Rapid Detection of Clindamycin Resistance in *Bacteroides* spp.

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High-level resistance to clindamycin can be accurately detected by the Wadsworth disk identification test. Of the 98 isolates of the *Bacteroides fragilis* group that were tested, 90 were inhibited by the 60-µg erythromycin disk and had clindamycin minimal inhibitory concentrations of ≤3.2 µg/ml. Of the remaining eight isolates, all were resistant to the erythromycin disk and had clindamycin minimal inhibitory concentrations of ≥100 µg/ml.

Clindamycin resistance in *Bacteroides* spp. is a relatively uncommon but increasingly significant clinical problem. Recently, a number of laboratories have reported the isolation of *Bacteroides* spp. resistant to clindamycin (minimal inhibitory concentration ≥8 µg/ml) (1–5, 7, 12, 14). Generally, most laboratories have reported that 2 to 7% of the *Bacteroides fragilis* group isolates were resistant to clindamycin, although resistance has been reported to be as high as 20 to 27% in some hospitals (1, 3). The multicenter studies of Cuchural et al. (3) and Bawdon et al. (1) demonstrated that at the present clindamycin resistance in *Bacteroides* spp. is not a generalized phenomenon but rather clustered in specific hospitals. However, because this resistance is encoded in a transferable plasmid (8–10, 15), more widespread dissemination may occur. Furthermore, in vitro resistance to clindamycin has been associated with poor clinical response in some patients (11, 16). Thus, the susceptibility of *Bacteroides* spp. to clindamycin should be determined promptly to avoid the use of ineffective antimicrobial therapy in patients infected with resistant organisms.

Although rapid methods have been developed for measuring β-lactamase production by *Bacteroides* spp., the determination of susceptibility to non-β-lactam antibiotics is slow and tedious. In addition, routine testing of all *B. fragilis* group isolates to detect the relatively few isolates resistant to clindamycin is expensive. We report in this study a simple, rapid, and inexpensive procedure for detecting clindamycin-resistant *Bacteroides* spp.

For the preliminary classification of gram-negative anaerobes, we routinely use the Wadsworth disk identification test (13). All gram-negative anaerobes are streaked onto a sheep blood agar plate (Schaedler agar base; Remel Labs, Lenexa, Kans.) and then the following disks (BBL, Microbiology Systems, Cockeysville, Md.) are placed on the agar surface: erythromycin (60 µg), rifampin (15 µg), kanamycin (1,000 µg), penicillin (2 U), and bile (25 mg). After overnight incubation in an anaerobic atmosphere, inhibition of bacterial growth by the antibiotics and stimulation by bile is recorded. Most *B. fragilis* group isolates are stimulated by bile, inhibited by erythromycin and rifampin, and resistant to colistin, kanamycin, and penicillin. Because clindamycin resistance in *Bacteroides* spp. is associated with high level erythromycin resistance (8, 15), we felt that resistance to erythromycin (i.e., no inhibition of growth around the disk) could be used to predict resistance to clindamycin. To test this hypothesis, we examined 98 isolates of the *B. fragilis* group that were recovered from clinical specimens during a 6-month period. The organisms identified by gas liquid chromatography and API 20A biochemical tests included *B. fragilis* (59), *Bacteroides distasonis* (19), *Bacteroides ovatus* (7), *Bacteroides thetaiotaomicron* (5), *Bacteroides vulgatus* (3), *Bacteroides uniformis* (3), and *Bacteroides* 3452A (2). After the initial isolation, the susceptibility of each organism to erythromycin was determined by the erythromycin disk identification test described above and to clindamycin by the broth disk elution test of Kurzynski et al. (6) with a final concentration of 3.2 µg of clindamycin per ml of thioglycolate broth. Of the 98 isolates that were tested, 90 were inhibited by 3.2 µg of clindamycin per ml and by the erythromycin disk test. The remaining eight isolates (two isolates each of *B. fragilis* and *Bacteroides* 3452A, and one isolate each of *B. distasonis*, *B. vulgatus*, *B. uniformis*, and *B. ovatus*) were resistant to clindamycin in the broth disk elution test and were not inhibited by erythromycin. To
further evaluate the level of clindamycin resistance for these eight isolates, we performed quantitative tube dilution tests in Wilkins-Chalgren broth. The clindamycin minimal inhibitory concentrations for these isolates were ≥100 μg/ml.

In summary, it appears that the erythromycin disk identification test can accurately predict clindamycin resistance in Bacteroides spp. This test can be performed directly from the primary isolation plate and can be interpreted after overnight incubation. Thus, the susceptibility test results can be available within 48 h after receipt of the clinical specimen. Although we observed complete concordance between the erythromycin screening tests and the quantitative dilution tests, all resistance should be confirmed by a standardized test method.

LITERATURE CITED