Introduction

In vitro studies of antimicrobial resistance among clinically significant anaerobes are important international tools for making clinical decisions in choosing empiric antimicrobial therapy. Routine susceptibility testing of anaerobes is rarely performed today and is highly dependent upon culture source, specimen type and pathogen isolated. Until recently, performing susceptibility testing of anaerobes was cumbersome and time consuming. The introduction of Etest for anaerobic susceptibility testing and the publishing of guidelines by the NCCLS for broth microdilution antimicrobial susceptibility testing gave laboratories an attractive alternative to older agar diffusion methods.

Background

As the number of published cases of anaerobic infections increased, so did the need to develop a standardized susceptibility testing methodology suitable for clinical laboratories. The first step in this process was the introduction of Etest, an agar strip diffusion method that provided results in 24 hours. A decade later, the methods were validated and published as guidelines by the National Committee for Clinical Laboratory Standards (NCCLS).

Revised Abstract

Background Today’s clinical microbiology laboratories perform limited anaerobic bacteriology and rarely conduct susceptibility testing. The reporting of antimicrobial resistance in clinically significant anaerobes is often determined via surveillance studies. In this study, a total of over 900 clinical anaerobic isolates were collected from the United States, Latin America, and Europe from 2001 to 2002. Anaerobes were isolated from intra-abdominal, skin and soft tissue, wounds, gynecological, and other sources as part of a multi-national clinical study. As these sources yielded numerous species of anaerobes, the data will be limited to Bacteroides, Prevotella, Fusobacterium, Clostridium, Eubacterium, and Peptostreptococcus spp. Methods Each isolate was identified using selective growth media and various biochemical profiles. Susceptibility testing was performed using the concentration gradient agar diffusion method (Etest). MICs to amoxicillin/clavulanic acid (A/C), ampicillin/shebaolin (A/S), clindamycin (CL), meropenam (MZ), piperacillin/tazobactam (P/T) and gentamicin (GR) were determined from agar plates and interpreted following manufacturer instructions and NCCLS guidelines. Results The susceptibility results of the 900 isolates as a group are outlined in table 1.

Results

Table 1. In vitro activity and percent susceptible (%) of six antimicrobials determined by Etest against 346 clinical anaerobic pathogens.

<table>
<thead>
<tr>
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Conclusions

- Cindamycin exhibited the highest MICs against Bacteroides sp (256 mcg/mL) followed by meropenem and piperacillin/tazobactam (16 mcg/mL), ampicillin/sublactum (4 mcg/mL), and amoxicillin/clavulanic acid and gentamicin (2 mcg/mL).
- All agents except cindamycin (>256 mcg/mL) and meropenem (8 mcg/mL) had MICs of <1 mcg/mL against Prevotella sp.
- Piperacillin/tazobactam demonstrated the highest MICs (>256 mcg/mL) to Fusobacterium sp. while all other agent’s MIC’s were <2 mcg/mL.
- Gram-positive anaerobes (Clostridium sp., Eubacterium sp., and Peptostreptococcus sp.) demonstrated varying degrees of activity to specific agents. Overall, amoxicillin/clavulanic acid, ampicillin/sublactum, and piperacillin/tazobactam demonstrated the lowest MICs for these pathogens.
- The results indicate that anaerobes vary according to species; however, agents such as amoxicillin/clavulanic acid and ampicillin/sublactum maintain high levels of activity.
- Gentamicin, a new broad-spectrum fluoroquinolone in development, demonstrated MICs equal to or better than to most agents tested against many clinically significant anaerobes.

References


Materials and Methods

- Isolates were collected in 2001 – 2002 from 328 study sites in the United States, Latin America, and Europe.
- The Global Survey of In Vitro Antimicrobial Susceptibilities of Bacteroides, Prevotella, Fusobacterium, Clostridium, Eubacterium, and Peptostreptococcus Species, published in 2001, is a continuing international study for microbiology professionals.

Antimicrobial Susceptibility Testing

- MICs were determined using the concentration gradient agar diffusion method (Etest), (AB Biodisk, Sweden). Testing was performed according to NCCLS guidelines and manufacturer instructions.
- Antibiotics tested were amoxicillin/clavulanic acid (A/C), ampicillin/sublactum (A/S), clindamycin (CL), meropenam (MZ), piperacillin/tazobactam (P/T), and gentamicin (GR).
- Organism suspension was inoculated into Brain Heart Infusion broth equivalent to a 1 McFarland standard.
- PRAS broth agar w/ Vitamin K and Hemin (Anaerobe West); PRAS brucella agar w/ Vitamin K and Hemin (Anaerobe Laboratories International for Microbiology Studies, Villanova, PA) were used for selective growth media for each organism and the isolate was identified using selective growth media and various biochemical profiles.
- All anaerobic work was performed using a Bactron IV anaerobic chamber from Sheldon Manufacturing, Cornelius, OR.
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