

Successful Control of Dental Caries in Sweden Without Fluoridation

Introduction

Swedish research and practice in preventing and controlling caries - from before the earliest stage of *Streptococcus mutans* infection in infancy, through childhood, adolescence and adulthood - has been thoroughly reported in the dental literature [1, 2].

There are many components in Sweden's comprehensive, highly successful and clearly cost-effective scheme, but there is no place for artificial fluoridation. Key aspects of their protocols have never been attempted in Britain. Yet UK dental public health practitioners invariably explain that they have tried 'everything', that nothing has worked well enough and that costs are prohibitive, so the only effective option is a new fluoridation scheme. This is despite a dearth of reliable scientific evidence to support the efficacy and safety of fluoridation[3].

How hard have UK practitioners really tried to target families at highest risk of caries with an integrated programme of family-based and individual dental health education and training, plus appropriate dental and non-dental treatment?

Rotherham Metropolitan Borough Council's Scrutiny Panel's model investigation of fluoridation on 19 February 2007 took evidence from Ms Louise Collins of Rotherham Oral Health Education Team. She revealed that positive results had recently been obtained for the first time in a limited area, early family targeting scheme in Rotherham. But funding for the scheme was to be discontinued, so Ms Collins was obliged to recommend fluoridation!

Simple calculations showed that the money needed to fully fund such a scheme across all the areas of social deprivation identified in Rotherham was less than half the admitted revenue costs of the proposed fluoridation scheme.

It seems that sums considerably less than those required for the fluoridation of a large urban area would allow the implementation of properly effective targeted schemes, which really could reach all of the populations identified as being in greatest need of early and continuing dental care provision. Councillors will no doubt appreciate that UK dental health promoters have no option but to work for and insistently to advocate mass fluoridation in their area - as described recently in "Riding the Fluoridation Tiger" [4].

Background

In the early 1970s Swedish children had some of the worst caries statistics in Europe. Worst of all was Varmland County, a rural community where tooth-brushing was hardly practised at all, despite rudimentary school-based dental care schemes. Yet in 12 years Varmland was transformed from being the worst area to bettering the most affluent parts of Sweden in caries control.

The 'Varmland Needs-based Caries Preventive Programme' was started in 1978 and by 1990 it was so clearly successful in minimising childhood caries that it was subsequently rolled out on a nation-wide basis.

Such cost-effective caries control programmes gave Sweden the best caries statistics in Europe. Other Scandinavian countries adopted similar policies and spending priorities. Topical fluoride products played some part in this transformation, but it was also clear that caries prevalence and primary and secondary decayed and filled (dft/DFT) statistics in Varmland County soon fell below those from naturally fluoridated Uppsala County. They also fell below Halland's, where far more fluoride-based treatments were used.

The Varmland scheme was successful because the whole of the preventive programme had been carefully researched before implementation and properly integrated. Its goals remain "no approximal fillings, no occlusal amalgam fillings and all children to take personal responsibility for their oral health".

Two interventions from the 'Needs-based Programme' had been particularly carefully researched in the 1970s. The first was the need to keep all parts of the teeth as plaque-free as possible; this is achieved by Professionally-applied Mechanical Tooth Cleaning (PMTTC) sessions at intervals dictated by individual needs. PMTTC focuses on the occluded areas and erupting tooth surfaces missed by tooth-brushing. The second was to control *Streptococcus mutans* infectivity.

Streptococcus mutans has been identified as the major etiological agent of human dental caries. Mother-to-infant infection is rapid if the mother has a high S mutans count, so all first-time mothers were tested to find a 25% high-risk group. This group was invited to join the preventive scheme. These mothers received PMTTC and cavity restoration, and advice about tooth-brushing and healthy diet. Those whose salivary S mutans counts stay higher than 300 000 per millilitre are asked to use chlorhexidine rinses. (This protocol should ideally be applied to all family members to delay infant infection for as long as possible).

Because S mutans creates adherent plaques rapidly while sugar is available, advice is given on avoidance of over-frequent exposures, and on post-meal brushing. (However the Swedish diet has become more cariogenic since the 1970s, and it must be other aspects of the primary prevention programme that have controlled S mutans so well).

Infants should not be exposed to fluoride products - their emerging teeth should stay as plaque free as possible. Early runaway childhood caries ('baby bottle caries') – still far too often found in deprived UK families – could not happen under adequate surveillance. Trained dental assistants see every child in Sweden at ages 1, 2 and 3. They establish the child's net caries risk and prescribe an appropriate level of treatment. Children are encouraged to take personal responsibility for their own dental health via pre-school, school-based and post-school dental health programmes, which cover all Swedish children up to the age of 20. Axelsson has described how, as this scheme continues, children become enlightened parents and, over time, the entire population learns how to care for its oral health into old age [2].

Without any wholly effective caries remedy, personal vigilance and professional intervention remain the only options available to control the course of dental decay. Sweden has discovered the way to optimise this approach. A breakthrough may soon be achieved; clinical trials of an effective oral anti-caries vaccine are reportedly under way in China.

Quantitative data is provided which shows how Varmland County was transformed between 1979 and 1991:

a)

Caries free experience %		
	1979	1991
3 years old		
Varmland	51	94
Sweden	68	88
5 years old		
Varmland	27	72
Sweden	35	60

b)

Varmland DFS* scores		
	1979	1990
12 yr	6	1
15 yr	12	3.5
19 yr	24.3	6.5

*DFS - decayed/filled surfaces, each permanent tooth having five surfaces

Cost-effectiveness is established by comparing the average treatment time per child per year - dentists are paid more than dental assistants:

	1979	1990
Varmland	1.8 hour (dentist)	0.8 hour (dentist) + 0.4 hr (preventive assistant)
Sweden	1.7 hour (dentist)	1.1 hour (dentist) + 0.4 hr (assistant)

Only with Integrated Caries Prevention could such results have been achieved. This starts with antenatal (anti-Strep mutans) care of mothers and continues with dietary advice and oral hygiene training. Infants are introduced to the scheme at 6 months; there are special programmes for children at high risk. All children attend at 3 years for a gentle PTMC session which, for 10% only, is followed with a fluoride varnish, repeated at 6-month intervals. Later on fluoride pastes and dental tapes will be used under instruction, with up to 6 visits per year to the school dental clinic. Fissure sealants are applied if increasing Strep mutans counts and high plaque formation rates are detected or if molar fissures are deep.

All childhood caries experience is recorded on a national computerised system for ongoing evaluation. Axelsson states that directed PMTC was used more extensively in Varmland than elsewhere and that, as it is credited with a 70-90% caries reduction, this probably accounts for much of Varmland's relative success.

The most recent data available (1991) showed that 40% of Swedish children, but 56% in Varmland were caries free at age 12. In 1991 mean caries score at age 12 in Varmland was 1.0 DFS; the predicted DFS score (molars) for 1994 was 'close to zero'.

Commentary

It might be claimed that Sweden has a far more homogeneous society than the UK and that is why an integrated dental health policy is so easily applied there. In the UK, since 1964, it has been a key NHS presumption that fluoridation provides the best, most cost-effective remedy for inequalities in dental health, and dental health policy has inevitably been moulded to fit this assumption.

Already significant differences in dental health in the North and the South have been compounded by NHS cost-cutting exercises, which have left over-stretched clinics in deprived Northern cities quite unable to fulfil their work quotas. This has made it virtually impossible for the most needy families to obtain the NHS treatment they need, especially as so many NHS dentists have now opted for private practice [5]. Statistics for multiple extractions under anaesthetic, the only remedy left for failed caries control, confirm this. Fluoridated West Midlands, as we know, spends far more per head on preventive dental health measures to enable them to claim that 'fluoridation is working there' [6].

In Sweden every child has access to a first class preventive programme; in the UK there are ever widening inequalities between deprived and privileged communities, and the available treatments ignore or fail to implement adequately the two most effective anti-caries (and also periodontally effective) measures that are universally available in Sweden - Strep mutans infectivity control, and regular ongoing professional plaque and calculus removal. The contrast in population-based care provision and results could not be more marked. Also note that there is no longer a place for artificial fluoridation in any Scandinavian country; they have undertaken independent research and legislated or simply refrained accordingly.

Ian Packington MA (Oxon) Cert Tox, Science Adviser to NPWA
2 November 2008

References

1. Axelsson P, Paulander J et al, *Caries Res* (1993) 27 Suppl 1: 83-94 "Integrated Caries Prevention: effect of a needs-related preventive programme on dental caries in children. County of Varmland, Sweden: results after 12 years"
2. Axelsson P, Lindhe J, Nystrom B, *J Clin Periodontol* (1991) 18: 182-189 "On the prevention of caries and periodontal disease. Results of a 15-year longitudinal study in adults"
3. NHS CRD at University of York, *Report 18: Systematic Review of Water Fluoridation*, September 2000. See page xiv
4. Graham J, "Riding the Fluoride Tiger" *The Ecologist*, April 2008
www.theecologist.org/pages/archive_detail.asp?comments=y&content_id=1876#comments
5. *Fluoride Watershed*, Vol 13 Spring/Summer (2007) p 6 (4 refs esp ME Curzon MA Pollard Brit Dent Jnl (1997) 182: 242-244) www.npwa.org.uk/files/ws_v13_n1_spsu07.pdf
6. Holdcroft C, *Preventive Treatment in Wolverhampton* publ NPWA