The long-term effect of a mouthrinse containing essential oils on dental plaque and gingivitis: a systematic review
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CRD summary
This review assessed the effects of mouthrinse containing essential oils on gingivitis and plaque. The authors concluded that mouthrinse containing essential oils used as an adjunct to unsupervised dental hygiene provided an additional benefit on both outcomes compared with a placebo or control. This conclusion reflects the evidence of the review and appears likely to be reliable.

Authors' objectives
To assess the efficacy of a mouthrinse containing essential oils on dental plaque and parameters of gingival inflammation.

Searching
MEDLINE and the Cochrane CENTRAL Register of controlled trials were searched to the end of December 2006. Search terms were reported. References of included studies were also checked. Only studies reported in English were eligible for inclusion.

Study selection
Studies of an essential oils product in subjects aged at least 18 years with good health, gingivitis and no severe periodontal problems were eligible for inclusion. Eligible studies were randomised controlled trials (RCTs), controlled clinical trials (CCTs) and uncontrolled longitudinal studies with a duration of at least six months. The primary outcome was gingivitis. Secondary outcomes were plaque indices and staining.

In all studies subjects used an essential oils mouthwash to rinse for 30 seconds twice daily in addition to regular daily toothbrushing. Controls used were 5% hydroalcohol mouthwash, vehicle control, placebo, dental floss or a positive control. Included studies assessed gingivitis using either the modified gingival index (MGI) or the gingival index (GI). Plaque was assessed using the Turesky modification of the plaque index (PI) or the PI. Bleeding was also assessed using the gingival bleeding index and the interproximal bleeding index. A secondary review outcome was stain, which was assessed using the Lobene stain index, visual assessment and photographs. Study duration was six months in all except one case where it was nine months. All included studies were RCTs.

Two reviewers independently assessed the papers for inclusion in the review. Disagreements were resolved by discussion.

Assessment of study quality
The following criteria were used to assess the studies for validity: randomisation, allocation concealment, blinded assessment and completeness of follow up. The authors did not state how many reviewers performed the assessment.

Data extraction
Two reviewers performed the data extraction. Means and standard deviations (SD) were extracted for baseline and final assessments; where standard errors were reported the SD was calculated. Mean differences were calculated.

Methods of synthesis
Data for baseline and final assessments were pooled in separate random effects meta-analyses to give a weighted mean difference (WMD) with 95% confidence interval (CI) for each outcome. Subgroup analyses were performed for each outcome scale, and for some subgroups based on comparators. Heterogeneity was assessed using the $I^2$ statistic.

Results of the review
Eleven RCTs (n = 2,810) were included in the review. Study quality was mixed, with eight RCTs reporting methods of
randomisation, none reporting allocation concealment, all using blinded assessment and six reporting reasons for losses to follow-up.

Gingivitis (eight RCTs): The overall WMD at the end of study was -0.32 (95% CI: -0.46, -0.19, p < 0.00001) in favour of the intervention, although baseline analysis revealed no difference between the groups. The results for subgroups of studies using the MGI and the GI were also significantly in favour of the essential oils mouthrinse. There was significant heterogeneity in the overall analysis, but not in the subgroup analyses.

Plaque (seven RCTs): There was a significant effect in favour of the intervention at end of study (WMD -0.83, 95% CI: -1.13, -0.53, p < 0.00001) but not at baseline. There was significant heterogeneity in the analysis.

Results for interproximal gingivitis and interproximal plaque were also reported and showed significant effects in favour of the intervention (with the exception of interproximal gingivitis in the comparison with dental floss).

**Authors’ conclusions**
Essential oils mouthrinse provides an additional benefit in plaque and gingivitis reduction when used as an adjunct to unsupervised oral hygiene, compared with a placebo and control.

**CRD commentary**
The review question and the inclusion criteria were clear. The authors searched two relevant databases, but the lack of a systematic search for unpublished studies and the restriction to English language reports may have led to the introduction of publication and language biases, and the omission of some relevant studies. The authors report using methods designed to reduce reviewer bias and error in the selection of studies and the assessment of validity, but not in the data extraction. An appropriate validity assessment was conducted. The decision to employ meta-analysis appears appropriate. Reasonable subgroup analyses were undertaken, although heterogeneity was not investigated further. The authors' conclusions reflect the evidence of the review and appear reliable.

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

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