SCIENTIFIC ARTICLE

Australian Dental Journal 2000;45:(3):179-186

# Antibiotic prescribing practices by South Australian general dental practitioners

Tom Jaunay,* Paul Sambrook,† Alastair Goss‡

**Abstract**

The prescribing habits of a randomly selected approximately 10 per cent sample of South Australian general dental practitioners were obtained by postal questionnaire. Sixty-eight (61 per cent) usable replies were received and analysed. Generally, there was an appropriate level of knowledge of antibiotic prescription. However, there was a tendency toward over-prescription and a demonstrated lack of knowledge of the incidence of adverse reactions, development of multiresistant strains and prophylaxis against bacterial endocarditis. All of these areas are real challenges to the profession, whether in an overall global community health sense or in a highly individualized clinical or medico-legal sense. These issues are discussed and the profession is urged to reconsider and re-educate itself on these challenges.

***Key words:*** Antibiotics, prescription, general dental.

*(Received for publication November 1999. Revised January 2000. Accepted February 2000.)*

## Introduction

Antibiotics, along with analgesics, are the most commonly prescribed medications by dental practitioners. Antibiotics are considered a safe drug as they have no direct effect on the host, only attacking the bacterial microflora. This apparent safety has engendered an attitude of prescribing antibiotics for a wide variety of conditions 'just in case' of infection and patients often expect antibiotic prescription. There is increasing evidence that this attitude is totally inappropriate.[1] Adverse reactions, bacterial resistance rendering antibiotics useless and the rise of multiresistant bacteria are increasing problems.[2]

Adverse reactions include vomiting, diarrhoea, rashes, anaphylaxis and sometimes death.[3] Bacteria have the ability to mutate or acquire resistance so as to render particular antibiotics useless within one or two decades.[4] The development of resistance is not only a problem with the target bacteria in the condition being treated with antibiotics, other organisms within the body are also affected.[5] The last decade has seen the emergence of multiresistant bacteria or 'superbugs' which do not respond to any antibiotic.[2] Thus, in just over half a century, the possibility of a return to the pre-antibiotic era, when infections were a leading cause of death and disease, has emerged.

Many guidelines for the rational use of antibiotics have been published.[6,7] Unfortunately, as these are often based on opinion as well as some microbiologic fact, they often give conflicting advice. For example, the recommendations for antibiotic prophylaxis against bacterial endocarditis secondary to dental treatment by UK,[8] US[9] and Australian[10-11] authorities differ. Indeed, in Australia, there are two different national guidelines,[10-11] as well as many local institutional guidelines,[12] leading to confusion and uncertainty.

This is further compounded by a lack of data on what individual practitioners prescribe. In an extensive study of Australian medical practitioners' prescribing habits, it was found that antibiotic usage in Australia was second only to France and higher than the UK and US.[13] Antibiotics were still commonly being prescribed for upper respiratory tract infections when it is well known that these are invariably viral. It is also well documented that antibiotics do not prevent secondary infection from upper respiratory tract infections in healthy individuals. There were regional differences in prescription, with rural practitioners being more likely to prescribe antibiotics than urban medical practitioners.

Wide differences in antibiotic prescription for the same condition have been reported. In one study the most generous practitioner was 15 times more likely to prescribe an antibiotic than the most restrictive.[14]

*Oral and Maxillofacial Surgery Registrar, Royal Hobart Hospital.
†Assistant Director, Oral and Maxillofacial Surgery Unit.
‡Professor and Director, Oral and Maxillofacial Surgery Unit.

**Table 1. Periapical pathology**

| Question | Response | | | | Opinion | |
|---|---|---|---|---|---|---|
| Clinical situation | Prescribe a/b* Yes | No | Type | Other treatment | Recommend | Overuse |
| Periapical pathology<br>no spread<br>chronic<br>asymptomatic | 0% | 100% | – | E/E† immediately 46%<br>E/E later 41% | E/E<br>No a/b | 0% |
| Periapical abscess<br>local swelling<br>feel well<br>acute | 39% | 61% | Amoxycillin 60% | E/E drain 54%<br>E/E 27% | E/E immediately<br>Drain<br>No a/b | 39% |
| Cellulitis<br>feel ill<br>feverish | 98% | 2% | Amoxycillin 63% | E/E immediately 26%<br>E/E drain 24% | E/E immediately<br>Drain<br>Give a/b | Under 21% |
| Endodontically debrided tooth<br>discharge<br>TTP<br>no swelling | 28% | 72% | Amoxycillin 50% | Redebride 90% | Redebride<br>No a/b | 28% |
| Toothache<br>no observed dental cause | 2% | 98% | Cephalosporin | Further investigate | Further investigate | 2% |

*a/b=antibiotics.
†E/E=extract or endodontics.

In another, the most generous practitioner prescribed 76 per cent of the time, while the most restrictive prescribed only 21 per cent of the time.[15] Generally, the individual practitioner's attitude toward pharmacotherapy determines whether or not a patient is given a prescription.

Data are scarce on the prescribing habits of dental practitioners. A Norwegian study showed a restricted use of antibiotics by dental practitioners.[16] In the representative week of the study, 32 per cent of the study population, which was 10 per cent of all dentists in Norway, did not prescribe an antibiotic. Five per cent of the study population did prescribe more than five times in the week. Periodontists, oral surgeons and those with research and teaching experience were more likely to prescribe antibiotics. Alarmingly, 32 per cent stated they never prescribed antibiotics for prophylaxis for patients with a history of endocarditis. US studies have shown a wider range of prescription of antibiotics both in terms of type and frequency.[17] US dentists also had a high level of uncertainty about the use of antibiotics as prophylaxis for patients with a history of endocarditis.[16]

The aim of this study was to determine the antibiotic prescribing habits and knowledge of South Australian (SA) general dental practitioners.

## Method and materials

A questionnaire on antibiotic prescribing was developed, based in part on a previous unpublished survey of dentists working in the public system. A trial of the questionnaire was carried out on a small group of experienced general dental practitioners and modified based on this experience.

It consisted of four sections: clinical scenarios for therapeutic prescription; questions on indications for prophylactic usage; general knowledge on antibiotics; and the demographics of the respondents. The questionnaire contained an insert listing 18 specific drug and dosage regimens plus the options to combine regimens or write in alternatives. (The questionnaire is available on written request.)

The two senior authors developed a 'correct answer' or opinion of appropriate treatment based on the established protocols of the Oral and Maxillofacial Surgery Unit. These are consistent with appropriate practice but do not follow a single reference guideline. From this, an overall score for each of the three sections was developed.

A random sample of 100 SA general dental practitioners was generated from the South Australian Dental Register – specialist practitioners were excluded. The questionnaire was mailed as part of a package which included a covering letter explaining the reasons for the survey and confirming anonymity, as well as a prepaid reply envelope. Respondents were given the option of returning the questionnaire indicating they did not wish to participate or were no longer in active general practice. In this eventuality, a questionnaire was mailed to the succeeding general dentist on the Register. A followup was mailed at six and 12 weeks. The mailing was carried out by an administrative officer so the names and addresses of the respondents were not known to the researchers.

The data were transferred to a PC database and appropriate statistical analysis performed.

## Results

**Table 2. Surgery**

| Question | | | Response | | Opinion | |
|---|---|---|---|---|---|---|
| Clinical situation | Prescribe a/b* Yes | No | Type | Other treatment | Recommend | Overuse |
| Extraction third molar asymptomatic bone covered | 30% | 70% | Amoxycillin 80% | – | No a/b | 30% |
| Extraction third molar asymptomatic oral comunics | 19% | 81% | Amoxycillin 90% | – | No a/b | 19% |
| Extraction third molar previous pericoronitis asymptomatic | 34% | 66% | Amoxycillin 78% | – | No a/b | 34% |
| Extraction third molar current pericoronitis | 75% | 25% | Amoxycillin 90% | – | Leave and local measures if exo Give a/b | Under 25% |
| Dentigerous cyst asymptomatic small | 3% | 97% | Cephalosporin | Leave and review 50% | Remove No a/b | 3% |
| Oro-antral fistula | 48% | 52% | Amoxycillin 75% | Refer 65% Close immediately 30% | Close immediately No a/b | 48% |
| Avulsion and reimplantation tooth | 47% | 53% | Amoxycillin 50% | Splint 72% | Splint Give a/b | Under 53% |

*a/b=antibiotics.

One hundred and seventeen surveys were mailed and 85 (73 per cent) were returned. Of these, five indicated they were no longer in active general dental practice and 12 declined to participate. Sixty-eight (61%) usable replies were received.

The results of the five clinical situations related to periapical pathology are presented in Table 1. In only one, the feverish, unwell patient with a cellulitis, was antibiotic prescription mandatory. All but one of the respondents prescribed antibiotics. Fifty per cent also correctly instituted concurrent treatment aimed at removing the cause and the one who did not prescribe relied on local measures alone. However, 49 per cent initially relied solely on the antibiotic. In the fit, well patient, with a localized infection, local treatment of the cause by drainage and removal of the tooth or pulp would have sufficed. Thirty-nine per cent of respondents gave an antibiotic, with eight relying initially on the antibiotic alone and treating the cause later. Twenty-eight per cent treated a draining sinus with antibiotics to cover the necessary endodontic redebridement. The remaining two scenarios, for which antibiotics had no indication, were appropriately treated.

The use of antibiotics prophylactically for surgery is presented in Table 2. Approximately 30 per cent of

**Table 3. Mucosal and periodontal**

| Question | | | Response | | Opinion | |
|---|---|---|---|---|---|---|
| Clinical situation | Prescribe a/b* Yes | No | Type | Other treatment | Recommend | Overuse |
| Acutely infected traumatic ulcer | 17% | 83% | Amoxycillin 50% | Manage cause 46% Rinses and manage cause 37% | Rinses and manage cause No a/b | 17% |
| Denture patient poor OH erythematous sleeps with dentures in | 19% | 81% | Amphotericin 100% | Leave denture out and mouth rinses 37% Leave denture out 25% | Cytology Leave denture out Mouth rinses | 19% |
| Acute necrotizing ulcerative gingivitis | 80% | 20% | Metronidazole 84% | Scale immediately 57% | Mouth rinses Give a/b Scale and clean later | Under 20% |
| Acute periodontitis fit patient for scaling | 30% | 70% | Amoxycillin 20% Tetracycline 20% Metronidazole 20% | – | Scale No a/b | 30% |
| Chronic periodontitis fit patient for scaling | 6% | 94% | Metronidazole 66% Tetracycline 33% | – | Scale N a/b | 61% |

*a/b=antibiotics.

**Table 4. Medical conditions requiring prophylactic antibiotic cover for high risk dental procedures**

| Condition | Correct response % |
|---|---|
| Previous bacterial endocarditis | 98 |
| Prosthetic heart valve | 96 |
| Mitral valve incompetence | 86 |
| Atrial septal defect with graft | 70 |
| Immunosuppressed patient | 65 |
| Atrial septal defect without graft | 63 |
| Patent ductus arteriosus | 62 |
| Head and neck radiotherapy | 54 |
| Heart murmur | 50 |
| Recent myocardial infarct | 44 |
| Diabetes (insulin dependent) | 13 |

respondents routinely prescribed antibiotics for surgical situations where there was no evidence of infection. With symptoms or complexity, the percentage prescribing increased. There was an equal split for antibiotic usage for reimplantation of avulsed teeth.

The use of antibiotics for a range of mucosal and peridontal problems is presented in Table 3. The patient with acute necrotizing ulcerative gingivitis did have an active bacterial infection for which antibiotics were indicated. Eighty per cent of respondents did prescribe and predominantly used metronidazole. Most used the lower dose regimen and none used metronidazole in combination with a penicillin. Thirty per cent prescribed antibiotics for the patient with acute periodontitis. No particular antibiotic predominated with equal use of amoxycillin, tetracylines and metronidazole. Twenty per cent used antifungals for the patient with denture stomatitis. None recommended fungal identification by cytology first.

Medical conditions which require antibiotic prophylaxis when high risk dental procedures are performed are presented in Table 4. The essential indications related to preventing bacterial colonization of the damaged endocardium and protecting against bacterial infection for immunologically compromised patients. The key cardiac conditions of previous endocarditis and prosthetic heart valves were highly identified. This level of identification reduced for other conditions. A grafted atrial septal defect, which is a high risk circumstance, was not covered by 30 per cent of respondents. An undefined heart murmur was equally covered or not covered. Unless urgent, dental treatment is best avoided for a patient with a myocardial infarct within the previous six weeks. Protection against bacterial infection for immunosuppressed patients, including insulin dependent diabetes, was low. Irradiated jaws are at risk of osteoradionecrosis and if hyperbaric oxygen is not available, antibiotics are indicated.

**Table 5. Medical conditions not requiring prophylactic antibiotic cover for high risk dental procedures**

| Condition | Correct response % |
|---|---|
| Carcinoma large intestine | 95 |
| Stroke | 90 |
| Orthopaedic plates | 84 |
| Old myocardial infarct | 82 |
| Femoral graft >6 months | 75 |
| Coronary bypass – surgery >6 months | 71 |
| Kidney failure | 69 |
| Rheumatic fever – no valvular damage | 64 |
| Hip prosthesis >6 months | 62 |

**Table 6. Identification of high risk dental procedures requiring antibiotic prophylaxis**

| Condition | Correct response % |
|---|---|
| Tooth extraction | 100 |
| Soft tissue surgery | 98 |
| Endodontic instrumentation beyond apex | 98 |
| Subgingival scaling | 96 |
| Subgingival polishing | 80 |
| Endodontic debridement | 72 |
| Placement crown with subgingival margins | 71 |
| Placement rubber dam | 53 |

Medical conditions that do not require antibiotic prophylaxis are presented in Table 5. It must be noted that if antibiotics are prescribed 'just in case', then there is no benefit but a quantifiable risk. The patient with the history of rheumatic fever but no murmur was given antibiotics by 36 per cent of respondents. A similar number prescribed for the old hip prosthesis but much fewer for the orthopaedic plates.

Identification of those dental procedures that are high risk and thus require antibiotic prophylaxis is presented in Table 6. Generally, the guide is if a procedure produces bleeding, then it should be covered. The main clinical situations were accurately identified by over 90 per cent of respondents but only 53 per cent identified rubber dam placement as a high risk procedure.

Identification of low risk dental procedures that do not require antibiotic prophylaxis is presented in Table 7. Apparently, 9 per cent of respondents would prescribe antibiotics daily so at-risk patients could brush their teeth!

**Table 7. Identification of low risk dental procedures not requiring antibiotic prophylaxis**

| Condition | Correct response % |
|---|---|
| Tooth brushing/flossing | 91 |
| Occlusal filling | 87 |
| Class III filling | 73 |
| Local anaesthetic injection | 67 |
| Matrix band | 66 |
| Endodontic obturation | 41 |

**Table 8. General knowledge questions about antibiotics**

| Question | Answer | Correct response |
|---|---|---|
| Incidence of penicillin allergy | 1 in 100 (Next option 1 in 1000 | 22% |
| Incidence of cross-reactions to cephalosporins | 1 in 5 | 63% |
| Relation of route to allergic incidence | Same | 64% |
| Alternative to penicillin | Erythromycin ineffective | 80% erythromycin |
| Patient on oral contraceptive and antibiotics | Risk of interference | 94% would prescribe |
| MRSA stands for | Methicillin resistant Staphylococcus aureus | 20% (41% multi-resistant) |
| Dentists' contribution to MRSA | Over-rescription<br>Low dose<br>Too long | 62% (1 or more correct responses) |

**Table 9. Demographics of respondents**

| | |
|---|---|
| Practice type | |
| Mainly private | 67% |
| Mainly public | 33% |
| Practice location | |
| Metropolitan | 42% |
| Suburban | 46% |
| Rural | 12% |
| Graduation | |
| Adelaide | 87% |
| Less than 15 years | 40% |
| More than 15 years | 60% |
| Postgraduate education | |
| P/G courses | 66% |
| Less than 1 year ago | 80% |
| Frequency of antibiotic prescription | |
| Daily | 9% |
| Weekly | 64% |
| Monthly + | 27% |

The responses to the general knowledge questions on antibiotics are presented in Table 8. Generally, the level of knowledge was poor and 78 per cent underestimated the incidence of true penicillin allergy. Despite much media publicity and health bulletins to professionals, the awareness of methicillin resistant Staphylococcus aureus (MRSA) was low.

The demographics of the respondents are presented in Table 9. The respondents reflect the practice and education mix of SA dentists. The involvement in recent postgraduate courses was about 50 per cent greater than the general dentist population (The University of Adelaide Postgraduate Committee in Dentistry, personal communication, 1998). The scores for each of the three clinical sections, alone or in combination, were compared with each of the demographic characteristics. Generally, there were few significant correlations. Length of time since graduation did show some significant correlation at the $p<0.05$ level. Graduates of 15 years or more had a lower score for the clinical scenarios, a lower score for general knowledge on antibiotics and a lower overall score. Involvement in postgraduate education showed a statistically significant relation ($p<0.05$) to the correct use of antibiotics. The greater the level of knowledge concerning antibiotics, as shown by the scores for the second and third sections of the questionnaire, then the lower the frequency of antibiotic prescription ($p<0.05$).

## Discussion

This study shows that a random sample of about 10 per cent of SA general dental practitioners has an appropriate knowledge of antibiotic prescription. When compared against a strict standard of indications for antibiotic prescription, there is a tendency to over-prescribe. There is also a demonstrable lack of knowledge in some key areas including the incidence of adverse reactions, the development of multiresistant strains and difficulties in the appropriate use of prophylactic antibiotics. These findings parallel foreign studies of dental prescribing, although there is a higher level of knowledge in this study.[16-18]

The study population, although demographically representative of the general dental population of SA, is biased. Of the overall sample, 32 (27 per cent) did not respond to three mailings and a further 17 (15 per cent) declined to participate for one reason or another. Those who did reply had a higher level of recent participation in postgraduate education than the whole dental population ($p<0.5$). Many considered it a test and variously advised the researchers they had consulted references. The views of the senior authors had been published in the *Australian Dental Journal* two months prior to the study,[19] so the results of this study may represent an overly favourable view of the situation.

The yardstick of the senior authors' opinions, although based on published guidelines and considerable experience and training, is not absolute. Clearly, other authorities could be expected to disagree on some aspects. Although antibiotic usage does have a scientific basis, there is a substantial basis for anecdotal opinion to influence practice.

Antibiotics only act against sensitive bacteria and they do so generally in the body and not at a single site. Thus, in therapeutic use, the essentials of removing the cause, draining pus, if present, and maximizing host resistance by controlling fever and dehydration are paramount.[20] Reliance on antibiotics alone, and particularly broad spectrum rather than specific antibiotics, may result in failure to control infections and encourage the development of resistant bacterial strains.

The evidence for antibiotics acting to prevent infection from surgical wounds in the mouth is poor

to non-existent. The incidence of wound infection following extractions is low, less than 3 per cent, so one is attempting to prevent a low and minor risk.[21,22] The clinical indications for prophylactic antibiotics in endodontics are similarly low. Although the use of antibiotics, in particular tetracylines, has been in vogue for periodontal disease, the clinical evidence of benefit is low to non-existent.[23]

The issue of antibiotic prophylaxis and bacterial endocarditis is more defined. Untreated bacterial endocarditis is a lethal condition and survivors may need valve replacement. Generally, the medical and dental risk factors are well defined. One more recently identified risk, which was underestimated in this study, is endodontic treatment. Although bacterial showering from endodontic preparation is low and transient, the placement of the rubber dam, particularly with the rubber dam clamps, results in a substantial bacteraemia. The authors are aware of at least two Australian cases of bacterial endocarditis where the rubber dam clamps placed during endodontic therapy were implicated. These cases resulted in indefensible litigation and hence were settled out of court. Antibiotic prophylaxis for endodontics with rubber dam is mandatory for at-risk patients. The use of antibiotic prophylaxis for patients with orthopaedic implants has been controversial. Recent studies show the risk to be exceedingly low and clearly far outweighed by the risk of adverse sequelae to the antibiotic.[24]

This study showed amoxycillin to be the overwhelming choice of antibiotic by most respondents. There was a tendency toward lower dosage over a longer period of time. If antibiotics are to be used, they are best prescribed in higher doses over a shorter period of time. The naturally occurring penicillins are effective against Gram-positive organisms only. The newer penicillins are acid stable when taken orally, however, greater blood levels are achieved when taken in a fasting state. Amoxycillin is a semi-synthetic antibiotic derived from the penicillin nucleus and is stable in the presence of gastric acid even with food. Amoxycillin has the same Gram-positive spectrum as benzylpenicillin but also has a Gram-negative spectrum which is similar to ampicillin. There is increasing evidence that quite a number of the Gram-negative organisms are developing resistance. Neither of these antibiotics are effective against penicillinase-producing organisms. Apart from the difference in the dosing regime, there are few microbiological reasons to use amoxycillin in preference for the spectrum of oral infections discussed in this paper. Amoxycillin's increased spectrum offers very little advantage and, theoretically, could be responsible for the development of resistant strains in non-oral pathogens.

In response to the questions on the alternatives for the patient who is allergic to penicillin, the overwhelming choice was erythromycin. Although this is the standard textbook answer, erythromycin is a weakly active, bacteriostatic antibiotic to most oral micro-organisms. Erythromycin is a macrolide type of antibiotic. It is susceptible to acid degradation when taken orally and is enteric coated in a gluten-free coating. The action of erythromycin is particularly against Gram-positive organisms. It is an inhibitor of protein synthesis and is only bacteriostatic in clinically tolerable doses. Resistance is a problem with erythromycin and can even develop during a course. This antibiotic has a high incidence of adverse effects such as nausea, vomiting, abdominal pain, diarrhoea and anorexia.

Fungi are difficult to treat as they survive in spore forms within the mucosal epithelial cells and are thus relatively inaccessible. Fungal infections are also commonly overdiagnosed. Hence, if fungal infection is suspected, then its presence must first be determined by cytology or culture. If present, then antifungals should be used for at least two weeks.

Antibiotic prescription is clearly a complex multi-factorial issue.[1-3] Obviously, health professionals with the right of prescription have a key but not sole role. Prescribers must have a thorough understanding of the clinical indicators for antibiotic prescription, both therapeutic and prophylactic. They also need an understanding of the risks of adverse reactions and the development of resistant and multiresistant strains.[2,20] This has to be in a population and global sense as well as for the individual patient in front of them.

Besides health professionals, the other key players are the pharmaceutical industry, the government and, last but not least, patients, both individual and the community. The pharmaceutical industry is often blamed for encouraging prescription of their products but this, after all, is their commercial responsibility. The pharmaceutical industry is bound by government regulation and has a strong code of professional ethics. Thus, whether to prescribe or not remains the clinician's responsibility. However, pharmaceutical companies can and do influence the type of antibiotic used. Amoxycillin, as the apparently superior product over penicillin, is a classic example of this.

The Australian government has strong regulatory procedures in place and there is strict evaluation of all new drugs, strict control of type and quantity of drugs by means of the pharmaceutical benefits scheme (PBS) and regular bulletins to medical practitioners. Communication specifically with dental prescribers has been limited. Professional education, beginning at undergraduate medical and dental schools, is comprehensive, with continuing

education via numerous publications. Again, communication specifically with dental practitioners has been brief and superficial. Despite this strong regulation and education, Australia has the second highest prescribing rate in the world.[13] However, the level of prescription has reached a plateau in the last five years, whereas in Europe and the US prescription levels continue to increase. This prescription plateau can be attributed to an ongoing educational campaign by Australian health authorities. These educational campaigns must be carefully and strategically conducted.[25] Projects involving groups of medical practitioners and the community have shown that general medical practitioners will change their prescribing habits if they find their prescribing deviates from evidence-based national guidelines. As part of these projects, they have the opportunity to reflect on and discuss these differences in a group.[26] Conversely, warnings of adverse reactions do not necessarily work. Despite warnings on adverse reactions to amoxycillin/clavulanic acid, there was an increased prescription rate of 10 per cent and a 15 per cent increase in adverse hepatic reactions in the year following the warning. This trend has now reversed.[27]

The community has a role in prescribing practice and, not surprisingly, after decades of unnecessary prescribing of antibiotics, they believe antibiotics are needed for most infections and demand that they be prescribed. Recent US and UK studies show this is not so.[28,29] In the US and UK studies, individuals responded to unhurried discussion of the situation with a balanced view of the potential risks and benefits. For example, for children with acute otitis media, the probability of benefit is low and equal to the adverse risk.[30] Most parents with a child with an acutely painful ear will want something done but will accept analgesics alone when advised spontaneous resolution will occur in 24 hours in 60 per cent of cases. With antibiotics, the improvement rate is similar but with the added risk of vomiting, diarrhoea or a rash. In rare cases, severe and occasionally fatal Stevens Johnson syndrome can occur after antibiotic administration.

The dental profession as a whole needs to commit to a deeper understanding of the global effect of unnecessary antibiotic prescription. Antibiotics, if used wisely and discriminately, are precise life-saving drugs; however, if used indiscriminately, there are significant short-term and particularly long-term adverse sequelae. The profession needs to play a role in ongoing patient and community education.


## Acknowledgement

The authors wish to thank the South Australian Dental Board for permission to use the mailing list; Dr Ross Smith, Senior Consultant Microbiologist, Royal Adelaide Hospital, for advice on the manuscript; Mrs L Eves for assistance in administering the survey and typing the manuscript; and acknowledge all those who participated.


## References


1. Turnidge J. Antibiotic use or misuse. (Editorial.) Med J Aust 1997;167:116-117.
2. Turnidge J, Nimmo G, Francis G. Evolution of resistance in *Staphylococcus aureus* in Australian teaching hospitals. Australian Group on Antimicrobial Resistance. Med J Aust 1996;164: 68-71.
3. Anonymous. Penicillin allergy. Drug Ther Bull 1996;34:87-88.
4. Collignon PJ, Bell JM. Drug resistant *Streptococcus pneumoniae*: the beginning of the end for many antibiotics? Australian Group on Antimicrobial Resistance. Med J Aust 1996;164:64-67.
5. Christiansen K. Pneumonia in the nineties. Aust Prescriber 1999;22:37-39.
6. Victorian Drug Usage Advisory Committee. Antibiotic guidelines. 10th edn. North Melbourne: Therapeutic Guidelines Limited, 1998.
7. Tolhurst JC, Buckle G, Williams SW. Chemotherapy with antibiotics and allied drugs. Canberra: National Health and Medical Research Council, Australian Government Publishing Service, 1972.
8. Littler W, McGowan DA, Conlon C, Shanson DC, Eykyn S, Swanton H. Amoxycillin prophylaxis for endocarditis prevention. British Society for Antimicrobial Chemotherapy Endocarditis Working Party. Br Dent J 1998;184:208.
9. Cheng TO. Prevention of bacterial endocarditis: American Heart Association recommendations. JAMA 1997;278:1233.
10. Anonymous. Antibiotic prophylaxis of endocarditis. Aust Prescriber 1992;15:3.
11. Woods RG. A guide to the use of drugs in dentistry. 12th Edn. Sydney: Australian Dental Association, 1996.
12. Therapeutic Subcommittee. Bacterial endodartitis – prophylactic guidelines. Adelaide: Royal Adelaide Hospital, 1999.
13. McManus P, Hammond ML, Whicker SD, Primrose JG, Mant A, Fairall SR. Antibiotic use in the Australian community, 1990-95. Med J Aust 1997;167:124-127.
14. Steffensen FH, Schonheyder HC, Sorensen HT. High prescribers of antibiotics among general practitioners – Relation to prescribing habits of other drugs and use of microbiological diagnostics. Scand J Infect Dis 1997;29:409-413.
15. Cars H, Hakansson A. To prescribe – or not to prescribe – antibiotics. District physicians' habits vary greatly, and are difficult to change. Scand J Prim Health Care. 1995;13:3-7.
16. Preus HR, Albandar JM, Gjermo P. Antibiotic prescribing practices amongst Norwegian dentists. Scand J Dent Res 1992;100:232-235.
17. Ciancio S, Reynard A, Zielezny, Mather M. A survey of drug prescribing practices of dentists. N Y State Dent J 1989;55: 29-31.
18. Sadowsky D, Kunzel C. A study of the implementation of endocarditis prevention in patients at risk. NY State Dent J 1986;52:34-37.
19. Sambrook P, Goss AN. Antibiotic use, misuse and abuse. (Letter to the editor.) Aust Dent J 1998;43:201-202.
20. Bridgeman A, Wiesenfeld D, Hellyar A, Sheldon W. Major maxillofacial interactions. An evaluation of 107 cases. Aust Dent J 1995;40:281-288.
21. Piecuch JF, Arzadon J, Lieblich SE. Prophylactic antibiotics for third molar surgery: A supportive opinion. J Oral Maxillofac Surg 1995;25:53-60.
22. Zeitler DL. Propylactic antibiotics for third molar surgery. A dissenting opinion. J Oral Maxillofac Surg 1995;25:61-64.
23. Lindhe J. Necrotising periodontal disease. In: Lindhe J,

KarringT, Lang NP. Clinical periodontology and implant dentistry. 3rd Edn. Copenhagen: Munksgaard, Copenhagen, 1997.

24. Sandhu SS, Lowry JC, Morton ME, Reuben SF. Antibiotic prophylaxis, dental treatment and arthroplasty: time to explode a myth. (Editorial.) J Bone Joint Surg 1997;79B:521-522.
25. Harvey K, Rogers S, Roughbad L. Initiative to improve antibiotic use. Aust Prescriber 1999; 22:26-28.
26. De Santis G, Harvey KJ, Howard D, Mashford ML, Moulds RF. Improving the quality of antibiotic prescriptions in general practice. The role of educational intervention. Med J Aust 1994;160:502-505.
27. Adverse Drug Reactions Advisory Committee. Antibiotics of continuing concern. Aust Adverse Drug Reactions Bull 1996;15:6-7.
28. Hamm RM, Hicks RJ, Bemben DA. Antibiotics and respiratory infections: Are patients more satisfied when expectations are met? J Fam Pract 1996;43:56-62.
29. Butler CC, Rollnick S, Pill R, Maggs-Rapport F, Stott N. Understanding the culture of prescribing: Qualitative study of general practitioner's and patients' perceptions of antibiotics for sore throats. BMJ 1998;317:637-642.
30. Del Mar C, Glasziou P, Hayem M. Are antibiotics indicated as initial treatment for children with acute otitis media? A meta-analysis. BMJ 1997;314:1526-1529.

*Address for correspondence/reprints:*
Professor Alastair Goss,
Oral and Maxillofacial Surgery Unit,

The University of Adelaide,

Adelaide, South Australia 5005.