



# Code of Practice:

## Antibiotic prophylaxis for patients with prosthetic joint replacements undergoing dental treatment

October 2018

The New Zealand Dental Association has developed this Code of Practice, Antibiotic prophylaxis for patients with prosthetic joint replacements undergoing dental treatment, based on available evidence and expert advice. This Code of Practice provides guidance to members regarding antibiotic prophylaxis for dental patients who have prosthetic joint replacements. The Code of Practice for Antibiotic prophylaxis for patients with prosthetic joint replacements undergoing dental treatment is also intended as a practical resource for members of the New Zealand Dental Association.



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## Introduction

Prosthetic replacement of large joints such as the hip, knee, elbow and shoulder is a common and highly successful orthopaedic surgical procedure. Mechanical failure (loosening or fracture) is the most common complication affecting prosthetic joints, followed by joint infection.<sup>1</sup> Infection of a prosthetic joint replacement is a devastating complication that can lead to loss of the prosthetic joint and serious morbidity for the patient.<sup>2</sup> Joint infection can occur early (< 3 months after surgery), delayed (3 to 24 months after surgery) or late (more than 24 months after surgery).<sup>1-3</sup> The total rate of joint infection is in the range 0.3% to 1.9%<sup>4</sup> with around 30% (0.09% – 0.57% overall) being late infections. It is thought that most early and delayed infections are caused by micro-organisms contaminating the joint during or shortly after the operation with late infections often being attributed to haematogenous seeding.<sup>1,3,5</sup>

There is a theoretical risk of oral organisms from a dental procedure-induced bacteraemia infecting a prosthetic joint.<sup>6-12</sup> Historically, as with bacterial endocarditis prophylaxis, prophylactic antibiotics before invasive dental care have been recommended to reduce the risk of a prosthetic joint infection occurring. Over the last decade or so, however, there has been considerable debate around the need for, and effectiveness of, antibiotic prophylaxis for individuals who have a prosthetic joint. Orthopaedic groups and associations have generally supported the use of prophylactic antibiotics<sup>13-15</sup> (in a variety of circumstances) and other groups of physicians, infectious disease specialists and dentists have suggested that routine antibiotic prophylaxis in such patients is unjustified.

This NZDA Code of Practice reviews the latest published data on this topic and provides guidance for NZDA members.

## Bacteraemia from oral sources

Bacteraemia with oral bacteria occurs following normal daily activities such as eating and tooth-brushing as well as during certain dental interventions.<sup>16-23</sup> The intensity of the bacteraemia caused by normal daily activities is similar to that caused by a dental intervention (eg. tooth extraction).<sup>22,24</sup> It has been reported that the overall exposure to oral induced bacteraemia from daily activities (due to the repetitive nature of the bacteraemia) is significantly greater (by several magnitudes) than the exposure from dental procedures.<sup>16,25,26</sup> The bacteraemia following a dental procedure is usually of short duration with no detectable bacteraemia in 80% of patients after 60 minutes.<sup>1,16,22,25-28</sup> Any 'invasive' oral procedure, whether it causes bleeding or not, has the potential to induce a bacteraemia.<sup>20,25,28</sup>

The magnitude of dental bacteraemia from day-to-day routine activities and associated with a dental procedure is related to the degree of oral and gingival inflammation.<sup>16,23-25,29,30-33</sup> To reduce bacteraemic risk, patients should maintain good oral health through effective home care and regular dental examination (and treatment as required).

## Bacteraemia and prosthetic joint infection

Barbari *et al* (2010) reported that the low grade bacteraemia caused by dental procedures and by physiologic activities (<1 x 10<sup>4</sup> colony-forming units per millilitre (CFU/ml) was substantially lower than the high-density bacteraemia needed to get haematogenous seeding of prosthetic joints in animal models (3-5 x 10<sup>8</sup> CFU/ml).<sup>29</sup> Most prosthetic joint infections are caused by staphylococci, beta-haemolytic streptococci or gram-negative enteric bacilli. Alpha-haemolytic (oral) streptococci and anaerobes are relatively rare causes of prosthetic joint infection and it is not possible to determine whether these bacteria originate from the mouth or further down the gastrointestinal tract.<sup>31</sup>

A recent retrospective epidemiologic analysis of over 57,000 patients with prosthetic hip or knee replacements and who received dental treatment showed no increased risk of prosthetic joint infection after the dental procedure.<sup>35</sup>



Comprehensive reviews of the literature have **failed to demonstrate substantive evidence** of haematogenous infection of prosthetic joints by oral organisms following dental procedures<sup>1,2,7,9,26,29,35-47</sup>

Patients with prosthetic joint replacements who present with acute oral infections should receive prompt treatment to remove the source of infection and therapeutic antibiotics should be administered when indicated.

## Effectiveness of prophylactic antibiotics at the time of dental procedures

The efficacy of pre-treatment antibiotic prophylaxis in preventing a subsequent transient bacteraemia is equivocal with evidence suggesting that bacteraemia cannot be avoided in all cases, although with prophylaxis any bacteraemia is likely to contain fewer bacterial species.<sup>18,23,24,26,27,48-55</sup> Uçkay *et al* (2008) completed a systematic review analysing 144 studies (including 23 prospective studies but no randomised controlled trials) with respect to the effectiveness of antibacterial prophylaxis in preventing prosthetic joint infection and concluded that the evidence supporting the efficacy of antibacterial prophylaxis is at best very weak.<sup>1</sup>

Berbari *et al* (2010) reported in a case control study that antibiotic prophylaxis in high-risk or low-risk dental procedures did not decrease the risk of subsequent total hip or knee infection (adjusted OR, 0.9 [95% CI, 0.5–1.6] and 1.2 [95% CI, 0.7–2.2], respectively) and concluded that pre-procedural antibacterial prophylaxis in patients receiving dental procedures did not alter the risk of subsequent joint infection.<sup>29</sup>

A recent non-randomised, retrospective comparison of 6,500 matched pairs of patients with prosthetic hip or knee replacements who underwent a dental procedure showed no difference in the risk of prosthetic joint infection between those patients given antibiotic prophylaxis and those who were not.<sup>35</sup>

Antibiotic prophylaxis prior to dental procedures may reduce the risk and intensity of any bacteraemia, but there is no evidence that antibiotic prophylaxis reduces or eliminates the risk of late prosthetic joint infection.<sup>1,29,43</sup> Antibiotic prophylaxis is not indicated for dental procedures in patients who have osseous pins, plates and screws.<sup>56</sup>

## Other considerations regarding prophylactic antibiotic use

The provision of antibiotic prophylaxis carries risks. For example, the frequency of anaphylaxis to penicillin group antibiotics is reported as 1-5 in 10,000 cases of penicillin therapy.<sup>57,58</sup> The increasingly problematic issue of bacterial resistance to antibiotics with the associated increase in morbidity and mortality requires practitioners to exercise prescribing restraint and only administer antibiotics where the evidence supports their use.

## Potential high-risk groups

In the past, there has been some support for the use of prophylactic antibiotics in a group of patients who, because of severe immune deficiency or past prosthetic joint infection, may be at an increased risk of haematogenous infection of a prosthetic joint associated with an 'invasive' dental procedure.<sup>a 2,9,11,12,26,36</sup> It should be noted that other authors suggest the risk is overstated.<sup>29,53,47,59</sup> Kao *et al* (2017) evaluation of prosthetic joint infections after dental procedures showed no causative link and no benefit from prophylactic antibiotics in a cohort that included tens of thousands of patients with co-morbidities such as chronic liver disease, connective tissue disease, diabetes and cancer.<sup>35</sup>

<sup>a</sup> All dental procedures that involve manipulation of the gingival tissues or the periapical region of the teeth or perforation of the oral mucosa<sup>60</sup>



## International guidelines

The use of antibiotic prophylaxis for patients with prosthetic joints undergoing dental treatment is not recommended in Australia,<sup>61</sup> the United Kingdom<sup>62</sup>, Canada<sup>63</sup>, the United States of America.<sup>64</sup> or Holland.<sup>47</sup>

## Concluding comments

The compelling data showing no association between dental procedures and prosthetic joint infection, the lack of data showing benefit of antibiotic prophylaxis to prevent dental procedure-associated prosthetic joint infection, and the risk of antibiotic-associated complications and resistance pressure all argue strongly against the prophylactic use of antibiotics before dental procedures for the purposes of preventing prosthetic joint infection including for immune-compromised patients.

## Recommendation

Antibiotic prophylaxis for the purpose of preventing prosthetic joint infection in individuals undergoing dental procedures is not recommended.



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# Antibiotic prophylaxis for patients with prosthetic joint replacements undergoing dental treatment

## Code of Practice Advisory Group

The Code of Practice – Antibiotic prophylaxis for patients with prosthetic joint replacements undergoing dental treatment aims to combine the best available evidence in a clinical practice context, and is the result of an extended period of development by the Code of Practice Advisory Group (Antibiotic prophylaxis for patients with prosthetic joint replacements undergoing dental treatment) who donated their time, technical and professional knowledge and expertise in the provision of advice that informs this Code of Practice.

The NZDA wishes to acknowledge and thank the members of the Code of Practice Advisory Group for their significant contribution to the development of this Code of Practice.

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This Code of Practice was developed in consultation with the NZ Orthopaedic Association

#### Disclaimer

This Code is intended to assist practitioners with making decisions regarding the management of patients with prosthetic joint replacements undergoing dental treatment. The recommendations in this Code are not intended to define a standard of care. Practitioners must exercise professional judgment when using the information contained in this Code of Practice.

This document's sole aim is to summarise the available information in the context of current clinical practice to assist members of the NZDA in matters relating to the management of patients with prosthetic joints who are receiving dental care.

The members of the Code of Practice Advisory Group and the NZDA shall not be liable for any actions arising from the use of, or reliance on, this document.

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