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Bloodstream Infections in European Hospitals: Aetiology and Antimicrobial Susceptibility Results from the SENTRY Antimicrobial Surveillance Program (2021–2022)

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Introduction

- The SENTRY Antimicrobial Surveillance Program monitors the frequency and antimicrobial susceptibility of bacteria causing bloodstream (BSI) and other infections in medical centres worldwide since 1997.
- This study evaluated the results for BSI in European medical centres.

Materials and Methods

- A total of 7,189 organisms were consecutively collected (1/patient) in 2021–2022 from 26 medical centres located in Western Europe (W-EU; n=5,465; 10 countries: Belgium, France, Germany, Ireland, Italy, Portugal, Spain, Sweden, Switzerland, and the United Kingdom) and 14 centres in the Eastern Europe/Mediterranean region (E-EU; n=1,724; 9 countries: Czech Republic, Greece, Hungary, Israel, Poland, Romania, Slovakia, Slovenia, and Turkey).
- Organisms were susceptibility tested at a monitoring laboratory by reference broth microdilution.
- EUCAST breakpoints were applied.
- Carbapenem-resistant Enterobacterales (CRE) isolates were subjected to whole genome sequencing (WGS).

Results

- *Escherichia coli*, *Staphylococcus aureus*, and *Klebsiella pneumoniae* represented the top 3 organisms in W-EU and E-EU and accounted for 52.6% and 48.3% of the collection, respectively (Figure 1).
- Gram-negative bacilli (GNB) represented 58.8% of organisms in W-EU and 67.3% in E-EU, and non-fermentative GNB accounted for 7.5% of organisms in W-EU and 16.6% in E-EU.
- Susceptibilities to ceftriaxone and levofloxacin among *E. coli* were lower in E-EU (77.0% and 68.3%, respectively) than W-EU (84.4% and 77.3%, respectively).
- Among *K. pneumoniae*, susceptibility to ceftriaxone and meropenem (Figure 2) were 68.8% and 91.2% in W-EU and only 39.4% and 74.3% in E-EU, respectively.
- CRE phenotypes were markedly higher in E-EU (9.1%) compared to W-EU (1.8%; Figure 2).
- Ceftazidime-avibactam and meropenem-vaborbactam retained good activity against Enterobacterales, with susceptibility rates of 99.7% and 99.7% in W-EU and 96.8% and 94.3% in E-EU, respectively; however, high resistance rates were observed among CRE, especially in E-EU (Figure 3).
- *P. aeruginosa* susceptibility to ceftazidime-avibactam and ceftolozane-tazobactam were 98.2% for both in W-EU and 87.4% and 84.1% in E-EU, respectively (Figure 4).
- Vancomycin resistance was markedly higher among *Enterococcus faecalis* and *E. faecium* in E-EU than W-EU (Figure 5).
- KPC was the most common carbapenemase type among CRE isolates in W-EU (76.0% of CREs), whereas OXA-48 type (34.2%) and MBL (32.9%) predominated in E-EU (Figure 6).

Conclusions

- Frequency and susceptibility rates varied considerably between W-EU and E-EU.
- Resistance rates among GNB were markedly higher in E-EU compared to W-EU.
- Increased resistance to newer β-lactamase inhibitor combinations among CRE and *P. aeruginosa* from E-EU countries is of great concern.
- Increased resistance to newer β-lactamase inhibitor combinations among CRE and *P. aeruginosa* is of great concern.

Figure 1. Frequencies of organisms isolated from patients hospitalised with bloodstream infection in Western Europe (W-EU) and Eastern Europe (E-EU; 2021–2022)

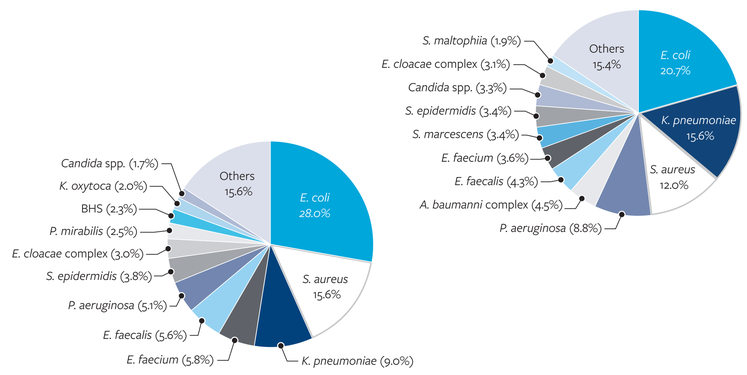
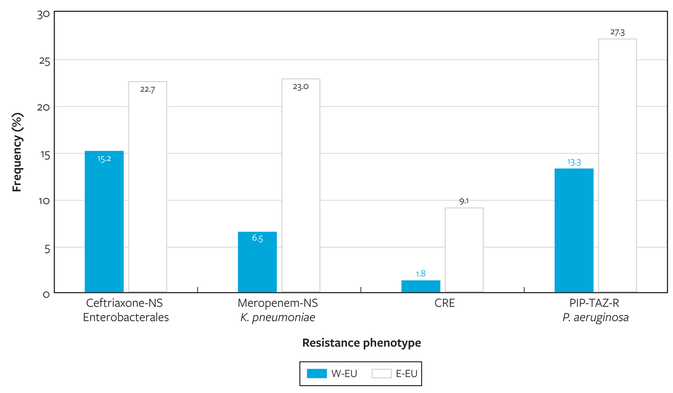
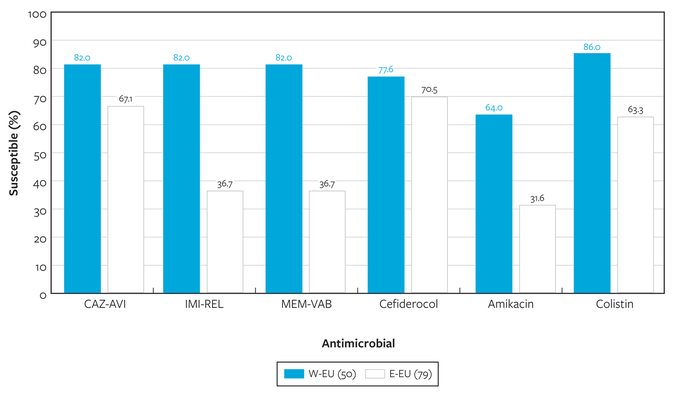


Figure 2. Prevalence of selected resistance phenotypes among Gram-negative organisms



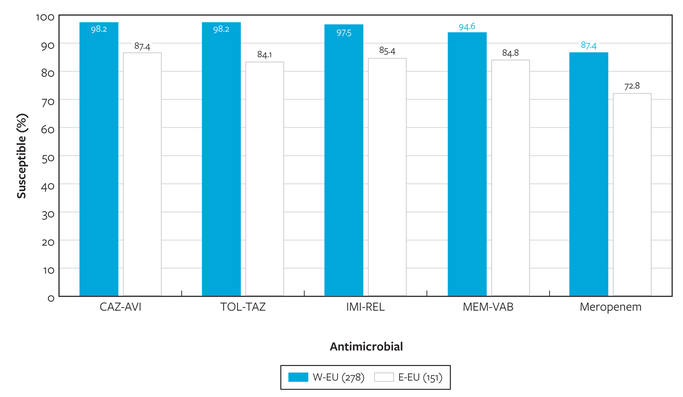
Abbreviations: W-EU, Western Europe; E-EU, Eastern Europe; NS, nonsusceptible; CRE, carbapenem-resistant Enterobacterales; PIP-TAZ, piperacillin-tazobactam; R, resistant.

Figure 3. Antimicrobial susceptibility of carbapenem-resistant Enterobacterales stratified by European region (2021–2022)



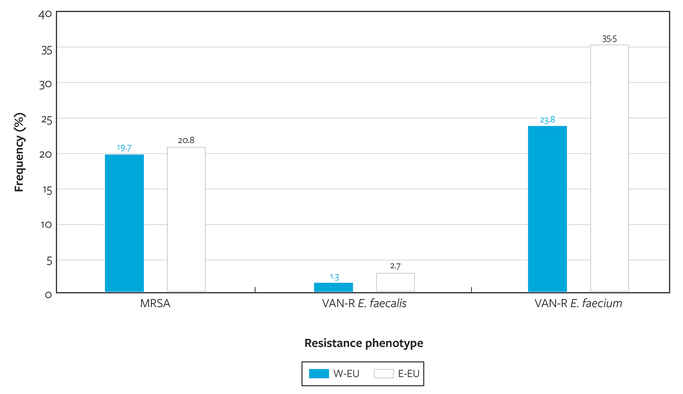
Abbreviation: W-EU, Western Europe; E-EU, Eastern Europe; CAZ-AVI, ceftazidime-avibactam; IMI-REL, imipenem-relebactam; MEM-VAB, meropenem-vaborbactam.

Figure 4. Antimicrobial susceptibility of *P. aeruginosa* stratified by region (2021–2022)



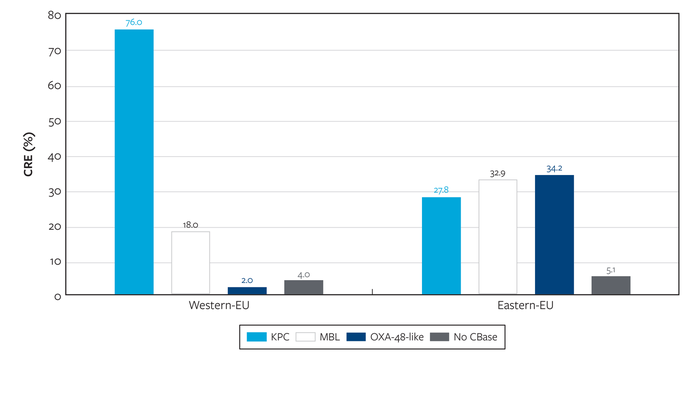
Abbreviations: CAZ-AVI, ceftazidime-avibactam; TOL-TAZ, ceftolozane-tazobactam; IMI-REL, imipenem-relebactam; MEM-VAB, meropenem-vaborbactam; W-EU, Western Europe; E-EU, Eastern Europe.

Figure 5. Prevalence of selected resistance phenotypes among Gram-positive organisms



Abbreviations: W-EU, Western Europe; E-EU, Eastern Europe; MRSA, methicillin-resistant *S. aureus*; VAN-R, vancomycin resistant.

Figure 6. Frequency of carbapenemase types among carbapenem-resistant Enterobacterales (CRE) stratified by region (2021–2022)



Abbreviations: KPC, *Klebsiella pneumoniae* carbapenemase; MBL, metallo-β-lactamase; OXA, oxacillinase; EU, Europe.

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