

# Dental & Oral Health

## RESEARCH REVIEW™

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Issue 1 – 2016

### In this issue:

- Saliva in the diagnosis of disease
- Treatment failure in endodontics
- Treating permanent teeth with deep dentine caries
- NSAIDs: first-line in endodontic pain relief?
- Management of dens invaginatus
- Oral care for pregnant patients
- Hypophosphatasia in dentistry
- An update of radiation shielding in dental settings
- Lollipop-induced oral lichenoid reaction in a child
- TCM use for oral conditions

#### Abbreviations used in this issue

**HIV** = human immunodeficiency virus  
**NSAID** = nonsteroidal anti-inflammatory drug  
**RCT** = randomised controlled trial  
**TCM** = traditional Chinese medicine

## Welcome to this issue of Dental and Oral Health Research Review.

This issue begins with a review of the latest advances in saliva-related studies in which the potential value of saliva for early diagnosis of oral and systemic diseases is discussed. A meta-analysis of analgesics for pain of endodontic origin concludes that NSAIDs are the agents of choice (in the absence of contraindications). Colleagues from Australia have reviewed and provided guidelines for reducing the risks associated with radiation exposure in dental practices. The final issue for 2016 concludes with a report on the use of TCMs (traditional Chinese medicines) by US-residing Chinese parents and their children for oral conditions.

We hope you have enjoyed Dental and Oral Health Research Review this year, and we look forward to returning in 2017.

Kind regards

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### Saliva in the diagnosis of diseases

**Authors:** Zhang C-Z et al.

**Summary:** Saliva is a hypotonic solution of salivary acini, gingival crevicular fluid and oral mucosal exudates with multiple functions: mouth cleaning, by washing away bacteria and food debris; digestion, as salivary amylase catalyses the hydrolysis of starch into maltose and sometimes glucose in the mouth; antibacterial effects provided by salivary lysozymes and thiocyanate ions; and saliva secretion contains risk factors for some diseases by excreting or transmitting potassium iodide, lead and mercury, and viruses such as rabies, polio and HIV infection. This review summarises the latest research into saliva-related studies and discusses the potential value of saliva in the early diagnosis of oral diseases, such as dental caries and periodontal disease, as well as cancer, diabetes and other systemic disorders.

**Comment (CM):** Using saliva as a diagnostic fluid has many advantages – it is simple and non-invasive to collect, convenient to store, and contains high-quality DNA. This paper discusses the concept of salivaomics, which encompasses genomics, transcriptomics, proteomics, metabolomics and microRNA analysis, for the early diagnoses of some oral and systemic diseases. The structures and functions of salivary bacteria have been studied as potential predictive markers for caries onset. With regards to periodontal disease, an easy to use and time-efficient *P. gingivalis* saliva kit has been developed. Tumour-specific DNA was positive in saliva in 100% of patients with oral tumours. Salivary proteins have also found to be useful for pancreatic, breast, prostate and lung cancer detection. Systemic diseases that can be diagnosed from salivary biomarkers include diabetes mellitus, acute myocardial infarction, viral infections (such as hepatitis A, B and C, HIV-1, measles, mumps, rubella, dengue and human cytomegalovirus), chronic liver disease and chronic renal failure. While research on saliva and the diagnosis of disease is still in its early stage, perhaps we can think more positively of this bodily fluid next time we are battling with a dental procedure while elbow-deep in saliva.

**Reference:** *Int J Oral Sci* 2016;8(3):133–7

[Abstract](#)



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## Assessment of treatment failure in endodontic therapy

**Author:** Bergenholtz G

**Summary:** This paper considers the place of clinical research in the field of endodontic therapy, and focuses on the assessment of cases with persistent lesions subsequent to endodontic treatment. Scant data and guidelines exist for assessing the failure of endodontic therapy. The paper explains that persistent apical periodontitis is not often regarded as a condition that requires treatment in clinical practice. The authors call for comprehensive research into the effect of apical periodontitis on general health and to confirm the extent to which persisting lesions in root-filled teeth result in adverse systemic health effects.

**Comment (CM):** Recent technological advancements have made root canal therapy a feasible and attractive discipline that allows dentists to properly manage most teeth with endodontic complications. While endodontic success has been defined, treatment failure has not. Is an asymptomatic tooth with apical periodontitis a failure? Does a small radiographic lesion that does not change in size indicate success? Cone-beam computed tomography is better able to identify periapical inflammatory lesions than intraoral radiographs, showing not just small but even large lesions that had failed to be visible by intraoral radiography. While this is of interest, it does not help us in clinical practice. No universal guidelines exist to support clinical decision-making as to which cases need retreatment and which can be monitored. Clinicians and scientists have different perspectives with a persistent apical periodontitis being a proper and well-defined parameter in scientific investigations, but not always being regarded as needing retreatment in clinical practice. The authors suggest that long-term prospective studies on the effect of periapical periodontitis on general health are needed. In the meantime, we will have to live with insufficient scientific knowledge and base our decisions on our personal interpretations.

**Reference:** *J Oral Rehabil* 2016;43(10):753–8  
[Abstract](#)

## Long-term survival and vitality outcomes of permanent teeth following deep caries treatment with step-wise and partial-caries-removal

**Authors:** Hoefler V et al.

**Summary:** This systematic review included nine publications utilising data from five clinical studies (two RCTs and three observational case-series) reporting long-term survival data (2–10 years) for 426 permanent teeth with deep dentine caries treated with partial caries removal (n=167) or stepwise caries removal techniques (n=259). Failures were defined as loss of pulp vitality or restorative failures following treatment. At 2 and 3 years, successful rates exceeded 88% with both techniques. In observational data, pulp vitality was maintained in 96% of teeth at 2 years with both techniques, while one RCT reported significantly higher vitality at 3 years for partial caries removal compared with stepwise caries removal techniques (96% vs. 83%; p<0.05). Risk of bias was high in all studies, due to limited quality of the evidence and methodology.

**Comment (CM):** Both stepwise and partial caries removal techniques are reported to result in fewer pulpal exposures than traditional one-step total caries removal. Stepwise caries removal initially removes all superficial and most of the central caries, leaving a thin layer of infected dentine to protect the pulp, placement of a provisional restoration, followed by re-entry after a prespecified time. Residual caries is then removed and a permanent restoration placed. In partial caries removal, also known as incomplete caries removal or indirect pulp capping, peripheral caries is removed, the thin layer of carious dentine covering the pulp is retained, covered with a liner, and a definitive restoration placed. This systematic review investigated two outcomes, namely restorative failures and loss of pulp vitality. Five studies met the inclusion criteria. Although it was found that success was greater than 88% at 2 and 3 years using either stepwise or partial caries removal, the authors concluded that larger, long-term clinical studies following diverse populations of participants are needed.

**Reference:** *J Dent* 2016;54:25–32

[Abstract](#)

## Evidence-based recommendations for analgesic efficacy to treat pain of endodontic origin

**Authors:** Aminoshariae A et al.

**Summary:** These researchers systematically reviewed English-language articles focusing on pain of endodontic origin and analgesics used to decrease that pain. All papers were published between January 1990 and April 2016. The aim of this investigation was to provide the best available scientific evidence for dental clinicians wanting to recommend or prescribe analgesics for endodontic pain.

**Comment (CM):** While analgesic efficacy in dentistry has historically been investigated using extraction of impacted third molars as a viable pain model, these patients differ from those in need of endodontic treatment who are generally older with possibly more complicated medical histories and can have preoperative pulpal or periradicular infections. This systematic review analysed 27 randomised, placebo-controlled trials and focussed on orally administered analgesics in two primary clinical situations. The twelve studies reporting on preoperative analgesics showed that preoperative steroids significantly reduce post procedural pain and that the combination of flurbiprofen and tramadol was better than either drug alone. Mixed reports were found regarding preoperative NSAIDs alone. Fifteen studies were included in the postoperative analgesic administration group. Most reported that NSAIDs were effective in reducing postoperative pain. Steroids were effective particularly where there was non-necrotic pulpal tissue, i.e. either vital or irreversible pulpitis. We must, of course, remember that postoperative pain after obturation is less after complete cleaning and shaping. The availability of effective analgesics does not lessen our responsibility to do a good job!

**Reference:** *J Am Dent Assoc* 2016;147(10):826–39

[Abstract](#)

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## Dens invaginatus: diagnosis and management strategies

**Authors:** Gallacher A et al.

**Summary:** This paper reviews the aetiology and classification of dens invaginatus lesions, a condition that predisposes teeth to developing pulpal disease. The resulting endodontic management can be challenging, due to the altered and sometimes complex anatomy of affected teeth. Early diagnosis is essential, as prophylactic treatment of the dens can prevent degeneration and pulpal necrosis. The article discusses the clinical features that assist with early diagnosis and it provides a comprehensive account of treatment options and management strategies for dens invaginatus.

**Comment (CM):** Dens invaginatus, a developmental dental anomaly where an infolding of enamel into dentine results in a pocket of organic material underneath the enamel surface, can lead to early caries and consequent pulp death. The teeth most commonly affected are lateral incisors followed by maxillary central incisors. In rare cases, dens invaginatus lesions have been reported in multiple teeth. Clinical features include a pronounced talon cusp, incisal notching, and an abnormally shaped tooth (wider mesially/distally or labially/lingually or conical in shape). A periapical radiograph should be taken to exclude the possibility of an underlying invagination and to visualise the anatomy of the root canal system, which in dens invaginatus cases may be grossly distorted. Patients with undiagnosed dens invaginatus may also present with symptoms of irreversible pulpitis or apical periodontitis with no obvious history of trauma or caries. Dens invaginatus has been reported to affect 0.3% to 10% of the population. It is important to be aware of its varied presentations, always check the contralateral tooth as dens invaginatus is bilateral in 43% of cases, and refer to an endodontist as treatment can be extremely complex.

**Reference:** *Br Dent J* 2016;221(7):383–7

[Abstract](#)

## Oral care for pregnant patients: a survey of dental hygienists' knowledge, attitudes and practice

**Authors:** Schramm SA et al.

**Summary:** These researchers conducted an anonymous electronic survey of 1047 Michigan Dental Hygiene Association members regarding dental hygienists' knowledge, behaviours and attitudes towards oral care for pregnant patients; there were 150 responses (14%). Most respondents (64%) indicated that, regardless of their years of experience or level of degree, they would like more education about caring for pregnant patients. A willingness to provide care for pregnant patients was reported by 90% of respondents, and 85% reported that they or their employers would accept referrals to treat pregnant women. Regarding the provision of treatments throughout pregnancy, 95.8%, 92.7%, 76.3% and 61.5% of respondents indicated that prophylactic therapies, emergency care, periodontal treatment and restorative care, respectively, were acceptable. The question "dental hygiene services should only be provided during the second trimester" had a disagreement rate of 85.6%, indicating that the level of knowledge on this topic was high.

**Comment (JL):** Dental hygienists are well positioned to provide both oral care and pregnancy-related oral health information, as well as to facilitate referrals to other healthcare providers. In this anonymous electronic survey of Michigan dental hygienists, 90% of respondents were willing to provide care for pregnant women. Those who were unwilling cited liability concerns, not feeling comfortable or preferring not to treat them. Although high percentages were knowledgeable regarding the provision of oral care during pregnancy and the association between poor dental care and adverse outcomes/obstetric complications, inconsistencies existed regarding when and what procedures can be safely performed during pregnancy. Only 50.5% agreed that radiographs during pregnancy are safe. Most desired more education about caring for pregnant patients. As improving health practices and preventive behaviours of pregnant women through education and referrals could reduce the risk of premature births and low birthweight babies, it is important that we are all able to provide this service. If our knowledge or attitudes need to be updated, reading this paper may provide the necessary motivation.

**Reference:** *J Dent Hyg* 2016;90(2):121–7

[Abstract](#)

## Hypophosphatasia: diagnosis and clinical signs – a dental surgeon perspective

**Author:** Bloch-Zupan A

**Summary:** This nonsystematic review of publications on hypophosphatasia described its different forms, its characteristic symptoms and associated laboratory findings. The author noted that diagnosing hypophosphatasia is challenging, as it is rare and presents with a variety of symptoms. While a low alkaline phosphatase level is indicative of hypophosphatasia, reference ranges vary according to age and sex. The article defined key features of hypophosphatasia and discussed its management strategies, in particular enzyme replacement therapy. A patient registry to better define the prevalence of hypophosphatasia and raise its awareness was also described.

**Comment (JL):** Hypophosphatasia is a rare genetic disorder with autosomal dominant and autosomal recessive inheritance. Six clinical forms, related to the age at which the onset of symptoms occurs, have been described. Four of these (infantile, childhood, adult and odontohypophosphatasia) have associated dental manifestations, with the premature loss of primary teeth with intact roots a common key feature. The adult variant, which manifests in middle age, also involves early loss of permanent teeth and an abnormal dentition. Odontohypophosphatasia is limited to dental manifestations and can occur at any age. Early exfoliation of incisors, reduced dentine thickness, enlarged pulp chambers and alveolar bone loss are all key features, but no skeletal abnormalities are evident. The authors suggest that a question regarding early loss of primary teeth should be part of our medical/dental history questionnaires for patients of all ages. Dental health professionals can be one of the first healthcare professionals in a position to recognise the diagnosis of hypophosphatasia. If suspected, referral to the patient's general practitioner or paediatrician is indicated. This paper aimed to raise awareness and aid in the recognition and management of hypophosphatasia. I would recommend it as a worthwhile read.

**Reference:** *Int J Paediatr Dent* 2016;26(6):426–38

[Abstract](#)

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### Independent commentary by Colleen Murray



Dr Colleen Murray graduated from the University of Pretoria with a BChD in 1984, followed by an Honours degree in Oral Radiology and Diagnostics in 1987. After a combination of private practice and university teaching, she emigrated to New Zealand in 1992, took a break from dentistry and obtained her BEd degree. She has been in Dunedin since 2003 when the pull back to dentistry resulted in a BDS and return to private practice. This was followed by a change to the academic setting and a PGDipClinDent in Paediatric Dentistry. Colleen is currently a Senior Lecturer in the Department of Oral Rehabilitation at the University of Otago, Pacific Island student support officer for the Faculty, NZDREX examiner and is on the ANZSPD committee. This is interspersed with her own research projects, particularly in the area of Dental Education, as well as student research supervision.

## Radiation shielding in dentistry: an update

**Authors:** Crane GD & Abbott PV

**Summary:** These authors performed a literature review and compiled guidelines on radiation protection for dental patients. Few published data exist on the effects of low-dose radiation used in dental practice, and most risk models are extrapolated from higher dose models. The authors caution that this *"lack of evidence does not denote the absence of risk"*, noting no 'safe' level of radiation exposure has been established and all imaging utilising ionising radiation poses a potential risk for patients. As such, the benefits of imaging must outweigh such potential risks, and all diagnostic imaging should adhere to the three basic principles of justification, optimisation and application of dose limits. Dose reduction techniques and shielding of sensitive organs were discussed, as was imaging in pregnant patients.

**Comment (JL):** Both the National Protection Board and the International Commission on Radiation Protection support that there is no threshold dose below which radiation is safe, and exposure of any tissue has the potential to induce malignant change. The thyroid gland is of the greatest concern in dental imaging, particularly in young patients. In a 6-year old, it lies 20–30mm closer to the dentition than in a 16-year old. Although prospective data on thyroid cancer risk and common diagnostic radiographs are limited, use of a thyroid shield/collar, the paralleling technique and rectangular collimation is strongly advised, especially for those under the age of 20 years. As lead aprons do not protect against scattered internal radiation or provide a difference in the extremely low gonadal zone, their use is not indicated for dental imaging other than to allay patients' anxieties or concerns. In pregnancy, use of a lead apron is indicated only when the primary beam is positioned towards the patient's trunk, e.g. in an occlusal maxillary view. Any individuals in the room during radiographic exposure, such as a parent, must wear a lead apron. While radiology in dentistry has significant diagnostic benefits, always keep in mind that the benefits for the patient must outweigh the potential risks.

**Reference:** *Aust Dent J* 2016;61(3):277–81  
[Abstract](#)

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## Lollipop-induced oral lichenoid reaction in a child

**Authors:** Bastos DB et al.

**Summary:** These authors reported the unusual case of a 15-year-old girl who had white plaques on her tongue and buccal mucosa that were initially diagnosed as oral lichen planus; systemic or local medication use was denied by the patient and her parents. Biopsy findings were suggestive of oral lichen planus. Her lesions did not respond to topical corticosteroids. Further investigations revealed almost daily consumption of an artificially coloured and flavoured lollipop. She stopped consuming these lollipops, and 1 week later her oral lesions had completely resolved. A diagnosis of an oral lichenoid reaction was made.

**Comment (JL):** Oral lichen planus, an autoimmune, mucocutaneous disease that affects the oral mucosa, usually affects middle-aged females. Oral lichenoid reactions are clinical and histological contemporaries of the classic oral lichen planus and are often associated with an identifiable inciting factor. In children, the diagnosis of oral lichenoid reaction is challenging due to nonspecific findings, its rarity in this group, as well as communication difficulties. This clinical report describes a 15-year-old female who reported with bilateral white plaques on her buccal and tongue mucosa. A biopsy was taken with the histopathological diagnosis suggestive of oral lichen planus. It was only at the third clinical interview that the patient's habit of sucking artificially coloured and flavoured lollipops was discovered – a behaviour unknown to her parents. These lollipops contained several compounds that could have induced the oral lichenoid reaction. This paper highlights the importance of a thorough medical history and investigation of a patient's habits, and the possible need to keep asking questions. Patients may assume that some information is not relevant and therefore neglect to mention it, and parents do not always know everything their children are doing.

**Reference:** *Int J Paediatr Dent* 2016;26(6):486–9  
[Abstract](#)

## Utilization of Chinese herbal medicine for selected oral conditions in two pediatric populations

**Authors:** Dai MR et al.

**Summary:** In this research, 318 Chinese parents with children aged <12 years were interviewed regarding the use of TCM for oral conditions by themselves and their children. TCM use for oral conditions was reported by 45.6% of the respondents (parents), with 19.1% reporting their children also used TCM for oral conditions, mostly aphthous ulcers (64.2%). The most frequently used TCMs were watermelon frost (37.4%), niuhuang jiedu pian (15.5%) and honey/propolis (9.9%). Significant predictors of TCM use included duration of US residency, with birth location and parental TCM use associated with childhood use.

**Comment (JL):** TCM, practiced for thousands of years, includes herbal medicines, acupuncture, massage, exercise and dietary therapy, and is accepted in many parts of the Western world as part of complementary or alternative medicine. As TCM is used for both adults and children, it is important that we are familiar with the common Chinese medicines used for oral conditions such as halitosis, gingivitis/periodontitis, aphthous ulcers, herpes labialis and toothache. This study, which explored the use of TCM for oral conditions in two Chinese paediatric populations, found that 19.1% of children younger than 12 years of age had used TCM at least once during the previous 2 years. Participants in this study felt that TCM agents were effective with few adverse reactions. It is important that, when we go over our patient's medical histories, we remember to include questions about the use of medicines other than those prescribed or bought from a pharmacy or supermarket. While some Chinese herbal medicines are safe, others may cause side effects or react with other drugs. Knowledge of the ingredients of common TCM agents is advised, particularly as we work and live in a diverse cultural environment.

**Reference:** *Pediatr Dent* 2016;38(4):311–6  
[Abstract](#)

## Independent commentary by Jonathan Leichter DMD, Cert Perio (Harvard).

Associate Professor Jonathan Leichter is currently Senior Lecturer in the Department of Oral Sciences at the University of Otago. Associate Professor Leichter joined the faculty after 20 years in fulltime private practice in New York and Boston, 18 of which were spent in specialist practice limited to periodontology and implant dentistry. Trained at Tufts University and obtaining his specialist training at Harvard University, he has been actively involved in clinical dental implant practice since 1984. Since 2002, he has supervised and mentored postgraduate students in periodontology, endodontics and prosthodontics. His research interests and publications are in the field of periodontology, dental trauma and laser applications in dentistry.

