

Oral Health in Ireland: A Handbook for Health Professionals

Second Edition

The Dental Health Foundation acknowledges funding contributions from the Health Service Executive and support, comments and information from the Department of Health. The National Oral Health Office, HSE is acknowledged for their role in reviewing this document.



Dental Health Foundation
Ireland






Oral Health Services Research Centre
University College Cork

Contents

Foreword	4
Chapter 1 Introduction	6
Chapter 2 The Healthy Mouth: Understanding Structure and Function	8
Tooth Types and Functions	8
Development of Teeth	9
Tooth Eruption	11
Dental Short Hand	12
Anatomy of the Tooth and Surrounding Structures	13
Saliva	14
Dental Biofilm (Plaque)	14
Chapter 3 Oral Health & Disease Prevention	16
Dental Caries (Tooth Decay)	16
Periodontal (Gum) Disease	22
Oral Cancer	25
Dental Trauma	26
Tooth Wear	27
Dry Mouth	28
Mouth Ulcers	29
Cold Sores	29
Tooth Sensitivity	29
Halitosis (Bad Breath)	30
Chapter 4 Oral Health & General Health: The Common Risk Factor Approach	32
The Mouth-Body Connection	32
The Common Risk Factor Approach	32
Common Risk Factors for Oral Health	33

ISBN: 978-0-9559661-1-8

	Chapter 5 Nutrition and Oral Health	38
	Getting the Balance Right	38
	Nutritional Advice: Oral Health vs. Heart Health	39
	Food and Drink Labels	40
	Medicines	40
	Good Food for all Stages of Life	41
	Chapter 6 Oral Health Care Products	46
	Toothpastes	46
	Toothbrushes	48
	Mouthrinses	49
	Interdental Cleaning Aids	50
	Plaque Disclosing Agents	50
	Denture Cleaners and Fixatives	50
	Saliva Substitutes	50
	References	52
	Other Reading	55
	Acknowledgements	57
	Save the Tooth Poster	58

Foreword

Reflecting the changes that have arisen since the publication of the first edition, fifteen years ago, *Oral Health in Ireland: A Handbook for Health Professionals (2nd Edition)* provides updated evidence based guidance on oral health promotion for health and allied health professionals. The evidence-based approach improves patient care by integrating three important aspects of clinical practice; professional expertise, a patient's needs and preferences and the best available scientific evidence.

Oral disease impacts on the vast majority of the population and despite advances in preventive dentistry the prevalence of dental decay and gum disease remains high. These conditions are preventable and *Oral Health in Ireland: A Handbook for Health Professionals (2nd Edition)* sets out a range of measures and recommendations in relation to maintaining optimum oral health. It focuses on enabling health and allied health professionals to promote and support an inclusive approach to addressing risk factors and preventing diseases while empowering people to take action to protect and be responsible for their own oral health.

This publication is in line with *Healthy Ireland – A Framework for Improved Health and Wellbeing 2013–2025*, the national framework for action to improve the health and wellbeing of our nation. Based on international evidence, it outlines a new commitment to public health with a considerable emphasis on prevention, while at the same time advocating for stronger health systems where wellbeing is valued and supported at every level of society and is everyone's responsibility.

I congratulate the Dental Health Foundation and the Oral Health Services Research Centre, University College, Cork on the preparation of this important document and wish them every success in their work.



Leo Varadkar T.D.
Minister for Health



Introduction

Oral disease is one of the most common diseases in contemporary society. In spite of considerable advances in preventive dentistry, the vast majority of the population will have experienced both dental decay and gum disease by their early twenties.

Advances in the prevention and treatment of oral diseases mean that most children born in this century will keep their teeth into old age, and the condition of these teeth will depend on how well they are looked after over a lifetime. The vital role our oral health plays in our daily lives, in terms of eating, speaking, smiling and socialising, is often overlooked but it is impossible to separate oral health from general health; behaviours that cause general disease are also implicated in oral disease. High sugar intake, for example, is linked to obesity, heart disease, diabetes and dental decay. Smoking is linked to cardiovascular disease, respiratory disease, gum disease and cancer, including oral cancer. In addition to sharing common risk factors, poor oral health appears to impact on general health. Research has shown a link between gum disease and heart disease; a link between gum disease in pregnancy and adverse pregnancy outcomes has also been reported, although further research is required to explain this association. Prevention of oral infection may also play a role in the control of diabetes. The World Health Organisation (WHO) has stated that oral disease prevention and the promotion of oral health needs to be integrated with chronic disease prevention and general health promotion, as the risks associated with general disease and oral disease are linked.¹ This approach was endorsed in 2013 at the World Health Assembly.

Health promotion is an explicit objective of *Your Health is your Wealth: a Policy Framework for a Healthier Ireland 2012–2020* which aims to realise the provisions in the Programme for Government regarding a healthier population that will be protected from health threats, living in a healthier and more sustainable environment, with increased social and economic productivity and greater social inclusion.

It is over 27 years since the proclamation of the *Ottawa Charter for Health Promotion*²; the tenets of this charter are as relevant today as they were then. They spell out the type of action needed to promote health:

- Build healthy public policy
- Create supportive environments
- Strengthen community actions
- Develop personal skills
- Reorient health services.

¹http://www.fdiworldental.org/media/26435/who_ncd-action-plan_2013-20_a66_wha.pdf

Examples of building healthy public policy and creating supportive environments in Ireland are the Health (Fluoridation of Water Supplies) Act 1960 and the Public Health (Tobacco) Act 2002, (Section 47) Regulations 2003, which introduced a ban on smoking in the work place. This publication of *Oral Health in Ireland: A Handbook for Health Professionals* is designed to promote and support an inclusive approach to addressing risk factors and preventing many diseases. As a nation we share a common goal of good health and quality of life, enabling a healthy and economically productive population. Achieving this common goal requires cooperation and team work across the public and private sector in diverse areas, for example, health, welfare, commerce, industry and employment. Health is produced through good living and working conditions, good social and emotional supports, healthy environments and positive health behaviours. The perspective of this book is from that of promotion of oral health, but it has the potential to also impact on general health through this common risk factor approach.

Recognising that a broad spectrum of people in diverse sectors – not just dentists, dental nurses and dental hygienists – have a role to play in oral health promotion, and that there was a need for a single publication in which the current scientific knowledge of the different oral diseases and conditions is presented, *Oral Health in Ireland* was first published by the Dental Health Foundation in 1999. This second edition of *Oral Health in Ireland: A Handbook for Health Professionals* updates the information contained in the first edition to reflect the changes in current scientific knowledge that have arisen over the last fifteen years. It includes one completely new chapter: Chapter 4 discusses in greater detail the connections between oral health and general health and the advantages provided by a Common Risk Factor Approach to health promotion. As with the first edition, the aim of this publication is to provide a concise, scientifically-based document on

oral health promotion for use by health and allied health professionals in the Republic of Ireland. The document sets out to describe:

- ▶ Oral health terminology and the determinants of oral health and disease
- ▶ Relevant information on the current oral health status and oral health practices of Irish children and adults
- ▶ Methods of disease prevention
- ▶ Common risk factors between oral health and general health
- ▶ Information on nutrition and oral health
- ▶ Oral health care products
- ▶ Sources of information on oral health in the Republic of Ireland.

2

The Healthy Mouth: Understanding Structure and Function

Oral health is achieved when the teeth and oral environment are not only healthy but also:

- ▶ **comfortable and functional**, that is, food can be chewed thoroughly and without pain or discomfort and the teeth are not sensitive to different stimuli such as cold;
- ▶ **socially acceptable**, that is, the mouth does not give rise to bad breath and the appearance of the teeth and gums should be acceptable and not give rise to embarrassment;
- ▶ **free from sources of infection which may affect general health**, that is, good oral hygiene should be maintained to minimise the risk of oral infections which may adversely impact on general health (e.g., gum disease is a risk factor for cardiovascular disease, diabetes mellitus, bacterial pneumonia and other systemic disorders).

This state of oral health should persist for life and, given a healthy lifestyle, is achievable for the majority of the population.

Structure and function is a useful starting point for the consideration of factors affecting the mouth and oral health. This chapter begins with a brief description of tooth types and their functions, some background information on the development of teeth and the numbering system used to describe them. The number and condition of teeth in the mouth at any given age are primary indicators of oral health status. The chapter then continues with an overview of saliva, which plays an essential role in the oral environment. Finally, dental biofilm (plaque), which promotes the development of oral disease, is described.

Tooth Types and Functions

The human mouth has four different tooth types. Each tooth type has its own specific function for the biting and chewing of food.



The **incisors** at the front of the mouth have a sharp biting surface and are used for cutting or shearing food into small chewable pieces. There are eight incisors in both primary (baby) and permanent sets of teeth (dentitions).



The **canines** are situated at the “corners” of the dental arches. They have a sharp, pointed biting surface. Their function is to grip and tear food. There are four canine teeth in both primary and permanent dentitions.

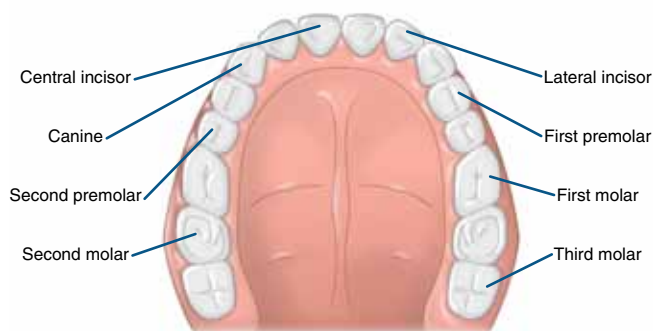


The **premolars**, unlike the incisors and canines, have a flat biting surface. Their function is to tear and crush food. They are unique to the permanent dentition, which has eight premolars.

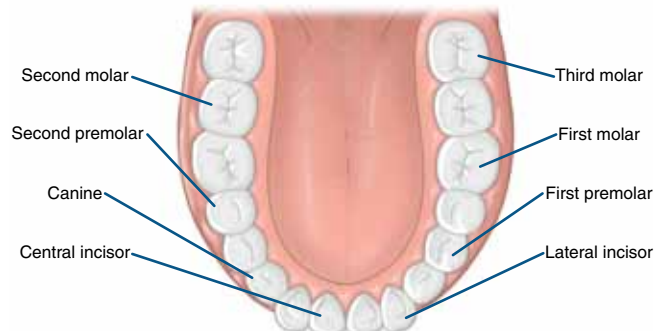


The **molars** are the largest of the teeth. They have a large flat biting surface. The function of the molars is to chew, crush and grind food. There are eight molars in the primary dentition and twelve in the permanent dentition.

Upper Jaw



Lower Jaw



Development of Teeth

Before Birth: Formation of Tooth Buds

By the third week after conception, the primitive mouth has formed. Over the next few weeks, the tongue, jaws and palate develop. During the sixth week, formation of embryonic cells or tooth buds that eventually form into teeth commences. By eight weeks, the tooth buds of all of the primary (baby) teeth can be discerned; by twenty weeks, the tooth buds of permanent teeth start to develop.

After Birth: Eruption of Primary and Permanent Teeth

The development of the teeth within the jaw continues after birth. Normally, the first primary teeth start to appear in the mouth around six months after birth. The primary central incisors, lateral incisors, first molars, canines and second molars normally appear in this order at intervals from 6–24 months. By age two and a half years, most children have their full complement of 20 primary teeth – 10 teeth in the upper (top) jaw and 10 teeth in the lower (bottom) jaw. As the child grows, the jaws also grow and spaces may begin to appear between the primary teeth. This growth makes spaces for the larger permanent teeth.

Tooth eruption times vary widely from child to child and the ages shown in the tooth eruption charts on page 11 represent average times of eruption.

From as early as age 5 years, the first permanent teeth, normally the four first permanent molars, begin to appear in the mouth. These erupt at the very back of the mouth behind the last primary tooth. As no teeth fall out to make way for these new permanent first molars, it is not unusual for the emergence of the first molars to go unnoticed. At the same time, the two primary lower central incisors begin to loosen and fall out as the permanent lower central incisors emerge in their place. Over the following six years or so, the remaining 18 primary teeth fall out and are replaced by permanent teeth. From about age 11 years, the four second permanent molars appear behind the first permanent molars. The last teeth to appear are the third molars or wisdom teeth. Not everybody has third molars and there is considerable variation in the age at which they erupt.

Symptoms of Teething

During the first two years of life, the most common side effect of teething is drooling or dribbling. Though the response to tooth eruption is very varied, symptoms of teething may include disturbed sleep, feeding irritability and swollen tender gums. Severe symptoms such as diarrhoea, fever and convulsions require medical attention and should not be attributed merely to teething.

The Importance of Primary Teeth

Some parents still consider that the primary teeth are not important because they fall out and are replaced by permanent teeth. However, besides their obvious importance for eating, appearance and speech, healthy primary teeth are also essential for guiding permanent teeth, which develop underneath them, into their correct positions. The primary molars, usually the last of the primary teeth to fall out, are normally not replaced by their permanent successors until about age 12 years.

Early neglect of primary teeth can result in a number of problems. Tooth decay in a young child can quickly lead to pain and infection (abscess) and, because of their young age, dental treatment can be difficult and may have to be carried out under general anaesthetic – a procedure that is not without risk. If a young child's primary molar tooth has to be taken out (extracted) due to severe tooth decay, then the guide for the permanent successor is lost. The space available for the permanent tooth can be reduced, resulting in crowding or misalignment of the permanent tooth. A number of longitudinal studies have also found that children who experienced tooth decay in their primary teeth had a greater risk of developing tooth decay in their permanent teeth than children who maintained healthy primary teeth.^{3–5} These findings underscore the importance for parents and carers to establish good oral habits (e.g., healthy eating, daily toothbrushing) for their children from an early age, starting when the first tooth appears. Dietary advice for parents/carers of young children is provided in *Chapter 5 – Nutrition and Oral Health* (see page 38) and toothbrushing advice in *Chapter 3 – Oral Health & Disease Prevention* (see pages 20 and 24). It is also important that children be brought for their first dental check-up before all the primary teeth have erupted, ideally before age 2 years.

Key Points

- ▶ There are 20 primary teeth.
- ▶ Primary teeth are important for eating, appearance and speech as well as for guiding permanent teeth, which develop underneath them, into their correct positions.
- ▶ Lower incisors are usually the first teeth to erupt at about 6 months; all 20 primary teeth are normally in the mouth between 2 and 2.5 years of age.
- ▶ All 20 primary teeth fall out.
- ▶ The primary molars, usually the last primary teeth to fall out, normally remain in the mouth up to about age 12 years.
- ▶ There are 32 permanent teeth including 4 wisdom teeth.
- ▶ The first permanent teeth to erupt (from as early as age 5 years) are the 4 first permanent molars behind the last primary teeth. Parents should be particularly vigilant and look out for the arrival of these teeth to ensure that they are brushed.
- ▶ Permanent incisors erupt between age 6 and 9 years.



Tooth Eruption

Average eruption times of primary teeth



	Tooth	Eruption (months)
Upper	Central incisor	7
	Lateral incisor	8
	Canine	16–20
	First molar	12–16
	Second molar	21–30
Lower	Central incisor	6 ½
	Lateral incisor	7
	Canine	16–20
	First molar	12–16
	Second molar	21–30

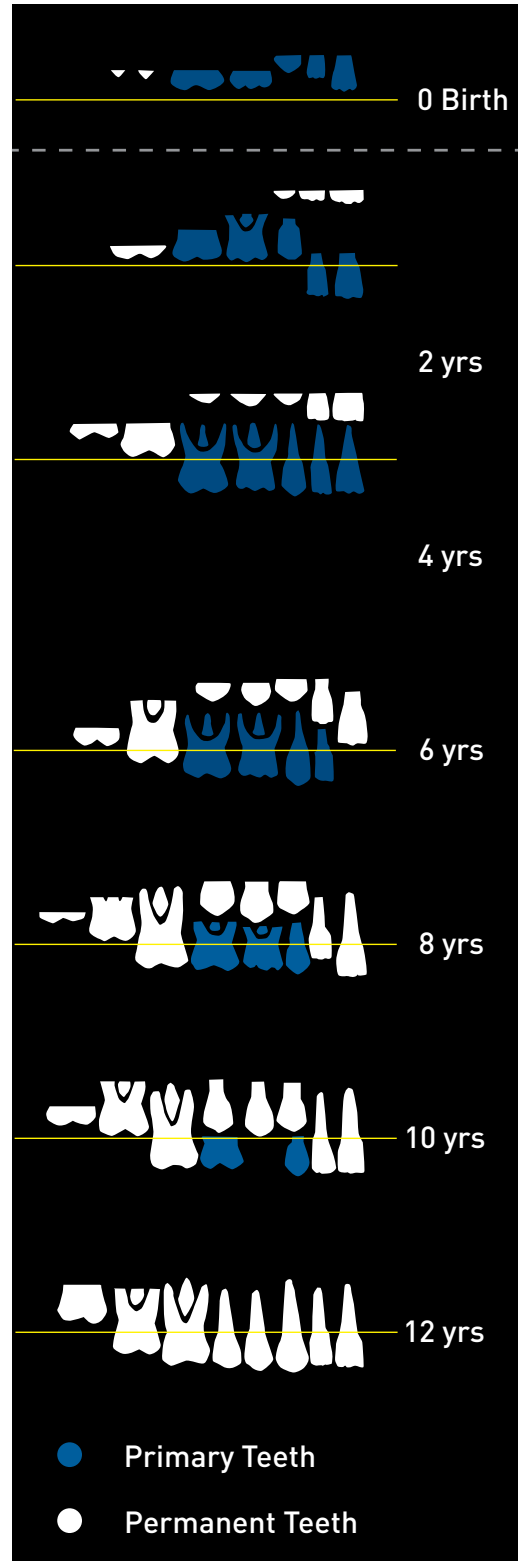
Source: Berkovitz et al., 1978

Average eruption times of permanent teeth



	Tooth	Eruption (years)
Upper	Central incisor	7–8
	Lateral incisor	8–9
	Canine	11–12
	First premolar	10–11
	Second premolar	10–12
	First molar	6–7
	Second molar	12–13
	Third molar	17–21
Lower	Central incisor	6–7
	Lateral incisor	7–8
	Canine	9–10
	First premolar	10–12
	Second premolar	11–12
	First molar	6–7
	Second molar	12–13
	Third molar	17–21

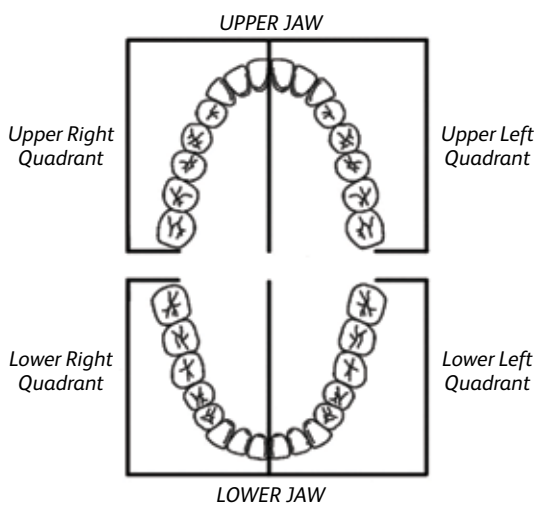
Source: Berkovitz et al., 1978



2

Dental Short Hand

Dentists use a variety of numbering systems for tooth identification. The F.D.I. (Federation Dentaire International) system is one that is generally used worldwide. This system uses two numbers to identify each tooth and divides the mouth into four quarters or quadrants as shown in the diagram below.



The first number indicates the quadrant. For permanent teeth, the quadrants are numbered 1 to 4 as follows:

Quadrant	
Upper right	= 1
Upper left	= 2
Lower left	= 3
Lower right	= 4

The second number indicates the tooth in each quadrant, beginning at 1 for central incisors to 8 for wisdom teeth:

Tooth	
Central incisor	= 1
Lateral incisor	= 2
Canine	= 3
First premolar	= 4
Second premolar	= 5
First molar	= 6
Second molar	= 7
Third molar	= 8

Thus, the tooth notation for the 32 permanent teeth is:

Upper Right								Upper Left							
1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
4.8	4.7	4.6	4.5	4.4	4.3	4.2	4.1	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8
Lower Right								Lower Left							

For the primary (baby) teeth, the quadrants are indicated as follows:

Quadrant	
Upper right	= 5
Upper left	= 6
Lower left	= 7
Lower right	= 8

The tooth notation for the 20 deciduous teeth therefore is:

Upper Right					Upper Left				
5.5	5.4	5.3	5.2	5.1	6.1	6.2	6.3	6.4	6.5
8.5	8.4	8.3	8.2	8.1	7.1	7.2	7.3	7.4	7.5
Lower Right					Lower Left				



Anatomy of the Tooth and Surrounding Structures

The tooth has two anatomical parts: the crown and the root. The **crown** is the part of the tooth that is normally visible in the mouth (above the gum line). The shape of the crown determines the function of the tooth. The **root** of a tooth is the part embedded in the jaw. It anchors the tooth in its bony socket and is normally not visible (below the gum line). The gum line is where the tooth and gums meet. The anatomy of teeth and the mouth structures which surround and support them are described below.

Structures of the tooth

Enamel: The hard outer layer of the crown. Enamel is the hardest substance in the body yet it can decay if teeth are not cared for properly.

Dentine: Not as hard as enamel; forms the bulk of the tooth and can be sensitive if the protection of the enamel is lost.

Pulp: Soft tissue containing the blood and nerve supply to the tooth. The pulp extends from the crown to the tip of the root, where it connects to the nerves and blood supply of the mouth. The pulp enables sensations of tooth sensitivity or pain.

Cementum: The layer of bone-like tissue covering the root. It is not as hard as enamel.

Structures around the tooth

Periodontal ligament: The periodontal ligament is responsible for attaching the tooth to the jaw bone. It is made up of thousands of fibres which fasten the cementum to the bony socket. These fibres anchor the tooth to the jaw bone and act as shock absorbers for the tooth, which is subjected to heavy forces during chewing.

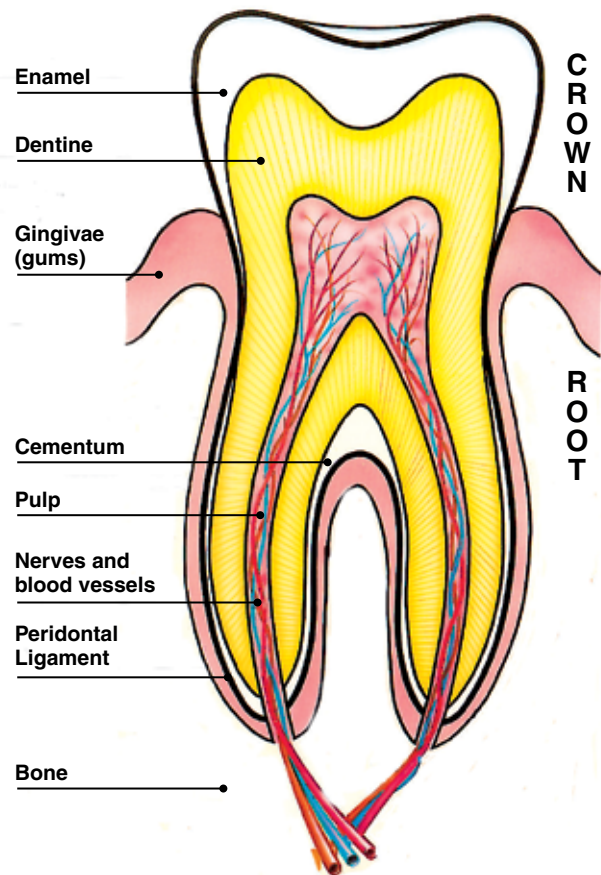
Gingivae (gums): Soft tissue that immediately surrounds the teeth and bone. It protects the bone and the roots of the teeth and provides an easily lubricated surface.

Oral Mucosa: This is the term used to describe the moist tissue that lines the mouth.

Bone: Provides a socket to surround and support the roots of the teeth.

Nerves and blood supply: Each tooth and periodontal ligament has a nerve supply and the teeth are sensitive to a wide variety of stimuli. The blood supply is necessary to maintain the vitality of the tooth.

Normal Tooth (Molar)



2

Saliva

The teeth and oral tissues are constantly bathed in saliva. Saliva is secreted by the salivary glands. The production of saliva increases when food or drinks are consumed. Its presence is vital to the maintenance of healthy oral tissue. Saliva has many important functions.

Functions of Saliva

Fluid/Lubricant: Coats oral mucosa and helps to protect against mechanical, thermal and chemical irritation. Assists smooth airflow, speech and swallowing.

Ion Reservoir: Holds ions needed for maintenance of enamel near the tooth. Helps prevent decay.

Buffer: Helps to neutralise plaque acids after eating, thus helps prevent decay.

Cleansing action: Clears food and aids swallowing.

Oral Hygiene / Antimicrobial actions: Helps control bacteria in the mouth.

Pellicle formation: Forms a protective coating on enamel.

Taste: Acts as a solvent thus allowing interaction of food with taste buds to facilitate taste.

Dental Biofilm (Plaque)

Dental biofilm or plaque is a causative factor for caries and periodontal disease. Dental biofilm is an almost colourless sticky bacterial film, which adheres to the tooth surface. It is not removed by rinsing with water. The accumulation of dental biofilm or plaque around the gum margin leads to the development of gingivitis in most people.

Gingivitis is characterised by inflamed, reddened gums which bleed easily during normal toothbrushing. The longer plaque is left on teeth, the greater the risk of developing gingivitis. Thus, daily careful plaque removal is required to prevent gingivitis. The most important plaque control method is toothbrushing, and should be established as a daily routine from early childhood. Plaque is also involved in causing dental decay. When foods containing sugars are eaten, the bacteria in plaque break down the sugars and acid is produced. This acid then dissolves the surface of the enamel under the plaque, causing dental decay (caries). Plaque is difficult to see, which makes it difficult to remove. A special dye in the form of a disclosing tablet can be used to stain the plaque making it easier to see. These tablets are available in most pharmacies and are an aid to plaque removal. A more detailed discussion of the factors influencing the decay process and methods for the control of plaque is given in *Chapter 3 – Oral Health & Disease Prevention*.



These teeth appear to be clean



After using a disclosing tablet



After effective brushing



3

Oral Health & Disease Prevention

The two main diseases which affect oral health are:

- ▶ **Dental caries (tooth decay)**, wherein bacterial processes that demineralise tooth surfaces result in cavities or holes in the teeth;
- ▶ **Periodontal (gum) disease**, wherein inflammatory responses to bacterial biofilm along the gum line result in damage to the tissues and bones that surround and anchor teeth.

There is now clear evidence that both of these diseases can be prevented or at least considerably reduced.

Indeed, since the introduction of water fluoridation in the 1960s, there has been a substantial reduction in the prevalence of dental caries in Ireland. Despite this improvement, large numbers of people continue to suffer high levels of tooth decay. In addition to dental caries and periodontal disease, there are a number of other important oral conditions which impact on oral health and well-being including:

- Oral cancer
- Dental trauma (fracture of teeth due to injury)
- Tooth wear (dental erosion, attrition and abrasion)
- Dry mouth
- Mouth ulcers
- Cold sores
- Tooth sensitivity
- Halitosis (bad breath).

The causes (determinants) of these conditions and how to prevent or control them will be considered in this section.

Oral health has risk factors which are also risk factors for general health (e.g., tobacco smoking, alcohol consumption). It is important, therefore, that strategies for the control of oral diseases should not be developed in isolation but as part of a “common risk factor approach” designed to control those risks common to a number of chronic diseases (see *Chapter 4 – Oral Health & General Health: The Common Risk Factor Approach.*) For all health professionals and the wider community, the common risk factor approach is particularly efficient in health promotion.⁶

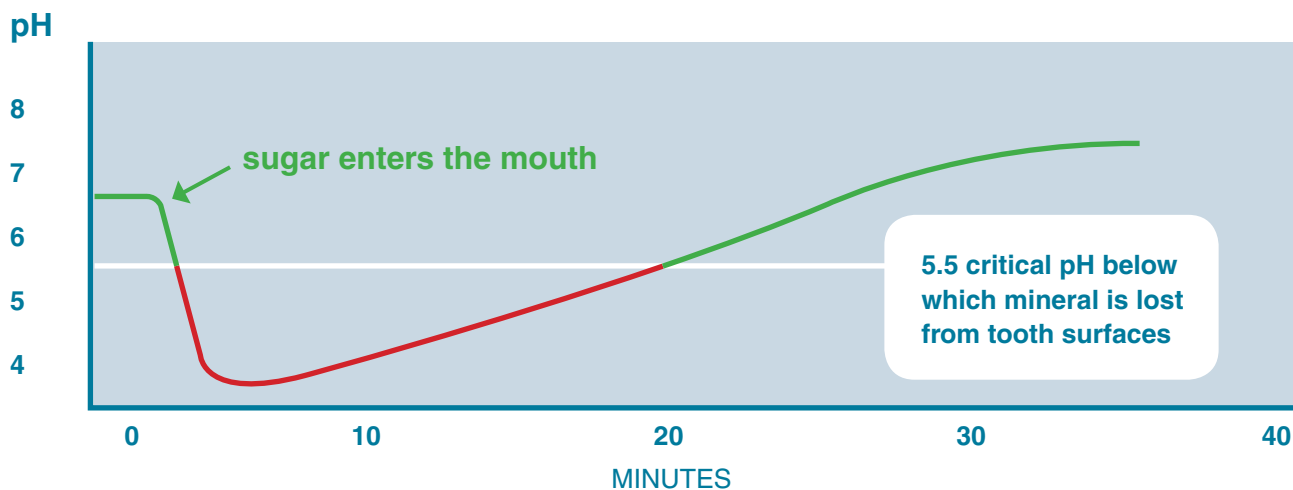
Dental Caries (Tooth Decay)

Dental caries (tooth decay) is a major oral health problem in most industrialised countries, affecting 60–90% of schoolchildren and the vast majority of adults.⁷ The early manifestation of the caries process is a small patch of demineralised (softened) enamel at the tooth surface, often hidden from sight in the fissures (grooves) of teeth or in between the teeth. The destruction spreads into the softer, sensitive part of the tooth beneath the enamel (dentine). The weakened enamel then collapses to form a cavity and the tooth is progressively destroyed. Caries can also attack the roots of teeth should they become exposed by gum recession. This is more common in older adults.

Dental caries is caused by the action of acids on the enamel surface. The acid is produced when sugars (mainly sucrose) in foods or drinks react with bacteria present in the dental biofilm (plaque) on the tooth surface. The acid produced leads to a loss of calcium and phosphate from the enamel; this process is called demineralisation.



Stephan Curve, plotting pH within dental plaque against time



Saliva acts to dilute and neutralise the acid which causes demineralisation and is an important natural defence against caries. Aside from buffering plaque acids and halting the demineralisation of enamel, saliva provides a reservoir of minerals adjacent to the enamel from which it can remineralise and “heal” once the acids have been neutralised. The enamel demineralises and remineralises many times during the course of a day. It is when this balance is upset and demineralisation exceeds remineralisation that caries progresses. When demineralisation occurs frequently and exceeds remineralisation over many months, there is a breakdown of the enamel surface leading to a cavity. Cavities, even in children who do not yet have their permanent teeth, can have serious and lasting complications such as pain, tooth abscess, tooth loss, broken teeth, chewing problems and serious infection.

The main treatment option for a tooth cavity is to drill out the decay and put in a filling (restoration) made from various materials (e.g., composite resins, amalgam, porcelain). Extensive tooth decay may necessitate a crown, root canal treatment or even extraction of the tooth.

During the 1990s, there was strong controversy regarding the possible damage to health from the use of mercury amalgam material to fill cavities caused by decay. Extensive research has shown that there is no valid scientific evidence to support a link between the presence of amalgam fillings in the mouth and systemic disease. A safety review (2008) conducted by the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) of the European Commission⁸ confirmed that both mercury amalgam and alternative filling materials such as composite resins, glass ionomer cements, ceramics and gold alloys are safe to use for restoring teeth. Nonetheless the Minamata Convention on Mercury (2013)

includes agreement to a global phase-down of the use of dental fillings containing mercury amalgam taking into account the domestic circumstances of individual countries. The need to ensure environmentally sound storage and final disposal of the product was also agreed.

Prevention of Dental Caries

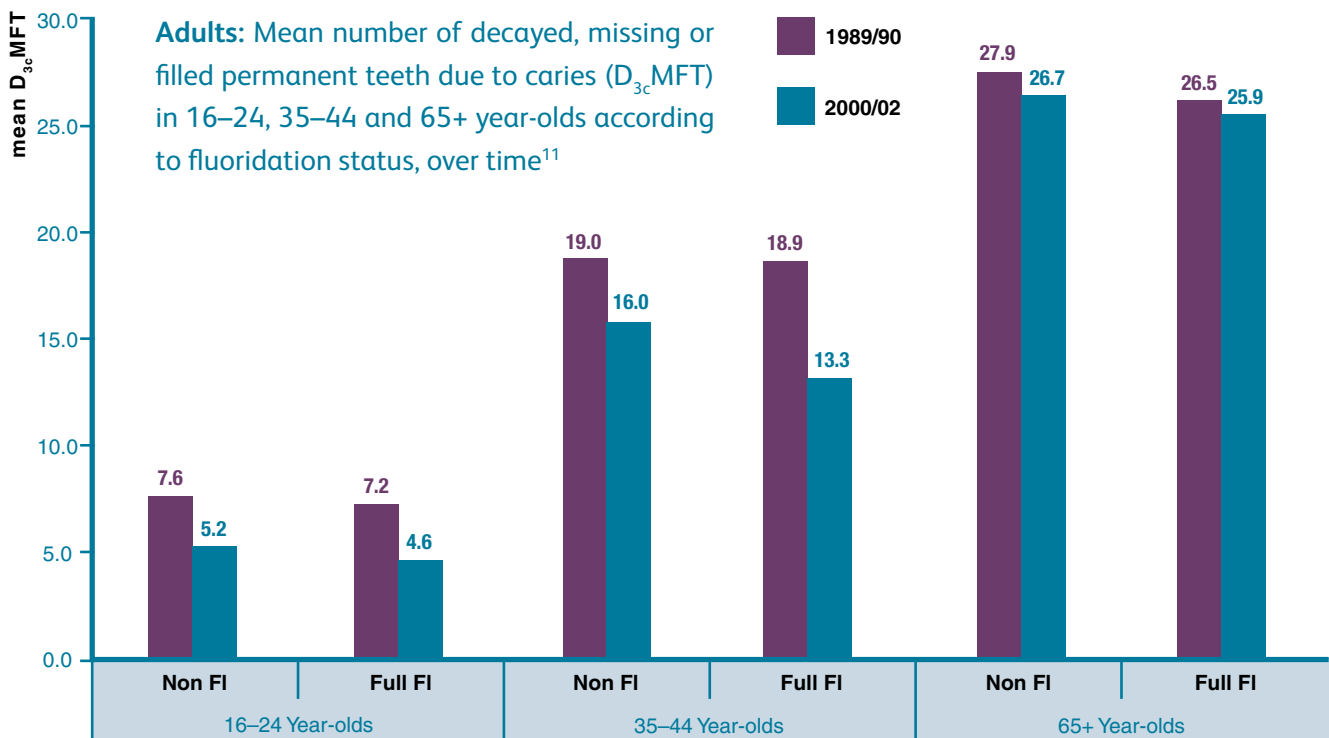
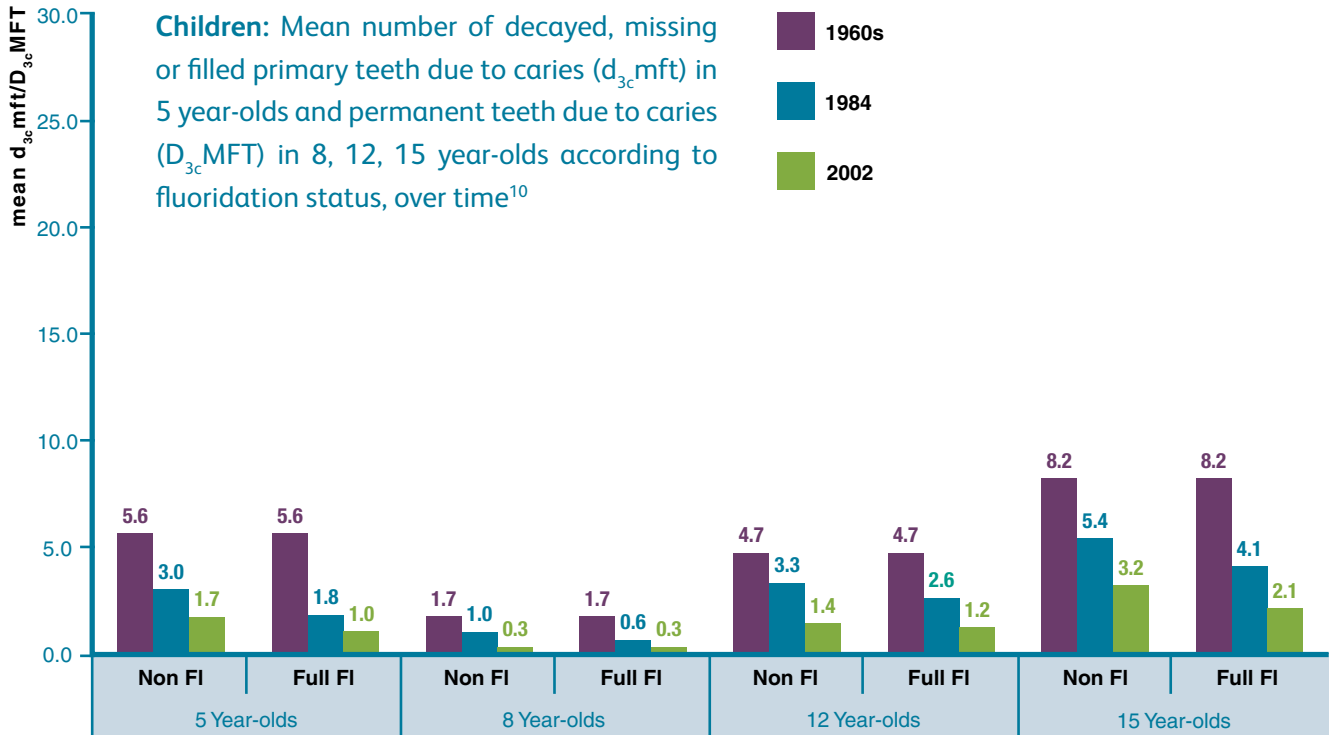
The prevention of dental caries can be approached in three ways:

- ▶ Use fluorides
- ▶ Reduce frequent consumption of sugars
- ▶ Apply pit and fissure sealants.

Fluorides

Fluoride is a substance that naturally occurs in some water sources. It is derived from fluorine, the thirteenth most common element on earth, and is known to help prevent dental caries. In Ireland, an estimated 73%⁹ of the population reside in communities served with water supplies containing a regulated amount of fluoride. The permissible range of fluoride in drinking water in Ireland is presently set at 0.6–0.8 parts per million (Health (Fluoridation of Water Supplies) Act 1960, (S.I. No. 42 of 2007)). This level of fluoride in drinking water is deemed optimal for the oral health of all age groups, including infants.

The dramatic improvement seen in the oral health of Ireland since the introduction of water fluoridation in the mid-1960s – particularly among children and young adults with lifetime exposure to water fluoridation (labelled “Full FI” in charts) – has been mainly attributed to the caries-preventive effect of fluorides in water and in toothpaste.



Fluoride works mainly by slowing down the process of demineralisation, whereby the enamel loses calcium and phosphate when exposed to acid following ingestion of food and drinks which contain sugars. It also helps to “heal” (remineralise) surfaces which show early signs of calcium or phosphate loss, such as an opaque appearance. Most benefit is obtained if a low level of fluoride is constantly maintained in the mouth throughout the day.

Fluoride delivered directly (or topically) to the tooth surfaces by toothpastes and rinses help to maintain fluoride levels in the mouth and provide added benefit to the fluoride delivered systemically via water fluoridation. Introduced in the mid-1970s, fluoride toothpastes now account for over 95% of the toothpaste sales in this country. The sale of mouthrinses, many of which contain fluoride, has also increased considerably since the mid-1980s.

The main advantage of water fluoridation is that its caries-reducing effects are available to everybody on the fluoridated water supply and is considered safe even for infant use. Bottled drinking waters contain highly variable amounts of fluoride depending on their source. While it is legally permissible for bottled natural mineral waters to contain up to 5 mg/l of fluoride, when fluoride concentration exceeds 1.5 mg/l the warning “contains more than 1.5 mg/l of fluoride: not suitable for regular consumption by infants and children under 7 years of age” must be clearly carried on the bottle label (Commission Directive 2003/40/EC).

Fluoride toothpastes are an important source of additional fluoride and should be used twice a day to help maintain a constant level of fluoride in the mouth. Daily fluoride mouthrinses are particularly useful for people who are prone to high levels of decay and also for people wearing orthodontic braces; fortnightly fluoride mouthrinse programmes are used in a number of schools in non-fluoridated areas. It is advisable that fluoride mouthrinsing be carried out at a different time from fluoride toothbrushing to maximise the added benefits from these topical fluorides. Fluoride varnishes and gels are alternative forms of topical fluorides that require application by a dentist or dental hygienist.

Despite the widespread availability of fluoride toothpastes, the most recent national oral health surveys show that only 58% of Irish children^a brush their teeth at least twice a day¹⁰ as recommended and that older people (aged 65+) in particular have poor oral hygiene habits¹¹. Only 52% of older people who have natural teeth (i.e., are not toothless) brush their teeth at least twice a day and 4.5% never brush¹¹.

There are no known side effects of water fluoridation at the optimal level, other than dental fluorosis. Dental fluorosis is mainly a cosmetic condition, commonly characterised by fine white lines or white patches on the teeth. The risk of developing dental fluorosis is linked to the ingestion of excess fluoride during enamel formation (amelogenesis) of the permanent teeth in childhood. International research indicates that the early use of fluoride toothpastes in young children can lead to the development of fluorosis in permanent teeth.

In Ireland, dental fluorosis remains at the very mild to mild level as measured by the Dean’s Index. However, the increase in the prevalence of dental fluorosis when levels of water fluoridation had remained constant (at 0.8–1.0 ppm between 1964 and 2007) suggests that young children are swallowing excess fluoride from toothpaste. As a result of this finding, in 2007 the permitted level of fluoride in water was lowered from 0.8–1.0 ppm to 0.6–0.8 ppm as a means of reducing the total intake of fluoride among young children. Recommendations on the appropriate use of fluoride toothpaste in young Irish children issued by the Expert Body on Fluorides and Health (<http://www.fluoridesandhealth.ie/>) advise that children aged 2–7 years should use only a small pea-sized amount of fluoride toothpaste 1,000–1,500 ppm and be supervised by an adult when toothbrushing; children under 2 years of age should not use toothpaste except on professional advice.



^aRefers to 8- and 15-year-olds surveyed during the *North South Survey of Children's Oral Health in Ireland 2002*.

The Irish Expert Body on Fluorides and Health advises:

From 0 until 2 years old:

- ▶ Start to clean a baby's teeth as soon as the first tooth appears.
- ▶ Brush a baby's teeth with a soft toothbrush and water only.
- ▶ Do not use toothpaste. (Professional advice on the use of fluoride toothpaste should be considered when a child below 2 years of age is thought to be at high risk of developing dental decay (e.g. children with special needs).

From 2 until 7 years old:

- ▶ Use a small pea-sized amount of fluoride toothpaste 1,000–1,500 ppm. (Paediatric toothpastes with low concentrations of fluoride (e.g., 500 ppm) require further research before their use can be recommended.)
- ▶ Supervise brushing twice a day, in the morning and at night just before bedtime.
- ▶ A child under seven years needs help from an adult when brushing teeth.
- ▶ A child should never eat or swallow toothpaste.
- ▶ Clean the teeth thoroughly twice every day with fluoride toothpaste.

Reduce Frequent Consumption of Sugars

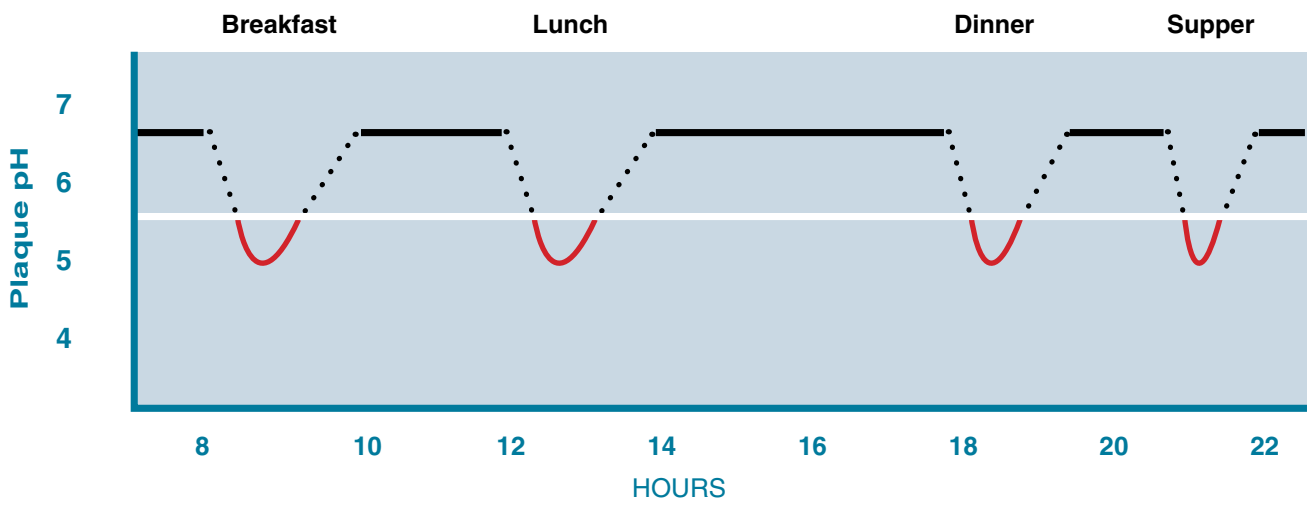
There is overwhelming evidence that frequent consumption of sugars is associated with caries. Dietary advice should be aimed at limiting the frequency of sugar intake. Studies have shown that sugar consumption remains a moderate risk factor for caries even when populations have adequate exposure to fluoride¹², and that exposure to fluoride coupled with a reduction of sugar intake has an additive effect on caries reduction¹³. In a comparison of food habits in children and adolescents in 35 countries and regions covering Europe, Israel and North America, Ireland ranked as having the highest average weekly frequency of sweets consumption.¹⁴

Foods and drinks containing “free sugars” (i.e., sugars which have been added to food plus sugars naturally present in honey, fruit juices and syrup) should be recognised and the frequency of their intake – especially between meals – reduced. As shown in the Stephan curves opposite, the intake of sugar between meals increases the periods of time plaque pH dips below the critical level of 5.5. When plaque pH is lower than 5.5, demineralisation occurs. Subjecting teeth to frequent bouts of demineralisation allows less time for their remineralisation; thus, teeth become more susceptible to decay. Detailed advice on nutrition and oral health is given in *Chapter 5 – Nutrition and Oral Health*.

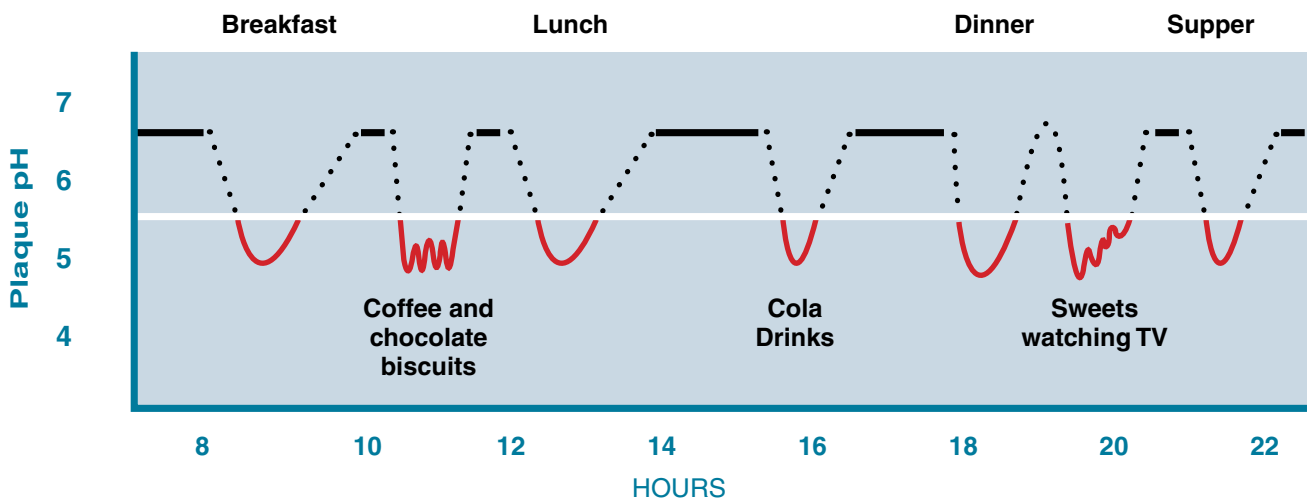


The effect on plaque pH when sugar is consumed at mealtimes only compared with sugar between meals

Sugar at meal times



Sugar between meals



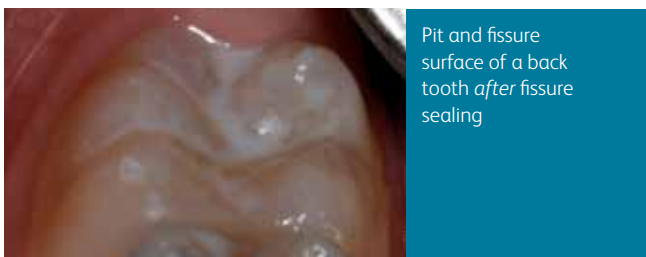
Pit and Fissure Sealants

Among children, tooth decay occurs most commonly on the pit and fissure surfaces of back teeth. Pit and fissure sealants are a safe and effective way to prevent dental caries on these vulnerable surfaces, and they are recommended for high caries risk children and should be applied as soon as the back teeth are sufficiently erupted to allow sealing. Pit and fissure sealants may also be used in adults. Sealants must be applied by a dental professional, i.e., a dentist or dental hygienist.

Pit and fissure sealants create a thin barrier preventing the access of plaque and plaque acids to the enamel surface. Their effectiveness at preventing caries has been demonstrated in a number of systematic reviews. However, sealants are only effective on the biting surfaces of teeth and should be seen as only one part of a comprehensive caries prevention programme which includes promotion of healthy eating and, for children over age 2 years, twice daily use of fluoride toothpaste containing at least 1,000 ppm F.



Pit and fissure surface of a back tooth *before* fissure sealing



Pit and fissure surface of a back tooth *after* fissure sealing

When devising a strategy for the control of dental decay for an individual patient or for a community, it is strongly recommended that a *combination* of these preventive measures – use fluorides, reduce frequent consumption of sugars, seal fissures – should be used, taking into account their cost and the effort required of the individual or community.

Plaque Control for Caries Prevention

Although caries can only develop when plaque is present, the evidence for plaque control as a caries prevention strategy is inconclusive; this may be due to the difficulty in eliminating plaque from the areas of the teeth which are more difficult to clean such as the pits and fissures on the biting surfaces and the areas between the teeth. Plaque control, however, is the main approach to preventing periodontal or gum disease.

Periodontal (Gum) Disease

Periodontal or gum disease is a pathological inflammatory condition of the gum and supporting tissues (periodontal tissues) surrounding the teeth. Most Irish adults suffer from some form of periodontal disease: based on the most recent national oral health survey, only 18% of 16–24 year olds, 8% of 35–44 year olds and 7% of older people aged 65 years and over have healthy gums.¹¹

The two most common periodontal diseases are:

- ▶ **Gingivitis** – inflammation of the gum at the necks of the teeth, and
- ▶ **Periodontitis** – inflammation affecting the bone and tissues of the teeth.

Gingivitis

Most children have signs of some inflammation of the gingival tissue at the necks of the teeth; among adults, the initial stage of gum disease is prevalent.⁶ This condition is termed gingivitis and is characterised by redness of the gum margins, swelling and bleeding on brushing.



Child, aged nine, has poor oral hygiene; plaque around the gum margins causing inflammation



Healthy Gums should be pale pink in colour, have a matt surface, firm consistency and finely tapered edges; they should never bleed during routine toothbrushing or flossing

Gingivitis occurs in both chronic and acute forms. Acute gingivitis is usually associated with specific infections, micro-organisms, or trauma. Chronic inflammation of the gum tissue surrounding the teeth is associated with the bacterial biofilm (plaque) that covers the teeth and gums. Gingivitis was once seen as the first stage in a chronic degenerative process which resulted in the loss of both gum and bone tissue surrounding the teeth. It is now recognised that gingivitis can be reversed by effective personal oral hygiene practices.

No specific public health measure has been developed to prevent gingivitis other than the instruction of groups and individuals on how to effectively remove the bacterial plaque from around the teeth and gums with a toothbrush and floss.

Periodontitis

When periodontal disease affects the bone and supporting tissue, it is termed periodontitis and is characterised by the formation of pockets or spaces between the tooth and gums. This may progress and cause chronic periodontal destruction leading to loosening or loss of teeth. The dynamics of the disease are such that the individual can experience episodes of rapid periodontal disease activity in a relatively short period of time, followed by periods of remission.



Though the majority of adults are affected by gingivitis, gingivitis fortunately does not always develop into periodontal disease. Progression of gum disease is influenced by a number of factors which include oral hygiene and genetic predisposition. One of the challenges for early detection of periodontal disease is its “silent” nature – the disease does not cause pain and can progress unnoticed. In its early stages, bleeding gums during toothbrushing may be the only sign; as the disease advances and the gums deteriorate, the bleeding may stop and there may be no further obvious sign until the teeth start to feel loose. In most cases, periodontal disease responds to treatment and although the destruction is largely irreversible its progression can be halted.

Factors Affecting Periodontal Disease

The rate of progression of periodontal disease in an individual is dependent on the virulence (or strength of attack) of the bacterial plaque and on the efficiency of the local and systemic immunoinflammatory responses in the person (host). The overall balance between the bacterial plaque challenge and the body's immunoinflammatory responses is critical to periodontal health. Current research suggests that host responses are influenced by specific environmental and genetic factors which can determine the general susceptibility of the host or the local susceptibility of a site (tooth) within the mouth to periodontal disease. In this regard, it is common for more severe forms of periodontal disease to present in individuals with compromised immune systems, e.g., those with diabetes, HIV infection, leukaemia and Down syndrome.

Smoking and diabetes are well-established risk factors for periodontal disease. Acute necrotising ulcerative gingivitis (Vincent's disease) occurs almost exclusively in smokers. Diet also impacts on periodontal health, from both the perspective of plaque build-up and that of the body's immunoinflammatory responses. Stress has also been linked to periodontal disease, but it is not clear whether the relationship has a physiological basis or is due simply to the fact that individuals under stress are less likely to perform regular good oral hygiene.¹⁵

As already stated, the vast majority of gum diseases can be easily prevented by daily thorough plaque removal. However, irregularities around the teeth such as overhanging edges on fillings, poorly contoured fillings, and some types of partial denture designs make tooth cleaning difficult and encourage the accumulation of plaque. The presence of calculus (tartar) – plaque that has calcified and hardened – may also cause plaque to accumulate more readily and requires professional removal (scaling). For the majority of the population, however, periodontal health can be effectively maintained by proper oral hygiene practices as well as avoidance of behavioural and environmental risk factors (e.g., tobacco smoke, stress, poor diet) on the part of the individual.

Because periodontal disease is linked to an increased susceptibility to systemic disease (e.g., cardiovascular disease, infective endocarditis, bacterial pneumonia, low birth weight, diabetes)¹⁶, it is important not only for oral health but also for general health to control periodontal disease.

Plaque Control for Gingival Health

Plaque control is the most important method of limiting periodontal disease and maintaining gingival health. This must be considered at two levels: what individuals can do for themselves by way of plaque control on a daily basis, and what dentists and hygienists can do to eliminate plaque retention factors in individuals and to advise patients on the most appropriate home care.

Toothbrushing

The most important plaque control method is toothbrushing, which should be established as a daily routine from early childhood. Parents/carers should commence brushing their child's teeth (without toothpaste until age 2 years) as soon as the first tooth appears in the mouth. From age 2 years, a pea-sized amount of toothpaste containing 1,000–1,500 ppm fluoride is recommended. Parents should continue to brush their child's teeth until the child develops sufficient manual dexterity to effectively brush his/her own teeth (approximately age 7 years). Parents should ensure that the first permanent molar teeth, which appear at the back of the mouth at about this time, are included in the brushing routine as soon as they appear.

Toothbrushing skills should be taught to people of all ages. The precise technique is less important than the result, which is that plaque is removed effectively every day without causing damage to the teeth or gums.

Recommended Toothbrushing Technique

A gentle scrub technique with very short horizontal movements to dislodge plaque at the gum margins is effective for most people and is easy to teach and readily accepted. Thus, careful use of a gentle scrub method using a toothbrush with densely packed, round-ended synthetic filaments of soft to medium texture should be encouraged for effective plaque removal. A toothbrush with a small brush head may also be recommended, as a small brush head enables better access to the back of the mouth and to tooth surfaces than a large brush head. While a variety of powered toothbrushes have become increasingly available, only powered toothbrushes with a rotation oscillation action (i.e., brush head moves in one direction and then the other) have been found to be better than manual toothbrushes at removing plaque and reducing gum inflammation, and are no more likely to cause injuries to gums.¹⁷

Faulty toothbrushing techniques involving excessive pressure may considerably increase gingival recession (i.e., the gum line recedes leading to exposure of the roots of the teeth), and loss of tooth substance by mechanical abrasion, and must therefore be corrected. Holding the toothbrush in a pen grip using just the thumb and forefinger, as opposed to resting the toothbrush in the palm of the hand and gripping with four fingers, results in less pressure being applied when toothbrushing and is recommended.

Aids to Plaque Removal

Plaque removal can be aided with the use of:

- ▶ Plaque disclosing agents
- ▶ Dental floss and other interdental cleaning aids
- ▶ Mouthrinses.

Plaque disclosing agents colour plaque to make it easily visible and are a useful aid for improving plaque control. Plaque disclosing agents should be used *after* brushing the teeth, to reveal areas where plaque still remains. Plaque disclosing agents will not in themselves remove plaque, but simply direct users to areas that they have missed with their toothbrush.

Dental floss and other interdental cleaning aids are of value if used correctly, which usually requires professional advice and instruction. An additional method of plaque control is the use of antiseptics, of which chlorhexidine is the most effective. Although chlorhexidine is available over the counter in Ireland in the form of mouthrinses and gels, its tendency to stain teeth and impair taste makes its long-term use generally unacceptable. Toothpastes and mouthrinses containing other antiseptic agents, while less effective than chlorhexidine, do not have these side effects and are of some value to gingival health.

Recommended Flossing Technique

Starting with clean hands, break off about 45 cm (18 inches) of dental floss from its dispenser. Wind one end of the floss around a middle finger of one hand. Wrap the other end and most of the floss on the same finger of the other hand, leaving a small length (7 to 10 cm / 3 to 4 inches) stretching between the hands. With the floss held tightly between thumb and forefinger or using your interdental flosser, use a gentle sawing motion to guide the floss between adjacent teeth. Take care not to snap the floss against the gums when doing this to avoid injury.



When the floss reaches the gum line, curve it into a C shape against one tooth and gently slide it into the space between the gum and the tooth. With the floss kept tight against the side of the tooth, gently move the floss away from the gum with up and down motions. Repeat this scrubbing action to clean plaque off the adjacent tooth. If preferred, interdental flossers such as shown in the image may also be used.



Move the floss back out from between the flossed teeth and repeat this procedure until all teeth have been cleaned. As the floss gets frayed or dirty, unwind unused floss from one hand and take up the used slack on the other hand.

Wash hands again after flossing.

Professional Treatment

It is the responsibility of the dental clinician to ensure that any dental treatment provided minimises plaque retention; this is a part of treatment planning. Clear advice must be given on the need to clean bridges, dentures and orthodontic appliances (braces) effectively and regularly. Calculus (or tartar) is a form of hardened (mineralised) plaque, which can form on teeth both above gum level and within periodontal pockets. Calculus cannot be removed by toothbrushing; careful professional scaling is needed for its removal. While appropriate professional treatment is important, it must be stressed that the highest priority for plaque control is effective daily oral hygiene by the individual.

Periodontal disease can be prevented with:

- ▶ Daily meticulous removal of plaque by toothbrushing
- ▶ Regular visits to the dentist/hygienist (once a year)
- ▶ Avoidance of behavioural and environmental risk factors (e.g., smoking, stress, poor diet).

Oral Cancer

In Ireland in 2009, oral and pharyngeal cancer accounted for approximately 1.1% of all cancer registrations. Oral cancer incidence increases with age. In Ireland, the average annual incidence rates for the period 1994–2009^a for cancer within the oral cavity rises (excluding cancer of the lips, pharynx, sinus and salivary glands) from 0.24 per 100,000 for both males and females in the 25–29 years age group to 13.30 females and 20.54 males per 100,000 in the 85 years and older age group. Though oral cancer remains more common in males there has been a shift in the gender distribution over the last decade. Of the new cases of oral and pharyngeal cancer registered in 1994, 24% were in women; this has risen to 32% in 2009. Studies also show increasing incidence in younger adults: UK cancer registries record 6% of all oral cancers in young people under the age of 45 years.¹⁸

Both smoking and alcohol are important independent risk factors for oral cancer and there is convincing evidence that their combined effect is synergistically greater than the sum of the risks associated with either. There is also evidence of a dose response with tobacco smoking: the more cigarettes consumed daily and the more years one has smoked, the greater the risk of oral cancer.

Other risk factors include a diet low in fresh fruit and vegetable, viral exposure (i.e., HPV), radiation exposure and, for cancers of the lip, excessive exposure to ultraviolet sunlight. A recent systematic review also found evidence that low socioeconomic status *per se* is significantly associated with increased oral cancer risk in both high- and low-income countries worldwide.¹⁹

Although oral cancer can occur without any pre-cancer signs,



Leukoplakia

a number of recognised precancerous lesions are also linked with smoking and alcohol consumption. Many of these have a whitish colour and may not be painful. While the number of these lesions (such as leukoplakia) which will become cancerous is extremely

low, a considerably higher proportion of people with these lesions develop oral cancer than among the general population.

^aDownloaded from National Cancer Registry website <http://ncr.ie/ncr/index.shtml> on 20 April 2012; includes only cancer within the oral cavity (i.e., Base of Tongue (C01), Other Tongue (C02), Gum (C03), Floor of Mouth (C04), Palate (C05), Other Mouth (C06) and Tonsil (C09)).

Prevention

The key to the prevention of oral cancer is to not use tobacco (or to give up tobacco use if already a user), and to adopt a sensible approach to the consumption of alcohol. It is estimated that at least three-quarters of oral cancers could be prevented by eliminating tobacco smoking and reducing alcohol consumption.¹⁸ (See page 49 for a discussion on rinses containing alcohol.) A healthy diet with at least five servings of fresh fruit and vegetables may also reduce the risk of oral cancer.

Oral cancer detected early has an extremely good prognosis (approx. 90% five-year survival rate). Despite this, the survival rate in Ireland is quite low (<50%) as 60% of cases present at an already advanced stage.²⁰ Hence, a regular dental check-up (once a year for adults) – whether you have your own natural teeth or dentures – is strongly advised.

Possible warning signs of oral cancer should not be ignored and if they persist for more than three weeks should be brought to the attention of a medical or dental professional for immediate investigation. These signs include:²¹

- ▶ A sore or ulcer in the mouth that does not heal
- ▶ White or red patches inside the mouth
- ▶ A lump in the mouth or neck
- ▶ Thickening or hardening of the cheek or tongue
- ▶ Difficulty chewing, swallowing or moving the tongue
- ▶ A persistent sore throat and hoarseness
- ▶ Persistent nosebleeds and a stuffy nose
- ▶ Unexplained loose teeth.

Dental Trauma



Trauma to upper central incisor

The most common teeth to be damaged during an accident are the upper central incisors. Primary incisors can be damaged especially when infants are learning to walk. The most common injury sustained to baby teeth is intrusion, i.e., the tooth is pushed up into the gum. This type of traumatic injury in young children can also result in damage to the underlying, developing permanent tooth.

Approximately one in 11 children in Ireland will have broken one or more of their permanent teeth before they reach the age of 15 years.¹⁰ Damage can range from a small chip off the enamel to a fracture involving the dental pulp. Occasionally, the tooth can also be displaced (subluxed) or, more rarely, knocked out completely (avulsed). Traumatic injuries to teeth can be complicated to treat and can have long term financial, aesthetic and functional problems for the patient.

Prevention and Management

Most traumatic injuries to teeth arise from accidents during normal everyday activities such as informal play and prevention in these circumstances is difficult. The wearing of mouthguards or helmets with face shields during organised contact sports can reduce the likelihood of fracturing a tooth. The 2012 GAA Congress passed a motion making it mandatory for all juvenile players as of 2013, and for all senior players as of 2014, to wear a mouthguard during football games and training. The wearing of safety helmets (e.g., for cycling, skate boarding) and of car seatbelts should also be advised. When a tooth is accidentally damaged, it is important that professional advice from a dentist is sought immediately.

WHAT TO DO IF A TOOTH IS KNOCKED OUT

In the case of a primary (baby) tooth that is knocked out completely:

- ▶ Parents/carers should make no attempt to replant a primary (baby) tooth that is knocked out as they could damage the permanent (adult) tooth that is developing under the gum – the child should be brought to a dentist to be checked.

In the case of a permanent tooth that is knocked out completely:

- ▶ Make sure that the tooth knocked out is a permanent tooth – primary (baby) teeth should not be replanted
- ▶ Keep the injured person calm.
- ▶ Find the tooth and pick it up by the crown (the white part). Avoid touching the root as this can damage the membrane which is essential to saving that tooth.
- ▶ If the tooth is dirty, wash it briefly (10 seconds) using milk, saline solution or cold running water.
- ▶ Encourage the injured person/parent to replant the tooth, using the shape of the teeth at either side of the gap as a guide to positioning.

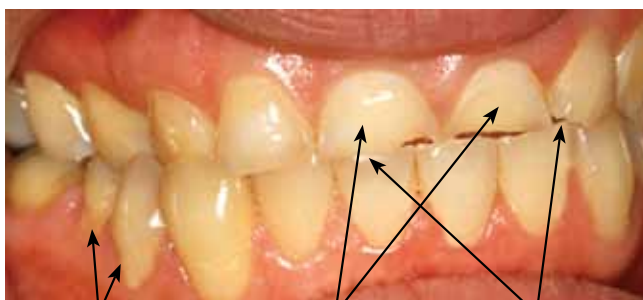
- ▶ Once repositioned, the injured person should bite on a handkerchief to hold the tooth in place until the dentist splints it.
- ▶ If the tooth cannot be replanted immediately, it can be carried inside the injured person's mouth between the teeth and the inside of the cheek, or in milk or a special storage medium for knocked out teeth, if available. Avoid storage in water.
- ▶ Seek emergency dental treatment immediately; phone ahead to tell your dentist you are on your way.

(For easy reference, see **Save That Tooth!** poster at the end of this document.)

Tooth Wear

Tooth wear is the term used to describe the progressive loss of a tooth's surface due to actions other than those which cause tooth decay or dental trauma. Tooth wear increases with age. The prevalence of any tooth wear (where dentine is exposed on at least one tooth surface) among the dentate (possessing natural teeth) population reported during the 2000–2002 National Surveys was 17.4% for 12-year-olds, 29.7% for 15-year-olds, 38.1% for 16–24 year-olds, 76.2% for 35–44 year-olds and 93.0% for 65+ year olds. For all age groups, males had a higher prevalence of tooth wear than females.^{10,11} The amount of tooth wear seen currently is considerably greater than in the past due to the fact that more people are now retaining their natural teeth into old age.

Tooth wear is caused by three phenomena: erosion, attrition and abrasion.



Abrasion

Erosion

Attrition

Erosion is the progressive loss of tooth substance by chemical or acid dissolution, and no bacteria are involved. Erosion of tooth surfaces is mostly the result of too frequent or inappropriate use of carbonated drinks (including sparkling water) and fruit juices with high levels of acidity. This habit would appear to be particularly common amongst teenagers and young adults.

Erosion is also a problem in individuals who suffer from gastro-oesophageal reflux disease (GORD) or from certain eating disorders (e.g., anorexia, bulimia). In addition, risk of erosion is high in individuals with a low “unstimulated” salivary flow rate.

Attrition is the progressive loss of hard tooth substances caused by mastication or grinding between opposing teeth. The extent of attrition will depend upon the use to which an individual puts their teeth. For example, it will increase in people who habitually clench or grind their teeth (a condition known as bruxism), e.g., during sleep. It will also tend to be more pronounced in people who eat a particularly fibrous diet.

Abrasion is the progressive loss of hard tooth substances caused by mechanical actions other than mastication or tooth-to-tooth contacts. Abrasion is commonly associated with incorrect toothbrushing technique, giving rise to notching at the junction of the crown and root of teeth. It will also be seen in individuals who use their teeth as a tool (e.g., to remove bottle tops, to hold pins, clips or nails).²² The long-term use of tongue jewellery also causes tooth abrasion, when the jewellery is hitting against the teeth.

Prevention

Reducing the frequency of drinking carbonated drinks and fruit juices with high levels of acidity is the key to preventing erosion of the teeth. Toothbrushing should be avoided immediately after consuming acidic drinks and foods for a period of time (at least 20 minutes), as the acid softens the enamel making it susceptible to damage from brushing.

Attrition is a slow-progressing condition and many people will only be made aware of the damage to their teeth on visiting the dentist. In the case of bruxism, treatment may require the wearing of a bite guard during sleep.

Abrasion can be reduced by adopting a correct toothbrushing technique (see *Recommended Toothbrushing Technique* – page 24). In particular, the toothbrush should be held using a pen-grip and vigorous horizontal scrubbing actions with a hard toothbrush should be avoided. Teeth should not be used as a tool to grip or hold items. Long-term use of tongue jewellery should be avoided.

Toothpastes vary in their level of abrasiveness; whilst abrasives help to remove tooth stain they may also contribute to tooth wear. Those concerned about tooth wear could seek a less abrasive fluoride toothpaste. Fluoride toothpastes also help to combat tooth wear, specifically erosive tooth wear, as the availability of fluoride promotes the formation of a calcium fluoride layer (CaF₂).²³

Dry Mouth

Dry mouth or xerostomia is a result of reduced or absent saliva flow. Unstimulated saliva normally flows at a rate of 0.3 ml per minute and a flow rate of less than 0.1 ml per minute is considered “dry”; stimulated saliva normally flows at a rate of 1–2 ml per minute and a flow rate of less than 0.7 ml per minute is considered “reduced”. These rates are average values but there is a wide range of normal salivary flow rates. Individuals can generally tolerate a 50% reduction in their own normal salivary flow rate before any impact is felt.

Most people have experienced the temporary sensation of “drying up” when nervous, for example when giving one’s first public speech. This is a normal reaction. Dry mouth may also be a symptom of dehydration caused by, for example, vigorous exercise or insufficient fluid intake on a hot day. The causes of chronic dry mouth include drugs, disease and radiotherapy. Reduced flow of saliva is a side effect of many medications (e.g., those used to control high blood pressure, anti-Parkinson drugs, anti-anxiety agents, antihistamines, diuretics, sedatives) and of some systemic diseases and conditions (e.g., Sjögren’s syndrome, systemic lupus erythematosus, rheumatoid arthritis, diabetes mellitus, nutritional deficiencies, depression).

Though not directly age-related, dry mouth is more commonly a complaint of older people, who tend to take more medications. While more than 50% of adults surveyed in 2000–2002 reported having some experience of dry mouth, dry mouth on a regular basis was reported by 12% of older people (aged 65+) compared to only 5–6% among younger adults (aged 16–24 and 35–44).¹¹



The feeling of a dry mouth is a particularly uncomfortable one and often gives rise to difficulty in speaking and eating and can have a major negative impact on a person’s quality of life. Reduced saliva flow can also give rise to an increased incidence of dental decay, gum disease and oral infection (e.g., candida albicans). Radiotherapy to treat cancer in the head and neck area may cause saliva flow to stop altogether, either long term (permanent) or for periods of up to three months (temporary). It is essential that people about to undergo such treatment are informed of the increased oral health risks associated with the reduced saliva flow that may result from their treatment, and are advised of the management measures they can take to minimise the detrimental effects of dry mouth.

Management

People with dry mouth lose the protective effect of saliva in preventing dental caries and trauma to the oral mucosa. Where dry mouth is medication induced, the prescribing doctor should be consulted about possible alternative drugs which may not have the same xerogenic or mouth drying side effect. For many people, the underlying cause of dry mouth cannot be prevented and management of the problem is the best option. Management involves making the person comfortable by providing oral lubricants (saliva substitutes), and preventing disease through the use of fluoride mouthrinses and mouthrinses to control plaque. People with dry mouth should be careful not to suck sweets (e.g., mints, boiled sweets) regularly. Although sucking sweets may give temporary relief, it will cause severe dental caries in the absence of saliva. Frequent consumption of drinks sweetened with sugar (e.g., soft drinks, tea) should also be avoided. Even sugar-free sweets and drinks can be problematic due to their acid content which is erosive to the teeth, especially in the absence of saliva. The frequent sipping of iced water may provide some relief and can be recommended. Acupuncture is an alternative therapy that may also bring relief to those with dry mouth.

Nowadays there are many saliva substitutes or oral lubricants on the market, generally available through pharmacy outlets; these can be effective in reducing the unpleasant side effects of reduced flow of saliva. Saliva stimulants have also been developed for those with some remaining salivary gland function; these are available on prescription but do have some side effects which should be discussed prior to use.

Mouth Ulcers

Many people suffer from recurrent ulcers in the mouth. These can be extremely painful. The most common form is called Minor Aphthous Ulceration (MIAU). Teenagers are most frequently affected, though many experience their first lesions well outside this age range. Usually one to five small ulcers (less than 1 mm in diameter) appear on the inside of lips or cheeks and floor of the mouth or tongue. The ulcers tend to be concentrated towards the front of the mouth. Prior to the ulcers appearing, the patient may experience a burning or prickling sensation. The ulcers are painful, particularly if the tongue is involved, and may make speaking and eating difficult. The course of these ulcers varies from a few days to a little over two weeks, but most commonly they last for about 10 days. Some minor trauma such as vigorous toothbrushing or an irregular filling can be precipitating factors. Mouth ulcers can also be precipitated by stress, illness, hormonal changes, menstruation and deficiencies in vitamin B12, iron and folic acid. Other more serious causes of mouth ulcers include herpes infection, Irritable Bowel Syndrome (IBS) and immune disorders.



Mouth ulcer

A more severe form of oral ulceration, called Major Aphthous Ulceration (MJAU) can affect any part of the oral mucosa, including the soft palate and the tonsillar area, and can extend into the oropharynx. The ulcers are larger than those seen in MIAU and last longer, up to periods of months in some cases. There are other forms of oral ulceration, where, for example, the ulceration may be part of a syndrome involving ulceration of the eyes, genitalia, the nervous system and joints.

Prevention

Successful prevention of mouth ulcers requires identification and treatment of their underlying cause or causes. It is important to seek the advice of a dentist, who may decide to refer the more severe cases to a specialist in oral medicine for a more thorough investigation into their underlying causes. Maintenance of a high level of oral hygiene will reduce the likelihood of secondary infection when mouth ulcers are present; this of course can prove difficult since patients may find toothbrushing too painful. Covering agents, some containing choline salicylate, are available though they can be difficult to apply. They may also be difficult to keep in place, for example inside the lips and

on the tongue, due to constant movement. Use of antiseptics (e.g., chlorhexidine mouthwash) is reported by some patients to be helpful. Topical steroids can also provide relief. In some females there is complete remission from aphthous ulcers during pregnancy. Hence, hormonal therapy has been tried with varied success. Local anaesthetic lozenges have been used as a last resort to give the patient some relief, for example when eating.

Cold Sores

Primary oral infection with the virus responsible for cold sores (herpes simplex virus (HSV)) typically occurs at a young age and is asymptomatic. Some children develop a symptomatic primary infection, presenting with inflammation and ulceration of the mouth and gums. The skin around the mouth may be affected and there may be swollen lymph glands, high temperature and loss of appetite. After the primary oral infection, HSV may remain inactive only to be activated later as the more common herpes labialis, or “cold sores”. Triggers for reactivation are well known and include sunlight, trauma, tiredness, stress, and menstruation. An episode of “cold sores” usually begins with a burning sensation on the affected area of the lips, which is usually followed by the development of painful blisters. The appearance of “cold sores” is a well-localised cluster of small vesicles along the red border of the lip or adjacent skin. The vesicles rupture, ulcerate, and crust within one to two days and heal within seven to 10 days.

Cold sores are contagious and strict hygiene measures should be adopted when a person is infected.

Prevention

Prevention is difficult, although the use of sun barrier creams will help reduce attacks in those holidaying in the sun. Also, a well-established product on the market (containing 5% w/w acyclovir), if applied during the early burning phase of cold sores, has been shown to be effective in reducing the duration of the episode.

Tooth Sensitivity

Some people suffer sharp bouts of pain especially when they take cold food or drinks into their mouths. This condition – known as *cervical dentine sensitivity* – is normally a result of exposure of the root surface at the gum margin due to gingival recession, gum disease or over-vigorous toothbrushing with a hard toothbrush. The condition can be quite distressing.



Prevention

Precautions outlined above to prevent gum disease and tooth abrasion will also help reduce the incidence of cervical dentine sensitivity. In severe cases, the advice of a dentist should be sought. To alleviate the sensitivity, the dentist may decide to apply a high concentration fluoride varnish on the site. It is worth noting that tooth sensitivity can also be due to other reasons such as a loose or cracked filling, hence the importance of seeking dental advice.

The oral health care industry has responded to the increased prevalence of cervical dentine sensitivity and a number of “sensitivity” toothpastes formulated to alleviate pain from cervical dentine sensitivity are currently on the market.

Halitosis (Bad Breath)

Halitosis – bad breath or oral malodour – is socially unacceptable. Self-diagnosis is, however, difficult as it is not possible to easily detect an odour from one’s own breath. Those who have halitosis are often unaware of it until they have been informed by friends or relatives. People who have been told that they suffer from bad breath may continually worry that an offensive smell can be detected from their breath.

Halitosis is mainly caused by excessive amounts of volatile sulphur compounds (VSCs) being produced by bacteria in the mouth. The amount of VSCs in a person’s breath can vary greatly during the day and is influenced by factors such as eating, drinking, oral hygiene, sleeping and the effect these activities have on saliva flow.

Studies have shown that up to 50% of adults suffer from objectionable mouth odour in early morning before breakfast or toothbrushing. The reason for this is that saliva incubates bacteria in the mouth during sleep when saliva flow is reduced. People with periodontal disease exhibit raised odour intensity due to the incubation of saliva and micro-organisms in periodontal pockets. A number of systemic diseases and conditions such as diabetes mellitus, chronic renal failure and cirrhosis of the liver can also give rise to particular bad odours in the breath.

There is increasing interest in the development of a reliable system that will measure the level of volatile sulphur compounds in one’s breath. This technology is making rapid progress, though the cost of a reliable system remains problematic.

While tobacco and certain foods and drinks (e.g., garlic, onions, coffee, alcohol) also influence breath, their effect comes from the lungs rather than from the mouth itself.

Prevention

Reduction of halitosis is achieved in several ways. The oral hygiene products and plaque control aimed at controlling dental caries and periodontal disease will also help prevent, control and mask halitosis. Periodontal treatment that results in reduced periodontal pocketing will also minimise halitosis.

The majority of studies on volatile sulphur compounds concentrate on the effects which commercially available mouthwashes have on the reduction of halitosis. Reduction in mouth odour is caused by the anti-microbial influence of the mouthwash. Some products, however, mask halitosis rather than deal with the cause of the problem. Toothbrushing, eating, chewing gum and tongue cleaning (with a toothbrush or specific tongue-cleaning devices) can be effective in controlling oral halitosis to an acceptable level, though their effect is not as long lasting as the effect of antimicrobial mouthwashes.

Oral health resource leaflets produced by the Oral Health Promotion Team, Dental Services, HSE (Dublin North East) may be downloaded from the Dental Health Foundation website (<http://www.dentalhealth.ie/publications/>).

Among the topics currently covered are:

- A Guide to Tooth Eruption
- Oral Health & Cancer
- Denture Care
- Oral Health & Smoking
- Oral Health & Diabetes
- Brush up for a Healthy Smile
- Oral Health Key Messages
- Sugar in Medicines
- Tooth Tips
- A Guide to Tooth Eruption.



4

Oral Health & General Health: The Common Risk Factor Approach

Key Points

- ▶ The mouth and body are integral to each other.
- ▶ Recognition that oral health and general health are interlinked is essential for determining appropriate oral health care programmes and strategies at both individual and community care levels.
- ▶ Oral health shares common risk factors with other chronic diseases/conditions.
- ▶ The adoption of a collaborative “Common Risk Factor Approach” which addresses common risk factors and their underlying social determinants for oral health promotion is more resource-efficient and effective than a targeted disease-specific approach.

The Mouth-Body Connection

Oral health is essential to general health and well-being at every stage of life. A healthy mouth enables not only nutrition of the physical body, but also enhances social interaction and promotes self-esteem and feelings of well-being. The mouth serves as a “window” to the rest of the body, providing signals of general health disorders. For example, mouth lesions may be the first signs of HIV infection, aphthous ulcers are occasionally a manifestation of Coeliac disease or Crohn’s disease, pale and bleeding gums can be a marker for blood disorders, bone loss in the lower jaw can be an early indicator of skeletal osteoporosis, and changes in tooth appearance can indicate bulimia or anorexia. The presence of many compounds (e.g., alcohol, nicotine, opiates, drugs, hormones, environmental toxins, antibodies) in the body can also be detected in the saliva.

Oral conditions have an impact on overall health and disease. Bacteria from the mouth can cause infection in other parts of the body when the immune system has been compromised by disease or medical treatments (e.g., infective endocarditis). Systemic conditions and their treatment are also known to impact on oral health (e.g., reduced saliva flow, altered balance of oral microorganisms).

Periodontal disease has been associated with a number of systemic conditions. Though the biological interactions between oral conditions such as periodontal disease and other medical conditions are still not fully understood, it is clear that

major chronic diseases – namely cancer and heart disease – share common risk factors with oral disease. Recognition that oral health and general health are interlinked is essential for determining appropriate oral health care programmes and strategies at both individual and community care levels. That the mouth and body are integral to each other underscores the importance of the integration of oral health into holistic general health policies and of the adoption of a collaborative “Common Risk Factor Approach” for oral health promotion.

The Common Risk Factor Approach

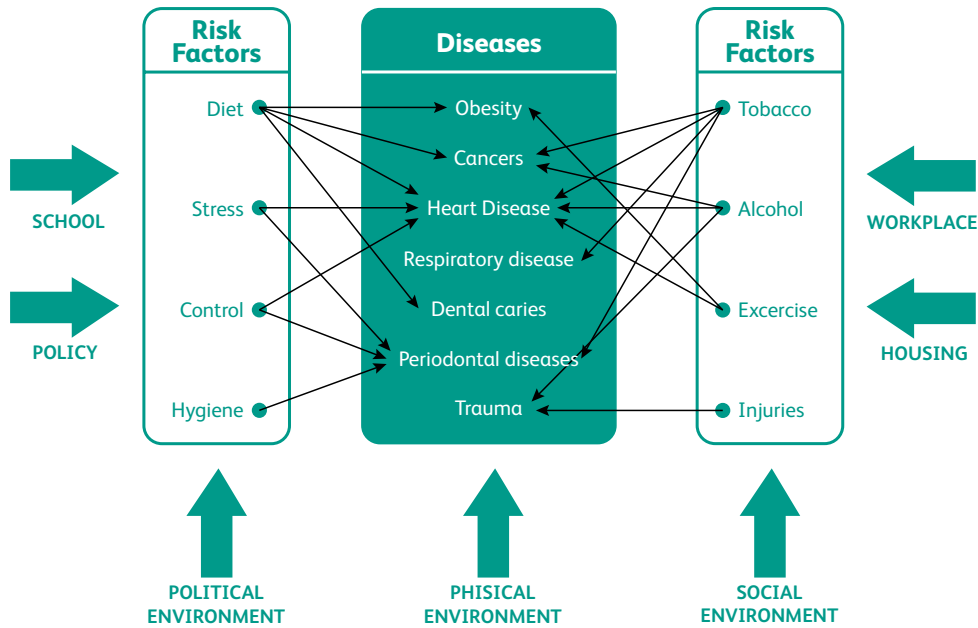
Traditionally, oral health promotion has focused on the care of the teeth and gums, in isolation from other health programmes. The Common Risk Factor Approach (CRFA) to health promotion takes a broader perspective and targets risk factors common to many chronic conditions *and their underlying social determinants*.^{7,24} The key concept of this approach is that concerted action against common health risks and their underlying social determinants will achieve improvements in a range of chronic health conditions more effectively and efficiently than isolated, disease-specific approaches.^{25,26}

Adoption of a common risk factor approach is more resource-efficient than a targeted disease-specific approach because:

- ▶ most chronic diseases have multiple risk factors
- ▶ one risk factor can impact on several diseases
- ▶ some risk factors cluster in groups of people
- ▶ risk factors can interact – in some instances synergistically – with each other.

The common risk factor approach provides a rationale for developing multi-sectoral healthy alliances between health professionals, statutory, voluntary and commercial bodies and the general public. It recognises that engendering lasting changes in individual “lifestyle” behaviours requires supportive social, economic and political environments.

Common Risk Factor Approach



Reproduced from Watt RG, 2005

Common Risk Factors for Oral Health

Oral disease is the most widespread chronic disease, despite being highly preventable. The common risk factors that oral disease shares with other chronic diseases/conditions are:

- **Diet** – Risk factor for dental caries, coronary heart disease, stroke, diabetes, cancers, obesity
- **Tobacco smoking/chewing** – Risk factor for oral and other cancers, periodontal disease, coronary heart disease, stroke, respiratory diseases, diabetes
- **Alcohol consumption** – Risk factor for oral and other cancers, cardiovascular disease, liver cirrhosis, trauma
- **Hygiene** – Risk factor for periodontal disease and other bacterial and inflammatory conditions
- **Injuries** – Risk factor for trauma, including dental trauma.
- **Control & Stress** – Risk factors for periodontal disease and cardiovascular disease
- **Socio-economic status** – Independent risk factor as well as underlying determinant of other risk factors.

Diet

Diet is a risk factor for dental caries, coronary heart disease, stroke, diabetes, cancers and obesity.

Diet – the foods and drinks we consume to nourish our body – and our eating habits have an important influence on our health and well being. A good diet provides the body with the appropriate quantity and quality of nutrients it requires to sustain health. Deficiency diseases such as anaemia and osteoporosis result from the inadequate intake of essential specific nutrients (undernutrition). Overeating or excessive intake of nutrients (overnutrition) leads to obesity, a recognised major health risk factor. Obesity is a serious problem in Ireland: in 2007, 25% of adults (24% of men; 26% of women) were obese²⁷; in 2002, 23% of boys and 28% of girls were either overweight or obese²⁸. Being overweight and obese increases the risk of coronary heart disease, stroke and Type 2 diabetes.

Dietary guidelines in Ireland are based on the Food Pyramid (shown on page 39) published by the Health Promotion Unit (www.healthpromotion.ie) of the Department of Health. The Food Pyramid is designed to help people to eat a balanced diet combining several different types of food in the right



amounts. The “top shelf” of the pyramid represents foods high in fat, sugar and salt which are not essential for health and which should be used sparingly (maximum 1 daily serving); the “bottom shelf” represents foods high in carbohydrates (e.g., breads, cereals and potatoes) which should comprise the bulk of our diet (i.e., 6+ daily servings). A survey of dietary habits of the Irish population (SLÁN 2007) found that only 14% of all adults surveyed (13% of men; 16% of women) complied with the “top shelf” recommendation to use foods high in fat, sugar and salt sparingly.²⁷

The top shelf of the Food Pyramid is of particular relevance to oral health as high consumption of foods/drinks containing added sugars is a direct cause of dental caries. The oral health message to restrict consumption of foods/drinks containing added sugars to mealtimes complements the healthy heart message to reduce consumption of foods high in oils and fats.

Furthermore, eating more fruits and vegetables can have a protective influence against cancers and systemic inflammatory (including periodontal) diseases.

The impact of dietary habits on oral health is discussed in greater detail in Chapter 5 – *Nutrition and Oral Health*.

Tobacco Smoking/Chewing

By simply quitting smoking, however, smokers, can, over time, reduce their risk levels and the sooner one quits, the greater the reduction in risk levels. Quitting before age 40 can reduce excess mortality attributable to continued smoking by 90%; quitting before age 30 reduces risk levels by more than 97%.³⁰

Tobacco contains chemicals that are harmful to the human body and the smoking or chewing of tobacco is the cause of 80–90% of oral cancers. Other oral consequences of tobacco consumption include increased risk of periodontal disease, bad breath, tooth discolouration, an increased build up of dental plaque, and delayed healing following tooth extraction, periodontal treatment or oral surgery. Smoking is bad for the health: it increases the risk of several types of cancers (lung

cancer, pancreatic cancer, cervical cancer, cancer of the kidney, liver cancer, cancers of the mouth, lip, throat, bladder cancer, stomach cancer and leukaemia), emphysema and other respiratory diseases, coronary heart disease, stroke, diabetes and ulcers. Smoking is also associated with adverse pregnancy outcomes – increased spontaneous abortions in the first trimester, premature placenta abruption, preterm delivery, decreased birth weight, sudden infant death syndrome – and earlier menopause in women and sperm abnormalities and impotence in men. It affects the senses of taste and smell.

The perils of smoking extend beyond active smokers to include those who are in their environment (i.e., passive smokers): second-hand smoke contains at least 50 known carcinogens and other harmful chemicals.

Smoking is the single most important preventable cause of illness and death. It is responsible for an estimated 30% of all cancer diseases and deaths and 90% of all lung cancers.²⁶ Compared to those who have never smoked, smokers are almost twice as likely to have a heart attack.²⁹ Smokers shorten their life expectancy by 10–15 years on average. By simply quitting smoking, however, smokers can, over time, reduce their risk levels.

Within the EU, Ireland has the highest smoking-related annual mortality rate, with 300 people in every 100,000 or approximately 7,000 people every year dying from smoking related diseases.^{31,32} Some 29% of adults surveyed in SLÁN 2007 reported being current smokers, 83% of whom smoked on a daily basis.²⁷ Among school age children surveyed in the HBSC 2010, 27% reported having ever smoked and 12% reported being current smokers, with older children and those from lower social classes more likely to report both behaviours.³³

When smoking is accompanied by alcohol consumption, its ill effects on health can be synergistically amplified: smokers who are also alcohol drinkers have a risk of oral cancer greater than the combined risk of those who only smoke and those who only drink alcohol.

Alcohol Consumption

Alcohol is a risk factor for oral and other cancers, cardiovascular disease, liver cirrhosis and trauma.

The risk of oral cancer is six times higher in those who drink alcohol compared to non-drinkers. Alcohol is the primary cause of liver cancer and is also a risk factor for breast cancer and colorectal cancer.³⁴

Alcohol is absorbed from the stomach into the blood stream and affects the central nervous system. Alcohol is a depressant and, in some individuals, can give rise to violent and irrational behaviour. Excessive alcohol consumption leads to liver damage, alcohol dependency, memory loss, cardiovascular disease, stomach ulcers, impotence, low birth weight babies, impaired motor skills, wrinkles and early ageing.

A standard drink in Ireland contains about 10 grams of pure alcohol. For adults, the recommended upper limits for alcohol intake are:

- ▶ Up to 11 standard drinks per week for women (112 grams of pure alcohol)
- ▶ Up to 17 standard drinks per week for men (168 grams of pure alcohol).

Standard Drink (SD) Equivalents



Source: www.healthpromotion.ie

Some studies have shown that regular moderate alcohol consumption (up to 2 standard drinks per day) can reduce the risk of heart disease and stroke. In particular, antioxidants in red wine can be beneficial to cardiovascular health. However, the risk of oral and pharyngeal cancers tends to increase with the amount of alcohol consumed and binge drinking – more than 5 standard drinks in one session – seriously increases the harmful effects of alcohol.

Recognising that alcohol contributes to a range of health, social and behavioural problems, the National Alcohol Policy, published in 1996, aimed at encouraging moderation in drinking (“*Less is Better*”) and reducing the incidence of alcohol-related problems in Ireland. In 2002, the Strategic Task Force on Alcohol (STIFA) was established with the brief to, *inter alia*, “*recommend specific, evidence based, measures to Government to prevent and reduce alcohol harm in Ireland*”.

SLÁN 2007 reported a reduction in average weekly alcohol consumption from 11 drinks in 1998 to 9 drinks in 2002 to 7 drinks in 2007, and a drop in the percentage of adults consuming more than the recommended weekly alcohol limits from 15% in 1998 to 13% in 2002 to 8% in 2007.²⁷ Despite these improvements, per capita alcohol consumption in Ireland is among the highest in the EU.³⁵ Moreover, more than a quarter (28%) of adults surveyed in SLÁN 2007 had indulged in binge drinking and over a third (33%–40%) of 15–17 year olds surveyed in HBSC 2010 reported being “really drunk” within the previous 30 days.^{27, 33}

Hygiene

Hygiene is a risk factor for periodontal disease and other bacterial and inflammatory conditions.

Hygiene in general refers to the practices used to ensure good health and cleanliness. Poor personal hygiene leads to inflammatory skin conditions and other bacterial infections. Oral hygiene refers to individual habits and professional methods used to control the bacterial biofilm (dental plaque) that grows on tooth surfaces. If not removed regularly, dental plaque can lead to tooth decay and periodontal disease. Toothbrushing as a daily routine is the most important method of plaque control.

Early assimilation of good oral hygiene into general hygiene practices promotes better overall oral health and general health. Oral hygiene practices should be included in guidelines for personal hygiene taught in schools and in the guidelines used for the care of the chronically ill, those with special needs and older people in residential care.

Risk of bacterial pneumonia in older people in residential care has been associated with poor oral hygiene. A systematic review of randomised controlled trials and other clinical studies estimated that one in ten cases of death from pneumonia among older people in a nursing home may be prevented by improving oral hygiene.³⁶ Epidemiological studies confirm an association between poor oral hygiene (periodontal disease) and higher risk levels of cardiovascular disease and low grade inflammation, though the nature of the association is not yet understood.^{37, 38}

Injuries

Injuries are a risk factor for trauma, including dental trauma
See also Dental Trauma on page 26

Most traumatic injuries to teeth arise from accidents during normal, everyday activities such as informal play or sports. The wearing of mouthguards or helmets with face shields during organised contact sports will reduce the likelihood of traumatic injuries to the head, face and teeth. The wearing of safety helmets (e.g., for cycling, skate boarding) and of car seatbelts is also advised.

Stress and Control

Stress and control are risk factors for periodontal disease and cardiovascular diseases.

Stress is the body’s reaction to external forces or events that cause physical, emotional or mental tension. When an individual feels stressed, adrenaline and stress hormones (e.g., cortisol) are released to prepare the body for the “fight-or-flight” response. While stress is a normal part of life, excessive stress can lead to health problems and lifestyle behavioural changes (e.g., taking up or increasing smoking, increasing alcohol intake, changing dietary habits, becoming physically inactive, neglecting oral and personal hygiene) which further increase health risks.

How individuals react to stress depends to a large extent on their personality type. Studies have shown, however, that even people with the most easy-going and adaptable personalities can suffer from stress if they lack a sense of control over aspects of their daily lives.

Chronic stress (e.g., low social support, low socioeconomic status, work stress, marital stress, caregiver strain) is a known risk factor for cardiovascular disease and periodontal disease. It has been theorised that chronic stress speeds up the process of atherosclerosis in the coronary arteries and that the stress hormone cortisol plays a role in increased periodontal destruction. Cortisol also acts to suppress the immune system,

Oral Health & General Health: The Common Risk Factor Approach

allowing bacteria to flourish in the mouth.

Exercise and stress management techniques provide individuals with tools to cope with the anxieties in their lives. The most effective way to deal with stress is by correcting or modifying its underlying causes (e.g., low socio-economic status), however, this may be beyond the control of the individual.

Socio-Economic Status

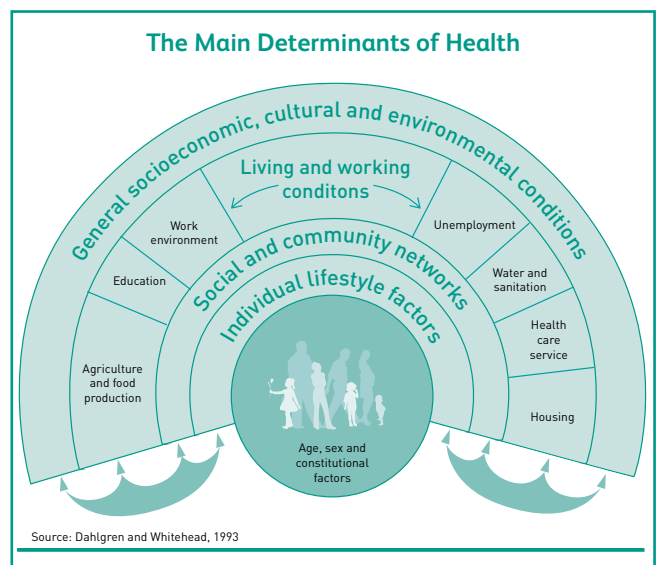
The link between general health and socio-economic status is well established.^{39–41} There is also a body of evidence showing that poor oral health is associated with low socio-economic status or deprivation.^{42–45} In both high and lower income countries around the world, low socio-economic status was significantly associated with increased oral cancer risk, even after adjusting for potential behavioural confounders.¹⁹ Thus, socio-economic status *per se* is an important risk factor: social disadvantage causes health disadvantage. SLÁN 2007 reported that long-term illness was more common among the lower social groups.²⁷

In addition to being a risk factor in itself, socio-economic status is also an important underlying determinant of other common risk factors. SLÁN 2007 reported that²⁷:

- ▶ those in the lower social class groups were more likely to smoke
- ▶ those in the higher social class groups were more likely to have tried to quit smoking in the previous year
- ▶ excessive alcohol consumption was more common among lower social class groups
- ▶ those in the higher social class groups were more likely to consume a greater quantity of fruit and vegetables
- ▶ 25% of those in the (highest) social classes 1–2 reported practicing four positive lifestyle behaviours – i.e., eating 5+ daily servings of fruit and vegetables, being a non-smoker, being a moderate drinker, being physically active – compared to 21% in the social classes 3–4 and 18% in social classes 5–6. Practicing all four of these positive behaviours confers an additional 14 years in life expectancy relative to practicing none of these behaviours.

Growing Up in Ireland – National Longitudinal Study of Children (<http://www.growingup.ie/>), which commenced in 2007, reports that differences in health across social groups are evident from as early as 3 years of age.

Dalhgren and Whitehead's pictorial representation of the main determinants of health reproduced below highlights the various influences which impact on the lives we lead.



Reproduced from: WHO Regional Office for Europe (2006). *European strategies for tackling social inequities in health: Levelling up Part 2.* (<http://www.euro.who.int/document/e89384.pdf>).

Acknowledging that personal lifestyle behavioural “choices” may, for certain segments of society, be limited by socio-economic, cultural, political and other environmental conditions beyond their control is essential for developing effective public health strategies.



Nutrition and Oral Health

Key Points

- ▶ Frequent consumption of sugar-containing foods and drinks is the most important cause of tooth decay.
- ▶ Twenty-three percent of 8-year-olds and 40% of 15-year-olds consume sweet snacks or drinks between normal meals three or more times a day¹⁰; half (48%) of all adults snack between meals, most commonly on biscuits and cakes²⁷.
- ▶ More than 8 out of 10 adults (86%) consume at least three servings a day of foods high in fats and sugar.²⁷ The Food Pyramid recommends that these foods are best avoided and limited to **“no more than 1 serving a day maximum and ideally not everyday.”**
- ▶ Poor nutrition is a “shared common risk factor” for cardiovascular diseases, cancer, obesity and oral diseases.
- ▶ A healthy diet for oral health should be promoted as part of general nutrition advice.

The single most important cause of dental caries is the frequency with which sugar-containing foods and drinks are consumed. The nutritional advice offered in relation to oral health should be based on the reduction of between-meal snacking of sugary foods and drinks.

The 1995 Food and Nutrition Policy guidelines for Ireland recommend that frequent consumption throughout the day of foods containing sugar should be avoided, especially by children. These guidelines further recommend that while a high energy intake is required for growth by adolescents (and this increases meal frequency), this should not be associated with frequent consumption of foods/drinks high in sugar throughout the day. The WHO recommendation is that the intake of “free sugars” – this term does not include sugars naturally present in whole fruits, vegetables and milk – should be less than 10% of total energy intake (which equates to <15–20 kg/person/year) and that frequency of intake be limited to four times or less a day¹².

The 2002 National Oral Health Survey reported that 23% of 8-year-olds and 40% of 15-year-olds consume sweet snacks or drinks between normal meals three or more times a day.¹⁰ The 2007 Lifestyle and Nutrition Survey (SLÁN) also reported that half (48%) of all adults snack between meals, most commonly on biscuits and cakes.²⁷

Getting the Balance Right

A variety of foods that provide important nutrients also contain sugars and should not be avoided but consumed as part of a healthy and balanced diet. From an oral health perspective, *whole* fruits, vegetables and milk containing natural sugars are preferable to foods with “free sugars”. The term “free sugars” includes any sugars which have been added to food plus sugars naturally present in honey, fruit juices and syrup. Foods containing “free sugars” are cariogenic and should be consumed only as part of a meal and not used as snacks between meals.

The biggest threat to both oral and general health comes from snack foods that have been allocated to the top shelf of the Food Pyramid (*see chart on page 39*) such as cakes, biscuits, chocolate sweets and fizzy drinks. The between meal frequency with which these foods high in added sugars/fats are consumed as well as their quantity should be kept to a minimum. The Food Pyramid is essentially a guide to the components of a well-balanced healthy diet and recommended serving sizes should be adjusted to an individual’s requirements as determined, among other variables, by their gender, life stage, physical size and activity levels. It is also important, within the guidelines of the Food Pyramid, to eat a varied diet, as this helps to ensure intake of essential nutrients.

The number of servings shown on the Food Pyramid is suitable for adults and children from 5 years of age; younger children should start with fewer and smaller servings in accordance with their growth and appetite. Children, as well as adults, are advised to drink plenty of water and to be physically active^a.

Your Guide to Healthy Eating Using The Food Pyramid is available at: http://www.dohc.ie/publications/yourguide_foodpyramid.html

^aThe National Guidelines on Physical Activity in Ireland (2009) published by the Department of Health and Children jointly with the Health Service Executive (available at http://www.dohc.ie/publications/yourguide_foodpyramid.html) recommends a target of at least 60 minutes of moderate to vigorous activity every day for children and a target of at least 30 minutes of moderate activity five days a week for adults.

Understanding the Food Pyramid



Source: Department of Health (2012) (http://www.dohc.ie/publications/pdf/YourGuide_HealthyEating_FoodPyramid.pdf?direct=1)

Nutritional Advice: Oral Health vs. Heart Health

One of the key issues in nutritional advice relating to good oral health is that the oral health message focuses on the intake of sugar-containing foods, whereas for heart health the focus tends to be on fat intake.

There is no evidence that nutrition advice promotes heart health at the expense of oral health or vice-versa. The Nutrition Guidelines for Heart Health (2007) published by the Irish Heart Foundation defines four population goals which, based on the strongest scientific evidence, would achieve the largest public heart health gains for the Irish population. These goals are:

1. **A reduction in intake of saturated fat to less than 10% of dietary energy and a reduction in trans fat to less than 2% of energy**

2. **An increase in fruit and vegetable intake to be greater than 400 grams a day**
3. **A reduction in salt intake to be less than 6 grams a day**
4. **A reduction in body mass index (BMI) to less than 25 kg/m², however the Irish Heart Foundation would as a first priority set the goal of halting the increase in levels of overweight and obesity in the Irish population.⁴⁶**

Goals 2 and 4 are also of particular relevance to oral health. Increased fruit and vegetable intake will lower not only the risk of cardiovascular disease but also of periodontal disease, which in itself may pose a risk factor for cardiovascular disease; and nutritional advice aimed at halting rising levels of obesity will also promote reduced intake of sugar-containing foods and drinks in favour of a more balanced and healthy diet as defined by the Food Pyramid.

Food and Drink Labels

Food and drink labels are intended to enable consumers to make informed nutritional choices between different products and should not carry misleading or false claims. The basic information required on food labels include: name of the product, list of ingredients, quantity of certain ingredients, net quantity, use by or best before dates, place of origin, special storage instructions, instructions for use, name and address of the manufacturer, packer or seller in the European Union, alcoholic strength of beverage with more than 1.2% alcohol. Information on the legislations that govern food labelling in Ireland may be found on the Food and Safety Authority of Ireland website http://www.fsai.ie/legislation/food_legislation/labelling_of_food.html.

As part of its consumer education campaign, the Food Safety Promotion Board (*safefood*) has made available on its website <http://www.safefood.eu> a number of resource materials on food labelling aimed at school-aged children (*How they measure up – Deciphering food labelling*) and the general public (*How they measure up – A simple guide to food labelling*). Health professionals also have a role to play in raising people's understanding of the nutritional claims on food labels which can be ambiguous, selective or prone to misinterpretation. For oral health, it is particularly important to educate the public on how to read and interpret the sugar content of products and be aware of hidden forms of sugar.

The terms “sugarless”, “sugar free”, “low sugar”, and “no added sugar” may only mean that there is no **added** sucrose in a product. The product may already contain sugars that can be listed as fructose, maltose, dextrose, glucose syrup, molasses, treacle, invert sugar, maltodextrins, maple syrup and honey – these can be cariogenic.

Nutrition information usually takes the form of a table which provides the amount of energy, protein, carbohydrate and fat per 100 g of product, and sometimes also per serving or pack. The information per serving is the most useful when comparing two foods. The sugar content of a product may be assessed by looking at the list of ingredients: the sooner sugar is mentioned on the list, the higher the sugar content of the product.

For example, the following is the list of ingredients on a confectionery dessert label:

Ingredients: water, fructose, milk chocolate, inulin - vegetable fibre, skimmed milk powder, fat reduced cocoa powder, dried whey, gelatine, hydrogenated vegetable oil, glucose syrup.

Fructose is the second ingredient in the list and immediately signals that this product has a high sugar content. Sugar in the form of glucose syrup is also listed. What is not so evident is that milk chocolate and inulin also contain sugar. Thus, this product has a higher sugar content than is evident at first glance.

Did you know that⁴⁷:

A carbonated drink (Cola) contains 35 g of sugar per 330 ml can – 35 g of sugar is equivalent to 7 teaspoons or 11 cubes of sugar.

A typical blackcurrant juice drink contains 70 g of sugar per 500 ml bottle – 70 g of sugar is equivalent to 14 teaspoons or 22 cubes of sugar (more sugar than contained in three standard packets of chewy sweets).

To put this in perspective, a teenage boy aged between 11 and 14 should aim to eat no more than 65 g sugar in one day (13 teaspoons) and a teenage girl aged between 11 and 14 should aim to eat no more than 54 g sugar in one day (just under 11 teaspoons).

Medicines

Pharmaceutical companies now produce sugar-free medicines and doctors and dentists should be encouraged to prescribe them when appropriate.

An information leaflet listing sugar-free medicines alphabetically by brand or generic name and by therapeutic category is produced by the National Pharmaceutical Association (United Kingdom). This quick-reference guide to sugar-free medicines is a useful tool for doctors and dentists. An adapted version of this listing is provided in *Delivering Better Oral Health: An evidence-based toolkit for prevention*, published by the UK Department of Health (2009): http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_102982.pdf.

Good Food for all Stages of Life

Dietary Advice for Parents/Carers of Infants

Breast milk provides the best source of nourishment for the early months of life. Mothers should be encouraged and supported in breast-feeding and may choose to continue to breast-feed as the weaning diet becomes increasingly varied.

Children have high energy needs for growth and development. It is important that children are given energy-rich foods that are nutritious such as wholegrain cereals, breads, dairy foods, meats, chicken and eggs. Foods from the bottom four shelves of the Food Pyramid should be used in preference to foods from the very top shelf that are high in added sugars/fats/salts and low in nutrients such as chocolate, cakes, sweets and soft drinks.



Practical tips:

Foods

- Do not add sugar to home prepared weaning foods.
- Limit baby foods sweetened with added sugars.

Drinks

- Milk and water are the best drinks for children.
- Breast milk is the best form of nourishment for young infants. If it is not possible to breast feed, a suitable iron-fortified infant formula should be used. Cow's milk is not advisable for infants less than 1 year old but is a suitable drink for older infants. Milk is a good source of calcium which is necessary for the development of teeth and bones.
- For children allergic to cow's milk, soy milk (also called soya milk, soybean milk or soy juice) is an alternative. Soy milk contains sugar and can cause dental decay if children are allowed drink it on demand throughout the day from a feeding bottle. Soy milk should be used as a "feed" and not as a drink.
- Plain tap water is a suitable drink for all ages but should be boiled – just once, for about 1 or 2 minutes – and cooled for infants less than 1 year. Natural mineral/bottled waters are not suitable for infants because of their mineral levels.
- Fruit juices should be unsweetened, well diluted to diminish their acidity and natural sugar content (1 measure to 4 or 5 measures of boiled water) and given only at mealtimes from a cup. Baby juices and herbal drinks are not needed, but if given should be used sparingly and only at mealtimes from a cup.
- Colas, squashes, fizzy drinks and diet drinks are unsuitable for infants as they are highly erosive to tooth enamel and have no nutritional value.
- Foods should never be added to the baby bottle as babies can choke from the added food.
- Infants should be weaned from using baby bottles by their first birthday.

Early Childhood Caries (ECC)

Parents/carers of infants should be particularly educated about the dangers of putting fruit juices and sugar-sweetened drinks into feeding bottles or reservoir feeders and giving these to the baby/toddler, especially when they are being put to bed. Such practices result in almost continuous bathing of the teeth with sugars and lead to severe and rapid tooth destruction – a condition described as Early Childhood Caries (ECC) and often referred to as “baby bottle decay”.



Decay in a young child caused by sugar-sweetened drink given in a baby bottle

Any sign of tooth decay in a child under the age of 3 years is described as Severe Early Childhood Caries (S-ECC)⁴⁸ and should be brought to the attention of a dentist.

This condition is preventable!



Healthy mouth in 3 year old



Severe Early Childhood Caries in 3 year old

**“Children should be fed
and put to bed —
NOT put to bed and fed”**

- Do make sure that your child does not sleep with a bottle in his or her mouth.
- Do avoid all sugar-containing liquids in the nap or bedtime bottle.
- Do encourage drinking from a cup.
- Do discontinue bottle feeding by your child's first birthday.
- Do avoid dipping a soother in sugar, honey or anything sweet before giving it to your child.
- Do encourage a varied diet in line with healthy eating recommendations.

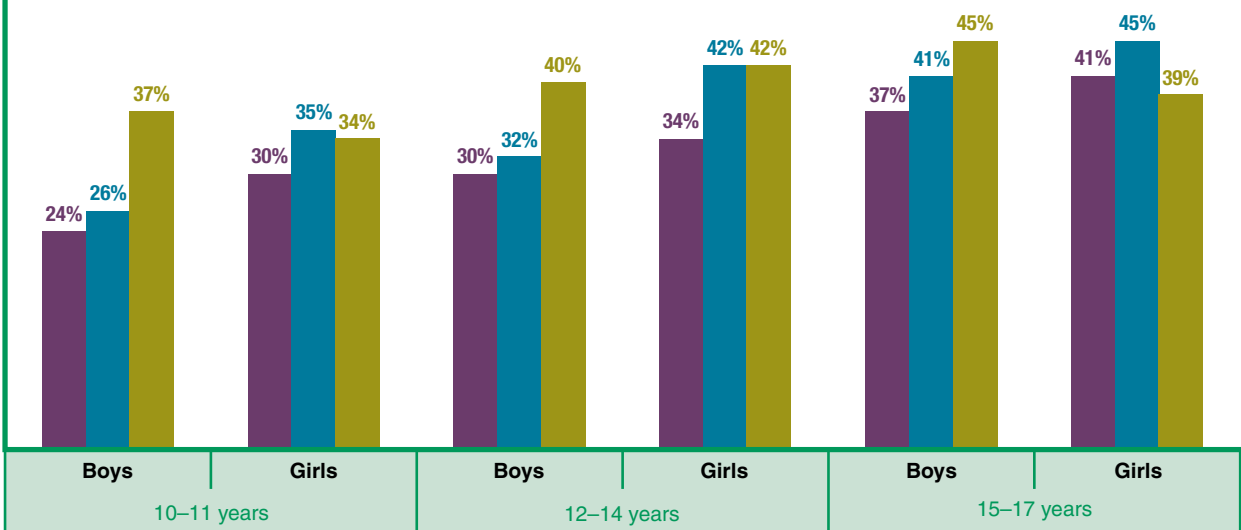
School Children/Adolescents

Overall, there has been a slight improvement in the dietary habits of school-aged children in recent years: the 2010 Irish Health Behaviour of School-Aged Children (HBSC) Study reports a slightly higher percentage of children consuming fruits and vegetables more than once daily and a slightly lower percentage consuming sweets and soft drinks daily or more often, compared with 2006. The HBSC study also reported evidence of a social class gradient, with children from the highest social classes (SC 1–2) more likely to have frequent fruit and vegetables consumption and less likely to have frequent soft drink consumption. Differences by age group and gender were also observed.

The slight improvements in children's dietary habits are likely linked to similar changes in adult dietary habits revealed by the 2007 SLÁN. It can be conjectured that these slight changes in dietary habits stem from a greater population awareness of the health impacts of lifestyle behaviour, in light of the concern for rising obesity in Ireland. However, eating habits, specifically in relation to sugar, can be changed by peer influence as children gain relative independence from family influences. Overall, 37% of the children surveyed in the 2010 HBSC survey reported eating sweets and 21% drinking soft drinks daily or more frequently, with higher rates in the older age groups. The graphs opposite show the breakdown of daily sweets and soft drinks consumption by age group, gender and social class.

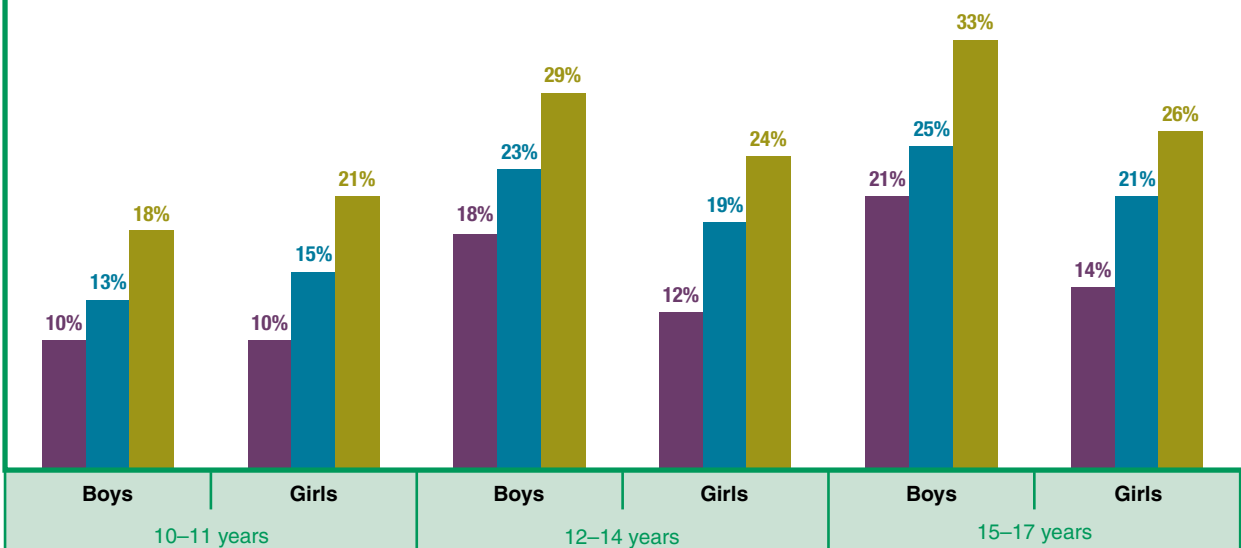
Percentage of children surveyed in 2010 who reported eating SWEETS daily or more often, by age group, gender and social class³³

- SC 1-2
- SC 3-4
- SC 5-7



Percentage of children surveyed in 2010 who reported drinking SOFT DRINKS daily or more often, by age group, gender and social class³³

- SC 1-2
- SC 3-4
- SC 5-7





Health implications of soft drinks

Some 21% of school-aged children in Ireland report drinking soft drinks on a daily basis.³³ Epidemiological studies in the United States, which has the highest per capita soft drink consumption in the world, have linked daily consumption of soft drinks containing cola (a phosphoric acid) with lower bone density in women. There is also concern that daily soft drink consumption is displacing milk intake, an important source of dietary calcium, thereby increasing the risk among young teenage girls of osteoporosis in later life. Research in the United States has also shown an association between soft drink consumption and the incidence of type 2 diabetes and obesity.

Dental health implications of soft drinks

The frequent consumption of carbonated (fizzy) drinks not only puts teeth at risk of decay but can also cause enamel erosion. This is due to their acidic content. (A more detailed discussion on *Tooth Wear* is given in *Chapter 3 – Oral Health & Disease Prevention*.)

Fruit juices/smoothies are an important source of vitamins in the diet but are lower in fibre than whole fruits and may contain added sugar, fat or salt. Thus, regardless of how much fruit juice or smoothies is consumed, they only get one count towards the “5-a-day” servings of fruits and vegetables recommended for healthy eating. Furthermore, fruit juices/smoothies should be taken **with meals** for two reasons: the frequent consumption of fruit juices/smoothies can lead to enamel erosion and, even though pure juices may not contain sucrose, they are rich in fructose and can also be cariogenic. As fructose in whole fruits pose little or no threat to dental health¹², whole fruits rather than fruit juices/smoothies should be consumed between meals.

Practical tips:

Foods

- Suggestions for between meal snacks are whole fruits, crisp raw vegetables, sandwiches, natural or unsweetened yoghurts, low fat hard cheeses, plain popcorn, nuts (unsalted) and milk.
- Cereals containing no added sugars such as porridge and shredded wheat are excellent energy providers; cereals with added sugars should be avoided. In general, the sugar and salt content of breakfast cereals should be checked as some breakfast cereals are high in one or the other or both. The recommended upper limit for salt intake is 6 g per day (equivalent to 2.4 g of sodium). Chopped up bananas or other fruit can be added to low-sugar cereals to top up their taste.

Drinks

- Milk and water are suitable to drink between meals.
- Pure juices, fruit squashes and smoothies should be consumed at meal times.
- Drinks containing added sugars, including probiotic and yoghurt type drinks, should be consumed at meal times.
- Regular intake of carbonated drinks, including sparkling water, can lead to enamel erosion of the teeth and should be avoided.

Adults and Older people

Loss of natural teeth is associated with poor nutritional status in older people.^{49,50} A tendency towards reduced salivary flow among older people together with increased gum recession places the older person with natural teeth at high risk of developing tooth decay, particularly root decay. Older people tend to be frequent users of over-the-counter medicines, e.g., cough drops, laxatives, antacids and various tonics, which are generally high in sugar. Use of sugar-free alternatives, which are now available for many of these over-the-counter remedies, is recommended to help reduce caries risk. The most important causes of dental erosion in adults are acid reflux and acidic drinks. Dietary advice on oral health for adults with natural teeth should be consistent with general health dietary guidelines.

Practical tips:

Foods

- Older people should be encouraged to snack on a wide variety of healthy foods with high nutrient density (e.g., bananas, berries, yoghurt, nuts, seeds, eggs, vegetable soup, wholegrain sandwiches), and limit foods from the top level of the Food Pyramid that are high in sugar, fats and salts but low in nutrients such as cakes, sweets, biscuits and soft drinks.

Drinks

- The consumption of 8–10 cups/glasses or about 2–2.5 litres of fluid a day is important for older people, as the body is less able to sense dehydration with advanced age.



6

Oral Health Care Products

A wide variety of oral health care products is available to consumers for over-the-counter (OTC) sale, and includes:

- Toothpastes
- Toothbrushes
- Mouthrinses
- Interdental cleaning aids (dental floss)
- Denture cleansers and fixatives
- Saliva substitutes.

Toothpastes and mouthrinses contain therapeutic agents designed to control various diseases and conditions of the mouth such as dental decay, gum diseases, tartar and tooth sensitivity. Toothbrushes and the different interdental cleansers and accessories are primarily designed for the mechanical removal of plaque. There is still a sizeable market for denture cleansers and fixatives despite the fact that the number of people having teeth extracted has fallen considerably since the 1970s. Dry mouth is a problem for many people, particularly those in the older age bracket, hence the increasing market for saliva substitutes.

Toothpastes

What is in Toothpaste?

- **Abrasives**
- **Detergent (1–2%)**
- **Binding agents (1%)**
- **Humectants (10–30%)**
- **Flavouring, sweetening and colouring agents (1–5%)**
- **Preservatives (0.05–0.50%)**
- **Fluoride and other therapeutic agents**
- **Water**

Toothpastes are the most widely used oral health care product and there is considerable choice available to the consumer. Toothpaste types range from general decay, plaque and tartar control types to specific formulations for sensitive teeth, for smokers, special children's formulations and the tooth whitening

past. Toothpaste ingredients are usually shown on packs as "w/w" (weight for weight) or grams per 100 grams. Under new European cosmetics legislation, toothpastes are required to list all ingredients. In addition to water, toothpaste will normally contain the following basic ingredients:

Abrasives

Abrasives are the cleaning and polishing agents in a toothpaste and account for about a third of the toothpaste by weight. Most abrasives are chalk or silica based. Examples are dicalcium phosphate, sodium metaphosphate, calcium carbonate, silica, zirconium silicate or calcium pyrophosphate. Abrasives differ in strength. An international standard defines a test paste against which toothpaste abrasivity can be assessed, but there is no system for ensuring that all toothpastes sold in the Republic of Ireland are at or below this abrasivity level. The unit of measurement is known as the Relative Dentine Abrasivity (RDA) or the Relative Enamel Abrasivity (REA).

Detergent (1–2%)

Detergents foam and loosen plaque and other debris from the tooth surface. Principal examples are sodium lauryl sulphate and sodium N-lauroyl sarcosinate.

Binding agents (1%)

These agents prevent separation of solid and liquid ingredients during storage. They are usually derived from cellulose, sodium carboxy-methyl cellulose being the most commonly used. Carrageenans (seaweed derived), xantham gums and alginates are also used.

Humectants (10–30%)

Humectants act to retain moisture and prevent the toothpaste from hardening on exposure to air. Glycerol, sorbitol and propylene glycol are commonly used. Glycerol and sorbitol also sweeten the toothpaste, though this is not their main function.

Flavouring, sweetening and colouring agents (1–5%)

Peppermint, spearmint, cinnamon, wintergreen and menthol are among the many different flavourings used. While rare, mucosal irritations from toothpaste (i.e., ulceration, gingivitis, angular cheilitis, perioral dermatitis) are usually linked to flavourings or preservatives they contain.

Preservatives (0.05–0.5%)

Alcohols, benzoates, formaldehyde and dichlorinated phenols are added to prevent bacterial growth on the organic binders and humectants.

Fluoride and other therapeutic agents

The majority of toothpastes combine the caries protection of fluoride with other therapeutic agents to control plaque, tartar and gum disease. The inclusion of antibacterial agents can help individuals improve their plaque control. Many toothpastes include triclosan, which has been shown to offer a clinically useful improvement in gum health. Other pastes specifically target “tartar” (hardened plaque) and use pyrophosphate to inhibit the mineralisation of dental plaque and hence the build-up of tartar (calculus). Toothpastes with desensitising agents are also available for sensitive teeth.

Types of Toothpaste

There are many different types of toothpastes on the market. The “all in one” toothpaste contains a combination of agents to reduce tartar formation, improve gum health and prevent dental caries. It is important to verify that the effectiveness of toothpastes advertising improved or new formulations have been “clinically proven” by seeking information from dental public health personnel with expertise in the field.

Fluoride toothpastes

Fluoride toothpastes make up more than 95% of all toothpaste sales. It is well recognised that the decline in the prevalence of dental caries recorded in most industrialised countries over the past 30 years can be attributed mainly to the widespread use of toothpaste that contain fluoride. Investigations into the effectiveness of adding fluoride to toothpaste have been carried out since 1945 and cover a wide range of active ingredients in various abrasive formulations. Fluoride compounds and their combinations which have been tested for the control of dental decay include sodium fluoride, stannous fluoride, sodium monofluorophosphate and amine fluoride. The most widely used fluoride compounds in the Republic of Ireland are sodium fluoride and sodium monofluorophosphate.

Amount of fluoride in toothpaste

The amount of fluoride contained in fluoride toothpaste should be indicated on the toothpaste tube, although this information may sometimes be hard to locate. It may appear after the label “Active ingredient” or as a component under “Ingredients” on the toothpaste tube. Whereas previously fluoride content was given as a percent of volume (% w/v) or weight (% w/w), it is now accepted that the most efficient method of informing people of the amount of fluoride in a toothpaste is to give the “parts per million” fluoride (ppm F). Most manufacturers now give fluoride content in ppm F.

Under EU Directive 76/768/EEC, toothpastes are classified as cosmetic products. EU Directives governing cosmetic products

prohibit the marketing of cosmetic products (including toothpastes) with over-the-counter levels of fluoride greater than 1,500 ppm F. At present, most toothpastes in Ireland contain 1,000–1,500 ppm F.

Fluoride toothpastes are more effective at preventing tooth decay at higher fluoride concentrations.⁵¹ If needed for therapeutic reasons, toothpastes containing more than 1,500 ppm F (e.g., 2,800 ppm F) are available but may be obtained only with a prescription.

Fluoride toothpaste for children

Because young infants and children under age 2 years can swallow most, if not all, of the toothpaste when brushing, there has been concern that the use of fluoride toothpaste containing 1,000–1,500 ppm F could give rise to enamel fluorosis of the front permanent incisors. Enamel fluorosis is a condition which can vary from minor white spots to unsightly yellow/brown discolouration of the enamel due to excessive intake of fluoride. In response to the concern over enamel fluorosis, some manufacturers now market low fluoride “children’s” or “paediatric” toothpastes containing less than 600 ppm fluoride. The effectiveness of these low fluoride “children’s” or “paediatric” toothpastes in preventing caries has not been established. What has been shown by a number of systematic reviews is that toothpastes with a low fluoride concentration of 250 ppm F are less effective than toothpastes with the standard 1,000–1,500 ppm F at preventing caries in permanent teeth.^{52–54}

Recommendations on the use of fluoride toothpaste in children have been produced by the Expert Body on Fluorides and Health (<http://www.fluoridesandhealth.ie/>). These recommendations aim to minimise the risk of fluorosis from fluoride toothpaste while maximising its caries-preventive benefits. These recommendations can be found in *Chapter 3 – Oral Health & Disease Prevention*.

Smokers toothpaste

People who smoke often suffer stained teeth because of tar deposits. Some smokers toothpastes use stronger abrasives to remove these stains. Vigorous brushing with more abrasive pastes may damage the enamel over time.

Special toothpaste to combat hypersensitivity

One of the consequences of ageing is that gum margins may recede, exposing the root surface of certain teeth, which in some instances result in hypersensitivity and pain – for example, when eating an ice cream or drinking cold drinks. Toothpaste specifically formulated for sensitive teeth can be effective in relieving the pain; these products vary in the way they work.

Whitening toothpaste

These pastes are being promoted primarily on the basis of cosmetic benefit. The market for these pastes is likely to continue to rise due to the increased retention of natural teeth by the middle aged and elderly, since enamel tends to lose its whiteness with age. Some whitening toothpastes use fluoride and an enzyme system.

Whitening toothpastes are not to be confused with hydrogen (or carbamide) peroxide whitening systems that may be accessed only through a dental practitioner. EU directives arising from The European Communities (Cosmetic Products) prohibit the direct sale to consumers of tooth whitening or oral hygiene products containing or releasing more than 0.1% hydrogen peroxide. As of 31 October 2012, oral products with a concentration of more than 0.1% and up to 6.0% hydrogen peroxide present or released may be made available to consumers with the restrictions that such products may only be accessed through a dental practitioner, that the first application of each cycle of use is by the dental practitioner and that the consumer is over 18 years of age.^a

Natural toothpaste

A wide range of “natural” toothpaste products is also available. These toothpastes are made from herbal extracts and other natural ingredients, such as essential oil of ginger, seaweed extract, propolis and much else. The health claims of many “natural” toothpastes have not been clinically proven. Thus, it is important to check if these “natural” toothpastes contain fluoride, a proven active ingredient for the prevention of tooth decay.

Toothbrushes

Manufacturers are producing a greater variety of toothbrushes incorporating different designs for handles, heads and bristles. Currently, the dental profession recommends the following: for children, a small toothbrush head, approximately 20 mm X 10 mm seems most suitable; for adults, the toothbrush head can be slightly larger, approximately 22–28 mm X 10–13 mm. Small-headed toothbrushes give better access to the back of the mouth. Nylon filaments are recommended because of their better physical properties and standardisation; the recommended diameter is 0.15–0.20 mm to give a soft to medium texture. Multi-tufted brushes are best. A general guide is that the size of the brush should be selected to suit mouth size, with smaller brushes being more suited to smaller mouths. Whether straight handles or angled handles are used is a matter of personal preference. People who experience difficulty cleaning

their back teeth may find it easier using an angled brush; in any case the best brush is the one that enables the user to clean their teeth thoroughly without causing trauma.

The frequency with which toothbrushes are replaced has yet to be correlated with oral health. **The most helpful guide is to replace a toothbrush when the bristles begin to show signs of wear.** Toothbrush handles can also be adapted to improve the grip by the user. Electrical or battery operated toothbrushes are useful for people who have difficulty holding and maneuvering an ordinary toothbrush, such as persons with poor motor control or a physical disability. A systematic review of trials involving the use of powered toothbrushes found that only powered brushes with an oscillation rotation action (i.e., brush head rotates in one direction and then the other) are more effective at removing plaque than conventional brushes, and can reduce gingivitis if used for over 3 months.¹⁷

- ▶ Toothbrushes should be replaced when bristles show signs of wear.
- ▶ Brushing is more effective with multi-tufted, small-headed toothbrushes with soft to medium nylon filaments and a comfortable handle.
- ▶ Powered brushes with brush heads that rotate first in one direction and then the other (oscillate/rotate) are more effective at removing plaque than manual toothbrushes and can reduce gingivitis if used for over 3 months.¹⁷



^aFor more information, see

[http://www.dentalcouncil.ie/files/Tooth%20whitening%20-%20Guidance%20\(Final\)%20-%2020121031_2.pdf](http://www.dentalcouncil.ie/files/Tooth%20whitening%20-%20Guidance%20(Final)%20-%2020121031_2.pdf)

Mouthrinses

Over the past two decades there has been a dramatic increase in over-the-counter sales of mouthrinses.⁵⁶ In particular, teenagers and young adults are purchasing these products as mouthrinsing has become part of the normal grooming process. From a health promotion point of view, this is a welcome trend since most of the mouthrinses sold contain therapeutic agents to control various oral health conditions such as caries, plaque/gingivitis, tooth wear and halitosis.

- ▶ Mouthrinses containing fluoride are very effective in the control of dental caries and are especially useful for those wearing orthodontic bands.
- ▶ If your dentist recommends that you use a fluoride mouth rinse, use it at a different time to brushing with fluoride toothpaste in order to maximise the caries-preventive benefits of fluoride
- ▶ Some fluoride mouthrinses are formulated to help control tooth wear.
- ▶ Mouthrinses for the control of gingivitis are also available.
- ▶ Many people use mouthrinses to freshen their breath.
- ▶ Alcohol-free mouthrinses are available and may be as effective as their alcohol-containing counterparts.

Rinses Containing Fluoride to Control Dental Caries

Fluoride mouthrinses have been used for many decades for the control of dental caries. Initially, these were used mainly within public health programmes such as daily, weekly or fortnightly mouthrinsing programmes using 0.05% or 0.2% sodium fluoride.

Some school-based mouthrinsing programmes continue in the Republic of Ireland. Indeed, one of the longest running school-based programmes in the world is conducted in non-fluoridated areas of Co. Waterford. This programme commenced in the late 1960s and has been shown to be effective in the control of dental caries.⁵⁵

Over the last two decades, over-the-counter sales of mouthrinses containing fluoride (usually 0.05% NaF) have increased.

Rinses Containing Fluoride to Control Tooth Wear (Erosion)

Such products are new to the market; they endeavour to hold the fluoride content of the rinse in contact with the tooth surface for a longer period of time, encouraging the formation of a harder enamel surface.

Rinses to Control Plaque and Gingivitis

For a number of people, toothbrushing does not sufficiently control plaque and gingivitis, hence the use of mouthrinses specifically formulated for this purpose. The most effective rinses contain chlorhexidine. This type of rinse is generally recommended for people who have acute gum problems. Long term use (more than 3–4 weeks) is not advised because it affects the oral flora. Also, the teeth may develop a brownish stain. Should this happen however, a dentist will be able to remove the stain without too much difficulty. The modes of action and effectiveness of mouthrinses in general are continually being reviewed. The popular pre- and post-brush rinses with co-polymer and triclosan and other products such as those containing essential oils do control plaque and improve gum health. In general, however, these are not as effective as rinses with chlorhexidine, but they have the benefit of not staining the teeth.

Rinses Containing Alcohol

Some mouthrinses contain a significant amount – up to 27% volume – of alcohol. Alcohol provides an antibacterial effect, acts as a carrier of flavor and adds “zing” to the mouthrinse. Alcohol consumption is also a known risk factor for oral cancer. Due to concerns regarding the possible carcinogenic effect of alcohol in mouthrinse, sporadic studies have been carried out over the last three decades to investigate the issue. These studies, however, have not provided firm evidence of a causal relationship between rinses containing alcohol and oral cancer.^{57–59} Cancer Research UK stresses that smoking and drinking more than 3 units of alcohol daily remain the most important risk factors for oral cancer.⁵⁷

However, the claim of “*sufficient evidence*” has been disputed by Cancer Research UK⁵⁷ and a science brief issued in 2009 by the American Dental Association states that “*studies published to date looking at alcohol-containing mouthrinses and oral cancer have neither established nor refuted a causal relationship between the use of these products and the development of oral cancer.*”⁵⁸

Some alcohol-free mouthrinses are available on the market and some research suggests that they are as effective as their alcohol-containing counterparts.^{60–62}

Interdental Cleaning Aids

Even the most efficient toothbrushing technique would not result in removal of all plaque deposits. Whilst mouthrinsing will help in further plaque control, use of dental floss, wood sticks and interdental brushes (shaped like tiny bottle brushes) are often recommended by dentists and dental hygienists. These cleaning aids are particularly recommended for patients where plaque accumulation may be a particular problem, e.g., patients with extensive fillings, crowns or bridges, orthodontic patients or patients with particular periodontal problems. Interdental cleaning aids are not generally recommended for children as they may damage their gums by incorrect usage.

Plaque Disclosing Agents

It is important to encourage people to monitor the effectiveness of their plaque control practices. Plaque disclosing agents stain the dental plaque which remains on teeth and are a simple way of highlighting deficiencies in brushing technique.



Denture Cleaners and Fixatives

Many people used to think that once they lost all their natural teeth their dental worries were over. This is not the case. When teeth are extracted, the bone that held them in the jaw resorbs (shrinks), so that the bony support for dentures constantly changes. This is a problem particularly in the lower jaw, where extensive bone loss can occur, making it very difficult for some people to control their lower denture. Hence, dentures should be checked every five years. As bone in the mouth constantly changes in shape, it is clear that individuals cannot expect a set of dentures to last for life. Some people may find denture fixatives helpful, but they are only a short term solution. The main constituents of fixatives are tragacanth gum which may cause constipation, and kanaya gum which can decalcify dental enamel. This can be a major problem if the individual still has some natural teeth present. Home-use denture repair kits and relining kits to make dentures fit more comfortably are not recommended. Temporary repair kits are sometimes useful to mend fractured dentures in an emergency, but broken dentures are best mended by a dentist, or a dental technician working in association with a dentist.

Dentures should be cleaned at least once a day with a non-abrasive paste and a soft toothbrush. A soft nail brush is a useful alternative for people whose manual dexterity is compromised.

Soaking the dentures once or twice a week in a diluted 2% sodium hypochlorite solution will help keep them really clean, but they must not be soaked in hot water. Disinfectants containing bleach should not be used on dentures with any metal components.

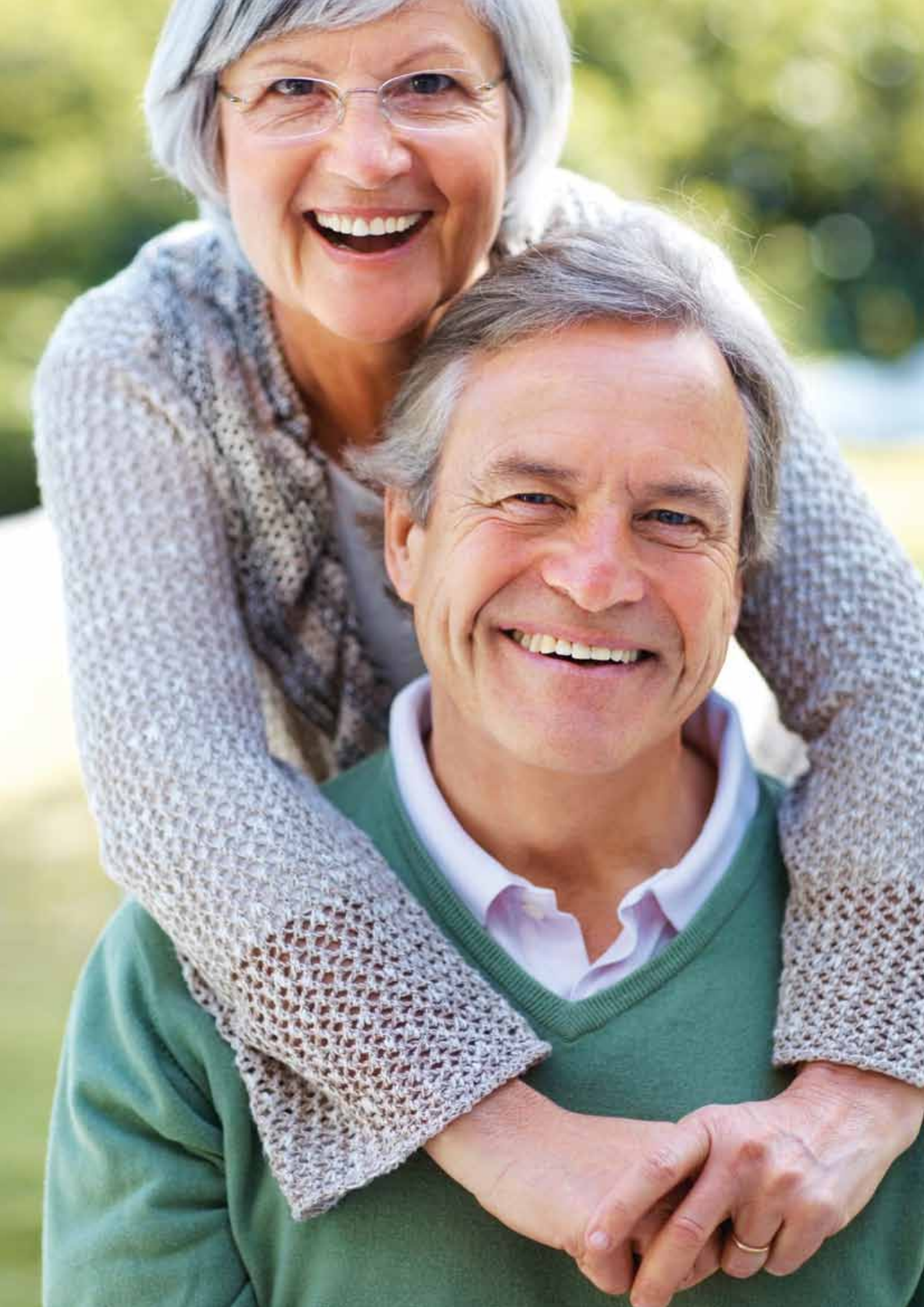
Dentures should be removed before sleeping and kept out of the mouth for 6 to 8 hours each day to give the gums a chance to rest.

Saliva Substitutes

One of the side effects of many drugs and a problem encountered by many older adults is xerostomia or dry mouth. Medical treatments such as radiotherapy can cause long term or even irreversible dry mouth. People with dry mouth can experience severe discomfort and considerable difficulty with eating and speaking. Acupuncture has been in use since the late 1990s as a treatment for dry mouth. Some people get relief by keeping a bottle of liquid at hand to sip as required. If fluoridated water is used, this can be beneficial in the prevention of dental caries; if drinks containing sugar are regularly sipped, rampant caries will result. Some people squirt lemon juice into the mouth to stimulate saliva flow, but lemon juice is acidic and this can result in acid erosion and destruction of the teeth (for people without natural teeth this problem does not arise). In more mild cases, regular use of non-sugar chewing gum can give considerable relief by stimulating salivary flow.

Another useful way to help with the discomfort of this condition is to recommend one of the artificial saliva preparations or oral lubricants. One example of a product range contains mouthrinse, toothpaste and an oral lubricant for those with dry mouth. Saliva substitutes can be useful if used just before eating, at night if a person wakes because of dry mouth, or first thing in the morning. A saliva substitute or oral lubricant that has a neutral pH is best for use by people with teeth, as an acidic product could lead to acid erosion of the teeth. Inclusion of fluoride could also have potential benefits.

- ▶ Dry mouth results from a number of diseases and is a side effect of many drugs; it can give rise to considerable discomfort.
- ▶ Various saliva substitutes or oral lubricants are now available and can give considerable relief.
- ▶ Sugarless gum can be useful to stimulate salivary flow where there is some residual gland function.





References

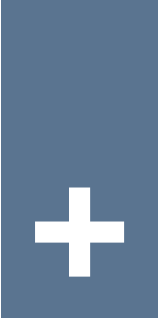
- 1 World Health Organisation. *Strategies for oral disease prevention and health promotion*. Available at: http://www.who.int/oral_health/strategies/en/ [Accessed 2 August 2010].
- 2 World Health Organisation. *The Ottawa Charter for Health Promotion*. Geneva, 1986. Available at: <http://www.who.int/healthpromotion/conferences/previous/ottawa/en/>
- 3 Alm A, Wendt LK, Koch G, Birkhed D. *Prevalence of Approximal Caries in Posterior Teeth in 15-Year-Old Swedish Teenagers in Relation to Their Caries Experience at 3 Years of Age*. *Caries Research* 2007; 41:392–398.
- 4 Raadal M, Espelid I. *Caries prevalence in primary teeth as a predictor of early fissure caries in the permanent first molars*. *Community Dent Oral Epidemiol* 1992; 20:30–34.
- 5 Skeie MS, Raadal M, Strand GV, Espelid I. *The relationship between caries in the primary dentition at 5 years of age and permanent dentition at 10 years of age – a longitudinal study*. *Int J Paediatr Dent* 2006; 16:152–160.
- 6 Sheiham, A. *The role of the dental team in promoting dental health & general health through oral health*. *Int Dent J* 1992; 42(4):223–228.
- 7 Petersen, PE. *The World Oral Health Report 2003: continuous Improvement of oral health in the 21st century – the approach of the WHO Oral Health Programme*. *Community Dent Oral Epidemiol* 2003; 31(Suppl. 1):3–24.
- 8 SCENIHR (Scientific Committee on Emerging and Newly-Identified Health Risks). *Scientific opinion on the Safety of Dental Amalgam and Alternative Dental Restoration Materials for Patients and Users*. 6 May 2008. Available at: http://ec.europa.eu/health/ph_risk/committees/04_scenihr/docs/scenihr_o_016.pdf
- 9 The Irish Expert Body on Fluorides and Health. *Code of Practice on the Fluoridation of Drinking Water 2007*. Available at: <http://www.dohc.ie/publications/pdf/codeofpractice.pdf>
- 10 Whelton H, Crowley E, O’Mullane D, Harding M, Guiney H, Cronin M, Flannery E, Kelleher V. *North South Survey of Children’s Oral Health in Ireland 2002*. Department of Health and Children. Dublin: Brunswick Press Ltd, Final Report – December 2006. Available at: <http://www.dohc.ie/publications/coral.html>
- 11 Whelton H, Crowley E, O’Mullane D, Woods N, McGrath C, Kelleher V, Guiney H, Byrtek M. *Oral Health of Irish Adults 2000–2002*. Department of Health and Children. Dublin: Brunswick Press Ltd, Final Report – April 2007. Available at: http://www.dohc.ie/publications/oral_health02.html
- 12 Moynihan PJ. *The role of diet and nutrition in the etiology and prevention of oral diseases*. *Bulletin of the World Health Organization* 2005; 83(9):694–699.
- 13 Weaver R. *Fluoride and war-time diet*. *British Dental Journal* 1950; 88:231–239.
- 14 Vareecken CA, De Henauw S, Maes L. *Adolescents’ food habits: results of the Health Behaviour in School-aged Children survey*. *British Journal of Nutrition* 2005; 94:423–431.
- 15 Van Dyke TE, Dave S. *Risk Factors for Periodontitis*. *J Int Acad Periodontol* 2005; 7(1):3–7. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1351013/pdf/nihms4855.pdf>
- 16 Li X, Kolltveit KM, Tronstad L, Olsen I. *Systemic Diseases Caused by Oral Infection*. *Clin Microbiol Rev* 2000; 13(4):547–558. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC88948/?tool=pmcentrez>
- 17 Robinson P, Deacon SA, Deery C, Heanue M, Walmsley AD, Worthington HV, Glenny A-M, Shaw BC. *Manual versus powered toothbrushing for oral health*. *Cochrane Database of Systematic Reviews* 2009. Issue 2. Art. No: CD002281. DOI: 10.1002/14651858.CD002281.
- 18 Warnakulasuriya S. *Global epidemiology of oral and oropharyngeal cancer*. *J. of Oral Oncology* 2009; 45(4–5):309–316.

- 19 Conway DI, Petticrew M, Marlborough H, Berthiller J, Hashibe M, Macpherson LM. *Socioeconomic inequalities and oral cancer risk: a systematic review and meta-analysis of case-control studies*. *Int. J. Cancer* 2008; 122(12): 2811–2819.
- 20 O'Sullivan E. *Oral and Pharyngeal Cancer in Ireland*. *Ir Med. J.* 2005; 98(4):102–105.
- 21 Mouth Head & Neck Cancer Ireland, Dental Health Foundation Ireland, Dublin Dental School & Hospital, Cork University Dental School & Hospital, Irish Cancer Society. *Mouth, Head and Neck Cancer 2010*. Available at: http://www.dentalhealth.ie/download/pdf/mouthhead_and_neck_Leaflet.pdf.
- 22 Bartlett DW, Shah P. *A Critical Review of Non-carious Cervical (Wear) Lesions and the Role of Abfraction, Erosion, and Abrasion*. *J Dent Res* 2006; 85(4):306–312. Available at: <http://jdr.sagepub.com/content/85/4/306.full.pdf+html>
- 23 Wiegand A, Attin T. *Influence of fluoride on the prevention of erosive lesions – a review*. *Oral Health Prev Dent* 2003; 1:245–253.
- 24 Grabauskas V. Integrated programme for community health in non communicable disease (Interhealth). In: Leparski E, editor. *The prevention of non communicable diseases: experiences and prospects*. Copenhagen: WHO Regional Office for Europe; 1987.
- 25 Watt RG. *Oral disease prevention and health promotion*. *Bulletin of the World Health Organization* 2005; 83(9):711-718.
- 26 Sheiham A, Watt RG. *The Common Risk Factor Approach: a rational basis for promoting oral health*. *Community Dent Oral Epidemiol* 2000; 28(6):399-406.
- 27 Morgan K, McGee H, Watson D, Perry I, Barry M, Shelley E, Harrington J, Molcho M, Layte R, Tully N, van Lente E, Ward M, Lutomski J, Conroy R, Brugha R. *SLÁN 2007: Survey of Lifestyle, Attitudes & Nutrition in Ireland. Main Report*. Department of Health and Children. Dublin: Stationery Office, 2008. Available at: http://www.dohc.ie/publications/pdf/slan07_report.pdf
- 28 Whelton H, Harrington J, Crowley E, Kelleher V, Cronin M, Perry IJ. *Prevalence of overweight and obesity on the island of Ireland: results from the North South Survey of Children's Height, Weight and Body Mass Index, 2002*. *BMC Public Health* 2007; 7:187. Available at: <http://www.biomedcentral.com/1471-2458/7/187>
- 29 British Heart Foundation website: http://www.bhf.org.uk/keeping_your_heart_healthy/preventing_heart_disease/smoking.aspx [Accessed 15 Jan 2009].
- 30 Pirie K, Peto R, Reeves, GK, Green J, Beral V. The 21st century hazards of smoking and benefits of stopping: a prospective study of one million women in the UK. *The Lancet* 2013; 381 (9861): 133–141. DOI:10.1016/S0140-6736(12)61720-6. Available at: [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(12\)61720-6/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(12)61720-6/fulltext)
- 31 IrishHealth.com website: http://www.irishhealth.com/clin/healthliv/health_ire.html [Accessed 15 Jan 2009].
- 32 Department of Health website: http://www.dohc.ie/issues/smoking_ban/smokekey.html [Accessed 15 Jan 2009].
- 33 Kelly C, Gavin A, Molcho M, Nic Gabhainn S. *The Irish Health Behaviour in School-Aged Children (HBSC) Study 2010*. Department of Health. Dublin: 2012. Available at: http://www.dohc.ie/publications/hbsc_report.html
- 34 The Irish Cancer Society website: <http://www.cancer.ie/reduce-your-risk/your-health/alcohol>.
- 35 European Commission Health and Consumers Directorate-General. *Pure alcohol consumption, litres per capita*. Available at: http://ec.europa.eu/health/ph_information/dissemination/echi/echi_11_en.pdf
- 36 Sjögren P, Nilsson E, Forsell M, Johansson O, Hoogstraate J. *A systematic review of the preventive effect of oral hygiene on pneumonia and respiratory tract infection in elderly people in hospitals and nursing homes: effect estimates and methodological quality of randomised controlled trials*. *J. American Geriatrics Society* 2008; 56(11):2124–30.
- 37 de Oliveira C, Watt R, Hamer M. *Toothbrushing, inflammation, and risk of cardiovascular disease: results from Scottish Health Survey*. *BMJ* 2010; 340:c2451. Available at: http://www.bmj.com/cgi/content/full/340/may27_1/c2451



- 38 DeStefano, Anda RF, Kahn HS, Williamson DF, Russell CM. *Dental disease and risk of coronary heart disease and mortality*. *BMJ* 1993; 306:688–691. Available at: <http://www.bmj.com/cgi/content/abstract/306/6879/688>
- 39 Department of Health & Social Security. *Inequalities in Health: Report of a Working Group (The Black Report)*. London: Her Majesty's Stationery Office, 1980.
- 40 Acheson D. *Independent inquiry into inequalities in health*. London: Her Majesty's Stationery Office, 1998.
- 41 Balanda K, Wilde J. *Inequalities in Mortality. A report on All-Ireland Mortality Data 1989–1998*. Dublin/Belfast: Institute of Public Health in Ireland, 2001.
- 42 Jones CM, Worthington H. *Water fluoridation, poverty and tooth decay in 12-year-old children*. *J. Dent* 2000; 28:389–393.
- 43 Gratrix D, Holloway P. *Factors of deprivation associated with dental caries in young children*. *Community Dent Health* 1994; 11:66–70.
- 44 Provart SJ, Carmichael CL. *The relationship between caries, fluoridation and material deprivation in five-year-old children in County Durham*. *Community Dent Health* 1995; 12:200–203.
- 45 Sweeney PC, Nugent Z, Pitts NB. *Deprivation and dental caries status of 5-year-old children in Scotland*. *Community Dent Oral Epidemiol* 1999; 27:152–159.
- 46 Irish Heart Foundation. *The Irish Heart Foundation Nutrition Guidelines for Heart Health*. Dublin, May 2007. Available at: http://www.irishheart.ie/iopen24/pub/positionstatements/final_nutrition_guidelines2007.pdf
- 47 Chewonthis.org.uk website (published by The Food Commission Research Charity Ltd.): http://www.chewonthis.org.uk/fat_salt_sugar_sugar_facts.htm [Accessed 6 November 2008].
- 48 Drury TF, Horowitz AM, Ismail AI, Maertens MP, Rozier RG, Selwitz RH. *Diagnosing and reporting early childhood caries for research purposes. A report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration*. *J Public Health Dent* 1999; 59(3):192–197
- 49 Nowjack-Raymer RE, Sheiham A. *Numbers of natural teeth, diet and nutritional status in US adults*. *J. Dent Res*. 2007; 86(12):1171–1175.
- 50 Lee JS, Weyant RJ, Corby P, Kritchevsky SB, Harris TB, Rooks R, Rubin SM, Newman AB. *Edentulism and nutritional status in a biracial sample of well-functioning, community-dwelling elderly: the Health, Aging, and Body Composition Study*. *Am J Clin Nutr* 2004; 79:295–302.
- 51 Walsh T., Worthington HV, Glenny AM, Appelbe P, Marinho VCC, Shi X. *Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents*. *Cochrane Database of Systematic Reviews* 2010. Issue 1. Art. No.: CD007868. DOI:10.1002/14651858.CD007868.pub2.
- 52 Ammari AB, Bloch-Zupan A, Ashley PF. *Systematic review of studies comparing the anti-caries efficacy of children's toothpaste containing 600 ppm of fluoride or less with high fluoride toothpastes of 1,000 ppm or above*. *Caries Research* 2003; 37:85–92.
- 53 Steiner M, Helfenstein U, Menghini G. *Effect of 1000 ppm relative to 250 pp fluoride toothpaste. A meta-analysis*. *Am J Dent*. 2004; 17(2):85–88.
- 54 Walsh T, Worthington HV, Glenny AM, Appelbe P, Marinho VCC, Shi X. *Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents*. *Cochrane Database of Systematic Reviews* 2010, Issue 1. Art. No.: CD007868. DOI: 10.1002/14651858.CD007868.pub2.
- 55 Holland TJ, Whelton H, O'Mullane D, Creedon P. *Evaluation of a fortnightly school-based sodium fluoride mouthrinse 4 years following its cessation*. *Caries Research* 1995; 29(6):431–434.
- 56 Marsh PD. *Contemporary Perspective on Plaque Control*. *British Dental Journal* 2012; 212: 601–606. DOI 10.1038/sj.bdj.2012.524.
- 57 Yinka Ebo. "Does mouthwash cause cancer?" *Cancer Research UK website*: <http://scienceblog.cancerresearchuk.org/2009/01/14/does-mouthwash-cause-can>, 14 January 2009 [Accessed 25 February 2010].
- 58 American Dental Association. "Science brief on alcohol-containing mouthrinses and oral cancer." *American dental*

- Association website: http://www.ada.org/prof/resources/topics/topics_cancer_brief_mouthrinses.pdf, March 2009 [Accessed 25 February 2010].
- 59 Gandini S, Negri E, Boffetta P, La Vecchia C, Boyle P. Mouthwash and oral cancer risk quantitative meta-analysis of epidemiologic studies. *Ann Agric Environ Med*. 2012; 19(2): 173-80. Available at
- 60 Herrera D, Roldan S, Santacruz I, Santos S, Masdevall M, Sanz M. *Differences in antimicrobial activity of four commercial 0.12% chlorhexidine mouthrinse formulations: an in vitro contact test and salivary bacterial counts study*. *J Clin Periodontol* 2003; 30:307–314.
- 61 Eldridge KR, Finnie SF, Stephens JA, Mauad AM, Munoz CA, Kettering JD. *Efficacy of an alcohol-free chlorhexidine mouthrinse as an antimicrobial agent*. *J Prosthet Dent* 1998; 80:685–690.
- 62 Bahna P, Hanna HA, Dvorak T, Vaporciyan A, Chambers M, Raad I. *Antiseptic effect of a novel alcohol-free mouthwash: A convenient prophylactic alternative for high-risk patients*. *Oral Oncol* 2007; 43:159–164.
- Other Reading:**
- Berkovitz BKB, Holland GR, Moxham BJ. *A Colour Atlas and Textbook of Oral Anatomy*. Wolfe Medical Publications Ltd., London 1978.
- Blinkhorn A, Fuller S, Mackie I. *Oral health care products: Advice on what to recommend to customers for a healthy mouth*. Eden Bianchi Press, Manchester 1995.
- Citizens Information Board. *Dental Services*. Available at http://www.citizensinformation.ie/en/health/dental_aural_and_optical_services/dental_services.html
- Edgar WM, O'Mullane DM. *Saliva and Oral Health*. 2nd Edition. BDJ: London 1996.
- Growing Up in Ireland – National Longitudinal Study of Children*. Available at <http://www.growingup.ie/>.
- Health Promotion Agency for Northern Ireland. *Nutrition and Dental Health. Guidelines for Professionals*. Revised 2008. Health Promotion Agency and EH&SSB, Belfast 2008.
- Irish Oral Health Services Guideline Initiative. *Oral Health Assessment: Best practice guidance for providing an oral health assessment programme for school-aged children in Ireland*, 2012. Available at <http://ohsrc.ucc.ie/html/guidelines.html>
- Irish Oral Health Services Guideline Initiative. *Pit and Fissure Sealants: Evidence-based guidance on the use of sealants for the prevention and management of pit and fissure caries*, 2010. Available at <http://ohsrc.ucc.ie/html/guidelines.html>
- Irish Oral Health Services Guideline Initiative. *Strategies to prevent dental caries in children and adolescents: Evidence-based guidance on identifying high caries risk children and developing preventive strategies for high caries risk children in Ireland*, 2009. Available at <http://ohsrc.ucc.ie/html/guidelines.html>
- Irish Oral Health Services Guideline Initiative. *Topical Fluorides: Evidence-based guidance on the use of topical fluorides for caries prevention in children and adolescents in Ireland*, 2008. Available at <http://ohsrc.ucc.ie/html/guidelines.html>
- Levine RS, Stillman-Lowe CR. *The Scientific Basis of Oral Health Education*. British Dental Association, 2004.
- Rugg-Gunn AJ. *Nutrition and Dental Health*. Oxford University Press, 1993.
- The Dental Trauma Guide* website (produced in cooperation with the Resource Centre for Rare Oral Diseases and Department of Oral and Maxillo-Facial Surgery at the University Hospital Copenhagen): <http://www.dentaltraumaguide.org/>



Acknowledgements

We would like to express our appreciation to the Officials at the Department of Health for their advice and assistance in the preparation of this publication; in particular to Ms Teresa Cody, Principal Officer, Ms Bernadette McDonnell, Assistant Principal Officer, Mr Roger Harrington, Former Assistant Principal Officer, Mr Peter Henshaw, Primary Care and Ms Ursula O'Dwyer, Consultant Dietician, Health Promotion Policy Unit.

We also thank the Dental Health Foundation Scientific Advisory Committee for its support. The generosity of time and advice of Professor John Clarkson (Chair) and of the Committee has ensured that this document remains a consensus of expert opinion. The areas of expertise contributed by the members of the Committee are as follows:

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The Dental Health Foundation staff Ms Pheena Kenny and Ms Etain Kett are gratefully acknowledged for their work on this document and Dr Mary Coleman (Trustee) is sincerely thanked for her contribution.

And finally, this second edition of *Oral Health in Ireland* would not have been possible without the research and editorial services of the Oral Health Services Research Centre, University College Cork and the funding support of the Health Service Executive.

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