To the Editor: Anaerobic bacteria (anaerobes) are the predominant flora on human skin and mucous membranes and are a common cause of endogenous infections. Anaerobes are commonly found in polymicrobial infections in combination with aerobes, and in this setting therapy should be directed towards both types of pathogens. Antibiotic resistance among anaerobes has increased, and antibiotics that were reliably effective, such as metronidazole, are no longer as active.1 Since culture of anaerobes is not within the scope of many laboratories, susceptibility testing is not routinely performed.

We prospectively studied antibiotic susceptibility profiles of anaerobes isolated from clinical specimens routinely tested in the microbiology laboratory at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) from June 2005 until February 2007. Our objectives were to determine the antimicrobial susceptibility patterns of anaerobes isolated from clinical specimens, initiate a surveillance programme to monitor the susceptibility profiles of anaerobes, and identify their changing trends in antibiotic susceptibility and resistance.

Specimens from patients with suspected mixed aerobic/anaerobic infections were submitted in anaerobic transport media to the microbiology laboratory, where microscopy, culture and susceptibility testing were performed. Antimicrobial susceptibility testing was performed periodically to identify emerging trends in resistance and to modify empirical treatment of anaerobic infections.

Background. Increasing resistance to some antimicrobial agents among anaerobic bacteria has made susceptibility patterns less predictable.

Method. This was a prospective study of the susceptibility data of anaerobic organisms isolated from clinical specimens from patients with suspected anaerobic infections from June 2005 until February 2007. Specimens were submitted to the microbiology laboratory at Charlotte Maxeke Johannesburg Academic Hospital, where microscopy, culture and susceptibility testing were performed using the E test® strip minimum inhibitory concentration method. Results were interpreted with reference to Clinical and Laboratory Standards Institute guidelines for amoxicillin-clavulanate, clindamycin, metronidazole, penicillin, ertapenem, cefoxitin, ceftriaxone, chloramphenicol and piperacillin-tazobactam.

Results. One hundred and eighty anaerobic isolates were submitted from 165 patients. The most active antimicrobial agents were chloramphenicol (100% susceptible), ertapenem (97.2%), piperacillin-tazobactam (99.4%) and amoxicillin-clavulanic acid (96.7%). Less active were metronidazole (89.4%), cefoxitin (85%), clindamycin (81.7%), ceftriaxone (68.3%) and penicillin (33.3%).

Conclusion. Susceptibility testing should be performed periodically to identify emerging trends in resistance and to modify empirical treatment of anaerobic infections.

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these isolates, while 11% and 18% demonstrated resistance to metronidazole and clindamycin, respectively.

**Discussion**

Our study illustrates the dynamic changes in antimicrobial susceptibility that have occurred among anaeorobes and emphasises a decrease in antimicrobial susceptibility compared with a survey in Cape Town in 1995. Of particular concern is the prevalence of metronidazole resistance that is largely unrecognised by clinicians. Susceptibility profiles of *B. fragilis* were similar to those from Brazil, demonstrating resistance rates of 12% for cefoxitin, 15.1% for cefotaxime, 1% for chloramphenicol, 18.2% for clindamycin, 75.7% for tetracycline and 16% for metronidazole. In our study, resistance to cefoxitin was 8.6%, to clindamycin 14.8% and to metronidazole 12.3%, but there was no resistance to chloramphenicol or amoxicillin-clavulanate. Others have reported clindamycin resistance rates as high as 33% in *B. fragilis*, and 36%, 49% and 46% in *B. thetaiotamicron, B. distasonis* and *B. caccae*, respectively. Oteo et al. reported an overall resistance rate of 49% to clindamycin for the *B. fragilis* group, while in our study resistance to clindamycin was 18.7%.

A Cape Town study demonstrated that 4% (total 26) of *C. perfringens* isolates were resistant to benzylpenicillin and clindamycin, but all were sensitive to cefoxitin, metronidazole, chloramphenicol and amoxicillin-clavulanate. *C. perfringens, C. fallax* and *C. sordellii* in this study exhibited no resistance to penicillin or metronidazole, while the single isolate of *C. septicum* showed high-level resistance to metronidazole (MIC 256 μg/ml). The single isolate of *C. paraperfringens* was resistant to clindamycin (MIC 128 μg/ml) and cefoxitin (MIC 256 μg/ml).

*P. melaninogena* (15 isolates) were resistant to penicillin and metronidazole in 60% and 6.7%, respectively. Two isolates of *Veillonella parvula* were resistant to penicillin.

Among all isolated anaerobe organisms, 97.2% were susceptible to tetracycline. This was similar to the findings of Goldstein et al., who demonstrated that tetracycline was consistently active against the *B. fragilis* group, but not against 12 (20%) of strains of *Bilophila wadsworthia*, 3 (5%) lactobacilli, and 1 *Acidimonaococcus fermentans*. Piferi prospectively investigated 370 clinical isolates of anaerobic bacteria over 6 months. With the exception of one isolate of *Fusobacterium varium* and *B. fragilis* (MIC 32 μg/ml), all were also sensitive to tetracycline.

In our study, among 20 strains of peptostreptococci, 35% were resistant to penicillin and 5% to clindamycin, with no resistance to metronidazole. In contrast, in Koch et al's study, 10% of 20 strains of *P. aeruginosa* were resistant to benzylpenicillin, cefoxitin and metronidazole; in addition *Peptostreptococcus spp.* (total of 17) showed resistance to benzylpenicillin in 12% and to metronidazole and clindamycin in 6%, respectively.

Appelbaum and Chatterton in 1978, in a study similar to that in South Africa on 265 anaerobic bacteria from clinical isolates, found low levels of resistance to penicillin, chloramphenicol, clindamycin and metronidazole. However, in our study 100% remain susceptible to chloramphenicol, but only 82% to clindamycin, 89% to metronidazole and 33% to penicillin.

**Conclusion**

We demonstrated a worrying increase in resistance to metronidazole, particularly in the *B. fragilis* group, and highlight the high rates of intermediate susceptibility to other anti-anaerobic agents. This emphasises the necessity for periodic active surveillance to identify and record these emerging trends.

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**Ethics.** This study was approved by Human Research Ethics Committee (Medical) at the University of the Witwatersrand.

**References**


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