originated (data not shown), one would perhaps expect to see mutations being lost or gained within the genes potentially affecting quinolone susceptibility. The stability of mutations in genes known to be associated with fluoroquinolone resistance, and the stable MIC values in clonally related MRSA isolates over time, have important implications for quinolone resistance in S. aureus. From this study of clinical MRSA isolates, it seems likely that once acquired, mutations and the decreased susceptibility to quinolones that they confer are highly stable, suggesting that the high prevalence of fluoroquinolone resistance that we are experiencing today in some parts of the world will remain.

References

Lactobacillus endocarditis caused by a probiotic organism

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Probiotics are microorganisms deliberately ingested to modify the gut flora in order to produce 'health' [1]. We report here what we believe to be the first case of endocarditis due to *Lactobacillus rhamnosus* brought about by self-medication with a freeze-dried probiotic preparation, in a subject who was previously fit and well.

*Lactobacillus* spp. are universally found in the mouth, female genital tract and gastrointestinal tract of humans, as well as in many foods and health food preparations. They are generally considered to be non-pathogenic [2,3]. Large quantities of products containing lactobacilli are sold worldwide; for example, $3 \times 10^9$ kg of products containing *Lactobacillus* sp. GG (ATCC 53103) were sold in Finland alone in 1992 [2]. However, lactobacilli have been associated causally with endocarditis, meningitis, pneumonia and local supplicative conditions [4]. The case of endocarditis we report is also interesting since the source of the infecting bacteria in endocarditis is so rarely elucidated. (This case was presented as Poster M243 at The Second European Congress of Chemotherapy, Hamburg, May 1998.)

A 67-year-old male with previously documented mild mitral valve regurgitation due to mitral valve prolapse presented to his family doctor complaining of persistent dry cough, slight shortness of breath and weight loss. A few weeks earlier, some carious teeth had been removed, and 3 g of amoxicillin by mouth 1 h before the procedure was given as prophylaxis. The subject was taking one or two capsules daily of a freeze-dried probiotic preparation, each capsule of which was stated to contain $2 \times 10^9$ bacteria of *L. rhamnosus.* Eight further sets of products containing *Lactobacillus* sp. GG (ATCC 53103) were sold in Finland alone in 1992 [2]. However, lactobacilli have been associated causally with endocarditis, meningitis, pneumonia and local supplicative conditions [4]. The case of endocarditis we report is also interesting since the source of the infecting bacteria in endocarditis is so rarely elucidated. (This case was presented as Poster M243 at The Second European Congress of Chemotherapy, Hamburg, May 1998.)

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The subject was referred to hospital; on examination, he looked well. Old splinter hemorrhages were present on one hand. He was apyrexial, with blood pressure 140/90 mmHg and pulse 90/min in sinus rhythm. A loud pansystolic murmur of mitral valve regurgitation was present at the cardiac apex, radiating to his axilla. His lungs were clear and there were no signs of heart failure. The remainder of the examination was unremarkable. Results of laboratory tests were normal apart from low hemoglobin (111 g/L), and raised C-reactive protein (22 mg/L) and erythrocyte sedimentation rate (ESR) (52 mm/h). Chest X-ray and electrocardiogram were normal. A transthoracic echocardiogram showed moderate mitral valve regurgitation and increased tissue on the posterior mitral valve leaflet which was thought to be a small vegetation.

Blood cultures yielded Gram-positive rods in all bottles of three sets. These grew in short chains on solid media after 48 h, and were catalase negative, asaculic positive and non-motile; further testing by API 50CHL and at The Public Health Laboratory showed the organisms to be *L. rhamnosus.* Eight further sets of blood cultures were also positive for *L. rhamnosus.* The antibiotic sensitivity was as shown in Table 1. One of the organisms cultured from the probiotic capsules was indistinguishable from that isolated from the blood cultures by virtue of identical cultural appearance, reactions in API 50CHL, sensitivity patterns and pyrolysis mass spectrometry.

The patient was treated with intravenous ampicillin (2 g 8-hourly) + gentamicin (80 mg 12-hourly) for 2 weeks and was discharged, well, on pivampicillin (1 g 12-hourly) + probenecid (500 mg 6-hourly) for 6 weeks. Attempts to isolate the causal lactobacillus from the patient's teeth or bowel were unsuccessful. The patient was well at follow-up 3 months after admission.

Although lactobacilli are recognized to be of low intrinsic virulence, there are several reports of infection caused by members of this genus. There are at least 58 cases of endocarditis in the literature [5-8]; 50% of these patients had some form of dental disease or had had dental treatment prior to the onset of endocarditis. Further, Antony et al [9] described 55 patients with lactobacillus bacteremia (often as part of a polybacteremia) in the absence of endocarditis. In those cases where etiologic strains were speciated (unfortunately, this was often not done), it is clear that the great susceptibility pattern of *Lactobacillus rhamnosus* (MICs in mg/L)

<table>
<thead>
<tr>
<th>Sensitive</th>
<th>Intermediate</th>
<th>Resistant</th>
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<tbody>
<tr>
<td>Chloramphenicol (&lt;4)</td>
<td>Ampicillin (2)</td>
<td>Cephaloridine (32)</td>
</tr>
<tr>
<td>Clindamycin (&lt;0.12)</td>
<td>Benzy1penicillin (0.5)</td>
<td>Co-trimoxazole (4/76)*</td>
</tr>
<tr>
<td>Erythromycin (&lt;0.12)</td>
<td></td>
<td>Vancomycin (128)</td>
</tr>
<tr>
<td>Gentamicin (2)</td>
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</tr>
<tr>
<td>Imipenem (2)</td>
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<td></td>
</tr>
<tr>
<td>Rifampicin (&lt;1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetracycline (2)</td>
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*Trimethoprim/sulfamethoxazole.
majority were the closely related, vancomycin-resistant [10] species L. casei, L. panacaei or L. rhamnosus, and that the vancomycin-sensitive species L. acidophilus is only rarely implicated.

Probiotics appear to be attractive to the public; promotional material makes such claims as ‘maintains a healthy digestion’, ‘improves digestibility and assimilation of food’, ‘keeps intestinal contents sweet’, ‘assists general well-being’, and ‘protects skin against harmful microbes’. As, in the UK, probiotics are foods rather than medicines, this type of claim, although virtually impossible to substantiate, is allowed.

There is considerable evidence that lactobacilli may be tolerant to β-lactam antibiotics [6,11]; this may have led to the failure in the case reported here of the oral prophylaxis given before the dental treatment. Tolerance has also been held responsible for treatment failure in several cases [6]. The patient described here chewed the contents of capsules, which could have increased the risk of endocarditis following dental treatment. Patients who are immunosuppressed or have pre-existing heart valve disease should avoid probiotic preparations containing L. rhamnosus, and warnings on packaging to this effect should be considered. It is noticeable that in the case presently being discussed, it was the L. rhamnosus rather than the other constituents of the probiotic capsules that caused the endocarditis, although all the species present had equal opportunity to colonize the valve. There appears to be less risk attached to the use of probiotic organisms such as L. acidophilus (see above) or Lactobacillus sp GG [2]. Another probiotic species best avoided is Enterococcus faecium (especially if vancomycin resistant [12]), as there may be more risks than benefits from its use [13].

References

High genetic identity within the C:2b:P1.2,5 meningococcal epidemic strain in Galicia (Spain)

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In the early 1990s, an increasing number of serogroup C meningococcal strains was observed [1], and a rise in the incidence of the disease was also found, especially in some regions in the northwest of the country,