Susceptibility of Eikenella corrodens to Ten Cephalosporins

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The susceptibility of 24 strains of Eikenella corrodens was determined by the agar dilution technique, to 10 cephalosporins, as well as to clindamycin, penicillin, and dicloxacillin. All strains were uniformly very susceptible to penicillin G and cefoxitin and resistant to clindamycin and dicloxacillin. Cefazolin showed good activity. Cephalaxin, cephradine, and cefadroxil showed poor activity, and cefamandole's activity was relatively poor. Cephalothin, cephraparin, cefaclor, and cefapirin showed moderate activity, with some strains relatively resistant.

Eikenella corrodens, formerly known as HB-1 (9, 10) and mistakenly included under Bacteroides corrodens (7), an obligate anaerobe, is a fastidious, facultatively anaerobic gram-negative rod that is part of the normal oral flora of humans and dogs (1, 2, 7, 13). It has been increasingly recognized as a pathogen in human infection; it has been implicated in endocarditis (4, 6), meningitis (4, 9), osteomyelitis (8, 9), cellulitis (2, 8, 9), and infections associated with orally contaminated wounds (2, 8–10, 13). E. corrodens is often isolated in mixed culture with streptococci, staphylococci, and gram-negative rods (2, 4, 9). Its unusual antimicrobial susceptibility pattern must be considered in choosing a therapeutic regimen. It is susceptible to penicillin and ampicillin but resistant to the penicillinase-resistant penicillins (oxacillin, dicloxacillin, nafcillin, methicillin) and to clindamycin (2, 11, 13).

The in vitro susceptibility of E. corrodens to cephalothin has been reported as variable (2), and failure of clinical response has been noted (2). E. corrodens has not been tested previously against any of the other cephalosporins despite their widespread usage in types of infections where E. corrodens is a potential pathogen.

We report the susceptibility of 24 strains of E. corrodens to 10 cephalosporins as well as to clindamycin, penicillin, and dicloxacillin.

All strains tested were recovered from clinical specimens obtained between 1975 and 1978. Isolates were confirmed as E. corrodens according to standard criteria (2, 7). All strains had typical corroding colonial morphology, were oxidase positive, and reduced nitrate to nitrite.

The sources of the isolates were as follows:

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The activity of the 13 antimicrobial agents tested against the 24 strains of *E. corrodens* is shown in Table 1. *E. corrodens* was uniformly very susceptible to penicillin G and cefoxitin and resistant to dicloxacillin and clindamycin. Cefazolin showed good activity at achievable peak serum levels. Susceptibility was variable to the other agents. Cephalothin, cepahpin, cefaclor, and cefamandole showed moderate activity with some strains relatively resistant. Cephalaxin, cephradine, and cefadroxil showed poor activity; cefamandole’s activity was relatively poor.

The cephalosporins have gained widespread clinical usage. They are frequently used as initial empiric therapy for a variety of situations including orally contaminated wounds and abscesses (3, 5, 12) where they are directed against the streptococci, staphylococci, and gram-negative rods which may be present. *E. corrodens* may also be a potential pathogen in these same situations. However, due to its unusual antimicrobial susceptibility pattern, such therapy may not prove adequate against *E. corrodens*. *E. corrodens* has been tested previously against cephalothin and found to have variable in vitro susceptibility (2). Brooks et al. (2) note that some of their patients developed infections with *Eikenella* while receiving cephalothin therapy providing “clinical confirmation of the in vitro resistance.” Since then several new cephalosporins have come into widespread clinical usage and others are being developed.

Our data are in agreement with prior reports that *E. corrodens* is susceptible to penicillin but resistant to dicloxacillin and clindamycin (2, 11, 13). On a weight basis, only cefoxitin, a cephamycin, showed comparable or better activity than penicillin against the strains tested. At achievable peak serum levels, cefazolin showed good activity, whereas cephalaxin, cephradine, and cefadroxil showed poor activity. Cephalothin, cepahpin, cefaclor, and cefaloridine were active at the upper limits of achievable peak serum levels.

Penicillin (or ampicillin) remains the drug of choice in infections caused by *E. corrodens*. Cefoxitin is more active than penicillin G on a weight basis and will apparently be clinically effective. Two of our isolates were from patients with pneumonia who were treated with cefoxitin. In both cases *E. corrodens* was recovered by transtracheal aspiration prior to therapy; both patients had an excellent clinical response (unpublished data). In situations where other cephalosporins are to be used for infection with *E. corrodens*, susceptibility testing of the involved strain should be performed.

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**LITERATURE CITED**

1. Bailie, W. E., E. C. Stowe, and A. M. Schmitt. 1978. Aerobic bacterial flora of oral and nasal fluids of canines with reference to bacteria associated with bites. J. Clin. Microbiol. 7:223-231.
2. Brooks, G. F., J. M. O’Donoghue, J. P. Rissing et al. 1974. *Eikenella corrodens*, a recently recognized pathogen. Medicine 53:325-342.
3. Chuiard, R. G., and R. D. D’Ambrosia. 1977. Human bite infections of the hand. J. Bone Jt. Surg. Am. Vol. 59:416-418.
4. Dorff, G. J., L. J. Jackson, and M. W. Rytel. 1974. Infections with *Eikenella corrodens*. Ann. Intern. Med. 80:305-309.
5. Eaton, R. G., and D. P. Butsch. 1970. Antibiotic guide-

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**Table 1. Activity of antimicrobial agents tested against 24 strains of *E. corrodens***

| Antimicrobial agent | Achievable peak serum levels* | Cumulative % susceptible at indicated concn (µg/ml) |
|---------------------|-----------------------------|--------------------------------------------------|
|                     |                            | 1.0     | 2.0     | 4.0     | 8.0     | 16.0    | 32.0    | 64.0    | 128 | >128 |
| Cephalothin         | (16-32)                     |         |         |         | 8.3     | 87.5    | 100     |         |     |     |
| Cepharpin           | (16-32)                     |         |         |         | 66.6    | 100     |         |         |     |     |
| Cefazolin           | (32-64)                     |         |         |         | 12.5    | 83.3    | 95.1    | 100     |     |     |
| Cephalexin          | (11-32)                     |         |         |         | 8.3     |         | 37.5    | 79.2    | 100 |     |
| Cephaloridine       | (16-32)                     |         |         |         | 37.5    | 95.8    | 100     |         |     |     |
| Cefoxitin           | (32-64)                     |         |         |         | 95.8    | 100     |         |         |     |     |
| Cefadroxil          | (16-32)                     |         |         |         |         |         | 33.3    | 95.8    | 100 |     |
| Cefaclor            | (6-30)                      |         |         |         | 4.2     | 58.3    | 83.3    | 100     |     |     |
| Cefamandole         | (16-32)                     |         |         |         | 33.3    | 70.8    | 83.3    | 100     |     |     |
| Cephradine          | (16-32)                     |         |         |         | 25      | 91.2    | 100     |         |     |     |
| Clindamycin         | (16)                        |         |         |         |         |         | 8.3     | 12.5    | 83.3 | 100 |
| Penicillin G        | (20)                        |         |         |         |         |         | 16.7    | 66.7    | 100 |     |
| Dicloxacillin       | (10-20)                     |         |         |         |         |         | 12.5    | 25      | 100 |     |

* Levels listed reflect maximal dosage by intravenous route when such a preparation exists.

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lines for hand infections. Surg. Gynecol. Obstet. 130:119-122.

6. Geraci, J. E., P. E. Hermans, and J. A. Washington II. 1974. *Eikenella corrodens* endocarditis. Mayo Clin. Proc. 49:950-953.

7. Jackson, F. L., and Y. E. Goodman. 1972. Transfer of the facultatively anaerobic organism *Bacteroides corrodens* Eiken to a new genus, *Eikenella*. Int. J. Syst. Bacteriol. 22:73-77.

8. Johnson, S. M., and G. A. Pankey. 1976. *Eikenella corrodens* osteomyelitis, arthritis and cellulitis of the hand. South. Med. J. 69:535-540.

9. Kaplan, J. M., G. H. McCracken, and J. D. Nelson. 1973. Infections in children caused by the HB group of bacteria. J. Pediatr. 82:398-403.

10. Riley, P. S., H. W. Tatum, and P. E. Weaver. 1973. Identity of HB-1 of King and *Eikenella corrodens* (Eiken) Jackson and Goodman. Int. J. Syst. Bacteriol. 23:75-76.

11. Robinson, J. V. A., and A. L. James. 1974. In vitro susceptibility of *Bacteroides corrodens* and *Eikenella corrodens* to ten chemotherapeutic agents. Antimicrob. Agents Chemother. 6:543-546.

12. Shields, C., M. J. Patzakis, M. H. Meyers, and J. P. Harvey, Jr. 1975. Hand infection secondary to human bites. J. Trauma 15:235-236.

13. Zinner, S. H., A. K. Daly, and W. M. McCormack. 1973. Isolation of *Eikenella corrodens* in a general hospital. Appl. Microbiol. 25:705-708.