ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Dec. 1980, p. 976-977
0066-4804/80/12-0976/02$02.00/0

Vol. 18, No. 6

NOTES

Corynebacterium equi: In Vitro Susceptibility to Twenty-Six Antimicrobial Agents

JOHN B. WOOLCOCK* AND MALCOLM D. MUTIMER

Department of Veterinary Pathology and Public Health, University of Queensland, St. Lucia, Queensland 4067, Australia

The minimal concentrations of 26 antimicrobial agents required to inhibit growth of 100 isolates of *Corynebacterium equi* in vitro have been determined. The most active agents were penicillin G, doxycycline, erythromycin, lincomycin, and the aminoglycosides.

Infection of horses with *Corynebacterium equi* can be a serious problem on some properties, and for various reasons therapy is frequently of no avail. Only very limited antimicrobial susceptibility data are available. This study was designed to assess the in vitro activity of representatives of various classes of antimicrobial agents against the organism.

One hundred strains of *C. equi* were used in this study. Of these, 7 were obtained from soil; 5, 5, and 15, respectively, were from bovine rumen, small intestine, and feces; 10 each were from porcine feces and lymph nodes; and 30 and 7, respectively, were from equine feces and lungs. Ten strains from bovine lymph nodes were supplied by B. Donald, Animal Research Institute, Department of Primary Industries, Yeerongpilly, Queensland, Australia. One strain, *Rhodococcus (Corynebacterium) equi* NCTC 1621, was supplied by M. Goodfellow, Department of Microbiology, University of Newcastle-upon-Tyne, Newcastle-upon-Tyne, England. The organisms were grown in peptone-yeast extract saline broth for 48 h (approximately 10^7 colony-forming units per ml), and a manual replica-inoculating apparatus similar to the semiautomatic apparatus described by Steers et al. (6) was used to inoculate the surface of the medium (diagnostic sensitivity test agar [Oxoid]). The plates were then dried and incubated for 48 h. In each run *Staphylococcus aureus* (NCTC 6571), with a known antibiotic susceptibility pattern, was tested concurrently. A stock solution of 100 μg of each of the following antibiotics per ml was prepared in the appropriate solvent: cefoxitin sodium (mefoxin), cephalothin, chlortetracycline, doxycycline, lincomycin, methicillin, neomycin, novobiocin, oxytetracycline, penicillin G, polymyxin B, spectinomycin, streptomycin, tetracycline, tylosin—in water; ampicillin, carbenicillin, gentamicin—in phosphate buffer, pH 8.0; furazolidone, trimethoprim, co-trimoxazole (20:1 combination of sulfamethoxazole and trimethoprim)—in dimethylformamide; nalidixic acid, sulfamethoxazole—in 0.1 N sodium hydroxide; chloramphenicol, erythromycin—in ethanol; spiramycin—in methanol. Doubling dilutions of each stock solution were prepared in distilled water, covering a range of 0.195 to 100 μg/ml.

Table 1 lists the minimal inhibitory concentrations of antibiotics against 50 and 90% of 100 strains of *C. equi*. The most active antimicrobial agents were penicillin G, doxycycline, erythromycin, lincomycin, and the aminoglycosides (gentamicin, neomycin, and streptomycin). The least active agents were spiramycin, sulfamethoxazole, furazolidone, nalidixic acid, and novobiocin.

Previous studies reporting the effect of various antimicrobial agents against human isolates of *C. equi* have utilized one or a few strains, and in most cases the disk diffusion method has been used (3, 5, 7). These studies indicate that the organism is susceptible to erythromycin, gentamicin, and streptomycin, but resistant to penicillin. An examination of 66 isolates of soil and animal origin indicated that the organism is susceptible to neomycin and erythromycin, but resistant to streptomycin and penicillin (1). Knight and Heitala (4) examined 13 equine isolates and found 10 or more strains to be susceptible to erythromycin, streptomycin, gentamicin, neomycin, chloramphenicol, and tetracycline, whereas 12 were resistant to lincomycin. Three strains were susceptible to penicillin, six strains were resistant, and four strains were classed as having intermediate susceptibility. These au-

TABLE 1. *Minimal inhibitory concentrations (MIC) of antibiotics against 50 and 90% of 100 strains of C. equi*

Antibiotic		MIC (μg/ml)		
Class	Specific agent	Range	For % of strains:	
			50	90
Penicillin	Ampicillin	0.39–12.5	3.12	6.25
	Carbenicillin	6.25–50	50	50
	Methicillin	25–>100	50	50
	Penicillin G	<0.195–3.12	1.56	3.12
Tetracycline	Chlortetracycline	6.25–50	50	50
	Doxycycline	1.56–12.5	3.12	3.12
	Oxytetracycline	25–100	50	50
	Tetracycline	0.78–25	6.25	12.5
Aminoglycoside	Gentamicin	<0.195–1.56	0.78	0.78
	Neomycin		<0.195	<0.195
	Streptomycin	<0.195–12.5	3.12	3.12
Macrolide	Erythromycin		<0.195	<0.195
	Spiramycin	3.12–100	50	100
	Tylosin	1.56–50	25	50
Cephamycin	Cefoxitin	1.56–50	12.5	12.5
Cephalosporin	Cephalothin	1.56–50	25	50
Polymyxin	Polymyxin B	6.25–50	25	25
Sulfonamide	Sulfamethoxazole	25–>100	>100	>100
Miscellaneous	Chloramphenicol	1.56–25	12.5	25
	Furazolidone	12.5–100	100	100
	Lincomycin	0.78–6.25	1.56	3.12
	Nalidixic acid		>100	>100
	Novobiocin	25–>100	100	100
	Spectinomycin	3.12–25	6.25	12.5
	Co-trimoxazole	3.12–100	50	50
	Trimethoprim	6.25–100	25	50

thors also give the minimal inhibitory concentrations of 12 antimicrobial agents against 15 equine strains of *C. equi*. The minimal inhibitory concentrations of the eight agents common to our study were comparable in the cases of penicillin, ampicillin, carbenicillin, erythromycin, and gentamicin; our values were slightly higher in the cases of cephalothin, chloramphenicol, and tetracycline. An assessment of the potential clinical utility of these agents is restricted by the paucity of published data on antimicrobial concentrations achievable in equine serum. English and Roberts (2), in reviewing available data, indicate that around 10 μg of streptomycin per ml is attainable, whereas Knight and Heitala (4) state that 0.8 μg of erythromycin and 2.4 to 7.64 μg of gentamicin per ml can be achieved. The latter authors also indicate that intravenous administration of high levels of potassium penicillin G results in serum concentrations of 3.4 to 19.2 μg/ml. These data combined with our in vitro results suggest that erythromycin, streptomycin, and gentamicin should be effective, as well as penicillin, if large doses are given intravenously.

LITERATURE CITED

1. **Barton, M. D., and K. L. Hughes.** 1980. *Corynebacterium equi*: a review. Vet. Bull. **50**:65–80.
2. **English, P. B., and M. C. Roberts.** 1979. Antimicrobial chemotherapy in the horse. I. Pharmacological considerations. J. Equine Med. Surg. **3**:259–268.
3. **Gardner, S. E., T. Pearson, and W. T. Hughes.** 1976. Pneumonitis due to *Corynebacterium equi*. Chest **70**: 92–94.
4. **Knight, H. D., and S. Heitala.** 1978. Antimicrobic susceptibility patterns in horses, p. 63–88. *In* J. D. Powers and T. E. Powers (ed.), Proceedings, 2nd Equine Pharmacology Symposium. American Association of Equine Practitioners, Denver, Colo.
5. **Savdie, E., P. Pigott, and F. Jennis.** 1977. Lung abscess due to *Corynebacterium equi* in a renal transplant patient. Med. J. Aust. **1**:817–819.
6. **Steers, E., E. L. Foltz, and B. S. Graves.** 1959. An inocula replicating apparatus for routine testing of bacterial susceptibility to antibiotics. Antibiot. Chemother. **9**:307–311.
7. **Thomsen, F., R. Henriques, and M. Magnusson.** 1968. *Corynebacterium equi* Magnusson isolated from a tuberculoid lesion in a child with adenitis coli. Dan. Med. Bull. **15**:135–138.