenotypes were higher among ICU compared to non-ICU isolates.

Phenotype	ICU	Non-ICU
CRE	2.6%	0.7%
MDR	11.2%	8.5%
XDR	1.4%	0.5%

Figure 2. Activity of the 4 BLICs against CRE and MDR isolates



Abbreviations: CAZ-AVI, ceftazidime-avibactam; C-T, ceftolozane-tazobactam; MEM-VAB, meropenem-vaborbactam; IMI-REL, imipenem-relebactam; PIP-TAZ, piperacillin-tazobactam; CRE, carbapenem-resistant Enterobacterales; MDR, multidrug-resistant (non-susceptible to ≥1 agent in ≥3 classes); XDR, extensively drug-resistant (susceptible to ≤2 classes).

Conclusions

- The novel β-lactamase inhibitor combinations, especially CAZ-AVI, MEM-VAB, and IMI-REL, represent valuable new therapeutic options for the treatment of infections caused by antimicrobial-resistant *Enterobacterales*.
- Resistance rates to β-lactams were generally higher among ICU compared to non-ICU isolates.
- Variations in susceptibility rates may reflect the differences in the frequencies of infection types between ICU and non-ICU patients.