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LITERATURE CITED

1. **Andiman, W. A., K. Martin, A. Rubinstein, S. Pawha, R. Eastman, B. Z. Katz, J. Pitt, and G. Miller.** 1985. Opportunistic lymphoproliferations associated with Epstein-Barr viral DNA in infants and children with AIDS. Lancet **i**:1390–1393.
2. **DeClercq, E., J. Descamps, P. De Somer, and A. Holý.** 1978. (*S*)-9(Dihydroxypropyl)adenine: an aliphatic nucleoside analog with broad-spectrum antiviral activity. Science **200**:563–565.
3. **DeClercq, E., A. Holý, I. Rosenberg, T. Sakuma, J. Balzarini, and P. C. Maudgal.** 1986. A novel selective broad-spectrum anti-DNA virus agent. Nature (London) **323**:464–467.
4. **Elion, G. B., P. A. Furman, A. J. Fyfe, P. DeMiranda, L. Beauchamp, and H. J. Schaeffer.** 1977. Selectivity of action of an antiherpetic agent, 9-(2-hydroxyethoxymethyl)guanine. Proc. Natl. Acad. Sci. USA **74**:5716–5720.
5. **Evans, A. S.** 1984. Hypothesis: the pathogenesis of AIDS involves activation of T- and B-cell cascades. Yale J. Biol. Med. **57**:317–327.
6. **Lin, J.-C., and J. S. Pagano.** 1985. Cellular transformation by the herpesviruses and antiviral drugs. Pharmacol. Ther. **28**: 135–161.
7. **Lin, J.-C., M. C. Smith, Y.-C. Cheng, and J. S. Pagano.** 1983. Epstein-Barr virus: inhibition of replication by three new drugs. Science **221**:578–579.
8. **Lin, J.-C., M. C. Smith, E. I. Choi, E. DeClercq, A. Verbruggen, and J. S. Pagano.** 1985. Effect of (E)-5-(2-bromovinyl)-2′-deoxyuridine on replication of Epstein-Barr virus in human lymphoblastoid cell lines. Antiviral Res. Suppl. **1**:121–126.
9. **Lin, J.-C., M. C. Smith, and J. S. Pagano.** 1984. Prolonged inhibitory effect of 9-(1,3-dihydroxy-2-propoxymethyl)guanine against replication of Epstein-Barr virus. J. Virol. **50**:50–55.
10. **Lin, J.-C., M. C. Smith, and J. S. Pagano.** 1985. Comparative efficacy and selectivity of some nucleoside analogs against Epstein-Barr virus. Antimicrob. Agents Chemother. **27**: 971–973.
11. **Sundovist, V. A., A. Linde, R. Kurthe, A. Werner, E. B. Helm, M. Popovic, R. C. Gallo, and B. Wahren.** 1986. Restricted IgG subclass responses to HTLV-III/LAV and to cytomegalovirus in patients with AIDS and lymphadenopathy syndrome. J. Infect. Dis. **153**:970–973.

TABLE 1. MICs of antimicrobial agents against anaerobic bacteria isolated from upper genital tract infections in women

Organism (no. of isolates tested)	Antimicrobial agent[a]	MIC (μg/ml)[b]		
		Range	50%	90%
Peptostreptococcus anaerobius (50)	Cefmetazole	0.25–16	0.5	8
	Cefotetan	0.25–128	2	32
	Cefoxitin	0.25–16	0.5	8
	Mezlocillin	0.25–16	0.25	4
	Amoxicillin-clavulanic acid	≤0.06–8	0.25	1.0
	Clindamycin	≤0.06–0.5	≤0.06	0.25
	Imipenem	≤0.06–1.0	≤0.06	0.5
	Metronidazole	≤0.06–1.0	0.5	1.0
Peptostreptococcus asaccharolyticus (46)	Cefmetazole	≤0.06–0.25	≤0.06	0.125
	Cefotetan	≤0.06–0.25	0.125	0.25
	Cefoxitin	≤0.06–0.25	≤0.06	0.125
	Mezlocillin		≤0.06	≤0.06
	Amoxicillin-clavulanic acid	≤0.06–0.125	≤0.06	≤0.06
	Clindamycin	≤0.06–>128	0.125	0.5
	Imipenem		≤0.06	≤0.06
	Metronidazole	0.5–2	1.0	2
Peptostreptococcus magnus (15)	Cefmetazole	0.25–0.5	0.5	0.5
	Cefotetan	0.25–1.0	0.5	1.0
	Cefoxitin	0.25–1.0	0.5	1.0
	Mezlocillin	0.125–0.25	0.125	0.25
	Amoxicillin-clavulanic acid	0.125–0.25	0.125	0.25
	Clindamycin	≤0.06–8	0.125	2
	Imipenem		≤0.06	≤0.06
	Metronidazole	0.25–1.0	0.5	1.0
Peptostreptococcus prevotii (13)	Cefmetazole	≤0.06–0.25	≤0.06	0.25
	Cefotetan	≤0.06–2	0.125	1.0
	Cefoxitin	≤0.06–0.5	≤0.06	0.25
	Mezlocillin	≤0.06–0.25	≤0.06	0.125
	Amoxicillin-clavulanic acid	≤0.06–0.125	≤0.06	0.125
	Clindamycin	≤0.06–0.125	≤0.06	0.125
	Imipenem		≤0.06	≤0.06
	Metronidazole	0.125–1.0	0.5	1.0
Peptostreptococcus tetradius (28)	Cefmetazole	≤0.06–0.5	≤0.06	0.125
	Cefotetan	≤0.06–4	0.125	0.5
	Cefoxitin	≤0.06–0.5	0.125	0.25
	Mezlocillin	≤0.06–0.5	≤0.06	0.125
	Amoxicillin-clavulanic acid	≤0.06–0.25	≤0.06	≤0.06
	Clindamycin	≤0.06–0.5	0.25	0.5
	Imipenem	≤0.06–0.25	≤0.06	≤0.06
	Metronidazole	0.25–1.0	1.0	1.0
Veillonella spp. (8)	Cefmetazole	≤0.06–1.0	0.125	1.0
	Cefotetan	≤0.06–8	2	8
	Cefoxitin	≤0.06–8	0.5	4
	Mezlocillin	≤0.06–64	1.0	8
	Amoxicillin-clavulanic acid	≤0.06–0.25	≤0.06	0.25
	Clindamycin	≤0.06–0.125	≤0.06	≤0.06
	Imipenem	≤0.06–0.25	≤0.06	0.25
	Metronidazole	0.25–2	1.0	1.0
Bacteroides bivius (46)	Cefmetazole	0.25–4	1.0	4
	Cefotetan	0.5–16	4	8
	Cefoxitin	0.25–4	1.0	2
	Mezlocillin	0.5–16	4	8
	Amoxicillin-clavulanic acid	≤0.6–4	0.25	1.0
	Clindamycin	≤0.06–>128	≤0.06	≤0.06
	Imipenem	≤0.06–0.125	≤0.06	≤0.06
	Metronidazole	0.25–8	2	4
Bacteroides disiens (23)	Cefmetazole	0.125–4	0.5	2
	Cefotetan	0.25–16	2	16
	Cefoxitin	0.125–4	0.5	2

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TABLE 1—*Continued*

Organism (no. of isolates tested)	Antimicrobial agent[a]	MIC (μg/ml)[b]		
		Range	50%	90%
	Mezlocillin	0.25–8	1.0	4
	Amoxicillin-clavulanic acid	≤0.06–1	0.125	0.5
	Clindamycin	≤0.06–0.125	≤0.06	≤0.06
	Imipenem	≤0.06–0.125	≤0.06	0.125
	Metronidazole	1.0–8	2	8
Black-pigmented *Bacteroides* spp. (16)	Cefmetazole	≤0.06–8	0.5	4
	Cefotetan	0.125–16	0.5	16
	Cefoxitin	≤0.06–4	0.25	4
	Mezlocillin	≤0.06–16	0.5	8
	Amoxicillin-clavulanic acid	≤0.06–0.5	≤0.06	0.5
	Clindamycin		≤0.06	≤0.06
	Imipenem	≤0.06–0.125	≤0.06	0.125
	Metronidazole	0.25–2	2	2
Bacteroides fragilis group (13)[c]	Cefmetazole	4–64	8	8
	Cefotetan	1.0–>128	4	8
	Cefoxitin	4–64	4	8
	Mezlocillin	4–>128	8	16
	Amoxicillin-clavulanic acid	0.25–4	0.5	4
	Clindamycin	≤0.06–1.0	0.25	0.5
	Imipenem	≤0.06–0.5	0.125	0.5
	Metronidazole	0.5–8	1.0	2
Fusobacterium spp. (12)	Cefmetazole		≤0.06	≤0.06
	Cefotetan		≤0.06	≤0.06
	Cefoxitin	≤0.06–0.25	≤0.06	0.25
	Mezlocillin		≤0.06	≤0.06
	Amoxicillin-clavulanic acid	≤0.06–0.125	≤0.06	0.125
	Clindamycin	≤0.06–0.125	≤0.06	0.125
	Imipenem	≤0.06–0.125	≤0.06	0.125
	Metronidazole	≤0.06–0.125	≤0.06	0.06

[a] For amoxicillin plus clavulanic acid, MICs are given as the concentration of amoxicillin. In all cases, the concentration of clavulanic acid was half of the concentration of amoxicillin.
[b] 50% and 90%, MIC for 50 and 90% of isolates, respectively.
[c] Includes: *B. fragilis*, eight isolates; *Bacteroides vulgatus*, three isolates; *B. distasonis*, one isolate; *Bacteroides uniformis*, one isolate.

The exceptions to this finding were those isolates of *P. anaerobius* for which MICs were elevated but beta-lactamases were not detected. MICs of beta-lactam antibiotics were elevated for nine (18%) of the isolates of *P. anaerobius*. Only with cefotetan were MICs for all nine isolates high enough for the organisms to be considered resistant (≥32 μg/ml). However, with amoxicillin-clavulanic acid, cefoxitin, cefmetazole, mezlocillin, and imipenem, MICs for these nine isolates were 1 to 5 dilutions higher than for the other 41 isolates of *P. anaerobius*, and for some of the isolates, MICs of all of the above-mentioned antimicrobial agents except imipenem were at the upper limits of susceptibility. We have previously noted elevated MICs of beta-lactam antibiotics against a similar percentage of a different group of *P. anaerobius* isolates (7).

TABLE 2. Beta-lactamase test results for anaerobic bacteria isolated from upper genital tract infections in women

Organism (no. of isolates tested)	No. (%) positive
Peptostreptococcus anaerobius (43)	0
Peptostreptococcus asaccharolyticus (30)	0
Peptostreptococcus magnus (15)	0
Peptostreptococcus prevotii (13)	0
Peptostreptococcus tetradius (28)	0
Veillonella spp. (8)	0
Bacteroides bivius (45)	41 (91)
Bacteroides disiens (23)	17 (74)
Black-pigmented *Bacteroides* spp. (16)	7 (44)
Bacteroides fragilis group (13)	12 (92)
Fusobacterium spp. (12)	0

Given the similar in vitro activities of cefmetazole and cefoxitin against anaerobic bacteria as shown in this study and against aerobic organisms commonly isolated from upper genital tract infections in women (4), we believe that cefmetazole would give treatment results similar to those of cefoxitin in similar dosages. One drug might be selected over the other if they are priced substantially differently. MICs of cefotetan were generally one- to twofold higher than those of cefoxitin and cefmetazole. This finding has also been shown by others (8, 10) against organisms commonly isolated from pelvic soft tissue infections, i.e., the *B. bivius-B. disiens* group and anaerobic gram-positive cocci. Therefore, although cefotetan has a long half-life in serum, cefotetan dosages may have to be adjusted to produce higher levels in serum to have the same effect as some of the other beta-lactam antimicrobial agents.

Clavulanic acid is an effective inhibitor of many beta-lactamases but has minimal antimicrobial activity of its own (6). The combination of amoxicillin and clavulanic acid was active against all organisms in which beta-lactamases were detected (MICs, ≤4 μg/ml). The highest amoxicillin-clavulanic acid MICs (8 μg/ml) were against *P. anaerobius* strains

for which MICs of the cephamycins, mezlocillin, and imipenem were also high.

This study gives further evidence that many common anaerobic isolates from pelvic soft tissue infections in women produce beta-lactamases. Therefore, antimicrobial agents which are not affected by beta-lactamases are necessary for treatment. However, all antimicrobial agents which demonstrate resistance to beta-lactamases are not equally active against anaerobic bacteria. This must be taken into account when dosage regimens and cost are determined.

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LITERATURE CITED

1. **Goldstein, E. J. C., and D. M. Citron.** 1986. Comparative in vitro activities of amoxicillin-clavulanic acid and imipenem against anaerobic bacteria isolated from community hospitals. Antimicrob. Agents Chemother. **29**:158–160.
2. **Holdeman, L. V., E. P. Cato, and W. E. C. Moore (ed.).** 1977. Anaerobe laboratory manual, 4th ed. Virginia Polytechnic Institute and State University, Blacksburg.
3. **Inouye, S., H. Goi, T. Watanabe, T. Hara, K. Miyauchi, T. Yoshida, Y. Kazuno, H. Kadosawa, F. Hirano, K. Kawaharajo, Y. Orikasa, and T. Nishino.** 1984. In vitro and in vivo antibacterial activities of MT-141, a new semisynthetic cephamycin, compared with those of five cephalosporins. Antimicrob. Agents Chemother. **26**:722–729.
4. **Jones, R. N., A. L. Barry, P. C. Fuchs, and C. Thornsberry.** 1986. Antimicrobial activity of cefmetazole (CS-1170) and recommendations for susceptibility testing by disk diffusion, dilution, and anaerobic methods. J. Clin. Microbiol. **24**:1055–1059.
5. **Knuppel, R. A., J. C. Scerbo, J. Dzink, G. W. Mitchell, C. L. Cetrulo, and J. Bartlett.** 1981. Quantitative transcervical uterine cultures with a new device. Obstet. Gynecol. **57**:243–248.
6. **Neu, H. C., and K. P. Fu.** 1978. Clavulanic acid, a novel inhibitor of β-lactamases. Antimicrob. Agents Chemother. **14**:650–655.
7. **Ohm-Smith, M. J., R. L. Sweet, and W. K. Hadley.** 1985. In vitro activity of cefbuperazone and other antimicrobial agents against isolates from the female genital tract. Antimicrob. Agents Chemother. **27**:958–960.
8. **Ruckdeschel, G.** 1983. Activity in vitro of cefotetan against non-sporing anaerobes: a comparative study. J. Antimicrob. Chemother. **11**(Suppl. A):117–124.
9. **Sutter, V. L., D. M. Citron, and S. M. Finegold.** 1980. Wadsworth anaerobic bacteriology manual, 3rd ed. C. V. Mosby Co., St. Louis.
10. **Werner, H.** 1983. Inhibitory activity of cefotetan and other β-lactams against anaerobes. J. Antimicrob. Chemother. **11** (Suppl. A):107–115.
11. **Wüst, J., and T. D. Wilkins.** 1978. Effect of clavulanic acid on anaerobic bacteria resistant to beta-lactam antibiotics. Antimicrob. Agents Chemother. **13**:130–133.