

# ORAL HEALTH DIALOGUE

2014

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## Editorial



Dear readers,

We believe in progress and, as Irish playwright George Bernard Shaw puts it, 'Progress is impossible without change'. So the editorial team has embraced this idea whole-heartedly in preparing this edition of Oral Health Dialogue, and the result has been an exciting 'face lift' of both appearance and content.

We hope that this brand-new modern look, layout and logo – plus a more approachable style – will enable us to speak more effectively about the current important issues in oral health, to a wider community of dental professionals. This issue is dedicated exclusively to caries – our first one-subject issue.

We would like your reaction to this innovative approach, and also feedback about the new appearance and content of the Oral Health Dialogue. Please contact us at [eugenio\\_garcia@colpal.com](mailto:eugenio_garcia@colpal.com)

Effie Mataliotaki  
Head Europe External Affairs & Communications  
Colgate-Palmolive



Dear readers,

Caries is a preventable disease, but after 50 years of scientific research and investment it continues to be the most prevalent condition in the world – tooth decay (which is also known as dental caries) affect up to 80% of the world's population.<sup>1</sup> – and spending on it still represents as much as 5–10% of public health expenditure related to oral health. We feel that progress to tackle it is long overdue.

Through this single-issue approach we want to offer you a satisfying opportunity to look at this topic in depth, with a focus on the need for an evidence-based approach to treatment and prevention of cavities. We are also showcasing the range of new technologies, and examining their vital contribution to making progress. We highlight oral health as an issue of equality – with certain parts of the world and communities disproportionately affected – and consider the suffering it causes.

We hope that this one-topic issue will fuel your thoughts about how to consign dental decay to history – whether via scientific progress or improvements in public education.

Bärbel Kiene  
Director Scientific Affairs Europe  
Colgate-Palmolive

<sup>1</sup> World Health Organization, Report on Oral Health, 2003. Available at [http://www.who.int/oral\\_health/media/en/orh\\_report03\\_en.pdf](http://www.who.int/oral_health/media/en/orh_report03_en.pdf). [Last accessed June 2013]

## Why a new technology is needed to combat dental caries

The widespread introduction of fluoride toothpastes in the 1960s and 1970s is widely credited as being the single most important factor responsible for the huge decline in tooth decay in many countries in the subsequent decade. [<http://www.who.int/bulletin/volumes/83/9/670.pdf> ] Half a century later – despite huge amounts of investment in treating dental caries – improvements have plateaued. Spending on it still represents as much as 5–10% of public health expenditure related to oral health, in a number of industrialised countries.

New technologies on the horizon today are the key to change, according to Dr Roger Ellwood. He talked to the Oral Health Dialogue about their crucial role in eliminating dental decay for good.

### HOW RELEVANT IS THE PROBLEM OF DENTAL DECAY TODAY?

This is a good question. Dental decay may not be in the same category as cancer and heart disease in threatening public health, but oral disease including dental caries and periodontitis, ranks as the fourth most expensive condition to treat world wide and causes a great deal of suffering to the majority of children and adults. Globally, children miss 51 million hours of school each year because of dental caries and in the UK, it was the fourth most common reason why children were admitted to hospital in 2012. When one takes into account the evidence linking infections in the mouth with other chronic diseases of later life such as heart disease, diabetes and respiratory disease, one is looking at an important threat which should not be ignored, especially as dental decay is both preventable and reversible.

### HOW WIDESPREAD IS THE PROBLEM ACROSS EUROPE?

Across Western Europe there has been a dramatic decline in the prevalence of dental caries. In these countries the mean DMFT in 12 year olds is ~1. However the picture is very different in Eastern Europe, and some areas of Central Europe, where the mean DMFT = 3–4 in 12-year-old. Some countries, such as Latvia and Poland, appear to have experienced some decline in caries over the past

decade, but some, have experienced an increase in recent studies.

It is also significant to note that dental decay is one of few conditions that can affect individuals at

#### Caries prevention beyond fluorides

### 12<sup>TH</sup> CONGRESS OF THE EUROPEAN ACADEMY OF PAEDIATRIC DENTISTRY (EAPD)

Colgate-Palmolive Europe recently sponsored a scientific forum entitled 'Caries prevention beyond fluoride', which was held as part of the 12<sup>th</sup> Congress of the European Academy of Paediatric Dentistry (EAPD), which was held between June 5 and 8, 2014, in Sopot, Poland. The symposium was attended by an audience of more than 500 and was presented by four of Europe's leading cariologists and paediatric dentists:

- Professor Urszula Kaczmarek, Wrocław Medical University, Poland
- Professor Svante Twetman, University of Copenhagen, Denmark
- Professor Elmar Hellwig, University of Freiburg, Germany
- Professor Bob ten Cate, Amsterdam Academic Centre of Dentistry, the Netherlands.

The speakers discussed our most recent understanding of caries as a biofilm mediated disease and the worrying increase in the incidence of caries that has been observed in some countries in recent years. They agreed that there is overwhelming evidence to support the use of topical fluoride in caries prophylaxis and that no alternative to fluoride currently exists for this purpose. The speakers concluded that new approaches and technologies are needed in caries prophylaxis and treatment, due to the observation that topical fluoride affords only a limited protection under highly cariogenic conditions.

Professor ten Cate also spoke about the recent introduction of Maximum Cavity Protection by Colgate, which combines Sugar Acid Neutraliser™ Technology and fluoride. This toothpaste fights sugar acids in plaque as well as re-mineralizing caries lesions and has been clinically proven to reduce tooth decay.

each life stage, from birth, through adolescence and adulthood, into old age.

### ARE DENTAL DECAY RATES CONSISTENT ACROSS POPULATIONS IN EUROPE?

No, this is not the case at all. There are profound inequalities even within countries with a relatively good record of treating caries, such as the UK, Switzerland and the Netherlands. As an example, take the findings of Pitts et al (Community Dent Health. 2005 Mar; 22(1): 46–56) which showed a wide discrepancy in disease prevalence among British five year olds, ranging from a mean DMFT of 0.47 in some prosperous areas of the south of England, to 3.69 in deprived areas of the north. Caries risk is particularly associated with socio-economic deprivation.

### WHAT IS THE ROLE OF ORAL HYGIENE ROUTINES IN TACKLING DENTAL DECAY?

Education is the basis of all preventative work. Only 41% of Europeans claim to have all their original teeth, and research indicates many of them still do not know how to follow routine oral hygiene practices, such as using fluoride-containing toothpaste, mouthwashes, inter-dental cleaning, chewing sugar-free gum and attending regular dental check ups. We know it works and a good example is Denmark, where children's oral health was among the poorest in Europe. Thanks to targeted preventive efforts by the public oral health care service, children and young people in Denmark now have Europe's best oral health in terms of mean DMFT (decayed, missing or filled teeth). The same can be observed in the UK where 2/3 of 12 year olds were found to be free of visible dental decay in 2009, compared with less than 10% in 1973.

### WHAT HAS MADE THE BIGGEST DIFFERENCE?

The widespread use of fluoride toothpastes has

been widely acknowledged by academic experts, the dental profession, and professional health organisations to be the single most important factor contributing to the decline in caries over the past decades.

### WHY DO WE NEED TO LOOK FOR NEW TECHNOLOGIES?

The cost of maintaining teeth – especially for adults in the second half of their lives who often have heavily restored teeth – is rising.

(However useful they have been in the fight against dental decay,) topical fluoride products alone do not target plaque – arguably the pathological factor most easy to modify in caries. Currently-available fluoride products help to control, but they cannot completely prevent dental caries. As fluoride's benefits are focused on the host tissue as a means of damage control after the caries process has been initiated and is in progress, combining fluoride with an agent that targets plaque pathogenicity, and prevents the caries process, would have potential to deliver a step-change improvement in caries prevention.

### WHAT ARE THE MOST PROMISING TECHNOLOGIES ON THE HORIZON?

The most remarkable caries innovation coming onto the market is a range of new fluoride toothpastes, to which the amino acid arginine and an insoluble calcium compound has been added. *In situ* trials have shown that this combination significantly promotes remineralisation, as well as simultaneously preventing the demineralisation of enamel. These effects are *significantly reduced* with toothpastes containing the same level of fluoride alone.

A next generation toothpaste technology based on 1.5% arginine, an insoluble calcium compound, and 1450 ppm fluoride has been developed and clinically validated.

This new technology can prevent changes in the mouth conducive to acid-producing bacteria and help maintain a 'healthy' plaque when challenged with dietary sugars. In this way it will be possible to make new strides in the prevention of caries.

# Fluoride toothpaste with 'a difference' provides new hope in fight against dental decay

Dental caries is one of the most prevalent chronic diseases affecting the majority of the world's population. A percentage of 10–20% of both children and adults are severely affected. Dental caries is 100% preventable! A number of measures that have the potential to prevent arrest and reverse caries lesions in their early stages are available today.

Traditionally, dental caries has been treated with the 'drill and fill' approach. However this philosophy has changed and nowadays, new guidelines are available for management of the disease, focusing on the preventive, rather than the surgical aspect of treatment. This is the result of the fact that a continuum of the disease has been recognized, where prevention and treatment at early stages can be applied, so as to arrest the progression of the early caries lesions. Topical fluoride application is the basis of any caries management protocol, but there are limitations in its effectiveness in controlling progression and severity. Anticaries, antimicrobials and remineralising agents can act together with fluoride to improve its efficiency. These agents were examined in two international conferences (ICNARA 1, 2008 and ICNARA 2, 2012) and were critically evaluated. The consensus of ICNARA 2 was that 'caries should be detected and monitored in early stages when a nonsurgical approach can be achieved and caries prevention protocols should encompass fluoride with other agents affecting the de-/remineralization balance but also antimicrobials strategies' (ten Cate, 2012).

### EARLY DETECTION

Success of all anti-caries agents depends on a robust and standardised system of early detection. The most promising diagnostic system today is ICDAS – the international convention for 'staging' caries after detection. This system is suitable for use across all areas of clinical practice, research, epidemiology and education.

ICDAS ranks cavities by severity (scale from 0 to 6) and activity of the lesion (+ or -), it is easy to learn and freely available. Studies show that ICDAS is accurate in diagnosing caries lesions. Use of the index severity component, for classification of the lesions on primary (Guedes et al, 2014) and permanent teeth (Ferreira Zandoná et al, 2012)

has also shown that ICDAS is a good predictor of lesion progression to cavitation.

### CARIES RISK ASSESSMENT

Caries risk is the chance of a person to develop caries lesions in a specific time period in the future if exposure to caries risk factors remains unchanged. Nowadays, caries risk assessment is fundamental for managing the disease in what concerns both prevention and treatment. For this purpose, several methods are available today (eg. ICCMS, Cariogram, CAMBRA, ADA, AAPD, SIGN), but their validity is limited due to lack of clinical trials (Fontana et al, 2008, Featherstone & Doméjean, 2012). Nevertheless, the clinician must use professional knowledge and expertise together with scientific data to assess patients' caries risk. A strong predictor for all ages, are early signs of active caries, indicating the need for early detection (Tvetman & Fontana, 2009).

### THE POWER OF FLUORIDE

The use of fluoride in caries prevention is well established and supported by ample of literature both for its efficacy and safety. Several comprehensive reviews have shown that regular brushing with fluoride toothpaste containing at least 1000 ppm fluoride reduces the development of coronal cavities by approximately 25%, compared to brushing with non-fluoride toothpaste (Wong et al, 2011, Walsh et al 2010). Efficacy increases both with the level of fluoride and with the frequency of

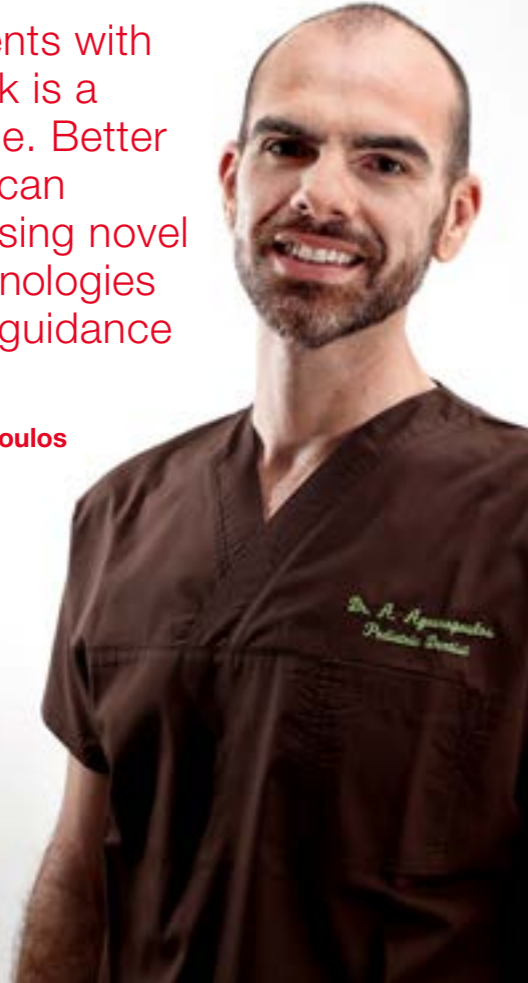
## RESOURCES

The ICDAS foundation has provided a range of resources to help with implementation of ICDAS Including

- e-learning package with CPD
- iPad application for collecting data
- Visit the site at: [www.icdas.org](http://www.icdas.org)

‘Treating patients with high caries risk is a great challenge. Better management can be provided using novel anticaries technologies together with guidance and support.’

**Dr. Andreas Agouropoulos**  
DDS, PhD



use of the toothpaste (Walsh et al 2010). The evidence for the effectiveness is high, while for developing fluorosis, when brushing before the age of 1, is weak and unreliable (Wong et al, 2011).

Other topical fluoride modalities with well documented effectiveness are varnishes, gels and mouthrinses. Fluoride varnish has a substantial caries-inhibiting effect on permanent (Prevented Fraction – PF 43%) and primary teeth (PF 37%) (Marinho et al, 2013). A similar effect has been shown for fluoride gels with PF 21% (Marinho et al, 2002) and mouthrinses with PF 26% (Marinho et al, 2003). The evidence of the above has been rated by Cochrane as moderate due to the quality of the existing studies (Marinho, 2009).

## OTHER AGENTS

### Antimicrobials

A better understanding of the microbiology of dental caries, has led to a shift on the focus from biofilm composition to the overall functionality of the oral microbiota (Zaura, 2012). There is a consensus that new antimicrobial agents should be more selective in eliminating specific cariogenic bacteria rather than broad spectrum chemotherapeutic agents (eg. chlorhexidine). A novel technology called Specifically Targeted Antimicrobial Peptides (STAMP) has been developed and is currently under clinical investigation (Eckert et al, 2012). Another approach is the use of light of various wavelengths, which penetrates biofilms and has antibacterial effects in the deep layers of plaque, where conventional antimicrobials have insufficient action (Feuerstein, 2012). Ozone has also been used as antibacterial agent and has been shown to stimulate remineralization of recently caries-affected teeth in the presence of fluoride. Although *in vitro* experiments suggest a promising potential of ozone in dentistry, this has not been proved in clinical studies to date (Rickard et al, 2004, Azarpazhooh & Limeback, 2008)

### Probiotics

Modulation of the microbiota in biofilms so as to restore and maintain health is the basis for the use of probiotics (Beighton, 2009). There is sufficient evidence that probiotics have a beneficial effect on the gut microbiota and the gastrointestinal health. Several clinical trials have shown a promising effect on dental caries prevention when probiotics are used but there are limitations and the mechanisms of action are not clear yet. Nevertheless, this is a field of growing interest and more randomized controlled trials will provide evidence for their clinical use (Tvetman & Keller, 2012).

### Polyols

The effectiveness of replacing sugars with polyols (eg. xylitol, maltitol, erytritol) for caries prevention has been widely accepted and many health organisations worldwide support the habitual use of sucrose-free xylitol or polyol combinations in chewing gums and/or lozenges for high caries risk populations. Xylitol inhibits metabolism and reduces maternal transmission of *S. mutans* to the offspring with habitual use. There is limited evidence on maltitol and erytritol (Milgrom et al, 2012).

Current knowledge supports the use of xylitol in chewing gums, confections and lozenges for frequent use while toothpastes, syrups and slowly dissolved disks are currently under investigation. Further research is needed to elucidate the mechanisms of action of these sweeteners and establish dosage and usage protocols, especially when used in combination with other preventive agents (mainly topical fluorides), so as to provide conclusive evidence (Fontana & González-Cabezas, 2012).

### Remineralizing agents

In recent years, various agents that promote remineralization, mostly sources of bioavailable calcium and phosphate, with synergistic to fluoride effects, have been tested. The most established one is the casein phosphate peptide – amorphous calcium phosphate (CPP-ACP), a nanocomplex that is a valuable extrinsic calcium reservoir for the oral cavity. CPP-ACP complexes are stable in the presence of fluoride and have been shown to inhibit demineralization and promote remineralization (Nongonierma & Fitzgerald, 2012). A number of *in situ* models and clinical trials have indicated that, when the agent is used in mouthrinses, toothpastes, sugar free gums and creams, not only prevents caries lesions development but also enhances their regression. Most authors of these studies agree that CPP-ACP should be used in combination with fluoride and not alone (Cochrane NJ, Reynolds 2012).

Another promising agent is functionalized  $\beta$ -tricalcium phosphate ( $\beta$ -TCP) that serves as a bioactive source of mineralizing components in synergy with fluoride. Although more research is needed, it seems that, supplementing fluoride products with  $\beta$ -TCP, can result in a formation of stronger and more acid resistant minerals than fluoride alone, suggesting a promising agent for robust remineralization (Karlinsky & Pfarrer, 2012).

The newest approach in the remineralization field is nanotechnology. Apart from the CPP-ACP nanocomplexes, a number of other nanoparticles have been developed for prevention and early caries lesion management. Various types of nano-sized hydroxyapatite or calcium carbonate have been tested with *in vitro* experiments. Although these agents seem to sufficiently promote remineralization of initial caries lesions *in vitro*, this occurs in the surface layer only and not in the body of the lesion. Another approach is the use of biomimetic strategies for artificial enamel

formation that might have the potential to repair enamel surface damage. This approach, although promising needs further research because little is known about the mechanical properties and the clinical stability of the produced enamel and its behavior to a new caries attack. Finally, in order to overcome the problem of secondary caries on the margins of restorations, ion releasing nanofillers have been added to composite resins with promising results. These particles release  $F^-$ ,  $Ca^{2+}$ ,  $PO_4^{3-}$ , or antibacterial agents. All the above approaches still lack clinical testing but the laboratory findings indicate that in the future, these novel technologies might be interesting for caries management (Hannig & Hannig 2012).

## ARGININE

Fluoride helps to arrest and reverse the caries process, but it does not affect acids produced by cariogenic bacteria. Arginine is an agent that is metabolized by non-pathogenic arginolytic oral bacteria, resulting in the formation of ammonia, a base that counterattacks the cariogenic acids produced in dental plaque. This action is complementary to the action of fluoride on preventing and reversing caries process. The effectiveness of the combination of fluoride and 1.5% arginine in toothpaste, has been tested in several clinical

Evidence for effectiveness of topical fluoride products

## COCHRANE ORAL HEALTH GROUP: SYSTEMATIC REVIEWS

- Fluoride gels for preventing dental caries in children and adolescents. Marinho VCC, et al (2002).
- Fluoride varnishes for preventing dental caries in children and adolescents. Marinho VCC, et al (2002).
- Topical fluoride (toothpastes, mouthrinses, gels or varnishes) for preventing dental caries in children and adolescents. Marinho VCC, et al (2003).
- Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents. Walsh T, et al (2009).

# Questioning the evidence

trials and it was found to be significantly more effective than fluoride alone in arresting and re-mineralizing early caries lesions (Yin et al, 2013, Srisilapanan et al, 2013) and root caries lesions (Hu et al, 2013, Souza et al, 2013). Additionally, the same combination has been evaluated in a 2-year caries clinical trial and has been shown to be significantly more effective than fluoride alone, in reducing the progression of early caries lesions to cavitation (Kraivaphan et al, 2013). This new technology represents a major advancement in caries management, and a paradigm shift in the effort to improve the efficacy of topical fluorides.

## Importance of recall and monitoring

Patient recall is a continuing care regime which provides opportunities to reassess and monitor the oral health of patients. There is some evidence that recall visits have a positive impact on the maintenance of a natural and functional dentition but there is no reliable evidence about the timing of recall visits despite the widely adopted 6-month interval (Clarkson et al, 2009). Furthermore, one of the barriers in the past, for the adoption of new approaches in caries management, has been the

lack of evidence of the efficacy of some of the proposed treatments. This underlines the importance of monitoring the result of interventions and recording the progress of the lesions (Pitts, 2004), assessing the risk of the patient and individualizing the recall and monitoring plans.

## Conclusion

The shift from the surgical to a preventive model of dentistry is the key to progress towards a cavity-free future. The change of focus towards prevention has allowed the development of the fluoride modalities in the past 40 years, which have been proved revolutionary in the fight against dental caries. Nevertheless, fluoride alone is not sufficient in controlling the caries process in high risk individuals. New technologies which act synergistically with fluoride will provide better management of initial caries lesions and prevent caries development. Regulatory changes for product acceptance are needed so as to accommodate the new knowledge. In addition, dental teams should incorporate new clinically proven technologies to their caries management protocols and also support their patients to maintain better home oral health care routines.

**‘Aristotle maintained that women have fewer teeth than men; although he was twice married, it never occurred to him to verify this statement by examining his wives’ mouths.’**

Bertrand Russell, British philosopher and logician

In a busy dental practice, serving all the patients and managing short appointment slots can be challenging, especially with the increasing time dedicated to preventative dentistry. The clinical teams need to be confident that both the care they administer and what they advise their patients to do, is according to evidence based dentistry (EBD).

EBD as stated by the American Dental Association (ADA) improves patient care by integrating three important aspects of clinical practice: 1. A dentist’s expertise, 2. A patient’s needs and preferences and 3. The best available scientific evidence. Actually it is not only the dentist’s expertise but all dental care professionals (DCP), including for example the dental hygienist/therapist, dental surgeon and orthodontist. In addition, if a product/regimen or method is the best option, the DCP is willing to use it and the patient is enthusiastic, it needs to be available in the setting, be cost efficient and affordable.

The Centre for Evidence-based Dentistry (CEBD) provides on their website the five step approach for practising EBD, including practical examples. The first steps are defining a question and finding the related evidence. That is also the start of the challenge, due to the enormous amount of evidence and its variable quality. Finding good or rather the right evidence is not always easy and therefore decisions are often taken based on the status of the DCP rather than the strength of the evidence. Appraising the evidence is time consuming and requires training. Many websites such as CEBM provide tools for appraising scientific literature. Different journals are also available with already appraised literature such as Evidence-Based dentistry and Journal of Evidence-Based Dental Practice.

In addition evidence hierarchies reflect the relative authority of various types of studies. There is no single, universally-accepted hierarchy of evidence. Randomized controlled trials (RCTs) rank above observational studies, while expert opinion and anecdotal experience are ranked at the bottom. Some evidence hierarchies place systematic review and meta-analysis above RCTs,

## HOW TO PRACTISE EBD – THE FIVE STEP APPROACH

**A structured (stepwise) process for dealing with clinical problem, encouraging the use of the latest information rather than a reliance on techniques, materials and treatments learned years earlier.**

- 1. Question – Developing a clear question based on the patients clinical problem.**
- 2. Find – Finding the latest evidence through efficient searching for information.**
- 3. Appraise – Critically appraising the evidence to assess its value.**
- 4. Act – Acting on the evidence you find, if appropriate and relevant to the clinical situation to provide treatment for the patients.**
- 5. Evaluate – Each aspect of your performance in this process can, and should be evaluated and this is increasingly relevant with the development of continuing professional development.**

Ref: CEBD – Centre for Evidence-based Dentistry

since these often combine data from multiple RCTs, and possibly from other study types as well.

Several websites provide already appraised literature that can be used for daily EBD care. The ADA EBD website has a free of charge database with critical summaries that help learning about the principal findings of a systematic review. The critical summary offers a peer-reviewed opinion concerning the quality of the review and the validity of the interpretations, and it offers additional insights into the implications for clinicians. It includes: 1) a brief summary of the Systematic Review; 2) a critique of the systematic review methods as well as the identified evidence; and 3) implications for clinicians. They have been prepared by ADA Evidence Reviewers who have experience in EBD or peer-reviewed scientific publications. In addition the plain language summaries are short and easy-to-read summaries of systematic reviews. They are written so that an informed patient can understand the key points of scientific evidence without getting into the clinical

## Measuring suffering – an evolving science



‘Several websites provide the dental professional with critically appraised literature and this information is very useful for evidence based dentistry.’

**Dagmar Slot, Researcher,  
Academic Centre for  
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details behind the analysis. With this knowledge, the dentist and patient can work together on the best treatment options.

Less known but also very valuable is the CAT library of the University of Texas. A CAT is a ‘Critically Appraised Topic’ related to a clinical dental problem. The students and faculty work together to find and report the strongest, most recent, and most relevant evidence pertaining to dental diagnosis and treatment. This online library rapidly provides users with up-to-date evidence-based answers to focused clinical questions. It has the option to search by key words or browse by dental specialty area. The CATs are updated as new research is published. DCPs are invited to leave a brief comment if they wish on each CAT. The comment may be related to their clinical experience and/or to new published evidence related to the question and will become a part of the CAT that subsequent users will be able to read.

When the highest and best evidence is found, then the EBD decision needs to be made. Being aware of the available evidence is one thing, but acting on it is another. The final step of the evidence-based approach is self-evaluation. Ending in a continuous process in order to provide the best care and enjoying our profession!

Measuring the impact of caries on individuals and society is a developing process, but DALYs (disability-adjusted life years) can provide powerful insights into the burden of dental decay in the context of other conditions, according to a presentation at the 61<sup>st</sup> Congress of the European Organisation for Caries Research in Greifswald, Germany, in 2014.

Dr Eduardo Bernabé examined the findings of the 2010 Global Burden of Dental Caries Study to demonstrate the value of DALYs for health policy makers and researchers, of quantifying the population burden associated with dental decay, in comparison with other health conditions like migraine and asthma. It builds on the earlier, and more limited, GBD 1990 study.

As the global disease burden has continued to shift away from communicable to non-communicable diseases, and from premature death to years lived with disability, the need to measure suffering itself has become more acute. DALYs represent a composite measurement of suffering due to disease and injury in populations, which captures both premature mortality and the prevalence and severity of ill-health.

What DALYs give is perspective. Untreated cavities accounted for 5 million DALYs globally in 2010 – a 35% increase from 1990. No one claims that dental caries are fatal, but untreated caries in permanent teeth is the most prevalent condition in the world (affecting 35.3% of the population – the equivalent of some 2,431 million individuals). The next most prevalent conditions are tension headache and migraine. Cavities in primary teeth are ranked at number 10.

Doctor Bernabé says: ‘DALYs is a validated measure and there is now plenty of literature to back it up. It has now been simplified, to remove the need for complicated adjustments the earlier versions required, so it is now much more useful.’

### WHAT DO DALYS TELL US ABOUT DENTAL DECAY?

Although untreated caries are located at the mild end of the disability scale, the total caries burden of disease (DALYs) has increased by 38.1% between 1990 and 2010. In primary teeth too, the DALYs burden has increased too over the same period by 5.3%. Men and women suffer equally from untreated dental decay, but the use of DALYs

opens up a picture of inequality. The burden on some groups is greater than others – particularly those already suffering from economic deprivation.

It is known that in the USA, caries is the most common chronic disease of childhood and is five times more common than asthma, and its impact can be significant. In the UK, Canada and the USA, there is evidence that early caries greatly affect the quality of life of children. A less well known finding is that among Aboriginal children in Western Australia, dental caries is the fifth most common disease leading to hospitalisation in pre-schoolers aged 1–4 years old, and the sixth most common for children aged 5–12.

Such information which can be revealed in DALYs could be a powerful tool for planners of dental health services. Significant strides have been made in caries prevention in children. In Denmark, where children’s oral health was among the poorest in Europe, they now have Europe’s best oral health in terms of mean DMFT (decayed, missing or filled teeth). The same can be observed in the UK where 2/3 of 12 year olds were found to be free of visible dental decay in 2009, compared with less than 10% in 1973.

A surprising finding included in Bernabé’s presentation, is that the peak age for disease burden is 25 years. The reason for this peak has not yet been established, but is probably linked with lifestyle changes young people make as they enter adulthood. The establishment of this peak, through the use of DALYs, contradicts one popular misconception – that caries is primarily a childhood disease.

Other studies back this finding. Locker reported in Canada that one third of adults over 50 years old reported problems with eating, communication and social interaction as a result of dental caries and 18.7% worried a great deal about their oral health.

### WHERE ARE THE GLOBAL HOT SPOTS?

Bernabé’s presentation made it clear that despite the widespread drop in the prevalence and severity of dental decay in permanent teeth in high income countries over the past decades, significant inequalities still remain – with the major burden of untreated caries (per person) concentrated

### WHERE TO FIND INFORMATION:

ADA (American Dental Association) Center for Evidence Based Dentistry: <http://ebd.ada.org/en/>  
University of Texas, Health Science Center, dental school, Critical Appraised Topics: <https://cats.uthscsa.edu/>  
Centre for Evidence-based Dentistry (CEBD): <http://www.cebd.org/>

Dagmar Else Slot, dental hygienist working in a private practice and as a researcher in the Department of Periodontology of Academic Centre for Dentistry Amsterdam (ACTA) focused on preventive and therapeutic procedures. She has participated in preparing systematic reviews and clinical research.



**Dr. Eduardo Bernabé,  
Senior Clinical Lecturer  
in Dental Public Health,  
King's College, London**

on Central Europe (which roughly corresponds to the Eastern European countries of the EU) and South Asia.

Central Europe has the worst record in the world – with 101 DALYs per capita – followed by South Asia at 96 DALYs per capita. Eastern Europe (at 91 DALYs per capita) is next in the burden ranking. Before 1989, many of these Eastern European countries had state dental services in schools, which closed after the fall of the Berlin Wall, leaving many people without affordable and accessible care.

The use of DALYs can be an invaluable tool to assist health economists to plan dental services. Even among EU member states, evidence suggests that more than half of countries do not put a policy emphasis on reduction of inequalities, according to the Oral Health Platform.

No systematic reassessment of disease and injury-specific epidemiology had been done since the 1990 study. The 2010 study aimed to calculate disease burden worldwide and for 21 regions for 1990, 2005, and 2010, with methods to allow meaningful comparisons over time.

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## WHAT NEXT?

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The implications of this study for oral health care investment are useful in planning workforce needs and in the content of dental education. One of the fundamental challenges is responding to the diversity of urgent oral health needs for communities.

In Bernabé's view, the 2010 study represents a call to action. He said: 'There has been a prevailing idea that dental caries is only a problem with children, but we have shown that this is clearly not true. Now that it is obvious there is a problem with adults too, we need to look at people's dental care and services across their whole life course – not just at children.'

## IMPRINT

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