The use of fluoride varnishes in the prevention of dental caries: a short review

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Authors' objectives
To review the current literature regarding the anti-caries efficacy of fluoride varnishes. In addition, to conduct a meta-analysis of a series of studies designed to detect the efficacy of fluoride varnishes for preventing caries.

Searching
A literature search was carried out as described by Chalmers et al. (see Other Publications of Related Interest no.1). The following sources were searched: the Index of Dental Literature from 1980 to 1997; MEDLINE from 1980 to 1997; EMBASE from 1980 to 1997; Biological Abstracts from 1995 to 1997; and Core Biomedical Collection from 1993 to 1997. The keywords used were 'fluoride' and 'paint', which included both the terms 'varnish' and 'lacquer'. No language restrictions were reported. Only published articles were identified.

Study selection

Study designs of evaluations included in the review
Randomised clinical trials (RCTs) with at least single-blinding of the outcome examiners were included. Studies employing a split-mouth design were excluded, because of potential contamination of the control sites by the active agents. In addition, the study had to be performed on fully erupted permanent teeth; the data had to be summarised in tabular form (graphical displays by themselves were excluded); and sample sizes, mean values, and standard deviations or standard errors had to be provided for both the treatment and control groups.

Specific interventions included in the review
Twice-yearly applications of a fluoride varnish on all tooth surfaces were compared with a control treatment, which had to be either standard active or a placebo but not a fluoride varnish treatment. The control treatment used in the analysis consisted of a regimen of fortnightly rinsing with 10 mL of 0.2% sodium fluoride solution. The patients had to be treated and monitored for a least one year.

Participants included in the review
The participants were school children (without special characteristics) aged 6 to 14 years.

Outcomes assessed in the review
DFS and DMFS were assessed. These abbreviations were not reported in full in the paper and the outcomes were not further defined. It is probable that a DFS score relates to decayed or filled surfaces (permanent teeth), whilst a DMFS score relates to decayed, missing or filled surfaces (permanent teeth); DMFT relates to decayed, missing or filled permanent teeth.

How were decisions on the relevance of primary studies made?
The titles and abstracts of the studies were printed and examined according to the specified inclusion criteria. The number of reviewers involved in selecting the studies was not stated.

Assessment of study quality
The validity of the studies was assessed according to the criteria of Chalmers et al. (see Other Publications of Related Interest no.1). No further details were reported. A quality score, based on the various validity criteria, was calculated and expressed as a percentage of the maximum achievable score. It was unclear how many of the reviewers performed the validity assessment.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data
The following types of data were tabulated: bibliographic details, number of patients, interventions, and mean increment DMFS (with standard deviations). For each study, the treatment effect was obtained by calculating the difference between the DMFT/DMFS increments of the experimental and control groups, according to the method of DerSimonian and Laird (see Other Publications of Related Interest no.2). The 95% confidence interval (CI) of the difference of the mean treatment effect was calculated by dividing the difference of the DMFS values for the experimental and control groups, by the sum of the DMFS values for the experimental and control groups.

Methods of synthesis
How were the studies combined?
The treatment effects were combined using a random-effects model and 95% CIs were quoted.

How were differences between studies investigated?
Heterogeneity between the studies was investigated using the Q test, as described by Whitehead and Whitehead (see Other Publications of Related Interest no.3).

Results of the review
Three RCTs involving 463 treatment and 461 control participants were included.

The incidence reduction of dental caries varied from 18 to 70% across the three studies. The pooled estimate of the treatment effect favoured fluoride varnish (-1.522, 95% CI: -3.168, 0.12), but did not reach statistical significance at the 0.05 level. The overall DMFS weighted mean was 4.09 in the fluoride varnish group and 5.07 in the control group, which was mainly brought about by one study of 248 participants. Significant heterogeneity was detected (Q=55.285, d.f.=3, P<0.001).

Authors' conclusions
The authors stated that a quantitative analytic approach (meta-analysis) incorporating rigorous and accurate methodological criteria was very difficult to perform because of the considerable heterogeneity found in the identified studies. This variation arose from differences in the experimental conditions and quantitative methods used, and was reflected in the variability of the results reported in the different studies. The authors concluded that 'in the face of these conditions, our analysis suggests that fluoride varnish is an efficacious caries preventive agent'.

CRD commentary
This was a clearly presented review, based on very clear inclusion criteria and a reasonable search of the published literature. However, it would appear that no specific attempts were made to locate unpublished data, so publication bias may be an issue. In addition, the authors failed to report how many of the reviewers were involved in selecting and assessing the quality of the studies, and extracting the data. Consequently, this may introduce bias if these processes were performed by a single reviewer. Only RCTs were included in the review, and the quality of the individual studies was assessed according to published criteria. However, the authors failed to present any of this information or discuss its influence on the findings of the review.

Very few details of the individual studies were presented; a small table summarising the characteristics of the studies would have been helpful to the reader. However, the authors appear to have conducted a reasonable analysis, both assessing and taking into account the heterogeneity between the studies. The authors also discussed, at length, the problems they encountered and various issues that should be considered when interpreting the review's findings. In particular, issues surrounding the heterogeneity between the studies were discussed. The authors were correct to suggest caution when interpreting their findings. However, the summary conclusions presented in the abstract failed to mention such caution. Overall, this was a reasonably conducted review and, from the data presented, the findings would appear to be valid.
Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors did not state any implications for research. However, the problems the authors encountered would suggest that future trials need more standardisation. In particular, this should address the participants’ ages, varnish application schemes and frequency, pre-application procedures, and above all, baseline caries incidence and fluoride background exposure.

Bibliographic details

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11355442

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Animals; Cariostatic Agents /administration & dosage /pharmacokinetics /therapeutic use; Child; Child, Preschool; DMF Index; Dental Caries /prevention & control; Fluorides, Topical /administration & dosage /pharmacokinetics /therapeutic use; Humans; Incidence; Lacquer; Mouthwashes /therapeutic use; Sodium Fluoride /administration & dosage /pharmacokinetics /therapeutic use; Statistics as Topic; Tooth /metabolism; Tooth, Deciduous /metabolism

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.