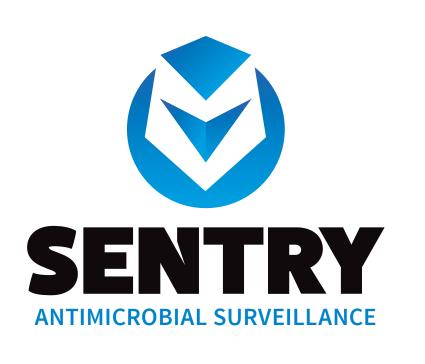
IDWeek 2020 Poster #

Frequency of Occurrence and Antimicrobial Susceptibility of Bacteria Isolated from Patients Hospitalized with Bacterial Pneumonia in the United States, Western Europe, and Eastern Europe: Results from the SENTRY Program (2016–2019)

Antimicrobial agent

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Introduction

- The SENTRY Antimicrobial Surveillance Program (SENTRY) monitors the frequency of occurrence and antimicrobial susceptibility of organisms from various infection types worldwide.
- Pneumonia is the second most common infection in hospitalized patients, and it is associated with significant morbidity and mortality.
- The initial antimicrobial management of patients with pneumonia mainly is driven by the understanding of causative pathogens; there are very limited data available on the frequency and antimicrobial susceptibility of organisms causing
- In the SENTRY Program, bacterial isolates are consecutively collected (1 per infection episode) according to the infection type and sent to a central monitoring laboratory (JMI Laboratories, North Liberty, Iowa, USA) where they are tested for susceptibility by reference broth microdilution methods against many antimicrobial agents currently available for clinical use.
- We evaluated the frequency and antimicrobial susceptibility patterns of pathogens collected by the SENTRY Program from patients hospitalized with bacterial pneumonia in 2016–2019.

Materials and Methods

Organism collection

- A total of 28,918 bacterial isolates were collected (1/patient) in 2016–2019 from 121 medical centers located in:
- United States (US; n=17,770; 82 centers).
- Western Europe (W-EU; n=7,966; 25 centers from 10 nations).
- Eastern Europe (E-EU; n=3,182; 14 centers from 11 nations).
- Each participating center was asked to collect consecutive bacterial isolates from lower respiratory tract specimens determined to be significant by local criteria as the reported probable cause of pneumonia.
- Qualified sputum samples and isolates from invasive sampling (transtracheal aspiration, bronchoalveolar lavage, protected brush samples, etc.) were
- Carbapenem-resistant Enterobacterales (CRE) was defined as any isolate displaying MIC values of >2 mg/L for meropenem, imipenem (not applied for Proteus mirabilis or indole-positive Proteeae), and/or doripenem.

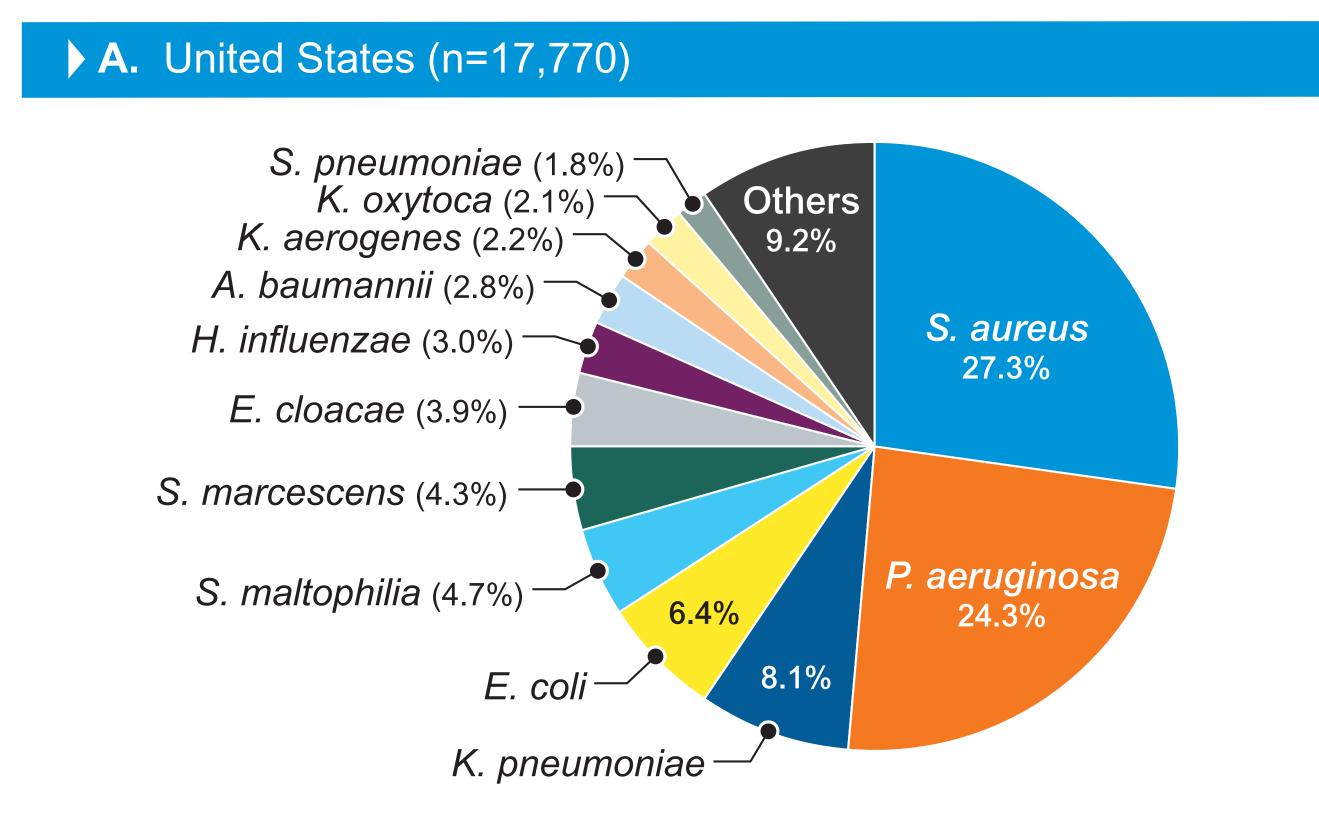
Susceptibility methods

- Organisms were tested for susceptibility by reference broth microdilution methods in a central laboratory.
- MIC panels were prepared at JMI Laboratories and broth microdilution tests were conducted according to the current Clinical and Laboratory Standards Institute (CLSI) documents.
- Susceptibility percentages and quality control results validation were based on the EUCAST (2020) and CLSI (M100; 2020) documents.

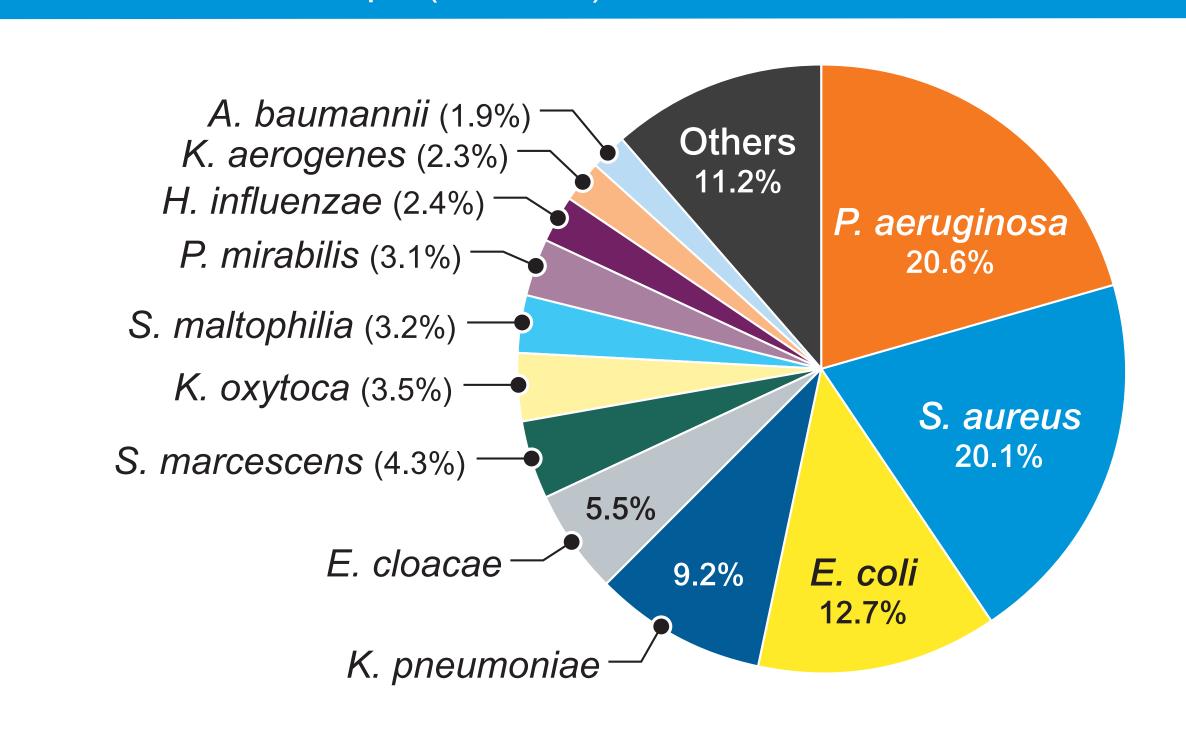
Results

- Gram-negative bacilli (GNB) represented 69.1%, 76.3%, and 88.6% of organisms; non-fermentative (NF) GNB represented 34.6%, 26.9%, and 51.8% of organisms in US, W-EU, and E-EU, respectively (Figures 1 and 2).
- High prevalence of NF-GNB was observed: P. aeruginosa ranked first in W-EU and E-EU and second in the US, A. baumannii ranked third in E-EU, and S. maltophilia was among the top 8 in all 3 regions (fifth in the US; Figure 1).
- P. aeruginosa susceptibility to piperacillin-tazobactam and meropenem was 76.1% and 74.8% in the US, 75.4% and 76.9% in W-EU, and 57.4% and 48.3% in E-EU, respectively (Table 1 and Figure 3).
- Overall MRSA rates were 43.7% in US, 21.4% in W-EU, and 28.7% in E-EU (Table 1 and Figure 3).
- MRSA rates decreased from 44.8% in 2016 to 40.2% in 2019 (p<0.05) in the US and from 29.3% in 2016 to 16.1% in 2019 in W-EU; in E-EU, MRSA rates increased from 32.8% in 2016 to 38.6% in 2019 (Table 2).
- CRE rates decreased continuously in the US from 3.0% in 2016 to 1.7% in 2019 (p<0.05; 2.4% overall) and were higher in E-EU (16.6%) than W-EU (2.2%; Table 2 and Figure 4).

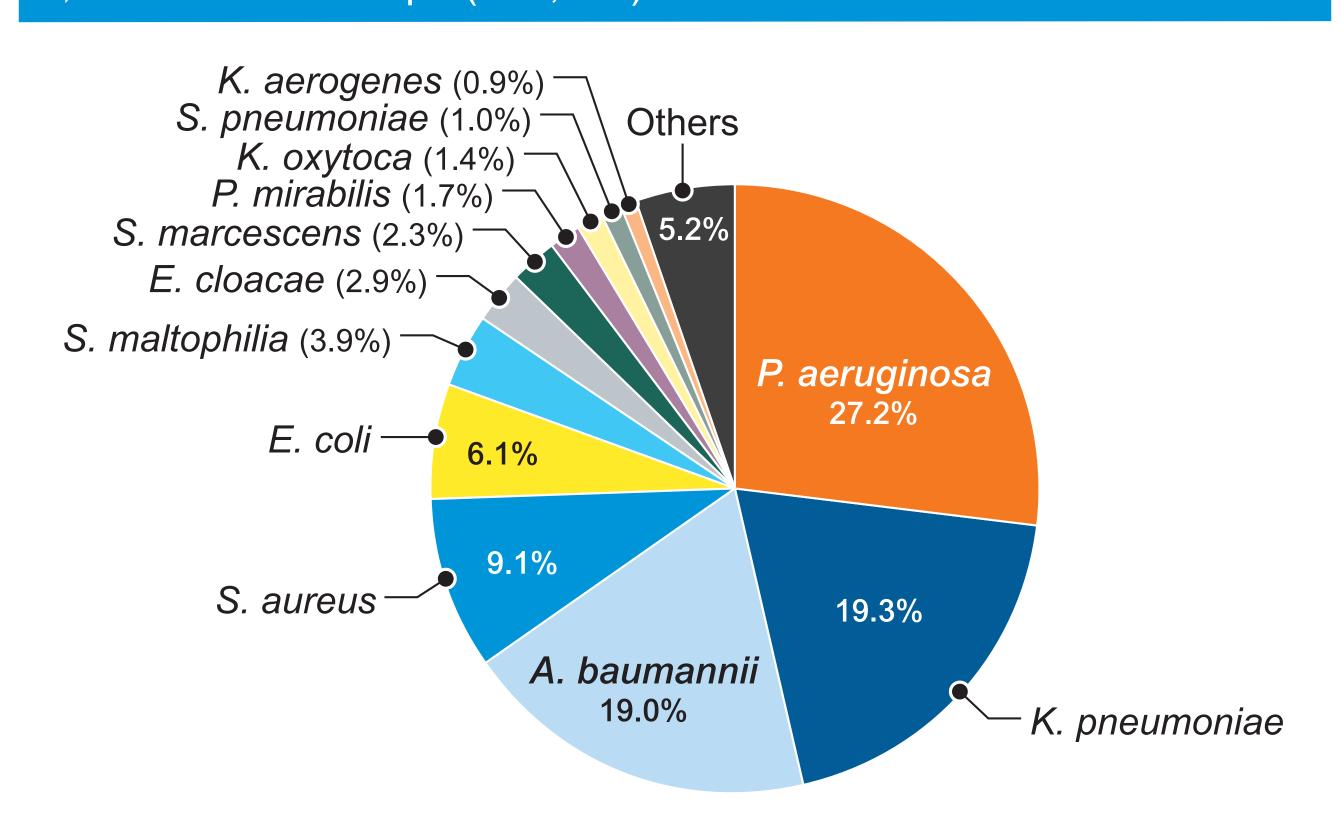
Figure 1. Frequency of occurrence of organisms isolated from patients hospitalized with pneumonia stratified by geographic region (2016-2019)







C. Eastern Europe (n=3,182)

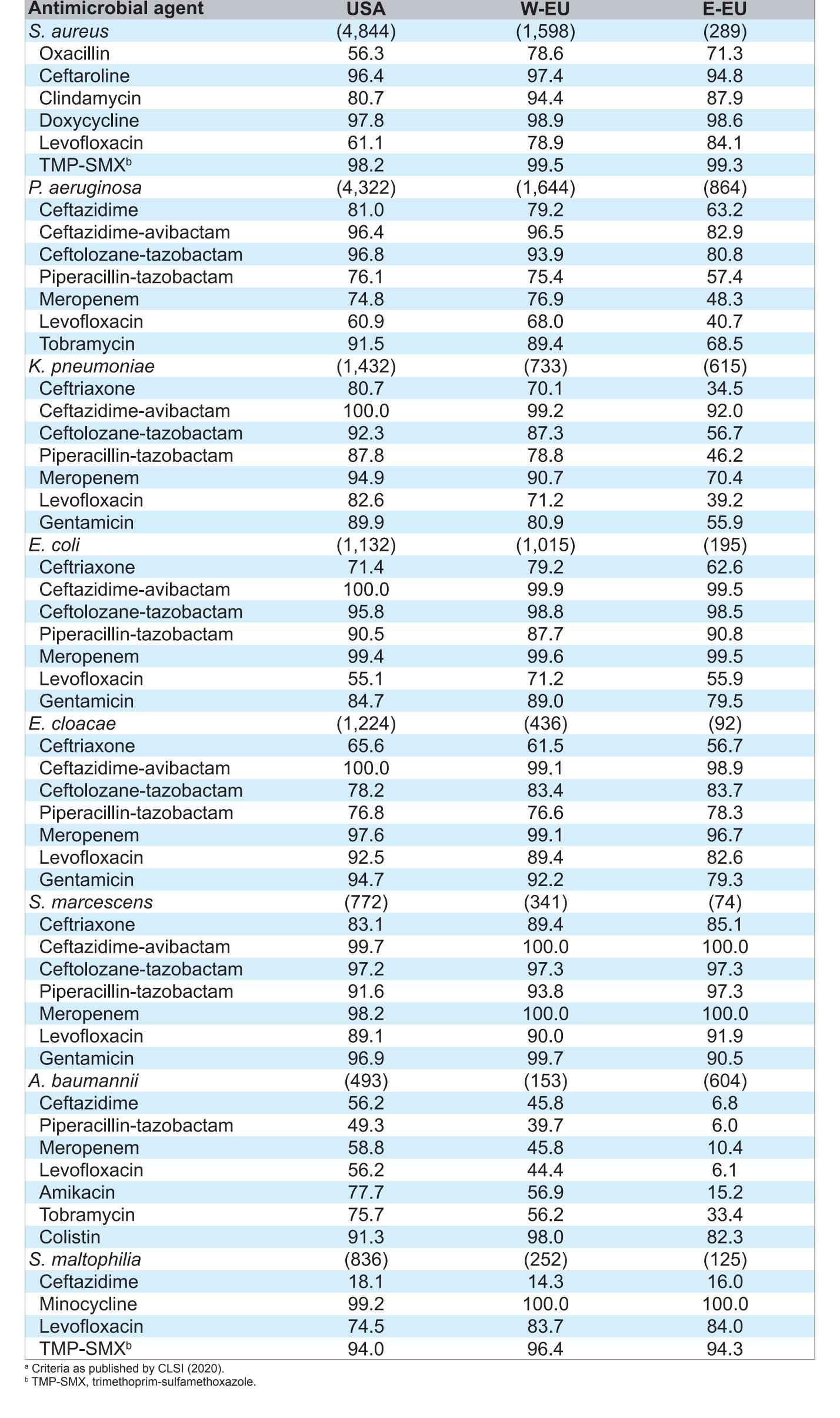


- Among *K. pneumoniae*, susceptibility to ceftriaxone and meropenem was 80.7% and 94.9% in the US, 70.1% and 90.7% in W-EU, and 34.5% and 70.4% in E-EU, respectively (Table 1 and Figure 4).
- Among E. coli, susceptibility to ceftriaxone and levofloxacin was 71.4% and 55.0% in the US, 79.2% and 71.2% in W-EU, and 62.6% and 55.9% in E-EU, respectively (Table 1 and Figure 4).
- Only 10.4% of *A. baumannii* isolates from E-EU were MEM-susceptible compared to 45.8% in W-EU and 58.8% in the US (Table 1 and Figure 5).

Table 1. Antimicrobial susceptibility of main organisms isolated from patients hospitalized with pneumonia from United States (USA), Western Europe (W-EU), and Eastern Europe (E-EU)

USA

% Susceptible by geographic region (no. of isolates)^a



Conclusions

- Rank order and antimicrobial susceptibility of bacteria isolated from patients hospitalized with pneumonia varied widely by geographic region.
- P. aeruginosa and S. aureus combined represented 51.6% and 40.7% of organisms isolated from patients with pneumonia in US and W-EU, respectively, and were the most common pathogens in these regions.
- Multidrug-resistant NF-GNB, such as *P. aeruginosa, A. baumannii,* and S. maltophilia, represented an important cause of pneumonia in US and Europe.
- The occurrence of some key resistance phenotypes increased in some regions and decreased in other regions over the 4 years of the investigation.

Figure 2. Frequency of Gram-negative and Gram-positive organisms isolated from patients hospitalized with pneumonia stratified by geographic region (2016–2019)

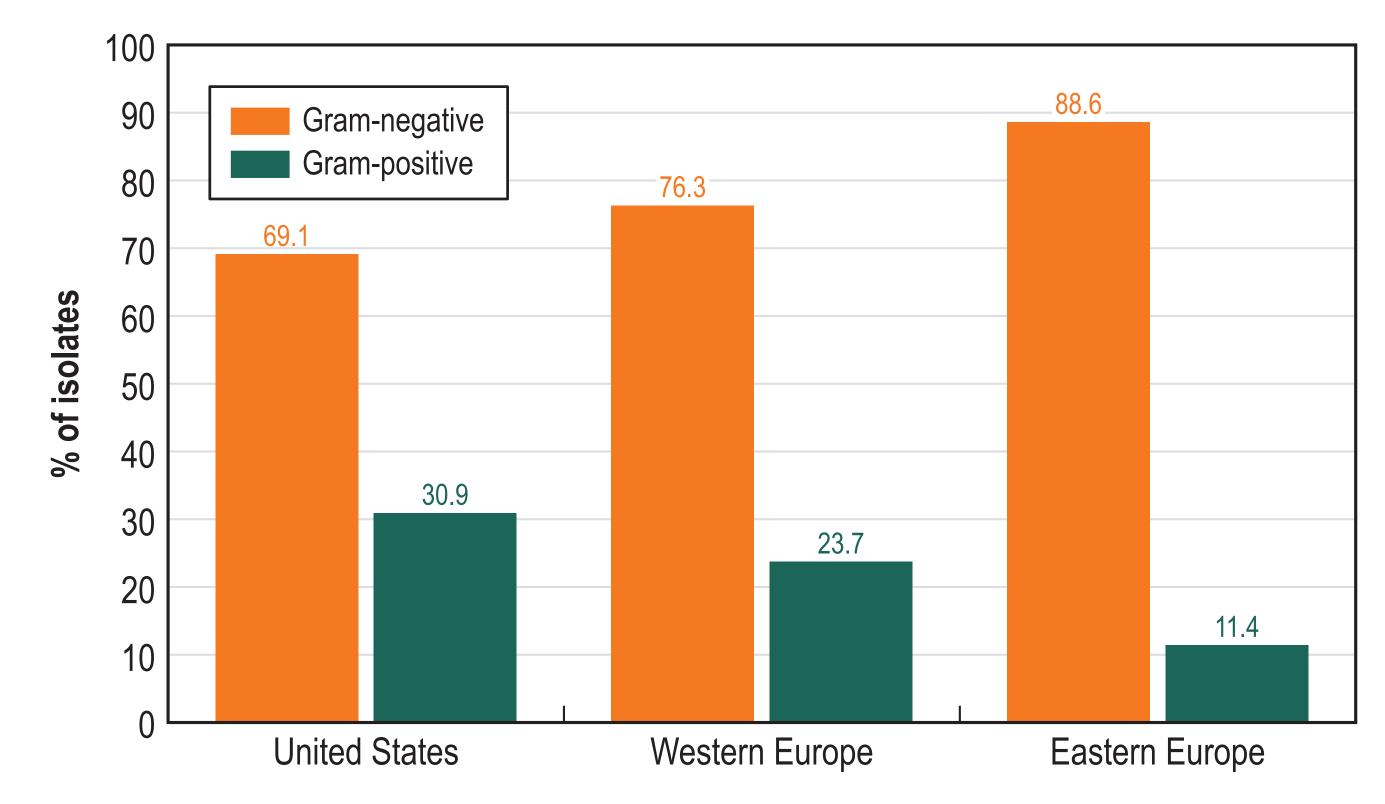


Figure 4. Frequency of meropenem-nonsusceptible K. pneumoniae (MEM-NS KPN), ceftriaxone-nonsusceptible *E. coli* (CRO-NS EC), and carbapenem-resistant Enterobacterales (CRE) isolated from patients hospitalized with pneumonia stratified by geographic region (2016-2019)

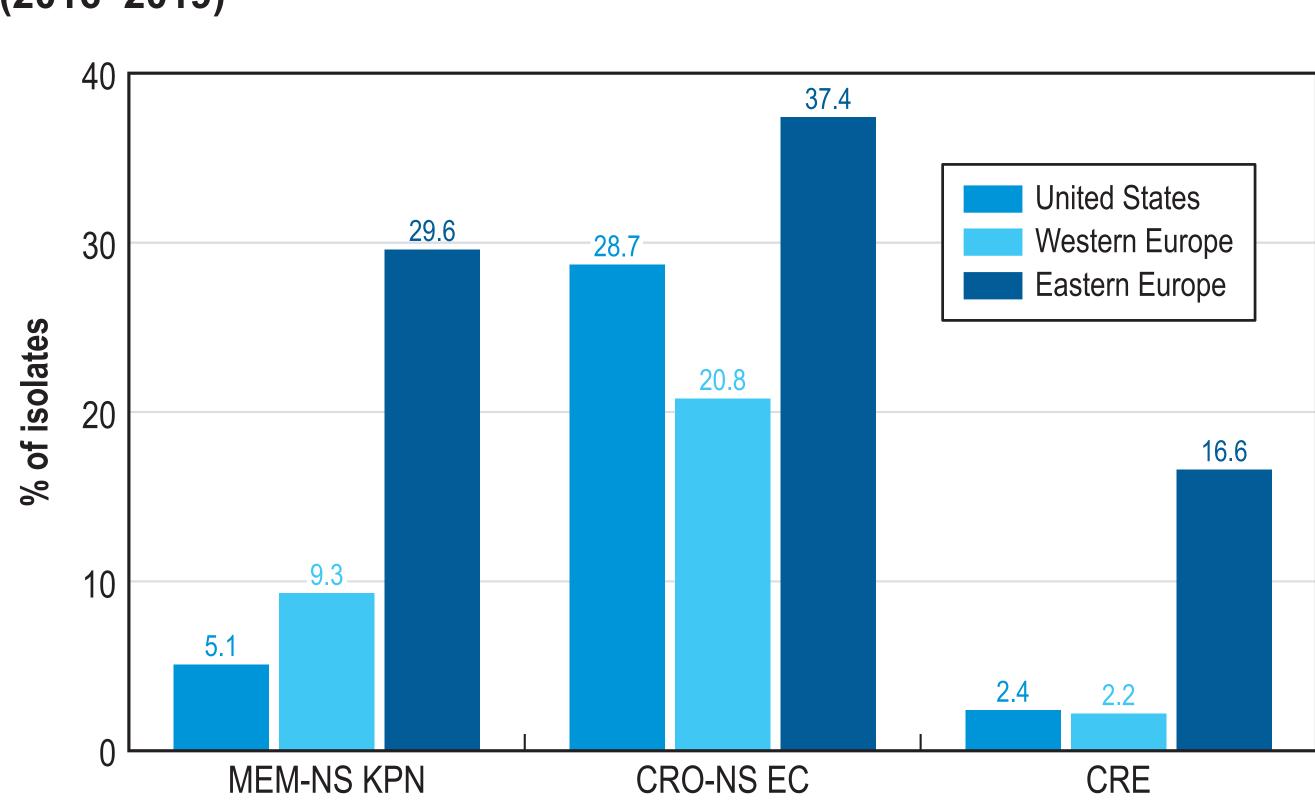


Table 2. Frequency of key resistance phenotypes stratified by year

Resistance phenotype /	Year			
Region	2016	2017	2018	2019
MRSA				
USA	44.8	44.5	42.9	40.1
W-EU	29.2	20.8	19.7	16.1
E-EU	32.8	23.5	17.5	38.6
PIP-TAZ-NS P. aeruginosa				
USA	23.8	25.2	24.8	21.1
W-EU	28.8	24.1	22.9	22.2
E-EU	39.6	40.2	44.5	47.2
MEM-NS A. baumannii				
USA	45.4	46.3	35.8	29.6
W-EU	65.3	74.2	45.2	29.0
E-EU	93.1	86.3	84.2	93.0
CRE				
USA	3.0	2.5	1.8	1.7
W-EU	4.0	1.8	2.0	1.4
E-EU	10.5	15.8	17.2	23.6

Abbreviations: MRSA, methicillin-resistant *S. aureus*; W-EU, Western Europe; E-EU, Eastern Europe; PIP-TAZ, piperacillin-tazobactam; NS. nonsusceptible: MEM. meropenem: CRE. carbapenem-resistant *Enterobacterales*

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Figure 3. Frequency of methicillin-resistant *S. aureus* (MRSA), piperacillin-tazobactam-nonsusceptible P. aeruginosa (PIP-TAZ-NS PSA), and meropenem-nonsusceptible *P. aeruginosa* (MEM-NS PSA) isolated from patients hospitalized with pneumonia stratified by geographic region (2016–2019)

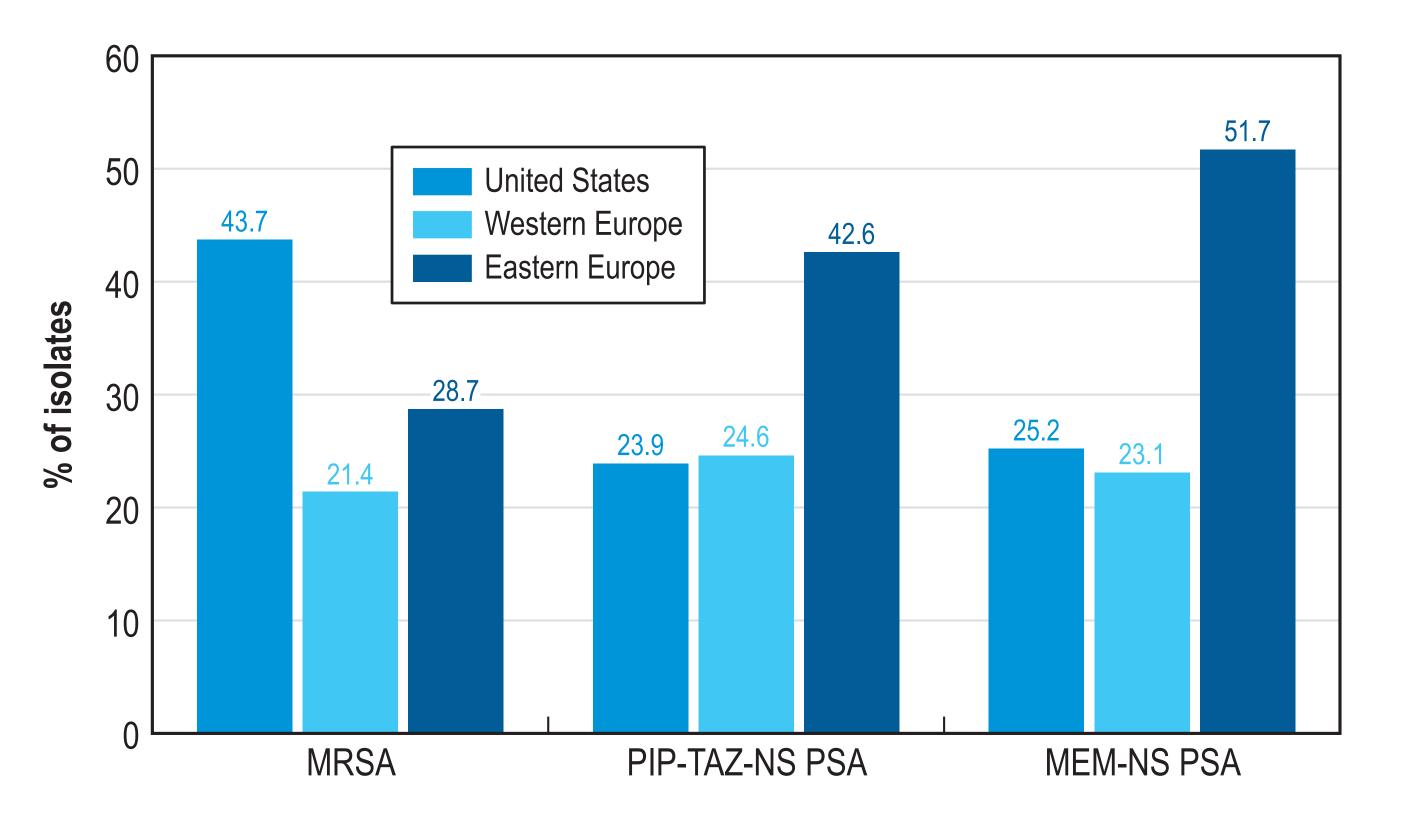
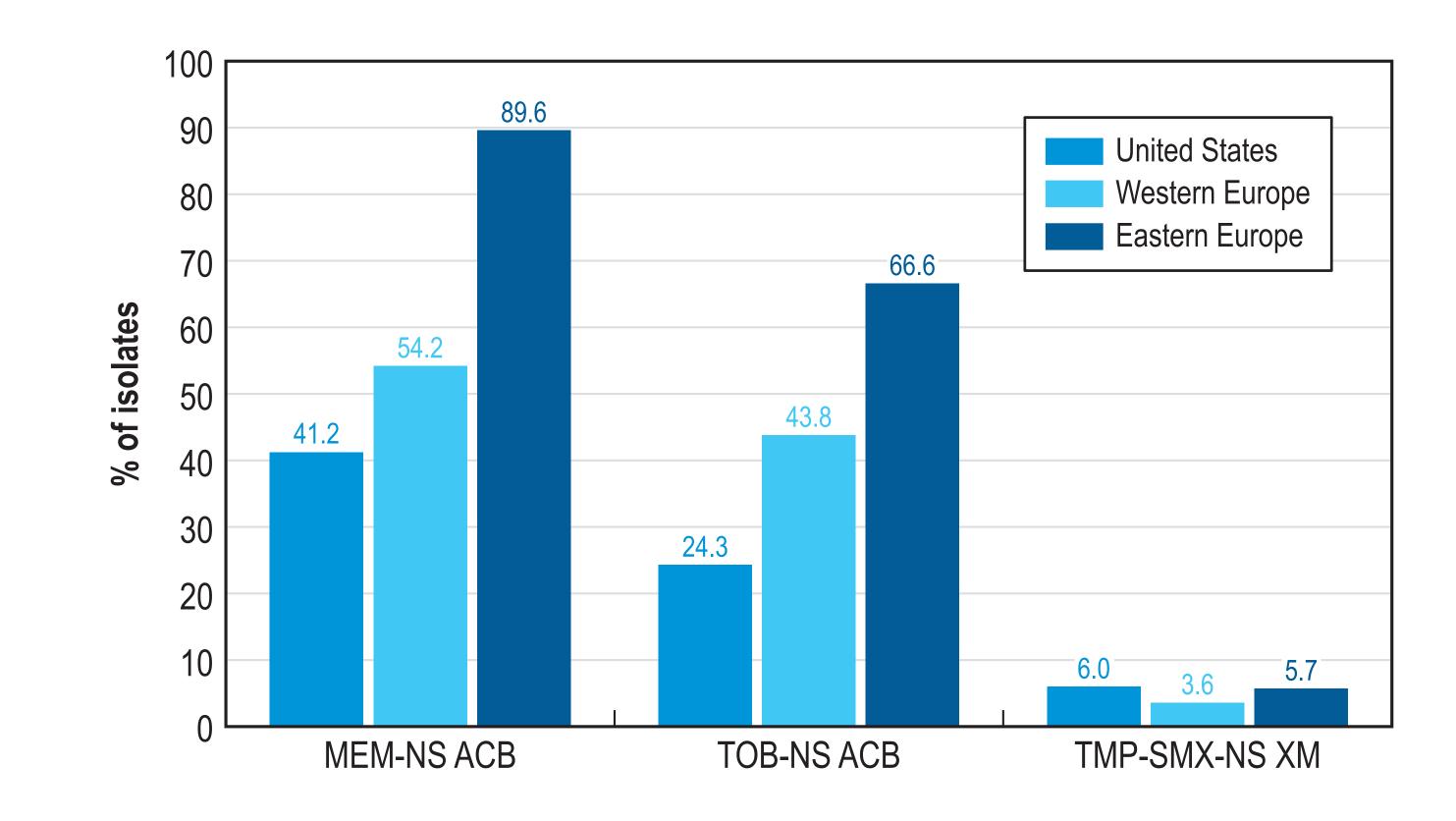


Figure 5. Frequency of meropenem-nonsusceptible A. baumannii (MEM-NS ACB), tobramycin-nonsusceptible A. baumannii (TOB-NS ACB), and trimethoprim-sulfamethoxazole-nonsusceptible S. maltophilia (TKP-SMX-NS XM)



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