

Editorial**Do we let children's teeth decay just because some people object to topping up the natural fluoride that's already in our water?**M.A. Lennon¹, J.F. Beal² and A.J. Rugg-Gunn³¹Clinical Professor, School of Clinical Dentistry, University of Sheffield; ²Consultant in Dental Public Health, Yorkshire & the Humber SHA; ³Emeritus Professor, University of Newcastle.

Tooth decay rates among children have been falling in most European countries since the mid-1970s, with the gap between the countries with the highest and lowest average levels narrowing. Widespread use of fluoride toothpaste, high levels of educational achievement in the Scandinavian countries, and public health approaches such as the use of fluoridated salt in Switzerland, France and Germany, have all contributed to this welcome improvement.

Whilst average tooth decay rates are down, those averages mask stubbornly high decay rates in some communities and in some social groups. Many young children in the UK still suffer from severe dental caries (BASCD, 2007). No one in public health could reasonably argue that dental caries in the UK is a battle already won. It is not.

Even if we take the deceptively soothing average dmft scores (decayed, missing or filled teeth), we find a fivefold difference between the best and worst dental health. The average South Staffordshire five year old has 0.6 dmft teeth (the best dental health in England), while the average Blackburn five year old has 3.2 dmft teeth (the worst in England) (BASCD, 2007).

Time to take stock of current oral health promotion strategies in areas with high tooth decay rates among children

In some communities in the UK traditional dental health education techniques have not been successful. Incentive schemes involving the distribution of free fluoride toothpaste have been tried in parts of the North West, but with relatively poor outcomes. Indeed, it is widely acknowledged that dental health promotion schemes dependent on individual compliance have limited effectiveness.

The quandary for members of a Strategic Health Authority (SHA) or Primary Care Trust (PCT) with enduringly high rates of caries is: do they persevere with ineffective strategies or do they consider alternatives that have been tried elsewhere and worked? Earlier this year, the Secretary of State for England Alan Johnson – no doubt basing his comments on advice from his Chief Dental Officer – called on SHAs and PCTs in areas with high dental health needs to consider water fluoridation.

No one is suggesting that all water supplies should be fluoridated. We suggest that the total population served by fluoridation schemes should be increased from 10% to around 30%. New schemes could be expected to be most effective in areas with particularly high levels of tooth decay among children. Subject to technical feasibility and public consultation, such schemes in England might include Greater Manchester, some other areas in the North West, and the large conurbations of Yorkshire. In addition, there are pockets of high dental need in, for example, Southampton and Inner London.

There are eight key questions for SHAs and PCTs:

1. Is the current level of tooth decay in children acceptable?
2. Have our previous oral health promotion strategies worked?
3. If the answer to questions 1 and 2 is 'no', what other methods are available to reduce tooth decay and dental health inequalities?
4. How effective is fluoridation in reducing tooth decay and dental health inequalities?
5. How safe is fluoridation?
6. Is it ethical to fluoridate water?
7. Is it technically feasible to fluoridate local water supplies and how much would it cost?
8. Does the local community support fluoridation?

What poor dental health means for children and families

If children living in a PCT have an average of two decayed, missing or filled teeth, they have a rate of tooth decay that is around 30% higher than the national average, and over three times higher than the best in the country. As well as causing those children more toothache, abscesses, fillings and extractions, these high levels of tooth decay mean that children are more likely to be absent from school. Worryingly, their poor dental health impacts on their general health and well-being (Sheiham, 2006). Poor dental health matters. Children are especially vulnerable to tooth decay and are the

group in the population least able to do anything about it, unless adults take action on their behalf.

Currently 5.5 million people in England receive fluoridated water supplies because many communities – Birmingham, Burton-on-Trent, Mansfield, Scunthorpe, Leamington Spa, Rugby to name but a few – have previously adopted water fluoridation as a key element of their local oral health promotion strategies. The question now is: should Bolton, Bury, Rochdale, Manchester, Bradford, Hull, Huddersfield, Southampton and similarly affected communities follow suit?

Does fluoridation work, what's the evidence?

The results of the most recent survey of children's teeth in Britain, involving 239,000 five year olds, demonstrated that of the ten PCTs with the lowest tooth decay rates, six are fluoridated (BASCD, 2007). Two of the remaining four have significant levels of natural fluoride in their water.

All water contains fluoride naturally. As many as 50 million people worldwide – including around 330,000 people in the UK – drink water with a naturally occurring concentration of one part of fluoride per million parts of water (1ppm), the optimum for maintaining good dental health. At levels lower than 0.3ppm there is no evidence of any dental benefit. Fluoridation is a carefully controlled process for topping up the naturally occurring fluoride to 1ppm.

Greater Manchester has natural fluoride in its water, but not enough to protect children from tooth decay. About ninety miles south, Birmingham has supplemented the natural fluoride in its water supply since 1964. If Greater Manchester children enjoyed the same level of dental health as their counterparts in Birmingham, they would have 40,000 fewer teeth decayed each year. In addition, 2,600 fewer general anaesthetics a year would be needed to extract badly decayed teeth, and 5,500 more children would be entirely free from tooth decay.

The benefits of fluoridation suggested by the recent survey are backed up by the results of systematic reviews of the worldwide evidence conducted in Australia (National Health and Medical Research Council, 2007), the United States (Truman *et al*, 2002) and the UK (McDonagh *et al*, 2000). The US review concluded there is strong evidence that “community water fluoridation is effective in reducing the cumulative experience of dental caries within communities”. It quantified the benefit as being a reduction in dental caries of between 30 and 50 per cent in three to 17-year olds.

The UK (York) review concluded that “the best evidence available suggests that fluoridation of drinking water supplies does reduce caries prevalence, both as measured by the proportion of children who are caries free and by the mean change in dmft/DMFT score”. Because of the heterogeneity of the studies included, the reviewers found it difficult to be precise about the likely benefits. However, they did calculate that, on average, fluoridation increases the number of children with no tooth decay at all by 15% and reduces the mean dmft/DMFT by 2.25. This latter figure represents a prevented fraction of approximately 40 per cent (Worthington and Clarkson, 2003). York also noted that studies in communities with

higher baseline dmft/DMFT values, as well as the studies of longer duration, showed greater benefits. Meanwhile, research workers continue to add to this evidence base (Spencer *et al*, 2008)

Striking a balance between reducing decay and preserving aesthetics

Balancing the benefits of less caries with the risk of an increase in dental fluorosis has always been an important consideration in determining fluoridation policy. Trendley Dean and his colleagues in their pioneering studies in the 1930s and 40s suggested that, at a fluoride concentration in water of 1ppm, the reduction in caries was substantial while the increase in fluorosis was confined to the milder forms (Lennon, 2006). Lord Jauncey in his landmark Scottish legal judgement declared that the aesthetic impact would be “of no concern to the owners of the teeth” (Lord Jauncey, 1983).

More recently, the York review estimated that 13% of children in a fluoridated area might have a level of dental fluorosis of aesthetic concern. However, the York team's estimates had combined data for both naturally and artificially fluoridated areas, even though the risk of unsightly fluorosis, for any level of fluoride, was substantially higher in naturally fluoridated areas than artificially fluoridated areas. In correspondence following publication of the review, the York team suggested that some additional confounding factor(s) might explain this unexpected finding (P Whiting personal communication, September 2001). Subsequently, a MRC review suggested that a more realistic figure for aesthetically important fluorosis in fluoridated areas within the UK might be between 3% and 4% and, in non-fluoridated areas, around 1% (Medical Research Council, 2002).

Is fluoridation safe –what's the evidence?

The safety of fluoridation has been explored in many individual studies as well as in systematic reviews of the available evidence. A report by the Royal College of Physicians found no evidence of harmful effects from water containing fluoride at 1ppm whether naturally occurring or added (Royal College of Physicians, 1976).

In 2000 the York review examined the best available evidence on fluoridation and found no association with, for example, cancer or bone fractures. Nor was evidence of harm found by Australian researchers completing reviews in 1979, 1985, 1991, 1998 and 2007. In 1985, an expert working group led by Professor George Knox reviewed 110 published papers examining data relating to fluoride and cancer incidence and mortality rates (Knox, 1985). The working group concluded “The evidence permits us to comment positively on the safety of fluoridated water in this respect. The absence of demonstrable effects on cancer rates in the face of long-term exposure to naturally elevated levels of fluoride in water: the absence of any demonstrable effects on cancer rates following the artificial fluoridation of water supplies: the large human populations observed: the consistency of the findings from many different sources of data in many different countries: lead us to

conclude that in this respect the fluoridation of water is safe.” Further reassurance was provided by a study published in 1991 by the US National Cancer Institute which examined 2.3 million cancer deaths and 125,000 cancer cases, and “identified no trends in cancer risk that could be ascribed to the consumption of fluoridated water” (Hoover *et al*, 1991).

Is the evidence on benefits and safety good enough for decisions to be taken on whether or not to fluoridate water? We believe that it is. Could the evidence be improved on? Yes, it could. Following the York report in 2000, the MRC made a number of recommendations on priorities for future research. In addition, the Water Act 2003 requires SHAs with fluoridation schemes to monitor health trends and publish four yearly reports.

Even if it works and is safe, is it ethical?

We need to take account of the ethical framework developed by the Nuffield Council on Bioethics, whose November 2007 report carefully balances individuals’ autonomy on the one hand with the collective good on the other (Nuffield Council on Bioethics, 2007). Nuffield devised the concept of an ‘intervention ladder’ for tackling major public health issues. The purpose of the ladder is to compare alternative approaches in terms of their intrusiveness and likely acceptability. However, Nuffield acknowledges that greater health needs may justify higher ranking interventions. Importantly, Nuffield proposes a ‘stewardship model’ that gives priority to measures that will address health inequalities and protect the health of children and other vulnerable groups. In rejecting the extreme libertarian standpoint, Nuffield stresses “the value of belonging to a society in which each person’s welfare, and that of the community, matters to everyone”. This value, it claims, is central in the “justification of both the goal of reducing health inequalities and the limitation on individual consent when it obstructs important general benefits.”

All this is a highly effective antidote to the “I’m all right, Jack” philosophy that sees tooth decay in other people’s children as someone else’s problem. Nuffield argues forcefully – and rightly – in favour of counterbalancing the liberal emphasis on choice and autonomy with “the imperative to support those who do not have the opportunities to choose because of, for instance, poverty or dependency”.

Nuffield also discusses how evidence should be evaluated in decision-making on public health matters. Stewardship, it says, is “not exercised simply by following the public vote, especially where issues involve complex scientific evidence”. However, its proposed ethical framework anticipates that the public will be consulted through measures that allow them “to scrutinise and judge the appropriateness of proposed policies”.

Nuffield is very clear about the kind of evidence that should be taken into account when decisions are made on public health. The minimum hurdle, it says, is that such evidence must have been “published in the peer-reviewed literature or have been subject to an equivalent scrutiny by expert peers”. Policy should be based on “the best available scientific evidence, using generally accepted criteria for evaluating the quality and implications of the evidence”.

When Nuffield’s ethical approach is matched with the evidence on fluoridation, we believe that the case for water fluoridation in areas with high levels of children’s tooth decay is sound and robust. Indeed, the reasoning behind the Nuffield approach has been articulated elsewhere by a number of leading commentators on fluoridation. During the debates leading up to the Water Act 2003, Lord Colwyn – a practising dentist – asked: “Is it morally acceptable to allow children to suffer the pain and discomfort of decayed teeth and allow them to experience the trauma of tooth extraction, sometimes under general anaesthetic, when we know of a simple way of adjusting the concentration of a naturally occurring element that goes a long way to alleviating these problems?” (Lord Colwyn, 2003).

If the need exists, consult the public

We contend that where fluoridation is technically feasible, and where there is a demonstrable dental health need, SHAs and PCTs should consult their local populations about its possible introduction. The existing Water Act and its associated Regulations lay down specific requirements for local consultation and recommend – very much in line with the Nuffield approach – that when an SHA evaluates the responses to consultation, it should have regard to the ‘cogency of the arguments used’ in relation to the scientific evidence.

We believe that the system of local decision-making on fluoridation that was approved by Parliament in the Water Act 2003 enables everyone to have their say whilst rightly placing the final decision in the hands of accountable public bodies charged with improving the health of the population. It is right that, in discharging their public accountability, SHAs and PCTs should listen to their local populations and explore any concerns they may have. Equally, they have a duty to improve public health and take effective measures to reduce high levels of caries, especially among children.

Consultations on fluoridation are not plebiscites. As Nuffield recognised, it is relatively easy for scare stories to distort the debate about fluoridation. SHAs and PCTs need to weigh the evidence and make their independent assessment of what is right for the health and welfare of their own populations. We hope that, as a number of them make these critically important decisions in the months ahead, they will rise to the challenge of their stewardship obligations.

In 2006, Colwyn Jones, the President of BASCD, responded on behalf of the Association to the Nuffield’s Public Health consultation paper. He reiterated the Association’s strong support for fluoridation, and underlined the benefits of fluoridation for both adults and children. It is important that the Association, and individual members, respond equally positively in the forthcoming public consultations on water fluoridation.

Finally, let us remember that the children who otherwise face a visit to the dentist to have decayed teeth extracted and filled will have no direct voice in the outcome.

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