The ongoing problem of antibiotic resistance, including multidrug resistance, is a global health issue. In order to determine the extent of the problem and to identify changes in the resistance patterns of global, regional, and local pathogens, worldwide antibiotic surveillance programs are essential. The Antimicrobial Testing Leadership and Surveillance (ATLAS) program has provided reliable, global, regional, and local in vitro susceptibility data, including mechanisms of resistance, since 2004. It is important to monitor the emergence of new species and new resistance mechanisms over time, in this analysis we present a longitudinal analysis of resistance to commonly prescribed antimicrobials for isolates collected globally for ATLAS 2012-2018.

Methods

A total of 251,837 gram-negative and 132,363 gram-positive non-duplicate, clinical isolates were collected from multiple infection sources from 743 unique sites in 74 countries during 2012-2018 in the ATLAS program. Isolate inclusion was independent of medical history, antimicrobial use, age, or gender. Organism identification was confirmed by MALDI-TOF mass spectrometry, and susceptibility testing was performed by broth microdilution following CLSI guidelines at a central laboratory performed by broth microdilution following CLSI guidelines at a central laboratory 

• Enterobacterales (185,287)
• Staphylococcus spp. (19,640)
• Moraxella spp., HACEK spp., and others (27,820)
• Acinetobacter spp. (13,505)
• P. aeruginosa (3,324)
• S. aureus, methicillin-resistant S. aureus (MRSA) (46,470)
• Listeria monocytogenes (2,927)
• Enterococcus spp., vancomycin-resistant Enterococcus (VRE) (2,106)
• Haemophilus influenzae (1,486)
• Enterococcus faecalis (677)
• Streptococcus pyogenes (387)

Antibiotic classes tested:

• β-lactams: penicillins, cephalosporins, carbapenems, β-lactamase inhibitor combinations
• Glycopeptides
• Polymyxins
• Aminoglycosides
• Fluoroquinolones
• Macrolides
• Tetracyclines
• Rifamycins
• Other

Infection types:

• Lower respiratory tract infections
• Urinary tract infections
• Skin and skin structure infections
• Central nervous system infections
• Bloodstream infections
• Gastrointestinal infections
• Other

Antimicrobials for isolates collected globally:

• Beta-lactams (penicillins, 3rd generation cephalosporins, monobactams, carbapenems, β-lactamase inhibitor combinations)
• Glycopeptides
• Polymyxins
• Aminoglycosides

Overall, the human pathogen Enterobacterales is the most frequent isolation site in all groups (Fig. 1). To further explore the data, we analyzed the proportion of isolates of the Enterobacterales (Fig. 2) and compared the results using the appropriate ATCC control criteria [2].

Results Summary

• The proportion of Enterobacterales isolates resistant to commonly used antimicrobials has fluctuated over the seven years compared in this analysis, with significant increases in resistance for amikacin (3.0% to 3.6%), cefepime (18.9% to 24.4%) ceftriaxone-avibactam (0.5% to 2.2%), and meropenem (2.7% to 5.7%), and a significant decrease in resistance to tigecycline (5.9% to 2.7%) between 2012-2018 (Chi-square with Yates' correction, p<0.0001) (Fig. 4).

• Piperacillin-tazobactam showed no significant change in resistance over seven years of study.

Conclusions

This longitudinal analysis of seven years of global surveillance confirms rising rates of antibiotic resistance to commonly used antibiotics. Continued monitoring is essential to understand the scope of this global public health issue, and to aid in the development of new strategies and treatments for these key pathogens.

References


2. FDA breakpoints were applied to Enterobacterales strains (EMIC and ICIC). For Enterobacterales, the susceptibility breakpoint was >99.9% resistant. For Enterococcus faecalis, the susceptibility breakpoint was >99.9% resistant. To test sensitivity, the following susceptibility breakpoints were used: Ciprofloxacin MIC >2 µg/mL; vancomycin MIC >8 µg/mL; tigecycline MIC >4 µg/mL.

Disclosures

This study was sponsored by Pfizer. Antimicrobials rights to use characterized in the references which were acquired by Pfizer in December 2016. IHMA received financial support from Pfizer in connection with the study and the development of this poster. MH, SB and DS are employees of IHMA. MD is an employee of Pfizer.

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