

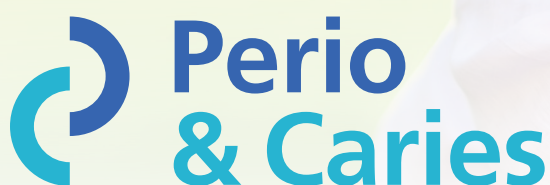


REPORT

# Relationship between **caries** and **gum disease**

Highlights of Perio Workshop 2016 on  
the boundaries between dental caries  
and periodontal diseases - jointly  
organised by the EFP and ORCA

Compiled by **Prof Nicola West** from the  
consensus reports chaired by **Prof Mariano  
Sanz, Prof Søren Jepsen, Prof Iain Chapple,**  
and **Prof Maurizio Tonetti**



**Perio  
Work  
shop**





**EFP**

European  
Federation of  
Periodontology

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### *Key*

- \* *Perio Workshop 2016 - working group 2:***  
Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases
- \*\* *Perio Workshop 2016 - working group 3:***  
Prevention and control of dental caries and periodontal diseases at individual and population level
- \*\*\* *Perio Workshop 2016 - working group 4:***  
Dental caries and periodontal diseases in the ageing population: call to action to protect and enhance oral health and wellbeing as an essential component of healthy ageing

# Relationship between **caries** and **gum disease**

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## *Introduction*

*Periodontal diseases and dental caries are the most common non-communicable diseases in mankind and the main cause of tooth loss. Both diseases can lead to nutritional compromise and negative impact on upon self-esteem and quality of life.*

*The dental biofilm is a major biological determinant common to the development of both diseases, which and both diseases share common risk factors and social determinants, important for their prevention and control.*

*Most recent scientific discussion points out that similar preventive approaches, based around routinely performed oral hygiene with a fluoride toothpaste, are effective with both periodontal diseases and dental caries.*

*Due to worldwide population growth and increased tooth retention, the number of people affected by dental caries and periodontitis has grown, thus increasing the total burden of these diseases globally, mainly in the older population.*

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## *Perio & Caries project - the key messages*

1. Caries and periodontal diseases are the most common human diseases but preventable.
2. Benefits of impact of tooth retention relate to nutritional status, speech, self-confidence and quality of life.
3. The burden of these diseases increases as the population ages.
4. We should be assessing dependence and frailty rather than chronological age per se.
5. Periodontal disease is associated with general health issues raising the need to integrate professions.
6. The oral healthcare team has to consider advising on weight loss, smoking cessation, exercise, and controlling diabetes and glycaemia in general.
7. Reducing sugar and starch intake in amount and frequency is important in preventing periodontal disease and caries; limit intake to mealtimes.
8. Bleeding gums are *not* normal and patients should be referred for oral health screening.
9. Educational programmes should target mothers to be, new mothers, care home workers and other groups who care for those with dependence.
10. Risk assessment using validated tools should be routine in dental practice to drive individualised preventive care.
11. Periodontal disease should be seen as a sign post to other general health issues.
12. Brushing twice daily with fluoride toothpaste is essential and can also be supplemented with chemical agents.
13. Remuneration approaches for dental professionals should reward prevention.
14. Dental check-ups should be provided free of charge at key touch points across the life course – 2, 5, 12, 26, 40 and 70 years of age.
15. Store tooth brushes separately in bathrooms to avoid horizontal transmission of potential pathogens.
16. Check saliva levels routinely and consider drug substitution in dry mouth as well as fluoride applications.

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## Oral healthcare team

All members of the oral healthcare team have a role to play in educating and motivating patients to reduce their intake of free sugars, to practice proper dental plaque control and encourage smoking cessation. Effective preventive and therapeutic interventions are available to manage both dental caries and periodontal diseases.

Over the last two decades, progress in prevention and treatment of dental caries and periodontal diseases has led to better oral health. However, due to increasing expectations of good oral, health-related wellbeing and quality of life in older age, this poses formidable challenges for clinical care and healthcare systems.

## *Dental caries*

**The oral healthcare team should be aware of the following concerning dental caries:**

- Data support the role of a genetic component in dental caries susceptibility.\*
- Susceptibility varies substantially throughout the life course, being particularly high in the young. \* Elders are also more vulnerable.\*\*\*
- There is an association between lower socio-economic status and higher dental caries risk.\*\*
- Dietary fermentable carbohydrates (sugars, starch) are a necessary component of dental caries initiation and progression.\*

**Recommendations for the oral healthcare professionals concerning dental caries:**

- Use toothpastes containing fluoride agents for the control of dental caries.\*\*
- Use professional fluoride application for individuals at a high dental caries risk.\*\*
- Educate and motivate patients to reduce intake of free sugars.\*
- Give advice on dietary starch reduction for individuals with root caries.\*

## *Periodontal diseases*

**The oral healthcare team should be aware of the following concerning periodontal diseases:**

- Data support the role of a genetic component cause to periodontal diseases modified by lifestyle (acquired) and environmental factors.\*
- There is an association between lower socio-economic status and higher prevalence of periodontitis; prevalence is lower in females than males.\*\*

**Recommendations for oral healthcare professionals concerning periodontal diseases:**

- Educate, motivate and support patients to practice individualised dental plaque control; oral hygiene instructions should be enhanced by motivational approaches. \*\*
- Recommend that fluoride toothpaste can be supplemented by adjunctive chemical plaque control agents to manage gingivitis for the primary prevention of periodontitis.\*\*
- Engage the entire oral healthcare team to give advice and support on smoking cessation and refer, where necessary, to specialist services.\*
- Engage in discussions on weight loss.\*
- Increase awareness of importance of vitamin D and antioxidant micronutrients through natural dietary sources, especially for the elderly.\*
- Encourage adherence to glycaemic control regimes in diabetes patients.\*

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## *Dental caries/periodontal diseases*

### **The oral healthcare team should be aware of dental caries/periodontal diseases:**

- Both dental caries and periodontal diseases are preventable.\*\* Preventive measures and treatment strategies are effective at all ages.\*\*\*
- Benefits related to retention of healthy dentitions and mastication go beyond oral health, wellbeing and self-esteem as they foster a healthy diet which is necessary to delay physical decline and loss of independence.\*\*\*

### **Recommendations for oral healthcare professionals concerning dental caries/periodontal diseases:**

- Consider routinely questioning patients about their family history of periodontal diseases and dental caries.\*
- Consider routinely including questions on dietary behaviour or habits in order to identify risk in individuals/ groups.\*
- Encourage conducting a nutritional assessment when there is disease activity.\*
- Examine intra-oral saliva production/moisture levels and consider fluoride supplements and/or saliva substitutes for patients with reduced salivary flow.\*
- Focus on identifying risk in individuals using validated risk assessment tools and design a regular \* individualised risk-based prevention programme for each patient.\*\*
- Provide advice and support for a healthy diet according to national dietary guidelines.\*
- Refer to a dietitian or general medical practitioner, where necessary.\*
- Encourage sugar ingestion cessation for individuals with active dental caries and/or gingival bleeding or a minimum reduction in the frequency of sugar intake at mealtimes.\*
- Incorporate professional tooth cleaning in a thorough, structured prophylaxis programme including oral hygiene instruction, motivation, dietary advice and fluoride application.\*\*
- Provide the same standard of prevention and care across all age ranges (whenever possible without consideration of age) to retain natural teeth and dentitions into older age.\*\*\*
- Consider level of dependence, rather than chronological age, in order to individualise preventive and treatment approaches for elders.\*\*\*
- Modify dental care where ageing is associated with a change in dependency, including medical status, with the aim of retaining a pain-free, functional dentition, using appropriate (minimally invasive, also palliative) treatment strategies.\*\*\*
- Consider medical aspects when treating oral diseases and collaborate with physicians and other caregivers.\*\*\*
- Consider mobility needs of elders in the dental practice.\*\*\*



## Non-dentistry health professionals

Fortunately, effective preventive and therapeutic interventions are available to manage both dental caries and periodontal diseases.

There are numerous groups of healthcare professionals that need to know more about these diseases and understand the ongoing balance between risk factors (e.g. smoking), protective factors (e.g. fluoride in dental caries, high levels of oral hygiene in periodontal diseases) and pathological factors.

This group of healthcare workers includes physicians (from paediatricians to general practitioners, to geriatricians), nurses (from public health nurses to community health visitors, to those working in oncology and geriatric settings), pharmacists (that are aware of the cariogenicity associated with salivary depletion and the dangers of medicines with added sugar and the importance of smoking cessation to periodontal diseases), dieticians (including those involved with diet and nutrition), nursery care workers and midwives working in well-baby clinics.

## *Dental caries*

**Non-dentistry health professionals should be aware of the following concerning dental caries:**

- Dental caries is a biofilm-mediated, sugar-driven, multifactorial, dynamic disease that results in the episodic demineralisation of dental hard tissues over time.\*
- Dental caries risk in individuals and groups will vary considerably; the dental caries process produces lesions in a range of extent and severity - each stage can either be active or inactive.\*
- Lifestyle changes and dietary and behavioural factors may influence both new disease and progression of existing lesions that may, at the early stages, be arrested or reversed.\*
- A multifaceted approach - minimising all pathological factors while focusing on diet and self-care, including frequent use of a toothbrush with a fluoride - is most likely to be effective in controlling this largely preventable disease.\*
- Aside from the common risk factors associated with dental caries, obesity and links to hyposalivation and maternal smoking, robust evidence for direct links to systemic disease and specific genetic factors is absent.\*

**Recommendations for physicians, nurses, pharmacists, dieticians and other health professionals concerning dental caries:**

- Substitute medicines where reduced salivary flow rate is a complication of a specific medication.\*
- Educate and motivate patients to reduce intake of free sugars.\*
- Ensure foods and drinks distributed at schools follow the latest health recommendations.\*
- Promote absence of processed foods for pre-school and school children.\*
- Recommend toothpastes containing fluoride agents.\*\*

## *Periodontal diseases*

**Non-dentistry health professionals should be aware of the following concerning periodontal diseases:**

- There are different forms of periodontal disease (gum disease), but the most common are gingivitis and periodontitis. Gingivitis is a necessary pre-requisite for periodontitis. Whilst

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not all cases of gingivitis will progress to periodontitis, managing the former is a vital primary preventive strategy in preventing the latter. If left untreated, periodontitis causes tooth loss. In its more severe forms, periodontitis is independently associated with higher mortality rates and robust evidence shows an increased risk for atherogenic cardiovascular diseases, diabetes control and related complications.\*

- Having periodontitis does not necessarily mean that someone has neglected proper oral self-care. Susceptibility varies, and the most highly susceptible individuals may acquire the disease even with relatively good oral hygiene.\*
- Risk of periodontitis has a strong heritability, but lifestyle and environmental factors and behaviours are key to determining whether disease develops or progresses.\*
- Periodontitis is treatable to the extent that teeth can be retained for life; however, early diagnosis is vital and the disease can start in adolescence or in later teenage years.\*
- Bleeding gums are not normal and the appearance of blood in saliva following tooth brushing is not normal. A dental care professional should be consulted to investigate further and provide adequate treatment.\*
- Whilst periodontitis is not a communicable disease, the bacteria that initiate the disease can be transferred between individuals. If transferred to a susceptible individual, their immune response may start to trigger the signs and symptoms of periodontitis.\*
- Periodontitis should be regarded as a “signpost” condition that may indicate malnutrition or that a patient may have an underlying chronic non-communicable disease (e.g. undiagnosed diabetes). The advice of a dental care professional should be sought.\*

#### **Recommendations for physicians, nurses, pharmacists, dieticians and other health professionals concerning periodontal diseases:**

- Encourage patients with bleeding gums, bad breath, any loose teeth, or with gaps between teeth to visit a dental care professional for an examination and diagnosis.\*
- Encourage anyone with signs of periodontal disease to clean between their teeth once daily, as directed by a dental care professional.\*
- Ensure that patients understand that unhealthy gums can be associated with other general health issues and that the mouth is a vital part of the body and not a separate organ.\*
- Educate, motivate and support patients to practice proper dental plaque control. \*\*
- Encourage care workers to seek advice on implementing individual oral hygiene for care home residents.\*
- Advise smoking cessation.\*\*

#### ***Dental caries/periodontal diseases***

#### **Non-dentistry health professionals should be aware of the following concerning dental caries/ periodontal diseases:**

- Both dental caries and periodontal diseases are preventable. Preventive measures\*\* should be applied to retain natural teeth and dentitions into older age.\*\*\*
- Wherever possible, provide interventions and advice that helps the individual link the benefits of preventing dental caries and periodontal diseases to systemic health.\*
- Dental caries and periodontal diseases are distinct diseases with different patho-biological mechanisms. Consider the ongoing balance between risk factors (e.g. smoking), protective factors (e.g. fluoride in dental caries, high levels of oral hygiene in periodontal diseases) and pathological factors. \*
- Preserving a functional dentition into old age is possible and may be associated with better overall quality of life and delayed frailty and dependence.\*\*\*

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- Chewing is an essential function to ensure adequate nutrition, best preserved with natural teeth. Good oral health and comfort are integral parts of healthy ageing.<sup>\*\*\*</sup>
- Epidemiological evidence and analysis of trends in risk factors suggest that the burden of dental caries and periodontal diseases will increase, as ageing populations tend to retain more teeth.<sup>\*\*\*</sup>
- Oral health is a critical component of healthy ageing and requires the ability to self-care and access preventive services and treatment.<sup>\*\*\*</sup>
- As older people become increasingly reliant on the care of others for their daily life activities, they need increased assistance in preserving their oral health and chewing function.<sup>\*\*\*</sup>
- Physical and mental health decline associated with ageing has a substantial impact on the ability to perform oral self-care; caregivers need to overcome these barriers.<sup>\*\*\*</sup>
- The level of dependence, rather than chronological age, has to be considered to individualise preventive and treatment approaches for older people.<sup>\*\*\*</sup>
- Benefits related to retention of healthy dentition and mastication go beyond oral health, wellbeing and self-esteem as they foster a healthy diet, which is necessary to delay physical decline and loss of dependence.<sup>\*\*\*</sup>

**Recommendations for physicians, nurses, pharmacists, dieticians and other health professionals concerning dental caries and periodontal diseases:**

- Encourage mothers to instil twice daily tooth brushing in their children from the moment the first baby tooth appears.\*
- Encourage everyone to brush their teeth twice daily with a fluoridated toothpaste. For those with a full dentition, each session should last at least two minutes.\*
- Encourage nursing mothers and other child carers to give sugar-free drinks from birth.\*
- Advise about the risks of diets high in sugar and medications containing sugar, which could lead to dental caries and periodontal diseases, especially in the very young and the elderly.\*
- Encourage everyone to limit the amount and frequency of sugar intake (ideally only at mealtimes) and \* to brush their teeth twice daily.\*\*
- Encourage the use of sugar-free drinks, mints and chewing gum.\*
- Include oral health (dental caries and periodontal diseases) in medical preventive programmes, particularly for diabetes, obesity, metabolic syndrome and cardiovascular disease (periodontal diseases).\*
- Increase knowledge in nursing homes of the impact of diets high in sugars and low in antioxidant micronutrients on oral health.\*

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## The public

Even if the risk of gingivitis and periodontitis typically increases with age, and caries often strikes during childhood and adolescence, all three diseases are extremely widespread among the general public, posing a very serious threat to their teeth. Both current and future patients face the dual risk of gum disease and caries throughout their life. Fortunately, effective preventive and therapeutic interventions are available today to deal with both problems.

Irrespective of your age and health status, it is important to reduce the intake of sugars, brush your teeth twice a day with fluoride toothpaste and stop smoking, in order to prevent these diseases. Teeth are for a lifetime; it is important to visit your dentist regularly, particularly if you have bleeding gums which are not normal.<sup>\*\*\*</sup>

## *Dental caries*

**The public should be aware of the following concerning dental caries:**

- Susceptibility varies substantially throughout life; it is particularly high in the young.\*
- There is an association between lower socio-economic status and higher dental caries risk.\*\*
- Dietary fermentable carbohydrates (sugars, starches) are a necessary component for dental caries initiation and progression.\*

**Recommendations for patients and future patients concerning dental caries:**

- Refrain from giving pre-school and school children processed foods.\*
- Use a fluoride toothpaste twice daily.\*
- Ask your dentist for professional fluoride application if you are at high risk of dental caries.\*\*

## *Periodontal diseases*

**The public should be aware of the following concerning periodontal diseases:**

- There are different forms of periodontal disease (gum disease), but the most common are gingivitis and periodontitis. Gingivitis is a necessary prerequisite for periodontitis. Whilst not all cases of gingivitis will progress to periodontitis, managing the former is a vital primary preventive strategy for preventing the latter. Periodontitis causes tooth loss, if left untreated. In its more severe forms, periodontitis is independently associated with higher mortality rates due to an increased risk of atherogenic cardiovascular diseases, diabetes and related complications.\*
- Risk for periodontitis has a strong heritability, but lifestyle and environmental factors and behaviours are key to determining whether the disease develops or progresses.\*
- Periodontitis is treatable to the extent that teeth can be retained for life, but early diagnosis is vital. The disease can start in adolescence or in later teenage years.\*
- Glycaemic control in non-diabetes and diabetic patients is a strong risk prevention strategy for periodontitis.\*

**Recommendations for patients and future patients concerning periodontal diseases:**

- Bleeding gums are not normal and the appearance of blood in saliva following tooth brushing is not normal. To treat this, you should consult a dental care professional. .\*

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- If you have bad breath or any looseness of teeth or gaps appearing between teeth, you should visit a dental care professional.\*
- Engage in discussions on weight loss.\*
- Brush your teeth twice a day. \*\*
- Consider advice on how to stop smoking.\*\*
- Consider supplementing fluoride with additional effective agents to reduce plaque such as chemical agents found in mouthwash and toothpastes.\*\*
- Encourage adherence to glycaemic control regimes in individuals with diabetes.\*

### ***Dental caries/periodontal diseases***

**The public should be aware of the following concerning dental caries/periodontal diseases:**

- Both dental caries and periodontal diseases are preventable.\*\*
- Retaining healthy teeth improves nutritional status, reduces the risk of general ill health due to dental caries and periodontal diseases, helps reduce health inequalities, has significant positive health economic impacts and improves quality of life and general wellbeing.\*
- Chewing is an essential function to ensure adequate nutrition and is best with natural teeth.\*\*\*

**Recommendations for patients and future patients concerning dental caries and periodontal diseases:**

- Encourage all nursing mothers to enter their babies into regular dental care pathways.\*
- Encourage all care homes to develop mechanisms and processes to maintain the oral health status of their residents.\*\*
- Keeping your teeth as you age is possible and is important for eating, speaking, smiling and feeling good about yourself. Teeth are for a lifetime.\*\*\*
- Look after your teeth and gums. Brush your teeth twice daily with fluoride toothpaste and clean in between your teeth with inter-dental brushes or other oral hygiene products, as advised by your dentist.\*\*\*
- Refrain from consuming sugary foods and sweet drinks as much as possible and restrict them to mealtimes only.\*\*\*
- Ask your carer for help if you have difficulty in cleaning your teeth and gums.\*\*\*
- See your dentist/oral care professional for preventive care for tooth decay and gum disease and have the necessary treatment.\*\*\*

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## Policymakers

Gum disease and dental caries are the most common non-communicable diseases known to mankind and underlie virtually all tooth loss. Retaining healthy teeth improves a person's nutritional status, reduces the risk of general ill health due to these diseases, helps reduce health inequalities, has significant positive health economic impacts and improves quality of life. Effective preventive and therapeutic interventions are available to manage both dental caries and periodontal diseases.

When dealing with health policy, it is important to reinforce positive social change by inspiring good habits among the population to prevent these diseases; reducing the intake of sugars, brushing teeth twice a day with fluoride toothpaste and stopping smoking.

There are a number of groups of healthcare professionals that need to know more about these diseases and understand the ongoing balance between risk factors (e.g. smoking), protective factors (e.g. fluoride in dental caries, high levels of oral hygiene in periodontal diseases) and pathological factors. This need should be addressed.

Policy interventions should be significant for the population/individual, designed in such a way that they offer combined benefits when dealing with dental caries, periodontal diseases and systemic health.

## *Dental caries*

**Public health agencies and policymakers should be aware of the following concerning dental caries:**

- Dental caries is a biofilm-mediated, sugar-driven, multi-factorial, dynamic disease, resulting over time in the episodic demineralisation of dental hard tissues.\*
- The ongoing balance between protective and pathological factors will determine whether health is maintained or whether dental caries lesions will be initiated and then progress.\*
- Adequate use of fluoride is a condition sine qua non for dental caries prevention.\*
- Lifestyle changes and dietary and behavioural factors may influence both new disease and the progression of existing lesions, which can be arrested or reversed at the early stages.\*
- Both primary and secondary preventive interventions are available for reducing the risk of new dental caries and dental caries progression.\*

**Recommendations for public health agencies and policymakers concerning dental caries:**

- Ensure that food and drinks distributed at schools follow the latest health recommendations.\*
- Promote the absence of processed foods for pre-school and school children.\*
- Educate the public to brush twice daily using a fluoridated toothpaste.\*
- Incorporate professional tooth cleaning in a thorough, structured prophylaxis programme that includes oral hygiene instruction, motivation, dietary advice and fluoride application.\*\*
- Agencies and governments should implement a locally appropriate combination of aligned upstream, mid-stream and downstream policies and activities aimed at dental caries prevention and control.\*
- Comprehensive implementation of the recent WHO guidelines on sugar consumption should be delivered, combined with other fluoride-related interventions. The focus should be on reducing the risk of dental caries initiation and progression across populations and risk groups. For example, in some countries, taxes on sugar and beverages with added sugar are being introduced and show some promise.\*
- Effective education is needed to update the public, patients, health professionals, healthcare

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providers and decision makers on the dynamic and initially reversible nature of the dental caries process.\*

### *Periodontal diseases*

#### **Public health agencies and policymakers should be aware of the following concerning periodontal diseases:**

- It is important to recognise that the evidence base for periodontal disease risk factors has strengthened; smoking cessation and glycaemic control in non-diabetes and diabetes patients are strong risk prevention strategies for periodontitis.\*
- There is a need to focus limited resources on preventive strategies for periodontal diseases and remuneration systems that encourage their uptake and implementation.\*
- Incorporate professional tooth cleaning in a thorough, structured prophylaxis programme including oral hygiene instruction, motivation and dietary advice to effectively manage periodontal diseases.\*\*

#### **Recommendations for public health agencies and policymakers concerning periodontal diseases:**

- Take responsibility for developing public health campaigns to educate the public about gum disease.\*
- Develop education packages that will become embedded in key stage health services spanning the life course, from antenatal (midwifery) clinics to health visitors to primary schools and secondary schools and care homes.\*
- Lobby to recognise oral health as a vital and integral aspect of general health and wellbeing.\*
- Ensure messaging about reducing sugar consumption is applied to gum diseases as well as dental caries by flagging that sugar causes inflammation.\*
- Ensure that the dental profession is encouraging education and motivation of patients to practice proper dental plaque control.\*\*
- Ensure that the entire oral healthcare team recommends smoking cessation advice and support; engage specialist services\* as part of managing gingivitis and periodontitis if necessary.\*\*
- Ensure that periodontal screening becomes a mandatory component of the oral health examination and consider mandatory reporting of periodontal screening to appropriate local commissioning bodies.\*
- Focus on behaviour changes to prevent and reinforce good lifestyle practices.\*
- Focus on the wider oral health workforce.\*
- Develop educational programmes for antenatal midwifery classes, health visitors, teachers at primary and secondary schools, pharmacists, general nurses as well as care home workers.\*
- Develop public awareness campaigns about gum diseases that are independent from the oral healthcare industry.\*

### *Dental caries/periodontal diseases*

#### **Public health agencies and policymakers should be aware of the following concerning dental caries/periodontal diseases:**

- Epidemiological evidence and analysis of trends in risk factors suggest that the burden of dental caries and periodontal diseases will increase in ageing populations, which tend to retain more teeth. This requires urgent action.\*\*\*

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- Good oral health and comfort is an integral part of healthy ageing. Demographic transitions, trends in risk factors and medical comorbidities, better prevention and management of dental caries and periodontal disease earlier in life leading to tooth retention all point to an urgent need for system-wide measures to align policy, practice, education and public information on changing oral health needs for the ageing population.<sup>\*\*\*</sup>
- Increased attention to the specific oral health needs of an ageing population. Preservation of a functional dentition into old age is possible and may be associated with better overall quality of life and delayed frailty and dependence. Specific actions are required, with input from relevant stakeholders and adapted to different health systems.<sup>\*\*\*</sup>
- Wherever possible, policy interventions should be meaningful at a population/individual level and should be designed to combine benefits for dental caries, periodontal diseases and systemic health.\*
- Dental care professionals should be an integral part of medical and social health teams involved in the care of elders. Routine sharing of relevant health information will be necessary to achieve this goal.<sup>\*\*\*</sup>

### **Recommendations for public health agencies and policymakers concerning dental caries and periodontal diseases:**

- Ensure that all nursing mothers enter their babies into regular dental care pathways.\*
- Ensure all care homes develop mechanisms and processes for maintaining the oral health status of their residents.\*
- Develop remuneration approaches that encourage prevention and an individually tailored plan of care, rather than intervention in dental contracts and payment systems.\*
- Embed risk assessment and risk driven care pathways into clinical care.\*
- Embed risk assessment and risk-driven care pathways into clinical care.\*
- Develop strategies to address oral health inequalities in areas of high socioeconomic need.\*
- Lobby and influence nutritional policies to reduce sugar containing snacks and foods in public areas, educational and recreational environments.\*
- Lobby to reduce the cost of healthy snacks, fruits and vegetables high in micronutrients.\*
- Include prevention and development of individually tailored oral care plans in national reimbursement systems.\*
- Seek to provide a free dental check-up for key stages in life, using 'touch points', for example at 2, 5, 12, 26, 40 and 70 years of age.\*
- Carry out counselling on dietary sources of antioxidant micronutrients, such as vitamin C and vitamin D, particularly for pregnant women and parents.\*
- Plan for the increasing oral healthcare needs of the ageing population. Specific actions are needed to overcome barriers in the care for vulnerable elders.<sup>\*\*\*</sup>
- Integrate assisted daily oral care in the professional profile of caregivers as well as provide access to dental care.<sup>\*\*\*</sup>
- Tackle inequalities in oral health for preventing and controlling dental caries and periodontal diseases. This requires strategies tailored to the determinants and needs of each group according to socioeconomic status.<sup>\*\*</sup>
- Encourage future oral health research, practice and policy towards a "social determinants" model, a closer collaboration and integration of dental and general health research is needed using a common risk factor approach.<sup>\*\*</sup>
- Translate prevalence data into disease burden data, in order to plan and allocate resources for the dental workforce.<sup>\*\*</sup>
- Take into account changing epidemiology and demography, as well as the changing needs of older adults, while developing and delivering both knowledge- and competence based curricula at undergraduate and postgraduate level and as part of continuing education of oral healthcare professionals.<sup>\*\*\*</sup>
- Strengthen knowledge and increase awareness of medical comorbidities and medications relevant to the oral care of older adults.<sup>\*\*\*</sup>

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## Researchers

To advance researchers' understanding of the role played by genetics in dental caries and periodontal disease initiation and/or progression, further research is required. There is an urgent need for epidemiological surveillance of dental caries, periodontal diseases, tooth loss and oral health related to quality of life in older populations.

### *Dental caries*

#### **Researchers should be aware of the following concerning dental caries:**

- Dental caries is a complex disease with multiple and diverse exposures that affect risk of disease initiation (risk factors) or progression of existing disease (prognostic factors). Such exposures include those that are inherited (e.g. susceptibility), those that are acquired (e.g. social, educational and economic factors and the local environment) and other diseases as well as lifestyle (e.g. sugar consumption, carbohydrate intake) factors. These may arise in different combinations in different individuals; at an individual patient level they may also have differentially weighted effects.\*

#### **Recommendations for researchers regarding dental caries:**

- Conduct studies on dental caries in adults to better understand what are the most important acquired risk factors and whether their modification (where feasible) improves dental caries outcomes.\*
- Determine the efficacy of other dietary interventions, such as functional foods and sugar alcohols, with regard to prevention/ management in dental caries.\*
- Conduct randomised clinical trials (RCTs) on the inactivation and monitoring of active dental caries lesions.\*\*

### *Periodontal diseases*

#### **Researchers should be aware of the following concerning periodontal diseases:**

- Periodontal diseases are complex diseases with multiple and diverse exposures impacting upon risk of disease initiation (risk factors) or progression of existing disease (prognostic factors). Exposures include those that are inherited (e.g. genetic variants), those that are acquired (e.g. social, educational and economic factors), the local environment (e.g. biofilm load or composition), other diseases (e.g. sub-optimally controlled diabetes) and lifestyle (e.g. smoking) factors. These may arise in different combinations in different individuals; at an individual patient level they may also have differentially weighted effects.\*
- Effective preventive and therapeutic interventions are available to manage periodontal diseases.\*

#### **Recommendations for researchers regarding periodontal diseases:**

- Consider further trend studies in periodontitis to better understand whether or not there is a decline in periodontitis. If so, what is driving the potential decrease of periodontitis in different populations.\*\*
- Gather authoritative evidence on whether interdental cleaning aids help to prevent periodontitis and tooth loss.\*\*
- Address the gap of knowledge on gingivitis in children.\*\*

\* Perio Workshop 2016 - working group 2: Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases

\*\* Perio Workshop 2016 - working group 3: Prevention and control of dental caries and periodontal diseases at individual and population level

\*\*\* Perio Workshop 2016 - working group 4: Dental caries and periodontal diseases in the ageing population: call to action to protect and enhance oral health and wellbeing as an essential component of healthy ageing

- Conduct further high quality research in the elderly in order to ascertain whether risk factors for periodontal diseases change across the life course.\*
- Clarify strategies for risk factor reduction in frail older people and those living in care homes that lack independence\*
- Investigate the effects of sugar through mechanisms other than those impacting on the biofilm in periodontal diseases.\*
- Determine the efficacy of other dietary interventions, such as pro/prebiotics in periodontal disease with regards to prevention/ management.\*

### *Dental caries/periodontal diseases*

#### **Researchers should be aware of the following concerning dental caries/ periodontal diseases:**

- Research priorities should be placed on how preventive and therapeutic regimens may preserve oral health, quality of life and nutrition into older age as comorbidities present unique challenge to the delivery of intrinsically efficacious and effective strategies.\*\*\*
- There is a need for the evaluation of the effect of legislation, restrictions, guidelines and public campaigns on the change in behaviour and improved parameters of oral health on the efficiency level.\*\*
- Robust studies on the incidence of chronic periodontitis and increment of dental caries are highly desirable to better understand the risk factors for periodontitis and dental caries in adults.\*\*
- The dental scientific community should harmonise epidemiological data sets across cohorts to allow common analysis for an improved understanding of the prevalence, as well incidence, of periodontitis and dental caries or the influence of risk factors on these diseases.\*\*

#### **Recommendations for researchers concerning dental caries/ periodontal diseases:**

- Develop clear definitions of disease in order to facilitate the identification of individuals that are at the highest risk for the development of the disease.\*
- Develop methodological consensus on suitable and robust epidemiologic measures for:
  - aspects of disease burden;\*\*
  - disease surveillance over time within and across national and geographical boundaries;\*\* and
  - aetiologic research.\*\*
- Conduct studies that are sufficiently powered.\*
- Undertake studies that employ longitudinal designs to better inform questions around causality.\*
- Conduct research in diverse populations of different geographical origins and different age groups.\*
- Analyse existing epidemiological data sets to determine whether dental caries and periodontitis co-occur due to the effect of common risk factors.\*\*
- Link existing registries (education, socio-economic conditions, general health) with dental registries (dental caries and periodontitis) to evaluate the effect of risk factors on dental caries and periodontitis or vice versa the effect of dental caries and periodontitis on general health to circumvent the problem of decreasing response rate in epidemiological studies.\*\*
- Implement tailored, multifaceted and comprehensive preventive programmes for dental caries and periodontal diseases and evaluate them on efficiency levels. Such approaches have already proven efficacious and efficient in early childhood dental caries.\*
- Monitor changes in dental disease prevalence subsequent to the introduction of new dietary guidelines, such as those recommended by the WHO.\*

\* Perio Workshop 2016 - working group 2: Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases

\*\* Perio Workshop 2016 - working group 3: Prevention and control of dental caries and periodontal diseases at individual and population level

\*\*\* Perio Workshop 2016 - working group 4: Dental caries and periodontal diseases in the ageing population: call to action to protect and enhance oral health and wellbeing as an essential component of healthy ageing

- Design hypothesis driven (candidate gene) or hypothesis free (GWAS) studies of dental caries and periodontal diseases within the same population cohorts and take into account interaction between different factors.\*
- Studies to unravel the mechanisms underlying genetic associations should be undertaken in search of the role of gene variants, including gene expression and other mechanisms of controlling gene function (epigenetics).\*
- Genetics studies reporting low p values but having employed small sample sizes should clearly state their limitations regarding a low 'strength' of association due to low study power, or similarly they should not conclusively exclude potential gene associations.\*
- Undertake research designed to improve understanding of potentially modifiable risk factors for both dental caries and periodontal diseases, specifically in relation to the following:
  - Hyposalivation and reduced salivary flow.\*
  - Smoking/tobacco use.\*
  - Carbohydrate (sucrose and starches) impacts upon biological pathways to disease, specifically exploring the effects of sugar frequency/ amount in relation to dental caries and periodontal diseases.\*
  - Micronutrient deficiencies and their impact upon disease initiation and progression, specifically in relation to vitamin's C, D and K, B6, B12, docosahexaenoic acid, eicosapentaenoic acid and trace elements and minerals such as magnesium, calcium and phosphate.\*
  - Longitudinal controlled studies focusing on the influence of dietary fats, fat types and proteins on dental caries and periodontal diseases.\*
  - Multi-centre intervention studies analysing the efficacy of micronutrient supplementation and carbohydrate restriction upon disease status.\*
  - Metabolic syndrome (including diabetes and obesity) and the impact of its management upon periodontal diseases and dental caries.\*
- Evaluate whether dental caries and/or periodontal diseases can be managed through diet changes with the help of motivational interviewing.\*
- Recommend comparative superiority studies with different types of psychological approaches in different groups both with regards to efficacy and efficiency.\*\*
- Obtain evidence on the use of interactive devices to aid oral hygiene such as electronic support systems for power toothbrushes and timers which are currently promoted. At present, evidence for a long-term successful change in behaviour is not available.\*\*
- Design RCTs addressing the simultaneous management of gingivitis and dental caries on the efficacy of:
  - Self-performed oral hygiene including tooth-brushing considering fluoridated toothpaste and interdental cleaning.\*\*
  - Different intervals between recall appointments in structured prevention programmes.\*\*
  - The adjunctive use of chemical plaque control agents including toothbrushing with fluoridated toothpaste as the control.\*\*

\* Perio Workshop 2016 - working group 2: Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases

\*\* Perio Workshop 2016 - working group 3: Prevention and control of dental caries and periodontal diseases at individual and population level

\*\*\* Perio Workshop 2016 - working group 4: Dental caries and periodontal diseases in the ageing population: call to action to protect and enhance oral health and wellbeing as an essential component of healthy ageing



## *Perio & Caries, a project based on Perio Workshop 2016*

The EFP project 'Perio & Caries' builds on the outcomes of Perio Workshop 2016, devoted to "The boundaries between dental caries and periodontal disease", organised by the EFP jointly with ORCA (European Organisation for Caries Research) in November 2016 and sponsored by Colgate. Perio Workshop is a leading annual scientific meeting focusing on state-of-the-art issues relating to gum health and gum disease, organised by the EFP in La Granja, Spain under the chairmanship of Mariano Sanz.

During Perio Workshop 2016, 75 leading global cariologists and periodontists from the EFP and ORCA reviewed, for the first time, all available evidence on common links between these prevalent oral conditions. Special emphasis was placed on associated causes and risk factors and prevention that may influence both periodontal diseases and caries. The conclusions of Perio Workshop 2016 are publicly available in a special open-access supplement of the EFP's *Journal of Clinical Periodontology*.

Caries and periodontal diseases share common genetic, aetiological and environmental factors, although they follow different trajectories. Thus they have always been considered as separate entities, but no longer. The project 'Perio & Caries' came about to disseminate these identified similarities - and the distinct characteristics of each entity - and to recommend clear preventive measures for individuals and the population at large.

The consensus reports produced by the four working groups at Perio Workshop 2016 examined the role of microbial biofilms; the interaction of lifestyle, behaviour and systemic diseases; prevention and control; and age-related effects, all in relation to dental caries and periodontal diseases.

Other major conclusions of Perio Workshop 2016 and the 'Perio & Caries' project include:

- Micro-organisms associated with both caries and periodontal diseases are metabolically highly specialised and organised as multi-species, microbial biofilms.
- The progression of these diseases involves multiple microbial interactions driven by different stressors. With caries, exposure to dietary sugars and fermenting organic acids results in increased quantities of acidogenic and aciduric species. In gingivitis, plaque accumulation at the gingival margin leads to inflammation and increased proportions of proteolytic and often obligate anaerobic species.
- There is moderately strong evidence for a genetic contribution to periodontal diseases and caries susceptibility, with an attributable risk estimated at up to 50 percent.
- There has been a global decline in the prevalence of caries and possibly periodontal diseases, although the increase in the global population and tooth retention imply a bigger burden of disease at the population level.

## *Perio Workshop 2016 - four working groups*

### *Working group 1:*

### *Role of microbial biofilms in the maintenance of oral health and the development of dental caries and periodontal disease*



This group, chaired by Mariano Sanz (EFP) and David Beighton (ORCA), reviewed the ecological interactions in the dental biofilm in health and disease, the role of microbial communities in the pathogenesis of periodontitis and caries and the innate host response in caries and periodontal diseases.

One of the main findings was that the biofilm is an essential component involved in the development of caries and periodontal

diseases. As a result, understanding the composition and inter-microbial interactions is fundamental in developing effective preventive and therapeutic measures.

In the same way, knowledge of the microbe-host interactions - involved in the maintenance of oral health and the initiation and progression of both dental caries and periodontal diseases - is key to improving preventive strategies and designing new strategies to improve oral health.

#### **Chairmen:**

Mariano Sanz, David Beighton

#### **Review papers:**

*Dental plaque biofilm: ecological interactions in health and disease* (by Egija Zaura & Philip Marsh)

*Role of microbial communities in the pathogenesis of periodontitis and caries* (by Alex Mira & Mike Curtis)

*The innate host response in caries and periodontal disease, Part 1: the role of tissues and cellular players* (by Mark Herzberg & Jörg Meyle)

*The innate host response in caries and periodontal disease, Part 2: functional fluids and effector molecules* (by Mark Herzberg & Jörg Meyle)

#### **Reviewers:**

Egija Zaura, Alex Mira, Mark Herzberg, Philip Marsh, Mike Curtis, Jörg Meyle

#### **Participants:**

Irene Dige, Svante Twetman, Jaime Cury, Rodrigo Giacaman, Eric Reynolds, Andrea Mombelli, David Herrera, Eija Könönen, Marc Quirynen, Lior Shapira

#### **Colgate representative:**

Irina Chivu

#### **Staff member:**

Ana Molina

**Working group 2:*****Interaction of lifestyle, behaviour or systemic diseases with oral health, dental caries and periodontal diseases***

This group, chaired by Iain Chapple (EFP) and Andreas Schulte (ORCA), carried out a systematic review of genetic risk factors, a narrative review of the role of diet and nutrition and reference documentation for modifiable acquired risk factors that are common to both diseases.

There is moderately strong evidence that a person is genetically predisposed to periodontal diseases and caries, although

the literature is more substantial for the former than the latter. The genes involved in each are different and no common genetic variants were found.

Fermentable carbohydrates (sugars and starches) were the most relevant common dietary risk factor for both diseases, but the associated mechanisms differed. The working group also found that 'functional foods' or probiotics could prove helpful in preventing caries and managing periodontal disease. However, it noted that evidence is limited and biological mechanisms involved are not yet fully understood.

In terms of acquired risk factors for both caries and periodontal diseases, the most common are hyposalivation, rheumatoid arthritis, smoking, undiagnosed or poorly controlled diabetes and obesity.

**Chairmen:**

Iain Chapple, Andreas Schulte

**Review papers:**

*Shared modifiable risk factors for dental caries and periodontal diseases* (by Guglielmo Campus & Philippe Bouchard)

*Genetic and epigenetic regulation of gene expression and its possible role in the pathogenesis of caries and periodontal disease* (by Luigi Nibali & Alexandre Vieira)

*Nutrition, dental caries, and periodontal disease: a practical overview* (by Philippe Hujoel & Peter Lingström)

**Reviewers:**

Guglielmo Campus, Alexandre Vieira, Peter Lingström, Philippe Bouchard, Luigi Nibali, Philippe Hujoel

**Participants:**

Nadine Schlüter, Chris Rahiotis, Cor van Loveren, David Manton, Nigel Pitts, Marja Laine, Wim Teughels, Fridus van der Weijden, Henrik Dommisch

**Colgate representative:**

Michael Schneider

**Staff member:**

Eduardo Montero



**Working group 3:**

***Prevention and control of dental caries and periodontal diseases at individual and population level***



Chaired by Søren Jepsen (EFP) and Vita Machiulskiene (ORCA), this group reviewed the current state of knowledge on epidemiology, social-behavioural aspects and plaque control. They noted that dental caries and periodontal diseases share common risk factors and social determinants that are important for their prevention and control.

Its three systematic reviews focused on:

(1) the global burden of dental caries and periodontitis on mankind; (2) socio-behavioural aspects in the prevention and control of dental caries and periodontal disease at an individual and population level; and (3) mechanical and chemical plaque control in the simultaneous management of gingivitis and dental caries.

Key findings showed that the prevalence and experience of dental caries have decreased in many regions in all age groups over the last three decades, but not all social groups have benefitted equally. In addition, while some studies have indicated a possible decline in the prevalence of periodontitis, there is insufficient evidence to conclude that its prevalence has changed over recent decades.

Global population growth and increased tooth retention mean that the number of people affected by dental caries and periodontitis has grown substantially: untreated caries by 37 percent and severe periodontitis by 67 percent between 1990 and 2013.

The most important behavioural factor for both diseases is efficient self-performed oral hygiene - tooth brushing with a fluoride toothpaste and interdental cleaning. Professional tooth cleaning, oral hygiene instruction and motivation, dietary advice and fluoride application are effective to deal with dental caries and gingivitis.

***Chairs:***

Søren Jepsen, Vita Machiulskiene

***Review papers:***

*The global burden of caries and periodontal diseases* (by Thomas Dietrich & Joannes Frencken)

*Socio-behavioural aspects in the prevention and control of dental caries and periodontal diseases at an individual and population level* (by Christof Dörfer & Julian Schmoekel)

*Mechanical and chemical plaque control in managing gingivitis and caries: a systematic review* (Elena Figuero & Joana Carvalho)

***Reviewers:***

Joannes Frencken, Julian Schmoekel, Joana Carvalho, Thomas Dietrich, Christof Dörfer, Elena Figuero



***Participants:***

Monique van der Veen, Wolfgang Buchalla, Livia Tenuta, Marisa Maltz, Susan Higham, Thomas Kocher, Filippo Graziani, Juan Blanco, Anton Sculean

***Representative from Platform for a Better Oral Health in Europe:***

Ken Eaton

***Colgate representative:***

Irina Laura Chivu-Garip

***Staff member:***

Alberto Ortiz-Vigón

**Working group 4:**

***Age-related effects on oral health, dental caries and periodontal diseases***



Chaired by Maurizio Tonetti (EFP) and Sebastian Paris (ORCA), this group reviewed scientific evidence and developed specific recommendations to prevent tooth loss and retain oral function - by preventing and treating caries and periodontal diseases later in life - and increasing awareness of the health benefits of oral hygiene as an essential component of healthy ageing.

Over the previous two decades, progress in preventing and treating of caries and periodontal diseases has improved oral health and tooth retention in the adult population. The ageing population and increasing expectations among older people of good oral health pose big challenges to clinical care and healthcare systems.

Three systematic reviews were carried out on: (1) the aspects of caries and periodontal diseases in older people; (2) the impact of ageing on caries and periodontal diseases; and (3) the effectiveness of interventions.

The experts found that an increase in the total burden posed by caries and periodontal diseases among the older population is a likely consequence of an ageing population, trends in risk factors and improved tooth retention. It noted that specific surveillance is required to monitor changes in oral health in the older population and that ageing impacts oral health, including periodontitis and possibly susceptibility to caries.

Considering the evidence that caries and periodontal diseases can be prevented and treated in older adults, the group found that oral health and functional tooth retention later in life offer benefits such as improving quality of life and preventing physical decline and dependency by fostering a healthy diet.

In the light of these findings, it is recommended that oral healthcare professionals and individuals should not base their decisions affecting tooth retention on chronological age, but on the level of dependency, life expectancy, frailty, comfort and quality of life. As a consequence, health policy should remove barriers to oral healthcare for vulnerable elders.

**Chairmen:**

Maurizio Tonetti, Sebastian Paris

**Review papers:**

*Aging, dental caries and periodontal diseases* (by Rodrigo Lopez & Falk Schweddicke)

*Changes in immune function (immune senescence) in caries and periodontal diseases: a systematic review* (by Philip Preshaw & Georg Conrads)

*Gingival recession and root caries in the ageing population: a critical evaluation of treatments* (by Peter Heasman & Bente Nyvad)

**Reviewers:**

Falk Schwendicke, Georg Conrads, Bente Nyvad, Rodrigo López, Philip Preshaw, Peter Heasman

***Participants:***

Peter Bottenberg, Alix Young, Jacques Vannobergen, Marie-Charlotte Huysmans, Gert Jan van der Putten, Stefan Renvert, Ian Needleman, Phoebus Madianos, Leonardo Trombelli, Peter Eickholz, Frauke Muller, Nicola West

***Colgate representative:***

Ian Pretty

***Staff members:***

Ignacio Sanz-Sánchez, Ignacio Sanz-Martín

## Authors



Iain Chapple

Iain Chapple is professor of Periodontology and head of the School of Dentistry at the University of Birmingham, UK. He is a former scientific editor of the *British Dental Journal* and the *Journal of Periodontal Research* and is currently associate editor of the *Journal Clinical Periodontology and Periodontology 2000*. He has written seven textbooks and 16 book chapters.

Prof Chapple was president of the IADR Periodontal Research Group (2006-07) and group programme chair (2008-2015) and council representative (2016).

At the EFP, he was treasurer (2007-2013), co-organiser of the Perio Workshops, chairman of the scientific advisory committee, and editor of the *JCP Digest* (2014-2016). Currently, he is the EFP secretary-general.

Furthermore, Prof Chapple was president of the British Society of Periodontology in 2014-2015. He was awarded the Charles Tomes medal by the Royal College of Surgeons in 2011 and the Rizzo Research Award of the IADR Periodontal Research Group in 2001.

He leads Birmingham's Periodontal Research Group, which is part of Birmingham's MRC Centre for Immune Regulation. Finally, he has published over 170 peer-reviewed manuscripts of international scientific literature. He is director of Research for the Institute of Clinical Sciences. He runs a regional clinical NHS service for a population base of six million and also a national oral service for adults patients with *Epidermolysis Bullosa*.

## Authors



Søren Jepsen

Søren Jepsen is professor and chairman of the department of Periodontology, Operative and Preventive Dentistry at the University of Bonn, Germany. Previously he was assistant professor in the department of Prosthodontics at the University of Hamburg and later associate professor in the department of Conservative Dentistry and Periodontology at the University of Kiel.

Prof Jepsen received his dental and his medical degrees from the University of Hamburg in 1981 and 1986 and a MS in Periodontology from Loma Linda University, California, USA, in 1992. He became a diplomate of the American Board of Periodontology in 1999.

Prof. Jepsen became elected member of Leopoldina (German National Academy of Sciences) in 2005. He was elected and invited as chair of the department of Periodontology, University of Berne in 2007. Since 2008 he is speaker of the Clinical Research Unit 208 "Aetiology and Sequelae of Periodontal Diseases" funded by the German Research Foundation at the University of Bonn.

He has served on the executive committee of the European Federation of Periodontology (EFP) as chair of its research committee (2004 – 2010) as board member (2012-2017) and as president (2015-2016), is co-chair of the organising committee for the AAP/EFP World Perio Workshop on a New Classification of Periodontal and Peri-implant Diseases in November 2017, and scientific chair for EuroPerio9 in 2018.

Prof. Jepsen has lectured and published extensively, has received numerous awards and is associate editor of the *Journal of Clinical Periodontology* and editorial board member of *Clinical Oral Implants Research*, the *European Journal of Oral Implantology*, and the *Chinese Journal of Dental Research*.

## Authors



**Mariano Sanz**

Mariano Sanz is professor and chair of periodontology at the University Complutense of Madrid (Spain) and a professor in the faculty of odontology at the University of Oslo (Norway).

He graduated in medicine in 1981 from the University Complutense of Madrid, from which he received a degree in stomatology in 1983 and where he qualified as a Doctor of Medicine in 1985. He received his speciality in periodontology from the University of California in Los Angeles (UCLA) in 1987. He has received honorary doctorates from the University of San Sebastian in Santiago (Chile), the University of Gothenburg (Sweden), and the University of Coimbra (Portugal).

Since 2005, Prof Sanz has been chair of the ETEP research group on the aetiology and therapy of periodontal diseases, whose main lines of research are oral microbiology, bacterial-host interactions, and antimicrobial approaches in the treatment of gingivitis and periodontitis. The research group has conducted clinical trials to measure the efficacy of different approaches to periodontal regeneration, surgical protocols using dental implants, and therapeutic approaches to treat peri-implantitis.

Prof Sanz has published 230 articles in scientific journals, written 50 book chapters, and has participated as an invited speaker at more than 200 scientific events in the last five years. He is an associate editor of the *Journal of Clinical Periodontology* and *Evidence-Based Dental Practice*, and a member of the editorial boards of various other dental journals.

He has been awarded the Jens Waerhaug Research Prize by the Scandinavian Society of Periodontology (1984), the Outstanding Service Award from the International Association for Dental Research (2015), and the IADR Straumann Award in Periodontal Regenerative Medicine (2015).

He is a member of the executive committee of the European Federation of Periodontology (EFP) and chair of its workshop committee. He has previously served the EFP as both president (1993-1994) and secretary general (1998-2005). He is president of the Osteology Foundation, president of the International Association for Dental Research's continental European division, and president-elect of the Association for Dental Education in Europe (ADEE).

## Authors



**Maurizio Tonetti**

Maurizio Tonetti is currently clinical professor of Periodontology at the Faculty of Dentistry of the Hong Kong University, and executive director of the European Research Group on Periodontology (ERGOPerio). Previously, Prof Tonetti was professor and head of the department of Periodontology at the School of Dental Medicine of the University of Connecticut. He served as well as professor and head of the departments of Periodontology at the University College in London, at the University of Berne, and at the University of North Carolina at Chapel Hill, USA. Currently he is the editor in chief of the *Journal of Clinical Periodontology*.

Regarding his clinical activity, as a specialist in periodontology Prof Tonetti maintains a part-time private practice limited to periodontology and implant surgery with emphasis on regeneration, minimally invasive surgery and microsurgery. He has been working for years with leading colleagues to provide periodontal care and dental implant treatment to the world elite.

The focus of his recent research activity is threefold: (1) improved understanding of periodontal infections and their general health consequences; (2) regeneration and bio-engineering of lost periodontal structures; and (3) replacement of hopeless teeth with dental implants. The research of his team has spanned from fundamental discovery to clinical translation.

Prof Tonetti is widely recognised for his contributions to improved periodontal diagnosis and risk assessment, control of periodontitis, the practice of periodontal regeneration, and design and execution of large clinical trials in periodontology and implant dentistry. His scientific work has been cited 20,000 times and has an H-factor of 79. He has been engaged worldwide in the planning and delivery of advanced educational programs in the fields of periodontology and implant dentistry.

## Authors



**Nicola West**

Nicola West is a British periodontist, implantologist, and specialist in endodontics and prosthodontics, who works since 2010 as professor and honorary consultant in Restorative Dentistry (Periodontology) at the School of Oral and Dental Sciences of the Bristol Dental School and Hospital, in southern England. Her previous appointment was as lecturer at the same University of Bristol. Currently she is the secretary of the British Society of Periodontology.

Author of multiple research publications, Prof West leads one of the largest Dental Clinical Trials Units in the UK and is considered a world authority in toothwear and dentine hypersensitivity, an oral pain condition affecting more than half the world's population. She is behind the development of an intra oral dental appliance that revolutionized the way research was conducted, by allowing development and evaluation of oral healthcare products without causing harm to the teeth.

Prof West collaborated with the Universities of Lyon, King's, Madrid, Berne, and Paris in a multicentre prevalence toothwear study across seven European countries (2011-2013) to determine risk factors in order to improve oral health and reduce dental treatment. Toothwear is increasing with prevalence of 40%. She extended this work to Africa, Asia and the US - her work on tooth surface loss resulted in marketing the low erosive beverage, Ribena ToothKind, now Ribena Light (first low erosive beverage accredited by the British Dental Association).

Furthermore, Nicola West innovated by launching in 2013-16 the first study measuring real time acidic drink tooth erosion and natural tooth repair using living teeth. These studies show public benefit from delaying tooth brushing more than 2 hours after imbibing acidic drinks to avoid tooth damage. She has worked extensively in the fields of tooth repair, prevention of daily tooth pain, loss of tooth structure and oral function by patient education, self applied toothpaste treatment, and assessment of dental implant failure.

Finally, as an international clinical trainer Prof West has supported new researchers in dentine hypersensitivity pain and toothwear assessment centres in four continents.



## "Perio & Caries", a joint **EFP-Colgate** project

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*The European Federation of Periodontology (EFP) is the leading global voice on gum health and gum disease and the driving force behind EuroPerio – the most important international periodontal congress – and Perio Workshop, a world-leading meeting on periodontal science. The EFP also edits the Journal of Clinical Periodontology, one of the most authoritative scientific publications in this field.*

*The EFP comprises 30 national societies of periodontology in Europe, northern Africa, Caucasia, and the Middle East, which together represent about 14,000 periodontists, dentists, researchers, and other members of the dental team focused on improving periodontal science and practice.*

[www.efp.org](http://www.efp.org)

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