



## Endocarditis prophylaxis: the new guidelines

**P**roperly controlled clinical antibiotic trials for the prevention of bacterial endocarditis in humans have never been done. Recommendations for antibiotic chemoprophylaxis are based on in vitro studies, vast clinical experience, data from experimental animal models, and consideration of those bacteria most likely to produce bacteremia from a given site and those most likely to result in endocarditis. The American Heart Association (AHA) first issued prevention guidelines in 1965, with periodic revisions since then, most recently in the December 12, 1990 issue of the *Journal of the American Medical Association*.<sup>1</sup> This latest revision reflects a continuing evolution based on accumulated clinical data and animal experiments. Major changes include shorter periods of antibiotic coverage and use of oral antibiotic prophylaxis when possible. It must be stated emphatically that these are only guidelines and are not intended as a standard of care in all cases. Practitioners must exercise their own clinical judgment in individual cases or special circumstances, and endocarditis may occur despite appropriate antibiotic prophylaxis. Scientific organizations in other countries have also formulated recommendations which may vary in certain respects from the AHA guidelines.<sup>2</sup>

Surgical and dental procedures and instrumentation involving mucosal surfaces or contaminated tissue commonly cause transient bacteremia of short duration. Blood-borne bacteria may lodge on damaged or abnormal heart valves or on the endocardium or the endothelium near congenital defects, resulting in bacterial endocarditis or endarteritis. Only a small number of bacterial species commonly cause endocarditis, and certain cardiac conditions are more often associated with endocarditis than others (Table 1). Furthermore, certain dental and surgical procedures are much more likely to initiate the bacteremia that results in endocarditis than are other procedures (Table 2).

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### NEW AHA REGIMENS

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The new prophylactic regimen for dental, oral, or upper respiratory tract procedures in patients at risk for *Streptococcus viridans* bacteremia is the following: (1) amoxicillin, 3 g orally 1 hour prior to the procedure, followed by 1.5 g 6 hours later; and (2) for penicillin-allergic patients, erythromycin ethylsuccinate, 800 mg; or erythromycin stearate, 1 g orally 2 hours prior to the procedure, followed by half-dosage 6 hours later; or clindamycin, 300 mg orally 1 hour before the procedure and 150 mg 6 hours after the procedure. The major change from the previous AHA guidelines (1984) is the selection of amoxicillin as the beta-lactam antibiotic of choice, as it displays better absorption than either ampicillin or penicillin V. The formulation of erythromycin now recommended is either the stearate or ethylsuccinate preparation, again because of better absorption and higher predicted serum concentrations.

For patients unable to take oral medications, the recommendations are as follows: (1) ampicillin, 2 g intravenously (IV) or intramuscularly (IM), 30 minutes before the procedure, followed by ampicillin 1 g IV or IM, or amoxicillin, 1.5 g orally 6 hours after the procedure; and (2) for penicillin-allergic patients, clindamycin, 300 mg IV 30 minutes before the procedure, and 150 mg IV or orally 6 hours later.

For high-risk patients (ie, those with prosthetic heart valves, prior endocarditis, surgically constructed systemic-pulmonary shunts or conduits) who are not candidates for the standard regimen, the recommendations are: (1) ampicillin, 2 g IV or IM plus gentamicin, 1.5 mg/kg IV or IM 30 minutes before the procedure, followed by amoxicillin, 1.5 g orally 6 hours later; and (2) for penicillin-allergic patients, vancomycin, 1 g IV over 1 hour as a single dose, beginning 1 hour before the procedure; no repeated dose is necessary.

When the entry site is either the genitourinary or the gastrointestinal tract, enterococcus is the most likely

pathogen. For prevention of bacterial endocarditis in patients undergoing genitourinary or gastrointestinal procedures or both, the following schedule is still recommended: (1) ampicillin, 2 g IV or IM, plus gentamicin, 1.5 mg/kg (not to exceed 80 mg) IV 30 minutes before the procedure, followed by amoxicillin, 1.5 g 6 hours later; and (2) for penicillin-allergic individuals, vancomycin, 1 g IV over 1 hour, plus gentamicin, 1.5 mg/kg IV or IM 1 hour before the procedure, with an option to repeat the dose 8 hours after the initial dose. Also included is an oral regimen for low-risk patients using amoxicillin as outlined above for dental procedures.

**PATIENT SELECTION**

Which patients should receive prophylaxis? Heading the list (*Table 1*) are patients with prosthetic cardiac valves, including not only artificial valves, but bioprosthetic valves as well, both the heterograft and homograft varieties. By definition, any patient with a history of bacterial endocarditis, with or without preexisting heart disease, has at least one or more damaged valves and is therefore a candidate for future prophylaxis. Patients with rheumatic or other acquired valvular dysfunctions and those with most congenital cardiac malformations require prophylaxis. Patients with mitral valve prolapse who demonstrate valvular regurgitation deserve chemoprophylaxis, as do (new to the list) any patients with hypertrophic cardiomyopathy.

Equally important is a list of those conditions for which endocarditis prophylaxis is not recommended (*Table 1*), including mitral valve prolapse without regurgitation, functional cardiac murmurs, a history of rheumatic fever without demonstrable valvular abnormality, and the presence of implanted cardiac pacemaker or defibrillator. Patients with surgically repaired secundum atrial septal defects or patent ductus arteriosus and who have no demonstrable residual lesion appear at no increased risk of endocarditis and therefore do not require prophylaxis. The biggest single group of patients who do not require prophylaxis is patients who have undergone coronary artery bypass surgery.

**ENDOCARDITIS RISK**

Which procedures place patients at risk for endocarditis? Foremost are dental procedures known to induce gingival or mucosal bleeding, including tooth extrac-

**TABLE 1**  
ENDOCARDITIS PROPHYLAXIS IN CARDIAC CONDITIONS

Prophylaxis recommended
Prosthetic cardiac valves (bioprosthetic or homograft)
Prior bacterial endocarditis
Most congenital cardiac malformations
Acquired valvular dysfunction (eg, rheumatic, surgical)
Hypertrophic cardiomyopathy
Mitral valve prolapse with valvular regurgitation
Prophylaxis not recommended
Isolated secundum atrial septal defect
Surgical repair (without residual) beyond 6 months for secundum atrial septal defect, ventricular septal defect, and patent ductus arteriosus
Previous coronary artery bypass graft surgery
Mitral valve prolapse without valvular regurgitation*
Physiologic, functional, or innocent heart murmurs
Prior Kawasaki disease without valve dysfunction
Prior rheumatic fever without valve dysfunction
Cardiac pacemakers and implanted defibrillators

\*Mitral valve prolapse associated with thickening or redundancy of valve leaflets may be at increased risk for bacterial endocarditis, especially in men age 45 and older.

tions or vigorous cleaning if it includes scaling below the gingival margin (*Table 2*). The risk of bleeding during these kinds of procedures is clearly determined by the extent of gingival inflammation. Also recommended for prophylaxis are tonsillectomy, adenoidectomy, surgical procedures involving transection of the intestinal or respiratory epithelial surfaces, sclerotherapy for esophageal varices, esophageal dilatation, gall bladder surgery, cystoscopy, prostate surgery, and vaginal hysterectomy. Even relatively minor invasive procedures involving the urinary tract or the female genital tract deserve prophylaxis if there is a preexisting urinary tract infection or pelvic infection in the female.

Prophylaxis is considered unnecessary for several procedures (*Table 2*). Dental procedures not likely to result in gingival bleeding, such as adjustment of orthodontic appliances or simple fillings above the gum line, do not require prophylaxis. The likelihood of gingival bleeding should be the major determinant of whether or not a given dental procedure merits prophylaxis. Other procedures also considered to require no prophylaxis are endotracheal intubation, flexible fiberoptic bronchoscopy, cardiac catheterization, upper or lower gastrointestinal endoscopy, and most invasive procedures involving the urinary tract and pelvic organs if there is no preexisting infection.

The AHA report also emphasizes the use of alternate means of reducing gingival inflammation in patients undergoing dental procedures. Chlorhexidine gluconate oral rinse has recently become popular as

TABLE 2  
ENDOCARDITIS PROPHYLAXIS IN DENTAL  
AND SURGICAL PROCEDURES

<p>Prophylaxis recommended</p> <ul style="list-style-type: none"> <li>Dental procedures that induce mucosal, gingival bleeding</li> <li>Tonsillectomy, adenoidectomy</li> <li>Surgery involving intestinal or respiratory mucosa</li> <li>Bronchoscopy using rigid bronchoscope</li> <li>Sclerotherapy for esophageal varices</li> <li>Esophageal dilatation</li> <li>Gallbladder surgery</li> <li>Cystoscopy, urethral dilatation</li> <li>Urethral catheterization in presence of infection</li> <li>Prostatic surgery</li> <li>Incision and drainage of infected tissue</li> <li>Vaginal hysterectomy</li> <li>Vaginal delivery in presence of infection</li> </ul> <p>Prophylaxis not recommended</p> <ul style="list-style-type: none"> <li>Dental procedures not likely to induce gingival bleeding</li> <li>Injection of local intraoral anesthetic (except intraligamentary injections)</li> <li>Shedding of primary teeth</li> <li>Tympanostomy tube insertion</li> <li>Endotracheal intubation</li> <li>Bronchoscopy using flexible bronchoscope (with or without biopsy)</li> <li>Cardiac catheterization</li> <li>Endoscopy with or without gastrointestinal biopsy</li> <li>Cesarean section</li> </ul> <p>Also, in the absence of infection:</p> <ul style="list-style-type: none"> <li>Urethral catheterization</li> <li>Dilatation and curettage</li> <li>Uncomplicated vaginal delivery</li> <li>Therapeutic abortion</li> <li>Sterilization procedures</li> <li>Insertion or removal of intrauterine devices</li> </ul>
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evidence mounts that its use shortly before and immediately following tooth extraction reduces postextraction bacteremia. Thus, in patients who have poor dental hygiene, the use of chlorhexidine oral rinse may be considered a helpful adjunct to antibiotic prophylaxis.

**PARENTERAL ANTIBIOTICS**

Previous recommendations have placed greater emphasis on parenteral antibiotics, especially for patients at particularly high risk, such as those with prosthetic cardiac valves. Technical problems and cost considerations that accompany the use of parenteral an-

tibiotics, together with the fact that failures have not been a problem when oral antibiotic chemoprophylaxis was used, have led to the new recommendations that emphasize the oral route. However, the use of parenteral drugs is clearly not contraindicated for endocarditis prophylaxis, and when they are used, ampicillin should be used as the first-choice drug, 2 g IV or IM 30 minutes before the procedure, followed by a single dose of 1.5 g of amoxicillin orally, given 6 hours after the initial dose. There is still room for considerable exercise in judgment, however, and physicians or dentists who wish to provide a more aggressive regimen of endocarditis prophylaxis to their patients at risk should use ampicillin and gentamicin parenterally or, for patients who are penicillin-allergic, vancomycin IV.

**USING THE RECOMMENDATIONS**

A number of recommendations in this AHA report, which also includes specific pediatric dosing, are open to interpretation and perhaps even argument, but it is an honest and thoughtful effort to bring order out of confusion. I urge everyone to read the original report carefully, keep a copy handy in the office, and remember that plaintiff lawyers will be all too eager to challenge even minor deviations from the guidelines. Each patient presents a unique set of circumstances that may not always fit comfortably into a given slot. The physician should welcome this latest effort to protect vulnerable patients from the serious consequences of procedure-related bacteremia.

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