WhiteGum

References

Ref1

IN VITRO STAIN REMOVAL/INHIBITION AND POLISH BY CALCIUM CARBONATE CHEWING GUMS

[C.J. KLEBER](mailto:kleber@ipfw.edu), M.H. MOORE, and M.S. PUTT, Indiana University - Purdue University, Fort Wayne, USA

**Objectives:** A 0.38% baking soda chewing gum containing 0, 2, 4, or 7.5% calcium carbonate was evaluated in vitro for stain removal, inhibition of new stain formation, and enamel polish.

**Methods:** Stain removal was conducted by treating artificially-stained teeth (JDR 61:1236, 1982) for 60 and 120 minutes using a mastication device to simulate human chewing (JDR 60:109, 1981). Stain inhibition was tested using stain-free teeth treated with water (control) or the test gums for 20 min/day for 7, 10, and 14 days. Between daily treatments, the teeth were subjected to a coffee/tea/red wine/bacteria stain formation process. In both studies, stain was measured colorimetrically using the L\*a\*b\* color scale and E. Polish was assessed by treating acid-dulled teeth for 60 minutes and using a reflectometer to measure the amount of specular light reflected by the teeth relative to a polished standard.

**Results:** The table lists mean ±SD and reductions in the final scores (n=8 teeth/group). Groups with different (letters) are statistically different at p<0.05.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CaCO3in Gum | Stain Removal | | Stain Inhibition | | Enamel Polish |
| E | Reduction | E | Reduction |
| 0.0% | 2.9 ±0.6 (a) | 10% | 28.5 ±2.3 (a) | 7% | 47 ±3 (a) |
| 2.0% | 5.3 ±2.9 (b) | 17% | 25.1 ±4.5 (b) | 18% | 63 ±4 (b) |
| 4.0% | 7.5 ±1.8 (c) | 25% | 23.8 ±4.3 (c) | 22% | 70 ±5 (c) |
| 7.5% | 7.9 ±0.9 (c) | 27% | 23.3 ±2.4 (c) | 24% | 71 ±1 (c) |

**Conclusions:** Addition of 2, 4, or 7.5% calcium carbonate to a baking soda chewing gum resulted in significant improvements in removing existing stain from teeth, inhibiting the formation of new stain, and polishing enamel in vitro. There were no significant differences between the gums containing 4% and 7.5% calcium carbonate. [Supported by Dandy A/S.]

Ref3

[J Clin Periodontol.](http://www.ncbi.nlm.nih.gov/pubmed/6964679) 1982 Jul;9(4):346-54.

**Effects of sugared and sugar-free chewing gum on the accumulation of plaque and debris on the teeth.**

[Addy M](http://www.ncbi.nlm.nih.gov/pubmed?term=Addy%20M%5BAuthor%5D&cauthor=true&cauthor_uid=6964679), [Perriam E](http://www.ncbi.nlm.nih.gov/pubmed?term=Perriam%20E%5BAuthor%5D&cauthor=true&cauthor_uid=6964679), [Sterry A](http://www.ncbi.nlm.nih.gov/pubmed?term=Sterry%20A%5BAuthor%5D&cauthor=true&cauthor_uid=6964679).

**Abstract**

The aim of this study was to determine the effects of sugar-free and sugar-containing gums on plaque formation, established plaque and salivary debris. Plaque accumulating during three 5-day periods was recorded in a group of 10 students who, in the absence of normal oral hygiene methods, chewed sugar-free or sugar-containing chewing gum or did not chew gum. In a second group of 10 students the effect of chewing the two types of gum on 3-day accumulations of plaque was recorded. Finally, the wet weight of liquorice debris present in saliva with and without gum chewing, was recorded. During the no chewing periods distinct and significant differences in the amounts of plaque accumulating at different sites were apparent. Both types of chewing gum significantly and comparably reduced plaque accumulation during the 5-day period. The chewing gums also significantly reduced established plaque on many tooth surfaces. Salivary debris was significantly reduced by 50% after chewing gum. It was noted that plaque removal occurred primarily from sites remote from the gingival margin and interdental areas and therefore it was concluded that the observed effects of chewing gum on plaque would not be reflected in a reduction in gingival inflammation.

Ref4

[Caries Res.](http://www.ncbi.nlm.nih.gov/pubmed/1628291) 1992;26(3):176-82.

**Effects of nine different chewing-gums and lozenges on salivary flow rate and pH.**

[Dawes C](http://www.ncbi.nlm.nih.gov/pubmed?term=Dawes%20C%5BAuthor%5D&cauthor=true&cauthor_uid=1628291), [Macpherson LM](http://www.ncbi.nlm.nih.gov/pubmed?term=Macpherson%20LM%5BAuthor%5D&cauthor=true&cauthor_uid=1628291).

**Source**

Department of Oral Biology, Faculty of Dentistry, University of Manitoba, Winnipeg, Canada.

**Abstract**

The objectives of this study were to determine how salivary flow rate and pH vary with time during use of chewing-gums and lozenges. Twenty-four young adults collected unstimulated saliva and then, on different occasions, chewed one of six flavoured gums, or gum base, or sucked on one of two lozenges, for 20 min, during which time eight separate saliva samples were collected. Flow rate peaked during the 1st minute of stimulation with all nine products. With the lozenges, flow rate fell towards the unstimulated rate when the lozenges had dissolved. There were no significant differences in the flow rates elicited by cinnamon- or peppermint-flavoured gums or between sugar-containing or sugar-free gums. With the flavoured gums, the mean flow rate followed a power curve (r = -0.992) with time and within about 10 min was not significantly different from that when gum base was the stimulus. The initial stimulated flow rate with flavoured gums was about 10-12 times greater than the unstimulated rate (0.47 ml/min). After 20 min of chewing, it was still about 2.7 times that rate and about the same as the flow rate elicited by chewing-gum base alone. The pH of unstimulated saliva was about 6.95. With one gum containing about 1.5% organic acids, the salivary pH fell to a minimum of 6.18 in the 1st minute of stimulation, but then rose rapidly to a level above that in unstimulated saliva. With a sucrose-containing and a sucrose-free gum, the pH rose immediately on stimulation and then fell slightly with time to levels which were significantly above the pH of unstimulated saliva.

Ref5

[J Dent Res.](http://www.ncbi.nlm.nih.gov/pubmed/8501281) 1993 May;72(5):852-7.

**The distribution of saliva and sucrose around the mouth during the use of chewing gum and the implications for the site-specificity of caries and calculus deposition.**

[Dawes C](http://www.ncbi.nlm.nih.gov/pubmed?term=Dawes%20C%5BAuthor%5D&cauthor=true&cauthor_uid=8501281), [MacPherson LM](http://www.ncbi.nlm.nih.gov/pubmed?term=MacPherson%20LM%5BAuthor%5D&cauthor=true&cauthor_uid=8501281).

**Source**

Department of Oral Biology, Faculty of Dentistry, University of Manitoba, Winnipeg, Canada.

**Abstract**

Over a 20-minute period, subjects expectorated 8 samples of whole saliva (EWS) while chewing gum. Flow rates were calculated, and sucrose was analyzed in these samples as well as in saliva collected on filter paper strips from different tooth surfaces. Salivary film velocity (SFV), based on a 0.1-mm-thick film, was estimated from the clearance half-times of KCl in agarose disks positioned in different regions of the mouth. Salivary flow rate peaked at 5.1 mL/min in the first min but fell to about 1.25 mL/min by the end of the 20 min of gum-chewing. In contrast, flow rate when subjects sucked sour lemon drops averaged about 5.3 mL/min throughout the 20-minute period. The mean salivary sucrose concentration during gum-chewing peaked in the second min at 384 mmol/L (13.1%) but had fallen to 14 mmol/L by the 15-20-minute time interval. The sucrose concentrations on the palatal surfaces of the upper incisors and the facial and lingual surfaces of the lower molars were not significantly different from that in EWS but were much lower on the facial surfaces of the upper incisors and molars, and on the lingual surfaces of the lower incisors. When flow was unstimulated, SFV was 0.8-1.0 mm/min on the facial surfaces of the upper incisors and lower molars but about 5-8 mm/min on the facial surfaces of the upper molars and on the lingual surfaces of the lower incisors and molars

Ref6

**Effects of chewing gums sweetened with sorbitol or a sorbitol/xylitol mixture on the remineralisation of human enamel lesions in situ.**

[Manning RH](http://www.ncbi.nlm.nih.gov/pubmed?term=Manning%20RH%5BAuthor%5D&cauthor=true&cauthor_uid=1521303), [Edgar WM](http://www.ncbi.nlm.nih.gov/pubmed?term=Edgar%20WM%5BAuthor%5D&cauthor=true&cauthor_uid=1521303), [Agalamanyi EA](http://www.ncbi.nlm.nih.gov/pubmed?term=Agalamanyi%20EA%5BAuthor%5D&cauthor=true&cauthor_uid=1521303).

**Source**

Department of Clinical Dental Sciences, University of Liverpool, UK.

**Abstract**

Intra-oral remineralisation of experimental caries-like lesions in human enamel, as determined by polarised light microscopy and quantitative microradiography, was promoted to a similar extent (% fall in delta Z, 18.6 and 19.0) by chewing a sorbitol or sorbitol/xylitol (3:1)-sweetened gum for 20 min after each of three meals and two sugary snacks daily. The results suggest that reported differences in the properties of the two sweeteners do not affect their ability to enhance remineralisation due to salivary stimulation.

Ref7

**In situ Remineralization of Subsurface Enamel Lesion after the Use of a Fluoride Chewing Gum**  
Lamb W.J. · Corpron R.E. · More F.G. · Beltran E.D. · Strachan D.S. · Kowalski C.J.   
Caries Res 1993;27:111–116 (DOI: 10.1159/000261527)

## Abstract

In situ remineralization of early enamel lesions by a fluoride chewing gum was studied. Human enamel specimens with subsurface lesions were mounted in removable lower appliances for 6 adults. Subjects used a F-free dentifrice 3 ×/day and chewed five sticks/day for the F gum group (0.1 mg F/stick) or five sticks of sugarless gum. No gum was chewed for controls. Surface microhardness was performed on: (1) sound enamel; (2) lesions; (3) after intraoral exposure, and (4) after acid-resistance testing (ART). Separate specimens were etched and measured for F uptake and image analyses on microradiographs were performed for all regimens. ΔZ values were calculated and converted to percent of mineralization. Values for F gum were significantly higher (p > 0.05) than non-F gum and controls for ART, percent remineralization, and F uptake up to 70 μm depth.

Ref9

[J Clin Dent.](http://www.ncbi.nlm.nih.gov/pubmed/23210419) 2012;23(3):86-91.

# Effectiveness of a new dentifrice with baking soda and peroxide in removing extrinsic stain and whitening teeth.

[Ghassemi A](http://www.ncbi.nlm.nih.gov/pubmed?term=Ghassemi%20A%5BAuthor%5D&cauthor=true&cauthor_uid=23210419), [Hooper W](http://www.ncbi.nlm.nih.gov/pubmed?term=Hooper%20W%5BAuthor%5D&cauthor=true&cauthor_uid=23210419), [Vorwerk L](http://www.ncbi.nlm.nih.gov/pubmed?term=Vorwerk%20L%5BAuthor%5D&cauthor=true&cauthor_uid=23210419), [Domke T](http://www.ncbi.nlm.nih.gov/pubmed?term=Domke%20T%5BAuthor%5D&cauthor=true&cauthor_uid=23210419), [DeSciscio P](http://www.ncbi.nlm.nih.gov/pubmed?term=DeSciscio%20P%5BAuthor%5D&cauthor=true&cauthor_uid=23210419), [Nathoo S](http://www.ncbi.nlm.nih.gov/pubmed?term=Nathoo%20S%5BAuthor%5D&cauthor=true&cauthor_uid=23210419).

### Source

Church & Dwight Co., Inc. Princeton, NJ, USA. annahita.ghassemi@churchdwight.com

### Abstract

#### OBJECTIVE:

The primary purpose of this randomized, controlled, six-week clinical trial was to determine the effectiveness and safety of a new whitening dentifrice in removing extrinsic tooth stain and whitening teeth. An additional two-week exploratory study was conducted to determine whether the whitening or stain-prevention activity of the dentifrice would persist following cessation of use.

#### METHODS:

In the first study (Phase I), one-hundred and forty-six qualifying subjects were randomly assigned to either a sodium bicarbonate whitening dentifrice group (Arm & Hammer Advance White Extreme Whitening Baking Soda and Peroxide Toothpaste) or a silica-based negative control dentifrice group, and brushed twice daily with their assigned dentifrice for six weeks. Tooth shade on the labial surfaces of the eight incisors was assessed using a Vita Classic shade guide, and extrinsic tooth stain was scored using a Modified Lobene Stain Index (MLSI) at baseline, week 4, and week 6. In Phase II (after the week 6 examination), volunteers from the Arm & Hammer whitening dentifrice group were randomly assigned to continue using the whitening

dentifrice or to use the negative control dentifrice twice daily for two weeks. The six-week shade and stain index scores served as the baseline for this exploratory phase and were rescored after two weeks.

#### RESULTS:

The whitening dentifrice group had statistically significant (p < 0.0001) mean shade score reductions of 1.82 and 2.57 from baseline to weeks 4 and 6, respectively. For the same periods, the negative control dentifrice group was virtually unchanged from baseline. For tooth stain, the MLSI total mean scores for the whitening dentifrice group showed statistically significant (p < 0.0001) decreases from baseline of 1.42 (41.6%) and 2.11 (61.6%) at weeks 4 and 6, respectively. In contrast, the negative control dentifrice group had a MLSI reduction of 0.07 at week 4 and a 0.06 increase at week 6. Between-group analyses using baseline-adjusted ANCOVA showed the whitening dentifrice to be statistically significantly more effective (p < 0.0001) than the negative control for shade and tooth stain reductions for all index comparisons. Compared to the six-week (baseline) scores, subjects who continued to use the whitening dentifrice for the additional two weeks experienced statistically significant (p < 0.0001) further mean reductions of 0.88 in shade score and 0.46 in MLSI score, while subjects who switched to the negative control dentifrice experienced smaller, statistically significant (p < 0.05) reductions of 0.34 in shade score and 0.13 in total MLSI score.

#### CONCLUSION:

The Arm & Hammer whitening dentifrice tested in this study is effective for removing extrinsic tooth stain and whitening teeth. While the results also suggest that this dentifrice may have stain-prevention activity that persists following cessation of product use, such activity would need to be confirmed with further studies.

Ref10

[J Clin Dent.](http://www.ncbi.nlm.nih.gov/pubmed/10518865" \o "The Journal of clinical dentistry.) 1998;9(3):67-71.

# A longitudinal comparison of tooth whitening resulting from dentifrice use.

[Koertge TE](http://www.ncbi.nlm.nih.gov/pubmed?term=Koertge%20TE%5BAuthor%5D&cauthor=true&cauthor_uid=10518865), [Brooks CN](http://www.ncbi.nlm.nih.gov/pubmed?term=Brooks%20CN%5BAuthor%5D&cauthor=true&cauthor_uid=10518865), [Sarbin AG](http://www.ncbi.nlm.nih.gov/pubmed?term=Sarbin%20AG%5BAuthor%5D&cauthor=true&cauthor_uid=10518865), [Powers D](http://www.ncbi.nlm.nih.gov/pubmed?term=Powers%20D%5BAuthor%5D&cauthor=true&cauthor_uid=10518865), [Gunsolley JC](http://www.ncbi.nlm.nih.gov/pubmed?term=Gunsolley%20JC%5BAuthor%5D&cauthor=true&cauthor_uid=10518865).

### Source

Department of Periodontics, Virginia Commonwealth University School of Dentistry, Richmond, USA. tkoertge@vcu.edu

### Abstract

The effect of twice-daily brushing with one of three different dentifrices (Arm & Hammer Dental Care, Arm & Hammer Dental Care Extra Whitening, Crest) on stain removal and tooth whitening was examined in 115 volunteers over a period of 12 weeks. The facial surfaces of 12 anterior teeth were assessed for stain using a published, modified version of a standard stain index. Whiteness was measured on teeth 8 and 9 using a single Vita Lumin-Vaccum Shade Guide for consistency. At baseline, the mean facial stain scores were significantly higher (p < 0.05-0.01) for both Arm & Hammer dentifrices than for Crest. In addition, the tooth shades, as indicated by the stain guide, specifically the b\* values representing yellowness, were quantified using a Minolta spectrophotometer. Arm & Hammer Dental Care Extra Whitening formula was found to be significantly better than Crest at removing naturally occurring extrinsic stain. The difference between Arm & Hammer Dental Care Extra Whitening and Crest became significant (p < 0.01) after two weeks of use, and remained intact during the balance of the study, achieving p values of 0.0002 for at least one of the three assessed parameters (total stain, proximal, and facial) at weeks 4 and 12. The study also found that Arm & Hammer Dental Care produced a significant increase in tooth whiteness by week 12, whereas Crest showed no such increase at any time during the study. These results suggest that the two Arm & Hammer Baking Soda products are more effective in reducing stain and increasing whiteness than the standard silica-based dentifrice. Their effectiveness is not related to abrasivity since they are less abrasive to tooth enamel than the silica-based product tested.