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Streptococcus Pneumoniae Susceptibility from 1995-2000: Results of the Antimicrobial Resistance Management (ARM) Program

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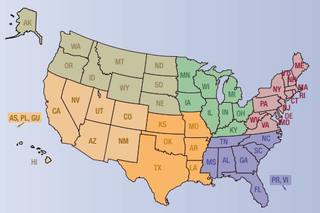
What is the Antimicrobial Resistance Management (ARM) Program?

PURPOSE

- The Antimicrobial Resistance Management (ARM) Program is an ongoing study to document trends in antimicrobial susceptibility patterns in inpatient and outpatient isolates and to identify relationships between antibiotic use and resistance rates
- Hospitals can delineate if and when antimicrobial resistance occurs
  - Allows strategic intervention
  - Provides data for local, regional, national benchmarks
  - Has potential to reduce costs of antibiotics associated with inappropriate use
- A total of 115 hospitals have enrolled to date
  - 85 (74%) nonteaching
  - 30 (26%) teaching
- For the purposes of comparison, US hospitals are grouped in 6 geographic regions (see map, below)



- The number of hospitals included from each region is as follows:
  - North Central: 18 (16%)
  - Northeast: 27 (23%)
  - South Central: 9 (8%)
  - Southeast: 56 (49%)
  - Southwest: 5 (4%)

DATA COLLECTION

- Each hospital provides a minimum of 3 years of antibiogram or sensitivity report data
- Individual antibiotics and organisms are captured in the database
  - 46 antibiotics
  - 19 organisms
- A Web-based analysis tool allows comparisons between antibiotic use and resistance rates for any number of parameters
  - One year with another year
  - Groups of years to other groups of years
    - Hospital to hospital
    - Hospital to hospital system
    - Hospital to state
    - Within a state
    - Hospital to region
    - Hospital to national
    - State to state
    - State to region
    - State to national
    - Region to national

Abstract

RATIONALE: *S pneumoniae* is the leading cause of community-acquired pneumonia and pneumococcal bacteremia. The ongoing ARM program, which has collected data on 19 organisms and 46 antibiotics, was developed to document susceptibility patterns, including for *S pneumoniae*, in both inpatient and outpatient isolates within the US. ***METHODS:*** Antibiograms and sensitivity reports of pneumococcal isolates collected between 1995 and 2000 were reviewed for resistance. A Web-based analysis tool was used to compare susceptibility of *S pneumoniae* to cefotaxime and ceftriaxone, historically regarded as therapeutically equivalent. ***RESULTS:*** Nationally, cefotaxime susceptibility was found to be 70.6% (n=3165) and ceftriaxone susceptibility, 80.8% (n=15,916). This difference was largely accounted for by isolates submitted during 1995-1998, specifically in the South East:

	Percentage of Susceptible Isolates	
	Cefotaxime	Ceftriaxone
South East	61.8% (n=1850)	77.7% (n=11,124)
North Central	78.5% (n=647)	85.9% (n=2458)
South Central	85.7% (n=379)	88.4% (n=372)
North East	89.6% (n=289)	90.5% (n=1662)

CONCLUSIONS: These data suggest that for *S pneumoniae*, cefotaxime and ceftriaxone may not be therapeutically equivalent. This information may be clinically important, given the new recommended breakpoints for these two third-generation cephalosporins.

Rationale

- *S pneumoniae* is the leading cause of community-acquired pneumonia and pneumococcal bacteremia and the primary cause of death from infectious diseases[1]
- Over the past decade, antimicrobial resistance has been increasing in frequency, including among *S pneumoniae* isolates
- Isolates nonsusceptible to the fluoroquinolone levofloxacin have also been found to have reduced susceptibility to other antimicrobials used to treat pneumonia, including cefotaxime
- Cefotaxime and ceftriaxone have historically been regarded as therapeutically equivalent for the empiric treatment of adults with community-acquired pneumonia, especially if drug-resistant *S pneumoniae* (DRSP) is suspected

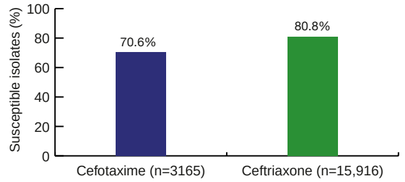
Methods

- Antibiograms and sensitivity reports of pneumococcal isolates in the ARM database were reviewed for susceptibility to cefotaxime or ceftriaxone
- National and regional susceptibility rates for 1995-2000 were compared using a Web-based analysis tool

Results

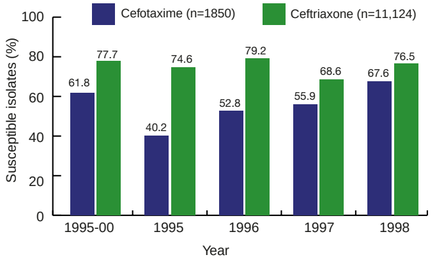
- Nationally, pneumococcal isolates were found to be less susceptible to cefotaxime than to ceftriaxone (Figure 1)

Figure 1. **S pneumoniae** ***susceptibility to cefotaxime and ceftriaxone, 1995-2000***



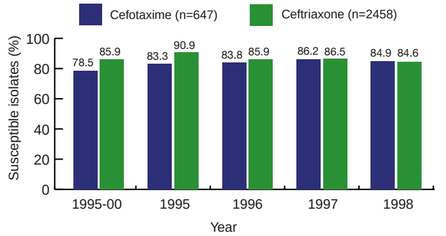
- The national difference was mirrored by isolates submitted during 1995-1998, primarily in the Southeast (Figure 2)

Figure 2. **S pneumoniae** ***susceptibility to cefotaxime and ceftriaxone in the Southeast, 1995-1998***



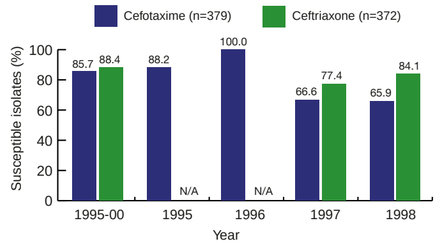
- Differences between the two third-generation cephalosporins were also noted in the North Central region from 1995-1998; this was primarily accounted for by data on isolates collected in 1995 (Figure 3)

Figure 3. **S pneumoniae** ***susceptibility to cefotaxime and ceftriaxone in the North Central region, 1995-1998***



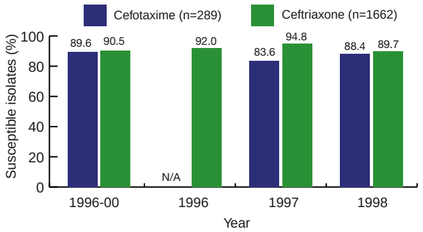
- Overall, fewer differences were seen between the agents in the South Central region for 1995-1998; however, isolates were less susceptible to cefotaxime than ceftriaxone in 1997 and 1998, years for which data were available for both agents (Figure 4)

Figure 4. **S pneumoniae** ***susceptibility to cefotaxime and ceftriaxone in the South Central region, 1995-1998***



- In the Northeast, similar susceptibility was seen between the two agents for 1995-1998; however, a marked difference was noted for 1997 (Figure 5)

Figure 5. **S pneumoniae** ***susceptibility to cefotaxime and ceftriaxone in the Northeast, 1996*-1998***



*Data not available for 1995

Conclusions

- Differences seen in *S pneumoniae* isolate susceptibility to cefotaxime and ceftriaxone suggest these two third-generation cephalosporins may not be therapeutically equivalent, which has implications given new recommended breakpoints
- These data suggest that ceftriaxone may offer greater coverage for community-acquired pneumonia, especially in patients with suspected drug-resistant *S pneumoniae*

References

1. Guidelines for the management of adults with community-acquired pneumoniae. Diagnosis, assessment of severity, antimicrobial therapy, and prevention. *Am J Respir Crit Care Med*. 2001;163:1730-1754.

Acknowledgments

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