Chlorhexidine varnish for preventing dental caries in children, adolescents and young adults: a systematic review
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CRD summary
This review tentatively concluded that chlorhexidine varnish has a moderate caries-inhibiting effect in children and young adults when applied every 3 to 4 months, but this appears to diminish approximately 2 years after the last application. Given the small number of variable studies, the authors are justified in advising caution when interpreting the results.

Authors' objectives
To determine the caries-inhibiting effects of chlorhexidine (CHX) varnishes, and the effects of application frequency and time between application and evaluation, on the permanent dentition of children, young adults and adults.

Searching
PubMed, EMBASE, Web of Science and the Cochrane Oral Health Group's Trials Register were searched up to August 2005; the search terms were provided. The reference lists of selected articles were also examined for further studies. Only studies written in English were eligible for inclusion in the review.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials and controlled trials using a parallel-group or split-mouth design were eligible for inclusion. The duration of the studies ranged from 0.75 to 3 years.

Specific interventions included in the review
Studies comparing CHX varnish with placebo or no anti-caries treatment were eligible for inclusion. Just under half of the included studies compared treatment with placebo, while most of the remaining studies used no treatment controls; other controls used were cleaning and neutral gel. The types of CHX varnish included Cervitec, EC40 and Chlorzoin. Application regimens varied and were described in the data tables. The duration of follow-up from last application varied between 3 and 39 months. Treatments were applied to the occlusal surface of first and/or second permanent molars; permanent teeth with orthodontic appliances; the fissure and pits of first permanent teeth; or all permanent teeth.

Participants included in the review
Studies including children, young adults and adults were eligible for inclusion. Studies on primary teeth, root caries and older adults (over 25 years old) were excluded. The included studies were of children (age range: 5 to 8 years), young adults (age range: 11 to 14 years), or both; none of the studies included adults.

Outcomes assessed in the review
Studies had to measure the caries-inhibiting effect using clinical and/or radiographic methods to be eligible for inclusion. The primary outcome used in the review was prevented fraction (PF); described as the increase in caries in the control group minus the increase in caries in the intervention group, divided by the increase in caries in the control group. The methods used to calculate PF were provided. Studies that did not provide sufficient information (either within the paper or as extra information from the authors) to calculate the PF were excluded. The outcome measures used in the included studies varied and included decayed, missing or filled surfaces or teeth. The majority of the studies recorded dentine caries alone or in addition to enamel caries.

How were decisions on the relevance of primary studies made?
Two reviewers assessed the relevance of studies.

Assessment of study quality
The authors did not state that they assessed validity, but did report whether studies were randomised or quasi-randomised, whether blinding was used, and what the drop-out rate was for each study.

**Data extraction**
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. In the parallel-group studies, the PF, standard error and 95% confidence intervals were calculated from the mean increase of caries in the intervention and controls groups. In the split-mouth studies, standard errors were calculated using the Jackknife method. Authors were contacted for additional data where required.

**Methods of synthesis**

**How were the studies combined?**
Differences between the studies precluded meta-analysis and the studies were combined in a narrative, accompanied by summary data tables. Publication bias was investigated using funnel plots.

**How were differences between studies investigated?**
Some differences between the studies were discussed in the review text and were evident from the data tables. In particular, the effects of application frequency and time between last application and evaluation were assessed. Studies were also grouped according to whether they used a parallel-group or split-mouth design.

**Results of the review**
Ten studies (n=1,736) were included in the review.

Four studies used a quasi-randomised design. Five studies were double-blinded, four were single-blinded, and one had questionable blinding. The drop-out rates varied between 0 and 21%, with the exception of one study which reported a 45% drop-out rate 3 years after discontinuation of the study.

Four out of 5 split-mouth design studies, but only one out of 5 parallel-group design studies, showed a statistically significant caries-inhibiting effect in favour of CHX varnish (effect sizes not reported). All but one of the studies that used CHX varnish applied every 3 to 4 months showed a significant caries-inhibiting effect; one of the 2 studies with longer application intervals showed a significant effect. There was no apparent association between the caries-inhibiting effect and the duration between evaluation and the last application.

The authors reported that it was not possible to evaluate publication bias because of the large variation in effects and the small number of included studies.

**Authors' conclusions**
It is tentatively concluded that, when applied every 3 to 4 months, CHX varnish has a moderate caries-inhibiting effect. However, this effect appears to have diminished approximately 2 years after the last application. There is no evidence for the caries-inhibiting effects of CHX varnish with longer application intervals.

**CRD commentary**
This review answered a clear review question and searched a number of electronic databases. However, only English language articles were eligible and there appears to have been no specific attempt to locate unpublished data, thus publication and language bias cannot be ruled out. The authors made some attempts to reduce reviewer error and bias, but the risk of this cannot be fully assessed given the poor reporting of the methods used. The authors’ decision not to calculate pooled effect sizes because of differences between the studies appears reasonable, but it would have been helpful to have reported the actual effect sizes alongside the forest plots. Given the small number of heterogeneous studies, the authors are justified in advising caution when interpreting their tentative conclusions.

**Implications of the review for practice and research**
The authors did not state any implications for practice or further research.

**Funding**

PubMedID
17184224

DOI
10.1111/j.1600-0722.2006.00392.x

Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Adult; Anti-Infective Agents, Local /administration & dosage; Cariostatic Agents /administration & dosage; Child; Chlorhexidine /administration & dosage; Controlled Clinical Trials as Topic; Dental Caries /prevention & control; Humans; Paint; Research Design; Time Factors

AccessionNumber
12007005129

Date bibliographic record published
01/04/2008

Date abstract record published
03/11/2008

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.