NOTES

Antibiotic Susceptibility of *Pseudomonas pseudomallei*

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The in vitro activity of various antibiotics against *Pseudomonas pseudomallei* was studied. The tetracyclines were the most active, followed by gentamicin, kanamycin, novobiocin, chloramphenicol, rifampin, cycloserine, erythromycin, and ampicillin.

Treatment of mild forms of human melioidosis has been successful with chloramphenicol or tetracyclines. Patients with septicemia or fulminant pneumonia, however, may die despite use of multiple antibiotics in large doses. Treat-

ment failures have occasionally been traced to acquisition of antibiotic resistance. Previous comparisons of in vitro susceptibility to antibiotics have shown the tetracyclines, chloramphenicol, novobiocin, kanamycin, sulfona-

FIG. 1. Cumulative percentage of 51 strains of *P. pseudomallei* inhibited by tetracycline and five analogues.

FIG. 2.

FIG. 2. Cumulative percentage of strains of *P. pseudomallei* inhibited by aminoglycoside antibiotics.

FIG. 3.

FIG. 3. Cumulative percentage of strains of *P. pseudomallei* inhibited by novobiocin, chloramphenicol, rifampin, cycloserine, erythromycin, and ampicillin.

mides, and rifampin to be active (1-6). The present study was undertaken to compare the susceptibility of 51 strains of *Pseudomonas pseudomallei* and 28 strains of *P. aeruginosa* to six tetracyclines, five aminoglycosides, four penicillins, four cephalosporins, two polypeptides, and nine miscellaneous antimicrobial agents. The strains of *P. pseudomallei* were provided by C. H. Zierdt, National Institutes of Health, Bethesda, Md. and R. J. Heckly, Naval Biological Laboratory, University of California, Berkeley, and identified by appropriate biochemical and serological tests (7). The strains of *P. aeruginosa* were isolated at this hospital.

Pure antibiotic powders were weighed and diluted to 2,560 µg/ml in sterile water and were further diluted in twofold steps with Mueller-Hinton broth (Difco). An 18-h broth culture of bacteria was diluted 10,000-fold with broth, and 0.5 ml was added to 0.5 ml of each antibiotic dilution; the final antibiotic concentrations ranged from 0.5 to 128 µg/ml. Incubation was at 35 C for 24 h, and the minimum inhibitory concentration (MIC) was read visually. Control strains of *Escherichia coli* and *Staphylococcus aureus* were included.

All of the tetracyclines except oxytetracycline were inhibitory for *P. pseudomallei* at relatively low concentrations (Fig. 1). Gentamicin and kanamycin were the most effective of the aminoglycosides against *P. pseudomallei*, with a broad range in MIC (Fig. 2). Figure 3 demonstrates susceptibility of the strains to novobiocin, chloramphenicol, rifampin, cycloserine, erythromycin, and ampicillin. With the method used, antimicrobial agents which were inactive against *P. pseudomallei* included sulfadiazine,

the cephalosporins (cephalothin, cephaloridine, cephalexin, and cefazolin), carbenicillin, penicillin G, oxacillin, dicloxacillin, polymyxin B, colistin, lincomycin, clindamycin, and vancomycin.

Colistin and polymyxin B were active against *P. aeruginosa* at 4 µg or less per ml, although they were inactive against *P. pseudomallei*. Conversely, novobiocin and cycloserine were entirely ineffective against *P. aeruginosa*, but were active over a broad range against *P. pseudomallei*.

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LITERATURE CITED

1. Chambon, L., P. de Lajudie, and J. Fournier. 1954. Etude de la sensibilité du bacille de Whitmore aux antibiotiques in vitro et chez les malades atteints de mélioi-dose. *Bull. Soc. Pathol. Exot.* 47:139-153.
2. Eickhoff, T. C., J. V. Bennett, P. S. Hayes, and J. Feeley. 1970. *Pseudomonas pseudomallei*: susceptibility to chemotherapeutic agents. *J. Infect. Dis.* 121:95-102.
3. Fisher, M. W., A. B. Hillegas, and P. L. Nazeeri. 1971. Susceptibility in vitro and in vivo of *Pseudomonas pseudomallei* to rifampin and tetracyclines. *Appl. Microbiol.* 21:13-16.
4. Grunberg, E., G. Beskid, W. F. Delorenzo, and E. Titworth. 1969. Activity of selected antimicrobial agents against the *Pseudomonas pseudomallei* infection of mice. *Amer. Rev. Resp. Dis.* 101:623-626.
5. Howe, C., A. Sampath, and M. Spotnitz. 1971. The pseudomallei group: a review. *J. Infect. Dis.* 124:598-606.
6. Malizia, W. F., G. A. West, W. G. Brundage, and D. C. Walden. 1969. Melioidosis—laboratory studies. *Health Lab. Sci.* 6:27-39.
7. Zierdt, C. H., and H. H. Marsh, III. 1971. Identification of *Pseudomonas pseudomallei*. *Amer. J. Clin. Pathol.* 55:596-603.