

Commentary

Effective use of fluorides for the prevention of dental caries in the 21st century: the WHO approach

Poul Erik. Petersen¹ and Michael A. Lennon²

¹Oral Health Programme, World Health Organization, Geneva, Switzerland,

²Department of Oral Health and Development, University of Sheffield, Sheffield, UK

Petersen PE, Lennon MA. Effective use of fluorides for the prevention of dental caries in the 21st century: the WHO approach. *Community Dent Oral Epidemiol* 2004; 32: 319–21. © Blackwell Munksgaard, 2004

Abstract – Despite great improvements in the oral health of populations across the world, problems still persist particularly among poor and disadvantaged groups in both developed and developing countries. According to the World Oral Health Report 2003, dental caries remains a major public health problem in most industrialized countries, affecting 60–90% of schoolchildren and the vast majority of adults. Although it appears that dental caries is less common and less severe in developing countries of Africa, it is anticipated that the incidence of caries will increase in several countries of that continent, due to changing living conditions and dietary habits, and inadequate exposure to fluorides. Research on the oral health effects of fluoride started around 100 years ago; the focus has been on the link between water and fluorides and dental caries and fluorosis, topical fluoride applications, fluoride toothpastes, and salt and milk fluoridation. Most recently, efforts have been made to summarize the extensive database through systematic reviews. Such reviews concluded that water fluoridation and use of fluoride toothpastes and mouthrinses significantly reduce the prevalence of dental caries. WHO recommends for public health that every effort must be made to develop affordable fluoridated toothpastes for use in developing countries. Water fluoridation, where technically feasible and culturally acceptable, has substantial advantages in public health; alternatively, fluoridation of salt and milk fluoridation schemes may be considered for prevention of dental caries.

Key words: dental caries; oral disease prevention; public health; use of fluorides; WHO

Poul Erik. Petersen, WHO Oral Health Programme, 20 Avenue Appia, 1211 Geneva 27, Switzerland
e-mail: petersenpe@who.int

Submitted 14 May 2004;
accepted 9 June 2004

The World Health Organization (WHO) recently published a global overview of oral health, a statement which described the WHO Oral Health Programme's approach to promoting further improvement in oral health during the 21st century (1–3). The report emphasized that despite great improvements in the oral health of populations across the world, problems still persist. This is particularly so among underprivileged groups in both developed and developing communities. WHO sees oral health as an integral part of general health. Oral diseases and conditions, including oral cancer, oral manifestations of HIV/AIDS, dental trauma, craniofacial anomalies, and noma, all have broad impacts on health and well-being. Oral health and general health share common risk

factors related to diet, the use of tobacco, and the excessive consumption of alcohol.

According to the WHO report, dental caries remains a major public health problem in most industrialized countries, affecting 60–90% of school children and the vast majority of adults. It is also the most prevalent oral disease in several Asian and Latin American countries. Although for the moment it appears to be less common and less severe in the greater part of Africa, the report anticipates that in light of changing living conditions and dietary habits, the incidence of dental caries will increase in many of that continent's developing countries. The principal reasons for this increase are growing sugar consumption and inadequate exposure to fluorides.

A WHO expert committee report on fluorides and oral health published in 1994 (4) is currently being updated. This commentary will seek, in the meantime, to provide an interim perspective on dental caries and dental fluorosis, diet and fluorides from a public health point of view.

The WHO oral health report (1–3) noted that dental caries can be controlled by the joint action of communities, professionals and individuals aimed at reducing the impact of sugar consumption and emphasizing the beneficial impact of fluorides. In many developing countries however, access to oral health services is limited. Likewise, in developed countries significant numbers of population groups are underserved. For these reasons professionally applied fluorides were not considered relevant to this review.

Research on the oral health effects of fluoride started around 100 years ago. For the first 50 years or so it focused on the link between waterborne fluoride – both natural and artificial – and dental caries and fluorosis. In the second half of the 20th century this focus shifted to the development and evaluation of fluoride toothpastes and rinses and, to a lesser extent, alternatives to water fluoridation such as salt and milk fluoridation. Most recently, efforts have been made to summarize these extensive datasets through systematic reviews, such as those conducted on water fluoridation by the UK University of York Centre for Reviews and Dissemination (5); on fluoride ingestion and bone fractures (6); and on fluoride toothpastes and rinses through the Cochrane Collaboration Oral Health Group (7, 8).

These systematic reviews concluded that:

- Water fluoridation reduces the prevalence of dental caries (% with dmft /DMFT > 0) by 15% and in absolute terms by 2.2 dmft/DMFT (5).
- Fluoride toothpastes and mouthrinses reduce the DMFS 3-year increment by 24–26% (7, 8).
- There is no credible evidence that water fluoridation is associated with any adverse health effects (5, 6).
- At certain concentrations of fluoride, water fluoridation is associated with an increased risk of unaesthetic dental fluorosis (5) although further analysis suggested that the risk might be substantially greater in naturally fluoridated areas and less in artificially fluoridated areas (9).
- There was a paucity of research into any possible adverse effects of fluoride toothpastes and rinses (7, 8).

Although these findings are important, it must be acknowledged that a lack of fluoride does not cause dental caries. The WHO report (1) is quite clear that the post-eruptive effect of sugar consumption is one of the main aetiological factors for dental caries and notes in particular the damaging effects of:

- Refined or processed foods in general.
- The consumption of sugary soft drinks.
- Children going to bed with a bottle of a sweetened drink or drinking at will from a bottle during the day.

A recent WHO/FAO analysis (10) of the evidence on the role of diet in chronic disease recommends that free (added) sugars should remain below 10% of energy intake and the consumption of foods/drinks containing free sugars should be limited to a maximum of four times per day. For countries with high consumption levels it is recommended that national health authorities and decision-makers formulate country-specific and community-specific goals for reduction of consumption of free sugars. However, WHO (10, 11) also notes that many countries currently undergoing nutrition transition do not have adequate fluoride exposure. It is the responsibility of national health authorities to ensure implementation of feasible fluoride programmes for their country (10, 11).

What are the implications of these data and what policy recommendations will minimize dental caries and dental fluorosis?

First, it is clear that all countries and communities should advocate a diet low in sugars in accordance with the WHO/FAO recommendations. This has been emphasized most recently in May 2004 at the World Health Assembly by the confirmation of the WHO Global Strategy on Diet, Physical Activity and Health (12). Secondly, countries with excessive levels of fluoride ingestion, particularly where there is a risk of severe dental fluorosis or of skeletal fluorosis, should maintain a maximum fluoride level of 1.5 mg/l as recommended by WHO Water Quality Guidelines (13), although this objective is admittedly not always technically easy to achieve. Thirdly, where sugar consumption is high or increasing, the caries-preventive effects of fluorides need to be enhanced. WHO (1–4) recommends that every effort must be made to develop affordable fluoride toothpastes for use in developing countries. As a public health measure, it would be in the interest of countries to exempt these toothpastes from the

duties and taxation imposed on cosmetics. Water fluoridation, where technically feasible and culturally acceptable, has substantial advantages particularly for subgroups at high risk of caries. Alternatively, fluoridated salt, which retains consumer choice, can also be recommended. WHO is currently in the process of developing guidelines for milk fluoridation programs, based on experiences from community trials carried out in both developed and developing countries.

Finally it is essential to maintain and foster health services research, most importantly to:

- Update our information on the cost-effectiveness of water, salt and milk fluoridation against a background of the now wide-spread use of fluoride toothpastes.
- Continue to develop and update our knowledge of the health effects of ingested fluoride.
- Further develop affordable techniques for adjusting water supplies with excessive natural fluoride to the levels recommended by the WHO Water Quality Guidelines.
- Better understand the public perception of dental fluorosis.
- Evaluate the effects of the introduction of affordable fluoride toothpastes on public purchasing and utilisation.

Such a programme of health services research will help to maintain and develop the outstanding progress made over the past half century in emphasizing the beneficial effects of fluorides.

References

1. Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century – the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 2003;31(Suppl. 1):3–24.
2. World Health Organization. The World Oral Health report 2003. Geneva: WHO; 2003. http://www.who.int/oral_health.
3. Organisation mondiale de la Santé. Rapport sur la santé bucco-dentaire dans le monde 2003. Genève: OMS; 2003. http://www.who.int/oral_health.
4. World Health Organization. Fluorides and oral health. WHO Technical Report Series 846. Geneva: WHO; 1994.
5. McDonagh MS, Whiting PF, Wilson PM, Sutton AJ, Chestnut I, Cooper J et al. Systematic review of water fluoridation. *Br Med J* 2000;321:855–9.
6. Demos LL, Kazda H, Cicuttini FM, Sinclair MI, Fairley CK. Water fluoridation, osteoporosis, fractures – recent developments. *Aust Dent J* 2001;46:80–7.
7. Marinho VC, Higgins JP, Logan S, Sheiham A. Fluoride toothpastes for preventing dental caries in children and adolescents (Cochrane review). In: *The Cochrane Library*, Issue 1, 2004. Chichester, UK: John Wiley & Sons Ltd.
8. Marinho VC, Higgins JP, Logan S, Sheiham A. Fluoride mouth rinses for preventing dental caries in children and adolescents (Cochrane review). In: *The Cochrane Library*, 2004. Chichester, UK: John Wiley & Sons Ltd.
9. MRC (Medical Research Council) Working Group Report. Water fluoridation and health. London: Medical Research Council; 2002.
10. World Health Organization. Diet nutrition and the prevention of chronic disease. WHO Technical Report Series 916. Geneva: World Health Organization; 2003.
11. Moynihan P, Petersen PE. Diet, nutrition and the prevention of dental diseases. *Publ Health Nutr* 2004; 7:201–26.
12. World Health Organization. Resolution WHA57.17. Global strategy on diet, physical activity and health. In: *Fifty-seventh World Health Assembly*. Geneva: 17–22 May, 2004.
13. World Health Organization. Guidelines for drinking water quality. Vol. 1. Recommendations, 2nd edn. Geneva: World Health Organization; 1993.