

## A Practical Guide to Antibiotic Prophylaxis in Restorative Dentistry

L.P. Longman and M.V. Martin

**Abstract:** *The purpose of this paper is to review the principles and practicalities of antibiotic prophylaxis in medically compromised patients who require restorative dentistry. Guidelines for the management of patients who are susceptible to infection are given. The importance of oral health and the rational use of both local and systemic antimicrobial prophylaxis is described.*

*Dent Update* 1999; **26**: 7-14

**Clinical Relevance:** *Bacteraemias induced by restorative dentistry can cause significant morbidity in patients who are medically compromised.*

The use of antibiotic prophylaxis in restorative dentistry is controversial. National guidelines exist to help practitioners rationalize the prescribing of chemoprophylaxis in dentistry,<sup>1</sup> but they are not explicit for every clinical situation. The restorative dentist frequently encounters situations where guidelines are vague or non-specific. Clinical judgement is therefore required to interpret them. Situations also exist in which national bodies advise against the use of systemic prophylaxis but the dentist is faced with a request for antibiotics from the patient or his/her specialist. This is frequently the case when treating a patient who has undergone a joint replacement. The aim of this article is to explore such difficult areas.

In most individuals a transient bacteraemia of dental origin is rarely

associated with any serious sequelae. There are, however, certain patients whose medical history renders them susceptible to infection following bacteraemia. The ensuing infection can be local or systemic and may be associated with significant morbidity; occasionally it is life threatening. These medically compromised patients should be regarded as having special dental needs. If serious bacterial infection is to be avoided during the dental management of this group, the clinician must be able to identify the patients susceptible to infection, the dental conditions and the procedures that place them at risk. Local and systemic antimicrobial prophylactic regimens should be prescribed as appropriate. It is essential that a long-term comprehensive preventive care strategy is employed for medically compromised patients and that restorative dentistry, when required, is of the highest quality.<sup>2</sup>

### LOCAL AND SYSTEMIC ANTIMICROBIAL PROPHYLAXIS

Antimicrobial prophylaxis is the

prevention of infection by administration of antimicrobial agents—locally, systemically or both.

When medically compromised patients are undergoing operative dental procedures, preoperative mouth-rinsing and atraumatic subgingival irrigation with chlorhexidine (0.2% w/v) should be instituted as a routine, irrespective of the use of systemic antibiotics. Chlorhexidine has been shown to reduce the magnitude of a dentally-induced bacteraemia<sup>3</sup> and decreases the ability of some micro-organisms to cause infection.<sup>4</sup> Subgingival use of chlorhexidine before extraction also reduces the incidence of dry sockets.<sup>5</sup> Local application of chlorhexidine should therefore always accompany the use of systemic antibiotics.<sup>1</sup>

Theoretically, the repeated use of chlorhexidine could lead to the selection of bacterial strains resistant to this disinfectant but this does not appear to be a problem in clinical practice.<sup>6</sup>

Prophylaxis should be directed against micro-organisms commonly responsible for postoperative infection. The antibiotic used should reach a serum concentration of at least four times higher than the minimum inhibitory concentration of the predominant pathogenic bacteria.<sup>7</sup> The most effective and least harmful systemic prophylaxis is to use single or short-term high dosage regimens to provide maximal concentration in susceptible tissues throughout the operation, up to surgical closure.<sup>8,9</sup> The use of prophylactic antibiotics beyond the immediate preoperative, interceptive and postoperative periods provides no

L.P. Longman, BSc, BDS, FDS RCS, PhD, Consultant/Honorary Lecturer in Restorative Dentistry, and M.V. Martin, BDS, BA, PhD, FRCPath, Senior Lecturer/Honorary Consultant in Oral Microbiology, Department of Clinical Dental Sciences, University of Liverpool.



## Conditions predisposing to risk of infective endocarditis

- History of infective endocarditis
- Ventricular septal defect
- Patent ductus arteriosus
- Coarctation of the aorta
- Prosthetic heart valve
- Rheumatic and other acquired valvular disease
- Surgically constructed systemic-pulmonary shunts
- Persistent heart murmur
- Atrial septal defect repaired with a patch
- Hypertrophic cardiomyopathy
- Marfan's syndrome

## Patients not at risk from infective endocarditis

- After coronary artery bypass surgery
- Six months after surgery for:
  - Ligated ductus arteriosus
  - Surgically closed atrial or ventricular septal defects (without Dacron patch)
  - Isolated secundum atrial septal defect

## Special risk patients

- The British Society of Antimicrobial Chemotherapy<sup>1</sup> have recognized a group of patients with endocardial disease whom they consider to be at 'special risk'. These patients are particularly susceptible to IE and should normally be referred to hospital for dental treatment requiring prophylaxis. Special risk patients are classified as patients with endocardial disease who
  - have had IE before or
  - require general anaesthesia and have a prosthetic heart valve or are allergic to penicillin or have had penicillin more than once in the previous month

**Table 1.** Endocardial lesions and infective endocarditis.

additional protection.<sup>10-12</sup> There is little evidence that postoperative administration of antimicrobials is beneficial, even in open wounds—in fact, such drugs may be harmful.<sup>8</sup>

Antibiotics should be used sparingly, avoiding multiple or repeated dosing whenever possible. Sensitive microorganisms are killed by antibiotics but, more importantly, the normal balance of the flora is destroyed, leading to the potential for opportunistic infections. Single doses of antimicrobial prophylaxis are unlikely to cause major perturbations of the commensal flora.

## THE PATIENT

Prophylactic antibiotics are recommended for two main groups:

1. Patients who are susceptible to infection because of pre-existing disease.
2. Patients undergoing surgical procedures that carry a high risk of infectious complications.

The first group mainly refers to patients who are at risk of developing infective endocarditis: patients who have undergone joint replacements or radiotherapy to the jaws may also be included in this category. In these patients the risk of infection is small but the

consequences are very serious. Patients with impaired host defence mechanisms should also be considered for prophylaxis as they are at risk from opportunistic infections—this includes organ transplant recipients and people receiving renal dialysis.

Patients in the second group have normal host defence mechanisms but the nature of the surgery renders them vulnerable to postoperative infections. Some authorities recommend routine use of systemic chemoprophylaxis in minor oral surgery (e.g. removal of impacted teeth or surgical endodontics) but for the use of antibiotics to be justified postoperative infection must be a common event and caused by predictable endogenous micro-organisms. The incidence of infection from exogenous organisms should be limited by good operative practice and not by systemic antibiotics.<sup>7</sup> Dental procedures in healthy patients do not usually carry a high incidence of postoperative infection.

Antibiotics are sometimes prescribed for healthy patients when they undergo minor oral surgery such as an apicectomy, to prevent infection at the surgical site rather than to prevent systemic spread of infection. Evidence for the effectiveness of prophylaxis in apicectomies is difficult to find: the use of a local disinfectant may be just as effective.<sup>13</sup> The prevalence of

postoperative infection following minor oral surgery is not high; in addition, any infection that does occur is rarely serious and is readily amenable to simple treatment. In most patients undergoing minor procedures there is no need for antibiotic prophylaxis; the overwhelming indication for antibiotic prophylaxis in dentistry is the medically compromised patient.

## INFECTIVE ENDOCARDITIS

Patients with acquired or congenital endocardial disease are at risk of developing infective endocarditis (IE) during dental procedures that cause a transient bacteraemia. Endocardial conditions that predispose a person to IE are listed in Table 1. It is likely that the importance of dental treatment as a cause of IE has been overstated but it nevertheless remains the greatest identifiable risk for susceptible patients. The use of chemoprophylaxis for such patients is well established, and is considered a necessity medicolegally. From the guidelines published by the British Society for Antimicrobial Chemotherapy (BSAC), procedures such as scaling, extraction and oral surgery *always* require antibiotic cover.<sup>1,14-16</sup> The use of chemoprophylaxis in some of the restorative procedures listed below is, however, more contentious.

## Periodontal Assessment and Treatment

The following procedures should be performed under systemic antibiotic cover:

- full mouth probing to determine the severity of the loss of periodontal attachment;
- supragingival and subgingival scaling;
- root planing;
- full mouth polishing of cervical surfaces of teeth;
- periodontal surgery.

However, it would be unreasonable routinely to prescribe antibiotic prophylaxis solely to determine the loss of attachment. This procedure should normally be undertaken at a visit when prophylaxis is required for other treatment (e.g. scaling).



NO ALLERGY TO PENICILLIN	PATIENT ALLERGIC TO PENICILLIN OR HAS RECEIVED PENICILLIN MORE THAN ONCE IN THE PREVIOUS MONTH
<b>Local or no anaesthesia</b>	
Amoxicillin (3 g orally 1 hour before operation)	Clindamycin* (600 mg orally 1 hour before operation)
<b>General anaesthesia</b>	
Amoxicillin (3 g) and probenecid (1 g) orally 4 hours before procedure or amoxicillin (3 g) orally 4 hours before and 3 g after surgery or amoxicillin (1 g) intravenously at induction and 500 mg orally 6 hours later	These patients are classified as special risk
<b>Special risk patients</b>	
Intravenous amoxicillin (1 g) and intravenous gentamicin (120 mg) before surgery or at induction and amoxicillin (500 mg) orally 6 hours later	Intravenous teicoplanin (400 mg) and intravenous gentamicin (120 mg) before procedure or at induction or clindamycin (300 mg) given intravenously over 10 minutes in 50 ml of diluent before surgery or at induction and 150 mg (oral or intravenous) 6 hours later or vancomycin (1 g, slow intravenous infusion over not less than 100 minutes), followed by gentamicin (120 mg, intravenous) before surgery or at induction
<p>*Clindamycin tablets should be swallowed with a glass of water to prevent oesophageal irritation.</p> <ul style="list-style-type: none"> <li>● Children under 10 years of age: half the adult dose of amoxicillin or clindamycin is recommended, children under 5 years: one-quarter of the adult dose.</li> <li>● For children under 10 years, 20 mg/kg of vancomycin should be used and 2 mg/kg of gentamicin</li> <li>● Children under 14 years of age: 6 mg/kg of teicoplanin plus 2 mg/kg of gentamicin.</li> <li>● Amoxicillin may be given twice in one month as it is unlikely that proliferation of clinically significant amoxicillin-resistant strains will occur after one 3 g dose of amoxicillin. A third dose of amoxicillin, however, should not be given until after an interval of one month. Two weeks should elapse between prophylactic doses of clindamycin.</li> </ul>	

**Table 2.** Antibiotic regimens recommended for the prophylaxis of dentally induced infective endocarditis (adapted from references 1,14)

The gingival bleeding index is often used to assess the presence of superficial inflammation. Although there is no evidence to link the provocation of gingival bleeding with the production of a dental bacteraemia, such procedures should be treated with caution and should not be routinely performed in patients susceptible to IE without antibiotic cover. Systemic antibiotics should *not* be prescribed solely to record the gingival bleeding index.

### Conservative Dentistry

The dentist is often concerned about treatment that occasionally gives rise to a bacteraemia, such as placement of a

wedged matrix band or subgingival restorations. Such procedures are not known to be associated with the initiation of IE. It is unrealistic and undesirable to give systemic prophylaxis routinely for such procedures; simple preoperative mouth-rinsing and subgingival irrigation with chlorhexidine should suffice. It is important to emphasize that elective conservative dentistry should not be undertaken in the presence of gingival inflammation. Good periodontal health is of paramount importance in patients susceptible to IE.

### Subgingival Restorations

The extent of a carious lesion cannot

always be predicted, and many restorations may extend subgingivally. The placement of subgingival restorations does not appear to be associated with development of IE. If placement of a satisfactory restoration requires surgical removal of gingival tissue then, in the absence of antibiotic prophylaxis, a suitable temporary dressing should be placed (the definitive restoration and local periodontal surgery will require prophylaxis at a later date). When multiple extensive carious lesions are present it would be prudent to stabilize the lesions with temporary restorations; this will allow the operator to assess the extent of all the lesions and plan any antibiotic prophylaxis. The objective is to minimize the number of antibiotic administrations required.

### Crowns and Gingival Retraction

Antibiotic cover is not required for the preparation and placement of crowns or for the use of retraction cord: local (sulcular) application of chlorhexidine should reduce any bacteraemia. However, when cervical margins are placed below the dentoepithelial junction the junctional periodontal tissue must be removed or displaced in order to facilitate impression taking. It would be prudent in such cases to postpone preparation of the cervical margins and impression taking to an appointment when antibiotic cover is given. Ideally, crown margins should be placed supragingivally or just beneath the free gingival margin and periodontal surgery (e.g. pocket elimination or crown lengthening procedures) may be indicated to improve the access to cervical margins, or to provide more retentive preparations. Such procedures should be performed under antibiotic cover.

### Non-surgical Endodontics

The necessity for systemic chemoprophylaxis for root canal therapy is controversial. Infective endocarditis as a consequence of root canal therapy has been reported only infrequently,<sup>17,18</sup> although it has been shown that extra-canal instrumentation regularly causes bacteraemia.<sup>19</sup> There is no consensus on the merit of antibiotic prophylaxis in root canal therapy: the clinician must assess each case individually. However, it may be prudent to carry out contentious procedures at a visit when other



procedures that require prophylaxis are going to be performed. Extra-canal instrumentation may occur during blind instrumentation of a root canal and it is the authors' opinion that antibiotic prophylaxis should be used for the radiographic determination of root length.<sup>20</sup> Antibiotic cover would not be required if biomechanical preparation and obturation were undertaken at future visits because extra-canal instrumentation would be very unlikely. Single-visit endodontics should be undertaken when appropriate.

## Intraligamentary Anaesthesia

The BSAC has warned against the use of intraligamentary anaesthesia in patients at risk from IE:<sup>1</sup> this practice carries a risk of severe bacteraemia and should not be used in such patients.

## Antibiotic Regimens

There is now considerable similarity between regimens recommended by various national agencies. In the UK clinicians are advised to follow the recommendations issued by the Working Party of the BSAC;<sup>1,14-16</sup> the current guidelines are shown in Table 2. Amoxicillin may be given twice in one month as it is unlikely that proliferation of clinically significant amoxicillin-resistant strains will occur after one 3 g dose<sup>15,21</sup> and the incidence of amoxicillin-resistant oral streptococci in adult patients susceptible to IE is not high.<sup>22</sup> A third dose of amoxicillin, however, should not be given until after an interval of one month.<sup>21</sup>

Concern has been expressed that patients may develop pseudomembranous colitis after the administration of clindamycin. However, this condition does not occur after a single prophylactic dose of the drug.<sup>1,16</sup> The low pH of clindamycin tablets can cause irritation of the oesophagus; to prevent this the preparation should be swallowed with a glass of water. An interval of at least 2 weeks is required between prophylactic doses of clindamycin.<sup>1,16</sup>

## Special Risk Patients

The BSAC has defined a subgroup of patients with endocardial disease who they consider as 'special risk'. Such patients are considered to be particularly

susceptible to IE and should be referred to hospital for dental treatment, which requires prophylaxis with parenteral antibiotics.<sup>1</sup> These 'special risk' patients are those who, in addition to their endocardial disease:

- have had IE before; or
- require a general anaesthetic and (i) have a prosthetic heart valve or (ii) are allergic to penicillin or have had penicillin more than once in the previous month.

## Patients with Joint Replacements

Bacteraemias of dental origin have been implicated in infections of total joint replacements;<sup>23-25</sup> this serious complication usually necessitates removal of the prosthesis. However, the evidence linking bacteraemias of dental origin and infection of a joint replacement is unproven and relies mainly on anecdotal case

reports.<sup>26-28</sup> Oral streptococci have only infrequently been isolated from infected endoprostheses, approximately 46% of the bacteria cultivated from infected joint replacements being staphylococci.<sup>25,26,28</sup>

In 1992 the BSAC Working Party found no evidence to support the routine use of antibiotic cover for dental procedures on patients with prosthetic joints.<sup>27</sup> The BSAC does not consider the advantages of antibiotic prophylaxis to outweigh the potential risks.<sup>27,29</sup> However, despite these guidelines, many orthopaedic surgeons continue to recommend antibiotic prophylaxis for dental treatment of patients who have a prosthetic joint.<sup>30</sup> When a dental surgeon elicits advice from a patient's orthopaedic surgeon, he or she should make sure it is followed.

## RADIOTHERAPY

Patients who have been exposed to, or who are receiving, therapeutic radiation to the

NO PENICILLIN ALLERGY	ALLERGIC TO PENICILLIN
<b>Local or no anaesthetic</b>	
Amoxicillin, 3 g orally 1 hour before procedure	Clindamycin 600 mg orally 1 hour before procedure or 1.5 g erythromycin stearate orally 1 to 2 hours before and 500 mg orally 6 hours after procedure or 500 mg ciprofloxacin orally 1 hour before procedure
<b>General anaesthetic</b>	
Amoxicillin (3 g) and probenecid (1 g) orally, 4 hours before surgery or amoxicillin (3 g) orally 4 hours before and amoxicillin (3 g) after surgery or amoxicillin (1 g) intravenous at induction and 500 mg orally 6 hours later	Clindamycin (300 mg) intravenous at induction
<ul style="list-style-type: none"> <li>● Patients who have been given clindamycin must be advised to consult their doctor if diarrhoea develops. Clindamycin tablets should be swallowed with a glass of water to prevent oesophageal irritation.</li> <li>● Dental procedures requiring cover:                             <ul style="list-style-type: none"> <li>● Only the following dental procedures require antibiotic cover:                                     <ul style="list-style-type: none"> <li>● Scaling</li> <li>● Extractions</li> <li>● Oral surgery</li> </ul> </li> </ul> </li> </ul>	
<p>Root canal therapy and advanced non-surgical restorative procedures would not normally require antibiotic prophylaxis, however, patients who have received radiotherapy to the head and neck may have a compromised vascular supply to the jaws. Antibiotic prophylaxis for root canal therapy may be considered appropriate for these patients.</p> <p><i>NB: This regimen may also be used in healthy patients to prevent postoperative infection following minor oral surgery.</i></p>	

**Table 3.** Suggested antibiotic regimen for the prevention of postoperative infection in immunocompromised patients (including transplant and dialysis patients) or those at risk from osteoradionecrosis.



jaws may be susceptible to local infection. After radiotherapy there is a diminution of the vascular supply in the irradiated area, especially in the mandible—this is a progressive risk and does not reduce with time. When possible, an opinion should be sought from the patient's oncologist on their susceptibility to osteoradionecrosis.

The risk of infection in irradiated patients is much greater with extraction than endodontics and, although the efficacy of antibiotics in preventing bacteraemia in this group of patients is questionable due to the poor blood flow to the irradiated area, patients who are at risk from osteoradionecrosis require antibiotic prophylaxis for extractions. In the absence of national recommendations, it is suggested that a single dose of either amoxycillin or clindamycin is used (see Table 3). Endodontics is the preferred treatment in irradiated patients for a necrotic pulp. The value of chemoprophylaxis during root canal therapy is doubtful and is not routinely recommended.

## IMMUNOCOMPROMISED PATIENTS

Patients may be immunocompromised for a large variety of reasons. The aetiology of the impaired host defences will influence the patient's susceptibility to infection. The white blood cell count may be an important marker of a patient's vulnerability to infection. The Working Party of the BSAC states that, in the absence of any other indication, patients who are immunocompromised (including transplant recipients) or have indwelling intraperitoneal catheters do not require antibiotic prophylaxis for dental treatment,<sup>29</sup> although in clinical practice it is not unusual for a physician or surgeon to request specifically that their patient is given systemic prophylaxis for certain dental procedures. When managing immunocompromised patients the dentist should liaise with the supervising consultant on prophylaxis, stating the position of the BSAC. If chemoprophylaxis is recommended the dentist should record the specialist's advice clearly in the patient's records. Ideally, the dentist should use a single-dose regimen (see Table 3). Dental procedures such as extractions, minor oral surgery and scaling may require systemic prophylaxis; root canal treatment and

periodontal assessment do not generally need cover. The antibiotic used should be effective against both the oral flora and the most likely potential pathogens; amoxycillin (3 g) or clindamycin (600 mg) are both suitable (Table 3) agents. Some renal specialists advise against the use of clindamycin in their patients; alternative regimens for such patients are suggested in Table 3.

Transplant recipients are immunosuppressed by their drug therapy and have traditionally been considered to be at increased risk of local and systemic infections. In the immediate post-transplant period operative complications and acute rejection of the organ are the major medical concerns. Routine dentistry should not be undertaken during this critical period; emergency dental treatment should be undertaken in this phase only after medical consultation. Elective dental treatment should be delayed until the patient is deemed to be in a stable post-transplant phase; this is usually 6 months after surgery.

There now appears to be a consensus amongst specialists that heart transplant recipients do not usually require antibiotic cover in the stable post-transplant period. It is advisable for the dental practitioner to liaise with the supervising consultant because immunosuppressant drug regimes vary and can influence the decision on whether to provide antibiotic cover. Cardiac transplant patients are not considered to be at risk of IE.

## MISCELLANEOUS PROSTHETIC IMPLANTS

Patients with cardiac pacemakers, intraocular lenses, breast implants, penile implants and prosthetic vascular grafts are not considered to be susceptible to infection from dental bacteraemias.<sup>14,31,32</sup> There is some evidence that antibiotic prophylaxis may be required in patients with cerebrospinal shunts and intravascular access devices (such as central venous lines used for parenteral nutrition or chemotherapy and catheters used for haemodialysis and plasmapheresis); specialist opinion on the need for prophylaxis in such cases should be sought. Patients receiving renal dialysis are immunocompromised by uraemia in end-stage renal disease, associated with metabolic and haematological abnormalities. As a consequence these

patients have an enhanced susceptibility to infection; septicaemia is a real possibility and is potentially life threatening. A bacteraemia during dental treatment may cause infection in a central dialysis line along the surgically created arteriovenous fistula and some renal specialists recommend antibiotic prophylaxis before certain dental treatments for dialysis patients (see Table 3).

## ESTABLISHMENT AND MAINTENANCE OF ORAL HEALTH: A PREVENTIVE PHILOSOPHY

Potentially the dentist's greatest contribution to the prevention of infection in medically compromised patients is in the establishment and maintenance of oral health. Bacteraemias of oral origin can result from many operative procedures and even from non-invasive activities such as toothbrushing, flossing and chewing<sup>19,31,33</sup> (Table 4). If oral health is poor, the frequency and magnitude of these bacteraemias is thought to be high, increasing the probability of serious sequelae. Spontaneous bacteraemias are common in patients with periodontitis and may be more important as a cause of systemic infection than those generated by operative procedures.<sup>25,34</sup> A patient's oral health therefore has serious implications for the long-term dental management of the medically compromised patient. Logically, good oral health will reduce the prevalence and size of spontaneous bacteraemias and thus the risk of haematogenous infection.

Procedure	%
Extractions:	
Single	51
Multiple	68-100
Subgingival scaling	51-83
Gingivectomy	83
Full periosteal flap	33-83
Root canal therapy:	
Intracanal instrumentation	0
Extracanal instrumentation	31
Flossing	20-58
Chewing	17-50
Toothbrushing	7-50

**Table 4.** The percentage of bacteraemias (positive blood cultures) associated with various dental procedures and oral activities (adapted from reference 19).



When restorative intervention is indicated in medically compromised patients, treatment planning requires great care and meticulous attention to detail (Table 5). Treatment plans should be realistic and consider the long-term maintenance of oral health. Consideration should also be given to the following points:

- The order and timing of treatment should be arranged to minimize the number of occasions on which antibiotic prophylaxis is required. This may necessitate an increase in the length of appointments when systemic antibiotics are used.
- The whole armamentarium available for the prevention of dental disease must be considered when treating an individual who is susceptible to infection. Effective oral hygiene instruction plays a pivotal role in any preventive care strategy. Dietary advice, fissure sealing and fluoride supplements should be considered in patients with early carious lesions or a high incidence of decay.

- Patient education is central to the establishment and maintenance of oral health. The risks of bacteraemia from the oral cavity are often poorly appreciated by patients at risk from haematogenous infection. In order for a patient to embrace a preventive philosophy he or she must understand why the maintenance of oral health is vital to their well-being. Patient education requires constant reinforcement; in practice this involves reviewing the patient's oral health at regular intervals.
- Regular review and maintenance is vital. The precise interval for recall should be assessed for each individual and will depend on their susceptibility to orodental disease; but it should rarely exceed 6 months. Patients at increased risk from dental disease, such as those with salivary gland hypofunction or uncontrolled periodontal diseases, will require more frequent follow-up. The insidious onset of chronic periodontitis makes it imperative that the clinician adopts a screening protocol for the detection and monitoring of any loss of periodontal

support. Adolescents, in particular, need regular assessment in order that the early stages of chronic periodontal diseases may be recognized.

- Liaison between the medical and dental professions should be encouraged. Ideally, patients should undergo dental assessment before endocardial surgery, organ transplantation, total joint replacement or radiotherapy to the orofacial tissues. These patients should then be counselled as to the importance of their dental status.

### Prevention of Infective Endocarditis: The American Perspective

The American Heart Association (AHA) have recently updated their recommendations for the prevention of bacterial endocarditis.<sup>35</sup> The new guidelines for restorative dentistry are more prescriptive than those given in previous reports.<sup>1,31</sup> In patients susceptible to infective endocarditis the AHA do not recommend the use of systemic

PREDISPOSING MEDICAL CONDITION				
Dental procedure	Endocardial disease	Total joint replacement	Immunocompromised, renal dialysis and transplant patients	Radiotherapy to jaws
Minor oral surgery, extractions biopsy, implant placement	Yes	No, unless requested by specialist	Liaise with specialist*	Yes
Periodontal surgery, surgical endodontics	Yes	No, unless requested by specialist	Liaise with specialist*	No (the elevation of mucoperiosteal flaps is not recommended in patients susceptible to osteoradionecrosis, especially in the mandible)
Scaling, root planing	Yes	No, unless requested by specialist	Liaise with specialist*	No
Incision of an abscess	Yes	No	Liaise with specialist*	No
Full mouth periodontal probing, bleeding index	Yes	No	No	No
Radiographic determination of root canal length	Yes	No	No	No
Root canal obturation	No	No	No	No
Matrix bands, crowns, impressions	No	No	No	No

\*The BSAC do not consider that these patients require antibiotic prophylaxis<sup>29</sup>

**Table 5.** Recommendations for the use of antimicrobial prophylaxis in dental patients who are medically compromised.



prophylaxis for the following procedures:

- taking oral impressions;
- restorative dentistry (with or without retraction cord); or
- intracanal endodontics.

The AHA advocate preoperative use of an antiseptic mouth-rinse; however, they do not advise gingival irrigation. The antibiotic of choice, in patients who can tolerate it, is a single oral dose of 2g amoxicillin.<sup>35</sup>

## Acknowledgements

The authors are grateful for the advice received from Ms E. Varga and Dr K.S. Last during the preparation of this manuscript.

## References

1. Working Party of the British Society for Antimicrobial Chemotherapy. Antibiotic prophylaxis of infective endocarditis. *Lancet* 1992; **1**: 1292-1293.
2. British Dental Association. Memorandum to the Royal Commission on the National Health Service. *Br Dent J* 1977; **142**: 53-63.
3. MacFarlane TW, Ferguson MM, Mulgrew CJ. Post extraction bacteraemia: role of antiseptics and antibiotics. *Br Dent J* 1984; **156**: 179-181.
4. Holloway PM, Bucknall RA, Denton GW. The effects of sub-lethal concentrations of chlorhexidine on bacterial pathogenicity. *J Hosp Infect* 1986; **8**: 39-46.
5. Field EA, Speechley JA, Rotter E, Scott J. Dry socket incidence after 12 year interval. *Br J Oral Maxillofac Surg* 1985; **23**: 419-427.
6. Milns B, Martin MV, Field EA. The sensitivity to chlorhexidine and cetyl pyridium chloride of staphylococci on the hands of dental students and theatre staff exposed to these disinfectants. *J Hosp Infect* 1994; **26**: 99-104.
7. Martindale. *The Extra Pharmacopoeia*, 29th edition. London: The Pharmaceutical Press, 1989; pp.102-103.
8. Polk HC Jr, Lopez-Mayor JF. Postoperative wound infections: A prospective study of determinant factors and prevention. *Surgery* 1969; **66**: 97.
9. Burke JF. Use of preventive antibiotics in clinical surgery. *Am Surg* 1973; **39**: 6-11.
10. Conte JE Jr, Cohen SN, Roe BB, Elashoff RM. Antibiotic prophylaxis and cardiac surgery: a prospective double blind comparison of single dose versus multiple-dose regimens. *Ann Intern Med* 1972; **76**: 943-949.
11. Stone HH, Haney BB, Kolb LD, Geheber CE, Hooper CA. Prophylactic and preventive antibiotic therapy: timing, duration and economics. *Ann Surg* 1979; **189**: 691-699.
12. Nelson CL, Green TG, Porter RA, Warren RD. One day versus seven days of preventive antibiotic therapy in orthopedic surgery. *Clin Orthop* 1983; **176**: 258-263.
13. Martin MV, Nind D. The use of chlorhexidine gluconate for pre-operative disinfection of apicectomy sites. *Br Dent J* 1987; **162**: 459-461.
14. Working Party of the British Society for Antimicrobial Chemotherapy. The antibiotic prophylaxis of infective endocarditis. *Lancet* 1982; **ii**: 1323-1326.
15. Working Party of the British Society for Antimicrobial Chemotherapy. Prophylaxis of infective endocarditis. *Lancet* 1986; **i**: 1267.
16. Working Party of the British Society for Antimicrobial Chemotherapy. Antibiotic prophylaxis of infective endocarditis. *Lancet* 1990; **i**: 88-89.
17. McGowan DA. Endodontics and infective endocarditis. *Int Endodont J* 1982; **15**: 127-131.
18. Longman LP, Martin MV, Butterworth C. Infective endocarditis and the dental practitioner: a review of 53 cases involving litigation. *Br Dent J* 1997; **182**: 465-468.
19. Bender IB, Barkan MJ. Dental bacteraemia and its relationship to bacterial endocarditis: preventive measures. *Compendium* 1989; **10**: 472-482.
20. Longman LP, Martin MV. The prevention of infective endocarditis-paedodontic considerations. *Int J Paediatr Dent* 1993; **3**: 63-70.
21. Woodman AJ, Vidic J, Newman HN, Marsh PD. Effect of repeated high-dose prophylaxis with amoxicillin on the resident oral flora of adult volunteers. *J Med Microbiol* 1985; **19**: 15-23.
22. Longman LP, Pearce PK, McGowan P, Hardy P, Martin MV. Antibiotic-resistant oral streptococci in dental patients susceptible to infective endocarditis. *J Med Microbiol* 1991; **34**: 33-37.
23. Blomgren G. Haematogenous infection of total joint replacement. *Acta Orthop Scand* 1981; **52** (Suppl 187).
24. Cioffi GA, Terezhalmay GT, Taybos GM. Total joint replacement: A consideration for antimicrobial prophylaxis. *Oral Surg Oral Med Oral Pathol* 1988; **66**: 124.
25. Bartzokas CA, Johnson R, Jane M, Martin MV, Pearce PK, Saw Y. Relation between mouth and haematogenous infection in total joint replacements. *BMJ* 1994; **309**: 506-508.
26. McGowan DA, Hendrey ML. Is antibiotic prophylaxis required for dental patients with joint replacements? *Br Dent J* 1985; **158**: 336-338.
27. Working Party of the British Society for Antimicrobial Chemotherapy. Case against antibiotic prophylaxis for dental treatment of patients with joint prostheses. *Lancet* 1992; **i**: 301.
28. Field EA, Martin MV. Prophylactic antibiotics for patients with prosthetic joints. *Br J Maxillofac Surg* 1991; **29**: 341-346.
29. *Dental Practitioners' Formulary*. 1996; **32**. London: The Pharmaceutical Press.
30. Sandhu SS, Lowry JC, Reuben SF, Morton ME. Who decides on the need for antibiotic prophylaxis in patients with major arthroplasties requiring dental treatment: is it a joint responsibility? *Ann R Coll Surg Engl* 1997; **79**: 143-147.
31. American Heart Association. Prevention of bacterial endocarditis. *JAMA* 1990; **264**: 2919-2922.
32. Little JW, Falace DA. Prosthetic implants. In: *Dental Management of the Medically Compromised Patient*, 4th ed. London: CV Mosby, 1993; pp. 533-542.
33. Silver JG, Martin AW, McBride BC. Experimental transient bacteraemias in human subjects with varying degrees of plaque accumulation and gingival inflammation. *J Clin Periodontol* 1977; **4**: 92-99.
34. Guntheroth WG. How important are dental procedures as a cause of infective endocarditis? *Am J Cardiol* 1984; **54**: 797-801.
35. American Heart Association. Prevention of bacterial endocarditis. *JAMA* 1997; **277**: 1794-1801.