Fluoridation of water

A briefing from the BMA Board of Science – February 2009

BMA Policy

The BMA remains committed to the fluoridation of mains water supplies, after appropriate public consultation, on the grounds of effectiveness, safety and equity.[a] The BMA believes that local authorities should be more proactive in helping to reduce the dental inequalities that exist across social groups in the UK.

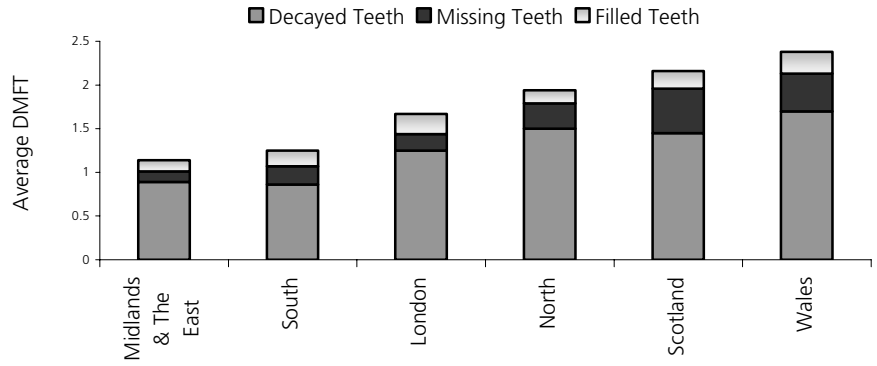
Background

Tooth decay

Dental caries (tooth decay) is a major oral health problem in most industrialised countries, with children an especially vulnerable group. The World Health Organisation (WHO) World Oral Health Report (2003) reported that dental caries affected 60-90 per cent of schoolchildren and the vast majority of adults worldwide [reference 1].

In the United Kingdom (UK), although the mean occurrence of decayed, missing or filled teeth (DMFT) in an individual has fallen – from 3.1 in 1983 to 0.8 in 2003 for 12 year olds – the figures represent a national average and are therefore not representative of the variation in caries levels found in different parts of the UK [reference 2]. The prevalence of poor dental health has well-defined links to socio-economic factors and geographical location. While the average caries incidence may have fallen, dental health inequalities are widening (see Figure 1), with tooth decay continuing to represent a significant public health threat in socially deprived areas. Children in non-fluoridated under-privileged areas of the UK are more likely to experience DMFT than those in either affluent, or similar, but fluoridated areas[b] [reference 3].

Figure 1: Dental Caries Experience of 5-year-old Children in Great Britain 2005 / 2006*



*Source: British Association for the Study of Community Dentistry (BASCD) Survey report 2005/2006

Fluoridation

Fluoride is naturally present in all water supplies at varying levels of concentration. Its potential for benefiting oral health was first identified in the 1930s, and it is now used widely in toothpastes and mouth rinses to help prevent dental caries. Many authorities worldwide artificially fluoridate their water supplies to either, improve the oral health of the population as a whole or, specifically target deprived

[a] BMA policy on water fluoridation was first established in 1977 and has since been reaffirmed in 1982, 1983, 1984 and 1998.

[b] A 'fluoridated area' is a geographically defined area where the water supply is either, naturally or artificially, fluoridated.

areas to help combat inequality in dental health. Information on artificial water fluoridation policies in different countries can be found in Appendix 1.

In the UK, around half a million people receive naturally fluoridated water. A further 5.5 million receive water which has been artificially fluoridated at, or around, the optimum level of one part per million (1ppm). West Midlands Strategic Health Authority (SHA) oversees the most extensive fluoridation scheme serving 84 per cent of its population. Smaller schemes are in place in the North East (34.8 per cent of population), East Midlands (13.8), Eastern England (5.4), North West (3.8) and Yorkshire and Humber (2.6) [reference 4]. In other parts of the UK, there are no artificial fluoridation schemes in operation and only rural Morayshire in Scotland receives naturally fluoridated water [reference 5].

Legislation

In England and Wales, the Water Act (2003) governs water fluoridation. The Act gives SHAs and the Welsh Assembly the responsibility of deciding, after appropriate public consultation, whether to fluoridate water supplies in their area. The Act obligates water suppliers to comply with SHA requests and outlines the terms by which they are indemnified against liabilities that arise.

In Scotland, water fluoridation is governed by the Water (Fluoridation) Act 1985 and in Northern Ireland, it is the responsibility of the Department of the Environment under the Water Order 1987. Both nations emphasise the importance of local consultation before the implementation of any fluoridation schemes.

Research evidence

A number of reviews have considered the evidence base in relation to the safety and efficacy of artificial water fluoridation. The following provides a summary of the main findings of these reviews:

The "York Review" (2000) [reference 6]

- The York Review concluded that the best available evidence supports the beneficial effect of water fluoridation on dental caries. It also found some evidence that it can help reduce inequalities in dental health across social classes in 5 to 12 year olds.
- In assessing the potential negative effects of fluoridation, the review found there to be no clear association between water fluoridation and bone fracture, or the incidence of cancer.
- Dental fluorosis – a developmental defect of tooth enamel causing mild white speckling of teeth – was identified as the most widely studied of all negative effects. Evidence indicated that six people would have to drink fluoridated water for one to be affected by mild fluorosis, and of these, only one quarter will have fluorosis of aesthetic concern.
- The review recommended that further research was needed to improve the quality of the evidence base on water fluoridation.

Centers for Disease Prevention and Control (CDC) – *Recommendations for using fluoride to prevent and control dental caries in the United States* (2002) [reference 7]

- This review recommended the continuation and extension of the fluoridation of drinking water in the US as a safe, effective and inexpensive public health measure. It found that 18 to 40 per cent of the reduction in dental caries in the US was attributable to community water fluoridation, with other contributory factors including the widespread use of fluoride toothpaste.
- The CDC concluded that water fluoridation remains the most effective means of reducing dental caries, and helps to reduce dental health inequalities associated with socio-economic status.

Medical Research Council (MRC) – *Water Fluoridation and Health* (2002) [reference 8]

- This report – commissioned in response to the recommendations of the "York Review" – concluded that water fluoridation has a beneficial effect on reducing dental caries and tackling oral health inequalities.
- The report also found no evidence to substantiate a link between water fluoridation and problems with immune or reproductive system problems, the kidneys, the gastro-intestinal tract or developmental (birth) defects.

All Party Parliamentary Group (APPG) on Primary Care and Public Health – *Inquiry into water fluoridation* (2003) [reference 9]

- This inquiry considered evidence from the WHO and the Forum on Water Fluoridation that had become available since 2002 [references 10 and 11]. It found that no credible research data exists to link water fluoridation with adverse health outcomes beyond fluorosis. The APPG concluded that the evidence was 'strongly supportive of the view that water fluoridation is a cheap and effective way of helping prevent dental decay in vulnerable groups'.
- The inquiry also found that further research into the public perception of the condition was necessary.

National Health Medical Research Council (NHMRC) – *Systematic Review of the Efficacy and Safety of Water Fluoridation* (Australian Government, 2007) [reference 12]

- The NHMRC systematic review supported the conclusions of previous research in asserting that there was no evidence to substantiate a link between fluoridation and adverse health outcomes such as cancer or an increased risk of bone fracture.

Ethical considerations

The 2007 Nuffield Council on Bioethics publication *Public Health: Ethical Issues* found that the key motivations for fluoridating a water supply – tackling health inequalities, protecting children, and creating an environment which sustains good health – were all consistent with the responsibilities a liberal state has to intervene in the interests of public health [reference 13]. It also identified three potential ethical objections:

- *without consent, fluoridation schemes can not be justified* – fluoridating water supplies affects all members of a targeted area. The scale of such an intervention makes it impossible for concerned individuals to withdraw their consent or opt-out of an operational scheme;
- *fluoridation removes the personal choice of those affected* – irrespective of the need to obtain consent, fluoridation of water supplies removes the personal choice of those who would wish to be exempt on the basis of held values (eg on the purity of water);
- *fluoridation coerces adults to lead healthy lives* – the fluoridation of water supplies restricts freedoms in such a way as to force adults to lead healthier lives.

In evaluating the ethical considerations, the Nuffield report stresses the importance of considering the balance of risks and benefits; the potential for alternatives; and where there are harms, the role of consent. The report recognises that the best available evidence suggests that fluoridation is beneficial, although the evidence on the extent of benefits and harms is weak overall. With respect to consent, the Nuffield Council recommends that local consultations take place to take into account the context in each area in which a decision is to be taken.

A debate also exists over whether the addition of fluoride to water supplies constitutes a medicinal intervention by local authorities and, if so, whether water fluoridation represents the forced medication of a population. The UK Medicines and Healthcare Products Regulatory Agency (MHRA) do not class fluoride as a medicinal product.

Cost-effectiveness

The cost effectiveness of water fluoridation has been extensively studied over many years. Economic studies have found that it is more cost-effective than alternative strategies, and that the cost-effectiveness of water fluoridation increases with the number of potential beneficiaries [reference 14].

The value for money of implementing a scheme in a particular area can be determined by assigning a monetary value to the projected number of medical interventions (fillings, extractions etc) that water fluoridation would prevent [reference 14]. In locations where the incidence of dental caries is less widespread, alternative strategies may be more appropriate. Where the average number of DMFT is two or above for children aged five years, the benefits are likely to outweigh the costs significantly [reference 14]. According to the most recent survey of this demographic, thirty-three PCTs in England, and the majority of Scotland and Wales, would fall within these parameters [reference 3]. For areas with a high prevalence of tooth decay, water fluoridation is both the most effective and the most cost-effective public health strategy.

Alternatives to water fluoridation

The use of topical applications of fluoride, such as toothpaste and mouthwash, is encouraged by dental organisations worldwide, irrespective of any public fluoridation schemes that are in place. Alternative strategies for population-wide fluoridation use milk or, more commonly, salt. Research has shown that, in countries where there is universal exposure, fluoridated salt is as effective as water fluoridation in preventing dental caries [reference 15].

Using salt can have an advantage over water fluoridation as it allows both fluoridated and non-fluoridated products to be available to the public. This retains a degree of customer choice and therefore eliminates the need to obtain consent for the intervention. This strategy though, does not have the same potential for achieving community-wide exposure to the caries prevention effects of fluoride, as some groups may choose the non-fluoridated salt. Research has shown that lower socio-economic groups, who are most vulnerable to dental caries, are less likely to choose a fluoridated product, such as salt or milk, than those from higher socio-economic groups [reference 16]. Interventions of this kind therefore, have a significant disadvantage in public health terms, as they are less effective in reducing oral health inequalities.

Conclusion

Fluoridation of water is a cost-effective public health strategy for reducing tooth decay in a population. Fluoride has been found to be highly protective against dental caries, and there is no convincing evidence of any adverse risk to human health by the introduction of water fluoridation. Through targeting of areas with a high prevalence of tooth decay, artificial water fluoridation is an effective strategy for reducing dental health inequalties.

Professional support for water fluoridation:
As of January 2009

- **England and Wales** - Department of Health
  Chief Dental Officer (CDO), Barry Cockcroft, in a guidance letter from February 2008 advised all SHAs and PCTs to consider the fluoridation of water supplies to help reduce inequalities in oral health in line with current legislation.

- **Northern Ireland** - Department of Health, Social Services and Public Safety
  The 2007 Oral Health Strategy for Northern Ireland recommends that 'As it is the most effective, cost-effective and equitable way of improving population dental health the DHSSPS will work in partnership with other stakeholders to examine the feasibility of fluoridating Northern Ireland's public water supplies'.

- **Scotland –** Department for Health and Community Care
  The Scottish Government currently have no plans to fluoridate the public water supplies in Scotland. It remains the responsibility of local authorities to request that Scottish Water fluoridate water supplies in a local area under the Water (Fluoridation) Act 1985.

- British Dental Association (BDA)
  The BDA are supportive of water fluoridation and state that 'the addition of fluoride into water supplies in certain areas could dramatically reduce the levels of tooth decay and give children a decent start in life'. They also stress the importance of its existing alongside a wider oral health strategy incorporating factors such as action on diet and smoking cessation.

- The British Association for the Study of Community Dentistry (BASCD)
  "Water fluoridation has been shown to be a very effective way to reduce dental ill health and to narrow dental health inequalities. It requires no lifestyle changes on behalf of individuals and everyone in society (with natural teeth) benefits."

- British Fluoridation Society (BFS)
  The BFS aim to 'promote improvement of dental health by securing the optimum fluoride content of water supplies (one part per million) in those areas where high levels of tooth decay remain a public health problem'.

- World Health Organisation (WHO)
  'Water fluoridation, where technically feasible and culturally acceptable, has substantial advantages [in public health] particularly for subgroups at high risk of caries.'

- FDI World Dental Federation
  The FDI World Dental Federation states 'over sixty years of research and recent systematic reviews have shown that water fluoridation is an effective and efficient public health measure for the prevention of dental decay. The public health benefits of water fluoridation far outweigh the possible occurrence of very mild enamel fluorosis/enamel opacities'.

Appendix 1

Artificial water fluoridation levels in various countries worldwide*

Country	Total population	Population that receive artificially	% of population served
USA	281,421,906	171,000,000	64
Brazil	172,558,000	65,585,000	>41
Colombia	42,802,000	29,406,860	70
Malaysia	22,632,000	15,842000 (approx)	70 (approx)
Canada	31,000,000	13,330,000	43
Australia	19,338,000	11,722,000	61
Hong Kong	6,708,309	6,708,309	100
Chile	15,401,000	5,423,877	40
UK	59,541,000	5,400,000	10
Korea	46,125,000	5,367,000	11.4

*Source: British Fluoridation Society *One in a million: the facts about water fluoridation* (2nd edition) http://www.bfsweb.org/onemillion/onemillion.htm

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