

# Chemoprophylaxis for the prevention of infective endocarditis: What is the current status?

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## Introduction

Despite advances in diagnostic and therapeutic interventions, the morbidity and mortality of infective endocarditis remain high.<sup>1</sup> There is no doubt that the potential consequences of infection are such that attempts at primary prevention are worthwhile. Although chemoprophylaxis is a routine and accepted practice in most developed countries, the scientific basis for chemoprophylaxis is controversial.<sup>2-4</sup> Variations in target patient populations, procedures and antibiotic protocols exist at international and national levels and in addition to other controversies may contribute to the low compliance rates and the inappropriate use of agents that have been described.<sup>5</sup> The aim of this review is to look at the evidence for prophylaxis, and to discuss currently recommended strategies.

## The evidence for prophylaxis

Current practice in chemoprophylaxis is based largely on logic rather than evidence and this has given rise to some controversy. Studies have demonstrated that transient bacteraemia occurs after certain procedures with organisms that are commonly associated with endocarditis.<sup>6,7</sup> Pre-existing cardiac abnormalities are present in 70-75% of patients with endocarditis.<sup>8</sup> Although animal studies have shown that systemic antibiotics can prevent streptococcal endocarditis, even when the inoculum of bacteria was large and a foreign body was present, no prospective study has proved that prophylaxis is effective in humans.<sup>9</sup>

In a retrospective survey of 533 patients with prosthetic valves undergoing dental or surgical procedures, no cases of endocarditis occurred in those receiving prophylaxis (304) as compared with 6 cases in the 229 that did not receive prophylaxis ( $p=0.04$ ).<sup>10</sup> Two case control studies, both with important limitations, have been performed and have shown a protective efficacy of 91% and 49% respectively.<sup>11,12</sup>

Such data has led some workers to argue that even if prophylaxis is effective, it may only prevent a small number of cases and may not be cost-effective as a general strategy. It is also known that fewer than 15% of patients with infective endocardi-

tis give a history of dental treatment in the three months preceding their illness and cases of failure of prophylaxis have been reported.<sup>13</sup>

Although it is generally agreed that a large prospective study is required to clarify these matters, it is unlikely that one will be performed. Despite these concerns and given the potential consequences of endocarditis expert groups advise that prophylaxis be given to those at risk of endocarditis undergoing procedures at risk of causing bacteraemia.<sup>1,14,15,21</sup> It is important that chemoprophylaxis is properly targeted at risk groups, and that agents are correctly administered.<sup>14</sup>

## Who should receive prophylaxis?

The risk of endocarditis varies depending on the underlying heart disease and the procedure performed. Prophylaxis is advised when both the procedure and the underlying condition pose substantial risk.

As already discussed international protocols vary. In general, in an attempt to improve compliance, it is advised that recommendations be as simple and specific as possible. This is a difficult balance to achieve and it is also important to recognise that guidelines cannot cover all situations and should not be considered a replacement for clinical judgement. Expert advice should be sought if any doubt exists. The British Society for Antimicrobial Chemotherapy (BSAC) has amongst the simplest recommendations;<sup>15-20</sup> the recommendations from the American Heart Association have recently been modified in an attempt to improve compliance, reduce cost and potential adverse affects and approach more uniform, worldwide guidelines.<sup>21</sup>

Risk may be ranked according to the nature of the underlying heart disease. The current system of ranking is based on the frequency with which pre-existing cardiac disorders occur in a large series of patients compared with the general population (Table 1).<sup>7,21</sup> Ideally chemoprophylaxis should be targeted at those at greater risk. Certain patients are considered at higher risk e.g. the risk in patients with prosthetic valves and a previous history of endocarditis is 5-10 times higher than in patients with native

### Table 1. Patients in whom endocarditis prophylaxis is recommended

- Prosthetic valve
- Previous episode bacterial endocarditis
- Congenital cardiac conditions (risk greater in cyanotic disease)
- Acquired valvular heart disease
- Mitral valve prolapse with valvular regurgitation and/or thickened leaflets
- Patent ductus arteriosus
- Hypertrophic obstructive cardiomyopathy

valve disease. The choice of an appropriate cut-off below which the risk is too low to require prophylaxis remains arbitrary. The BSAC recommends prophylaxis in patients with heart valve lesions, septal defect and patent ductus arteriosus.<sup>15</sup>

Studies have shown that the frequency and degree of bacteraemia after procedures varies with the procedure (Table 2).<sup>7</sup> It is generally accepted that the risk is highest for dental and oral procedures, lower for genitourinary procedures and low for gastrointestinal procedures.<sup>6,7</sup> Controversy exists about the need for prophylaxis for flexible bronchoscopy, endotracheal intubation, and colonoscopy with and without biopsy.<sup>21</sup> The BSAC working party recommends prophylaxis in some groups

### Table 2. Dental and surgical procedures that require antibiotic prophylaxis

- Dental procedures, i.e. dental extractions, scaling and periodontal surgery in all patients
- Upper respiratory tract procedures in all patients
- Genito-urinary procedures in all patients (does not include urinary catheterisation)
- Obstetric and gynaecological procedures in patients with prosthetic valves or a previous episode of bacterial endocarditis
- Gastrointestinal procedures in patients with prosthetic valves or a previous episode of bacterial endocarditis

when patients are at higher risk, i.e. prosthetic valves or a previous episode of bacterial endocarditis.<sup>15</sup>

The choice of antimicrobial agent is a relatively simple matter. The agent is directed against the likely organism and is dependent on the patient's history.

### Prophylactic regimens

Prophylaxis is most effective when adequate concentrations are achieved during and after the procedure. There is no evidence to support continuing the antibiotic for more than six to eight hours after the procedure and this behaviour may induce resistance and should be avoided.

The BSAC recommendations are summarised in Table 3.

A clinician about to undertake a risk procedure needs to ask the following questions:

- What is the underlying valve lesion?
- What procedure is to be performed?
- Does the patient require prophylaxis?
- Is the patient penicillin allergic or have they received penicillin more than once in the last month?
- What is the appropriate choice of antibiotic?

The current debate centres around the cost benefit of a preventative strategy in general terms and is based on the lack of prospective data and the fact that only a small number of cases are due to a recent medical/dental procedure. Further studies are necessary to clarify these issues. Until these problems are clarified it is important that prophylaxis is administered in an appropriate manner. In addition to chemoprophylaxis, the importance of optimising dental health cannot be overemphasised. In the future, current strategies may need modification if the epidemiology of this serious condition changes.

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### Table 3. Recommendations for endocarditis in adult patients (BSAC Working Party)

- (1) Dental extractions, scaling or periodontal surgery (under local or no anaesthetic)**  
 Patients not allergic to penicillin and not prescribed penicillin more than once in the previous month (including those with a prosthetic valve)  
 Amoxycillin 3g orally 1 hour before procedure  
 Patients allergic to penicillin and prescribed penicillin more than once in the previous month  
 Clindamycin 600mg orally 1 hour before procedure  
 Patients who have a history of endocarditis As under general anaesthetic 1 (e) and 1 (f)  
 Dental extractions, scaling or periodontal surgery (under general anaesthetic)  
 Patients not allergic to penicillin and not prescribed penicillin more than once in the previous month and not having a prosthetic valve or previous history of endocarditis  
 Amoxycillin 1g i/m or i/v at induction and 500mg 6 hours later orally.  
 Patients not allergic to penicillin and not prescribed penicillin more than once in the previous month but having a prosthetic valve or previous history of endocarditis  
 Amoxycillin 1g and gentamicin 120mg i/m or i/v at induction and amoxycillin 500mg 6 hours later orally  
 Patients allergic to penicillin or prescribed penicillin more than once in the previous month and having a prosthetic valve or previous history of endocarditis  
 Vancomycin 1g over 100 min before procedure and gentamicin 120mg at induction or 15 min before procedure  
 or teicoplanin 400mg and gentamicin 120mg at induction or 15 min before procedure  
 or clindamycin 300mg i/v at induction and 150 mg orally 6 hours later
- (2) Surgery or instrumentation of the upper respiratory tract**  
 As above 1 (a) to 1 (f)
- (3) Genitourinary surgery or instrumentation**  
 If urine sterile as for 1 (e) or (f) except clindamycin regimens do not cover faecal enterococci and should not be used. If urine infected, prophylaxis should also cover infective organism.
- (4) Obstetric and gynaecological procedures**  
 Chemoprophylaxis only recommended for those with a prosthetic valve or previous history of endocarditis. As for 1 (e) or (f) except clindamycin regimens do not cover faecal enterococci and should not be used
- (5) Gastrointestinal procedures**  
 Chemoprophylaxis only recommended for those with a prosthetic valve or previous history of endocarditis. As for 1 (d) or (f) except clindamycin regimens do not cover faecal enterococci and should not be used

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## The Palpitating Quiz

**Michael struggled up on the bed and the doctor could see his ankles were swollen. He took the pulse; it seemed almost to come and go - very odd. He could hardly hear the heart sounds: although with his cold the hearing wasn't too good at the time. This is probably why he also had some difficulty recording the blood pressure. He spoke to Michael's wife who told him about the weight loss in recent months. The doctor thought it best to give a diuretic and to get an x-ray and ECG in the morning. Unfortunately by then it was too late. What was the likely diagnosis and what should the doctor have done?**

Answer to the autumn rollover palpitating quiz

### **Subclavian steal syndrome**

This is an uncommon cause of transient cerebral ischaemia, which may occur if the subclavian artery is stenosed proximal to the origin of the vertebral artery. The increased blood flow needed when the arm on the affected side is exercised (Jimmy's mother waving frantically) may be met by blood from the unaffected subclavian artery via the two vertebral arteries. Blood destined for the basilar artery from the vertebral artery on the normal side is 'stolen' down the other vertebral artery to supply the arm being used, thus rendering the brain stem ischaemic. Remember to take the blood pressure in both arms, and listen for bruits over the supraclavicular fossae.

The prize is a £400 travelling bursary sponsored by



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Entries to the Editor, HeartWise,

Eireann Publications, 25 Windsor Place, Dublin 2. Fax: 4753311.

The closing date for entries is 21st January.