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National Fluoride Information Centre (NFIC)

Conference Report

'Researching Water Fluoridation; Evaluation & Surveillance'
31 January 2007, The University of Manchester

Some 105 people attended this one-day conference organised by the National Fluoride Information Centre (NFIC) and held in the Manchester Dental Education Centre, Manchester University. The morning and afternoon sessions were chaired by Dr Barry Cockcroft, Chief Dental Officer for England. Ten international speakers presented papers and there were panel discussions at the end of the morning and afternoon sessions.

Dr Cockcroft welcomed participants to the meeting. As a strong supporter of fluoridation he said he was pleased to chair this first conference organised by the NFIC which was devoted to understanding and improving the research behind the use of fluorides in caries prevention.

1. Professor Anthony Blinkhorn, Director of the National Fluoride Information Centre, said the Centre was delighted to organise the conference and welcome so many distinguished speakers.

He said that the Centre's role was to provide objective information on all types of fluoride delivery to the public – salt, milk, water, and professionally and self applied fluoride agents. This information is based on scientific evidence and disseminated in ways that can be understood by the whole population. He described the interactive website (available in six languages) as well as how enquiries by telephone, post and e-mail were handled. About 50,000 people access the website within a six-month period; half of these making a return visit.

Fluoride toothpaste and water fluoridation were the most popular topics. Information leaflets were proving to be popular and their scope and coverage are being expanded. A future aim of the Centre is to invigorate future research into the safe and effective use of all forms of fluoride in the promotion of dental health.

2. Mr Paul Wilson, Research Fellow at the Centre for Reviews and Dissemination, The University of York. 'Systematic Reviews: are they necessary?'

Systematic reviews are the major part of the Centre's activity. He listed four reasons why systematic reviews are necessary. These include information overload, single studies are rarely definitive, conflicting evidence, and the need to control bias.

Systematic reviews are conducted according to explicit, pre-specified, reproducible methods. They include a clear question, a comprehensive search of the literature and a critical assessment of the studies. They indicate gaps in our knowledge and, contrary to popular opinion, they are quick.

The Centre for Reviews and Dissemination is involved with systematic reviews in the fields of health and social care interventions, and as such conducted a review into the effectiveness and safety of water fluoridation in which he was involved. He reported that the Review decided, from current evidence, that fluoridation was effective in reducing the prevalence of dental caries, but it was difficult to say by how much. However, the evidence on which this was based was of less than high quality, as was that on its safety. Fluoridation would increase the prevalence of fluorosis. The matter of the reduction of inequalities in dental health in the population was still undecided. The subsequent report from the Medical Research Council dealt with the matter of future research on these issues in greater detail. Mr Wilson then praised the work of the Cochrane Oral Health Group for their systematic reviews of other fluoride agents. He concluded that systematic reviews are necessary and are an integral part of the research cycle.

3. Professor Martin Tickle, Research Director of the Oral Health Unit.

'The problems of evaluating a water fluoridation programme.'

Professor Tickle accepted the conclusion from the York Report that the evidence supporting the effectiveness of fluoridation was not of the highest quality, and, taking into account also the recommendations of the MRC, he proceeded to address these issues. As a randomised controlled trial would be logistically impossible to carry out, he proposed prospective cohort studies controlled for at least three possible confounding factors including total fluoride exposure, sugar consumption, and dental treatment decisions. Socio-economic status is a well-known confounder but there are several ways of classifying this. Selecting study and control populations could be difficult, as fluoridation was likely to be targeted at high-risk communities. He suggested including two age groups – 0-5 and 6-12 years in the evaluation, but group concealment would be difficult. Improvements in photographic techniques for measuring dental caries and dental fluorosis could be very useful in assisting this. Positive consent to dental examination would be another difficult area, as would loss to follow up and population mobility. It would be important to ensure that control populations did not receive other preventive programmes. He made a plea for other outcome measures, such as cost and quality of life, to be included in an evaluation. The above comments referred to a trial aimed at evaluating efficacy. This was important but, from a public health perspective, effectiveness was more relevant. Because of this, serial cross sectional studies will also be required.

In summary, he said that evaluating water fluoridation was intellectually and operationally difficult but that well-designed studies were possible.

**4. The Right Honourable Rosie Winterton,
Minister of State, Department of Health.**

Keynote Speaker

The Rt Hon Rosie Winterton addressed the meeting. She remarked that that one of the reasons for the present restructuring of the provision of dental care in this country was to aid prevention. The recent National Survey of Child Dental Health showed our children to have among the best levels of dental health in Europe, but there were inequalities. Two important aspects of the 2005 oral health plan for England, "Choosing Better Oral Health" were decreasing inequalities and improving dental health through several initiatives including the 'Brushing for Life' programme. There is now a statutory requirement for primary care trusts (PCTs) to have an oral health promotion policy. This is best integrated with other measures to improve health and well being in a common risk factor approach.

An excellent example of this existed in Ipswich PCT under their "Adopt a School Scheme". Further guidance was being prepared for the dental team on prevention including the best use of fluoride. She emphasised the benefits of fluoride, especially that of water fluoridation which are apparent when children's dental health in South Birmingham and South Manchester are compared. The source of fluoride in water is not important as good dental health in Hartlepool is due to fluoride being present naturally in water. She commented that over 60 per cent of the populations in the USA, Australia and Ireland received fluoridated water, while only about 10 per cent of the UK did so. We need to look to see whether we should increase this proportion. The Strategic Health Authorities (SHAs) were now 'in the driving seat'. All SHAs had agreed to look at

levels of oral health and at means of reducing these as well as inequalities. Fluoridation is an important part of this, but during the consultation process the people involved would need to be confident that there are positive benefits and no serious disadvantages. These were the reasons for commissioning the York and MRC studies, and this Conference will develop the issues raised. In addition, SHAs with fluoridated areas are now required to monitor the health of people involved and report their findings every four years. The Public Health Observatories will help to identify the indicators to be used in this process. The Department is anxious to promote research in this area and this Conference should make a significant contribution to this programme. Finally, she was appreciative of the work of the National Fluoride Information Centre.

5. Professor Roger Ellwood,

Professor of Diagnostic Science, Director of The University of Manchester Dental Health Unit.

'Evaluating the impact of water fluoridation on children.'

Professor Ellwood said that the questions raised by the York and MRC reports might only be addressed by a properly designed prospective multi-centre evaluation of water fluoridation with carefully matched test and control populations. The question of whether fluoridation reduces inequalities in the prevalence of caries in relation to social class or geographical location could best be answered by considering whether fluoridation was likely to reduce inequalities between populations with low and high caries risk. Difficulties in demonstrating this relationship with social class probably reflect the inadequacy of social class as a surrogate of risk, and care needs to be addressed in formulating the correct research question.

He discussed the problems of measuring dental fluorosis and the importance of assessing the public health relevance of enamel defects. Surprisingly, the public saw white teeth, which might have mild fluorosis, as a benefit. Further research was suggested in this area. Imaging methods were discussed as a possible answer to the problems perceived with lack of examiner blinding in studies of water fluoridation. Further research was also required to determine total fluoride intake and how this related to fluorosis.

Finally, it was emphasised that agreement was required on the appropriate use of other fluoride sources such as toothpaste in relation to fluoridation and that methods to disseminate this information were required.

6. Professor John Spencer,

Director of the Australian Research Centre for Population Oral Health, University of Adelaide.

'Evaluating the impact of water fluoridation on oral health',

Professor Spencer drew on the extensive studies of water fluoridation in Australia. While pointing out that most of the studies to evaluate water fluoridation had been repeated cross-sectional studies, he described the advantages of cohort studies which now are their most frequently used method of evaluation. He argued that both historical and prospective designs were relevant, yielding valid and informative data. A major topic had been determining individual's exposure to fluoride and relating this to dental caries

and dental fluorosis experience. His discussions concerned the nature of this exposure, the amount of exposure and the timing of exposure. Caries experience was related to the per cent lifetime exposure to fluoridated water and this was independent of socio-economic considerations. The cohort studies provided unique data on the relative importance of pre- and post-eruption exposure to fluoridated water – both were important, the effect varying with different tooth surfaces. The additive effect of water fluoridation and use of fluoride toothpastes was also clear from their analyses. He also demonstrated the attenuating effect of consumption of non-public water. One advantage of their prospective studies was that actual dental treatment received had been recorded for each child rather than relying on periodic examinations. Their analyses allowed the benefits and risks of water fluoridation to be clearly laid out. It appears that the earliest signs of fluorosis are more aesthetically acceptable to the population than no fluorosis. There is also a need for the continual reassessment of the effectiveness of fluoridation but difficulties in this area include residential mobility and the need to adjust for the halo/diffusion effect when the majority of the major centres of production are in fluoridated cities.

7. At the end of the morning session, a panel discussion involving questions and answers from all the speakers took place. It was agreed that the most appropriate age group for assessment would be up to 15 years if this did not create too many difficulties with schools. It was also agreed that not all hypoplasias were due to fluorosis and that skill and experience were critical when making this diagnosis. The point was made that as the effect of fluoridation could not be measured using randomised controlled trials, the highest form of evidence, the next level of cohort studies would need to be accepted. There was also a need to take into account the effect on caries levels of ceasing fluoridation schemes, and continuing research in areas where fluoridation was already proceeding.

8. **Professor Stephen Birch,**
Professor of Health Economics, McMaster University, Canada

'Economics of water fluoridation'.

Professor Birch first, pointed out some of the advantages of economic evaluation – when there are not enough resources to do everything (scarcity), when choices have to be made, and taking advantage of opportunity costs.

The benefits of fluoridation could be expressed in a number of ways. First, the lower caries prevalence, second, the universal coverage, third, the effect on health-related well-being of individuals, fourth, the effect on population well-being (e.g. measurement of willingness to pay) and fifth, the fact that no change in individual behaviour was necessary.

Cost:effectiveness however, depended on risk, prevalence of caries and the size of the population served. The costs of water fluoridation are capital, labour and materials.

However, cost savings need to be considered realistically. Often savings are illusory and are likely to go towards other type of care (e.g. increase in orthodontic care).

Decision-makers need to be clear of the costs and benefits. Regarding costs, additional

resources will be required and this must be offset against reducing expenditures on dental services. The benefits need to be compared with other ways of investing this level of additional resources.

**9. Professor Gary McFarlane,
Professor of Epidemiology, University of Aberdeen**

'Assessing the relationship between water fluoridation and cancer'.

The two most relevant designs of studies were the 'case-control' study and the 'cohort' study. Matching was very important for both these designs. The main problem with the cohort design when studying rarely occurring cancers was the very large numbers of subjects, and therefore the expense, involved, if the study was to have adequate power. With power at 90 per cent, the number of subjects would probably be well into six figures. Most of the studies reviewed in the York report were ecological studies. For all cancers, the analyses suggested no effect. However, such all-inclusive analyses might obscure effects for rarer cancers: it was necessary to look at site-specific risk, particularly, in the case of fluoride, bone cancer or osteosarcoma.

Professor McFarlane described the studies that had examined the relationship between water fluoride and osteosarcoma. Current evidence would suggest no increased risk but the publication of a bigger study later this year should be of special interest. The same was also true of cancers of kidney and bladder, but he cautioned about giving too much weight to one positive study, since in any analyses of several studies the occurrence of a type 1 error (false positive) could be expected. The most recent comprehensive review of this subject by the US National Academy of Sciences in 2006 suggested no evidence of increased risk.

In conclusion, at present, the 'best bet' was much closer to 'no risk' than to 'increased risk' however, the difference between "no risk" and "low risk" depended on the size of the study.

**10. Dr John Langford,
Consultant in Dental Public Health, West Midlands Strategic Health**

'Surveillance of water fluoridation programmes in the UK'.

Dr Langford said that, from 1961 to 2002, there have been a series of government-initiated and other reports investigating dental and general health issues relating to water fluoridation in the UK.

However, the Water Act 2003 amended previous fluoridation provisions. This legislation only applies to England and Wales. In England, the duty to take this forward is placed on the Strategic Health Authorities (SHAs). For SHAs with existing water fluoridation programmes, there is a requirement to 'monitor the effects on the health of persons living in the fluoridated area', and 'publish reports at four-yearly intervals containing an analysis of those effects'. In practice this amounts to a series of questions. First, does it reduce levels of decay in both children and adults, second, does it increase the level of aesthetically

unacceptable dental fluorosis, third, is it economically viable and, finally, are there any adverse effects on general health. To answer the final question, decisions have to be made about what conditions to include in the surveillance programme and the York report and MRC review provide a useful starting point.

There appears to be five SHAs in England with water fluoridation programmes. It is important for there to be a common approach amongst these and that monitoring programmes should be proportional and accountable to the public. Both local and national data will be needed.

11. Professor Jayanth Kumar,

***Director of the Oral Health and Surveillance Unit, New York State Department of Health
'Measuring the impact of fluoridation: the American experience.'***

Professor Kumar said that the experience presented came largely from New York State. Water fluoridation was judged alongside other public health programmes. Overall, comparisons were rather favourable for water fluoridation. There was a standing committee for water fluoridation, and lots of questions were generated. He presented three basic questions which related to the effectiveness of community water fluoridation (CWF) in preventing dental caries. First, does it reduce socio-economic disparities, second, does it reduce caries in people of all ages and, third, does it improve oral health in neighbouring communities (diffusion effect). While answers to some of the questions came from State surveys, there was also much reliance on historical data and national data. He drew attention to the reduced effectiveness of water fluoridation in terms of the number of tooth surfaces saved compared with historical data, but the effect on a population basis was still substantial. He presented data that quantified the diffusion effect and data showing that water fluoridation reduced dental health disparities related to income. Continuing surveillance data were important, for example, to monitor the continuing use of fluoride tablets, which still occurs in fluoridated areas.

Finally, he listed challenges that need to be addressed. Amongst these are: finding comparable population groups, systems for monitoring fluoride levels in water, measuring fluoride intake/exposure, recording data on covariates, finding objective measures to assess outcomes, and benefit and risk analysis.

Delegate Feedback

- The speakers were excellent and the day was extremely useful
- The speakers made the subjects come to life – brilliant!
- A great broad expertise of panellists
- Excellent day, very interesting, thank you
- I enjoyed the international mix of perspectives and expertise
- The quality of the speakers was superb and excellent networking opportunities

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