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SURVIVAL POTENTIAL OF CIPROFLOXACIN-RESISTANT BACTERIAL STRAINS

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The 4-quinolones are rarely, if ever, affected by plasmid-mediated resistance and so the only mechanism that remains for bacteria to become resistant to the 4-quinolones is by chromosomal mutation. This chromosomally-mediated resistance occurs either by an alteration in the target enzyme DNA gyrase or by a mutation that reduces the permeability of the drug (Lewin et al 1990). It is not known what additional effects such mutations have on the competitive ability of bacteria.

In order to investigate if ciprofloxacin-resistance affects the survival potential of the bacterium, the growth rates of some ciprofloxacin-resistant clinical strains of Pseudomonas aeruginosa, Staphylococcus aureus and Staphylococcus epidermidis were compared with standard sensitive laboratory strains of the same species. Overnight nutrient broth cultures were subcultured into nutrient broth and the viable count was monitored every hour for eight hours. There were no detectable differences between the growth rates of the ciprofloxacin-resistant strains and the sensitive control strains in cultures grown statically. Even when the cultures were aerated to enhance any differences that might occur, no difference could be detected. The effect on survival of mixing together a ciprofloxacin-resistant strain and its sensitive control was then examined. Overnight cultures of each control organism and ciprofloxacin-resistant strain were subcultured into fresh nutrient broth. Equal titres of both stains were also added to fresh broth to make the mixed culture. The cultures were incubated statically and growth rates were monitored over a period of 30 hours by viable counts at regular intervals onto nutrient agar plates containing or lacking ciprofloxacin (4mg/L). In all cases, the ciprofloxacin-resistant strains persisted in the mixture; the level of persistence remaining steady over the 30 hours (Table).

Table

	Percentage of resistant bacteria in mixture							
Time (hours)	0	5	10	14	18	22	26	30
P. aeruginosa	66	57	62	57	61	60	62	60
S. aureus	40	42	42	-	42	45	42	44
S. epidermidis	57	44	42	41	41	41	40	45

Yamamoto and Droffner (1985) showed that alterations in DNA gyrase can cause facultative anaerobes to become strict aerobes. The ability of some ciprofloxacin-resistant strains of S. aureus and S. epidermidis to grow anaerobically was investigated and it was found that they retained the ability to grow in the absence of oxygen. Hence ciprofloxacin-resistant strains appear to be as competitive as the sensitive control strains under laboratory conditions. Therefore the pathogenicity of the ciprofloxacin-resistant strains should be investigated to determine whether such organisms are as likely to cause and maintain an infection as their sensitive counterparts.

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