

# The effect of chewing apples on dental plaque and food debris

J. M. BIRKELAND AND L. JORKJEND

Dental Institute of Experimental Research, University of Oslo, Blindern, Oslo, Norway

**ABSTRACT** – The aim of the present study was to assess the cleansing effect of the chewing of apples. The plaque situation in 47 children 12 years of age was assessed by the Plaque Index System. Judging from plaque incidence values, the chewing of apples had no cleansing effect on moderate amounts of plaque. A similar experiment with 57 children of the same age showed, however, that food debris was removed by chewing apples.

(Received for publication 25 February, accepted 10 May 1974)

The chewing of hard fruits and vegetables has been assumed to cleanse the teeth. Judging from experimental studies in adults, however, the chewing of fibrous food seems neither to affect the amount of dental plaque formed within 18 days<sup>1,2</sup> nor the gingivitis which develops in the absence of active oral hygiene<sup>3</sup>. Regular chewing of apples, on the other hand, has been found to reduce gingival disease in children, but deposits at the gingival margin were not assessed<sup>13</sup>. Since there is a causal relationship between plaque and gingivitis,<sup>10</sup> the apparent discrepancy between the findings in adults and children may be related to the amount of plaque at the gingival margin.

Plaque and gingivitis have been recorded frequently in Norwegian children<sup>3,4,6,12</sup>. The present study was conducted to assess a possible cleansing effect of apple chewing on the amount of plaque in children. Furthermore, the effect of this procedure on the oral clearance of food particles was evaluated.

## MATERIAL AND METHODS

The material comprised 12-year-old children attending primary schools in Porsgrunn, Norway. Children with orthodontic appliances were excluded.

*Effect on plaque.* The plaque situation of 47 children was assessed by the Plaque Index System. The maxillary and mandibular first molars and the incisors were recorded, i.e. 48 recordings in each child.

One day after this initial plaque scoring, 24 children (the apple group, chosen at random among the participants) were asked to eat a whole unpeeled apple and then to rinse the mouth with tap water. Immediately after this procedure, the plaque situation was re-scored. Twenty-three children (the control group) only rinsed with tap water before the re-examination. The children performed their conventional oral hygiene between the recordings.

The percentage frequency of the Score 2 is 100/48 of the nominal values. The frequencies of the Score 2 also express the plaque situation in children<sup>3</sup>. The incidence of plaque was assessed for each individual by paired comparison of the frequencies of the Score 2 from the two examinations. A possible effect of chewing apples on the amount of plaque was indicated by alteration in the incidence values. Comparisons within and between groups were evaluated by t-tests,  $\alpha = 0.01$ .

*Effect on food debris.* Twenty-seven children (chosen at random) were asked to eat a bun and then an apple (the apple group) while 30 children received only the bun. In order to detect food particles easily, the buns contained nycocin (Color Index No. 16255). Within 5 minutes after the eating of the red bun, the number of surfaces with food particles was recorded.

## RESULTS AND DISCUSSION

*Effect on dental plaque.* The mean initial frequencies of the plaque Score 2 were 51 % and 52 % of the total number of the plaque scores (Table 1). No areas were assigned Score 3. Judged by the initial frequencies of the Score 2, there was no significant difference in amount of plaque between the groups ( $t = 0.52$ , d. f. = 45). The same frequencies of

Table 1. Percentage frequencies (mean  $\pm$  s.d.) of Plaque Index Scores 0 and 2 at the initial recording of 12-year-old children (48 PI I scores per child)

Group	Score 0	Score 2
Apple ( $n = 24$ )	$7 \pm 9$	$52 \pm 26$
Control ( $n = 23$ )	$8 \pm 10$	$51 \pm 27$

Table 2. Effect of chewing apples on plaque and on food debris. The incidence of plaque expressed by the difference between the frequencies of Plaque Index Score 2 at two observations

Group	Mean no. ( $\pm$ s.d.) of differences of Score 2	Mean no. ( $\pm$ s.d.) of tooth surfaces with food debris
Apple	$0.8 \pm 6$ ( $n=24$ )	$2 \pm 6$ ( $n=27$ )
Control	$0.3 \pm 7$ ( $n=23$ )	$26 \pm 16$ ( $n=30$ )

the Score 2 at the two examinations of the control group (Table 2) confirm findings in this type of material<sup>3</sup>, i.e. the experimental design seems suitable for evaluating a possible effect on alterations in the plaque situation. When the frequencies of Score 2 of each individual were compared, the succeeding intergroup comparison indicated no significant difference in the incidence of plaque ( $t = 0.06$ , d.f. = 45). That chewing apples had no cleansing effect on moderate amounts of plaque confirms the findings in adults<sup>1, 2, 9, 15</sup>. The favorable effect of apple chewing on gingival disease observed by SLACK & MARTIN<sup>13</sup> may be ascribed to their material and their methods.

*Effect on food debris.* The children who ate the apples had significantly fewer food particles on their teeth than the control group children (Table 2). The findings are in agreement with the cleansing effect of chewing apples after subjects had eaten a cake made with yeast<sup>7</sup>. In addition, chewing apples accelerates the oral sugar clearance<sup>8</sup>.

The primary effect of chewing apples is the effective removal of food debris (e.g. refs. 5, 11) since

plaque remains on the teeth. These facts, however, may justify ending a meal with an apple.

## REFERENCES

- ARNIM, S. S.: The use of disclosing agents for measuring tooth cleanliness. *J. Periodontol.* 1963: 34: 227–245.
- BERGENHOLTZ, A., HUGOSON, A. & SOHLBERG, F.: Den plaqueavlägsnande förmågan hos några munhygieniska hjälpmedel. *Sven. Tandlaek. Tidsskr.* 1967: 60: 447–453.
- BIRKELAND, J. M. & JORKJEND, L.: A new approach to the evaluation of Plaque Index scores. *J. Periodontal Res.* 1973: 8: 284–289.
- BIRKELAND, J. M., JORKJEND, L. & FEHR, F. R. v. D.: The influence of fluoride mouth rinsing on the incidence of gingivitis in Norwegian children. *Community Dent. Oral Epidemiol.* 1973: 1: 17–21.
- ERIKSEN, H. M.: Tannrensende kost. *Nor. Tannlaegeforen. Tid.* 1972: 82: 615–618.
- JORKJEND, L. & BIRKELAND, J. M.: Plaque and gingivitis among Norwegian children participating in a dental health program. *Community Dent. Oral Epidemiol.* 1973: 1: 41–46.
- KNIGHTON, H. T.: Effect of various foods and cleansing agents on the elimination of artificially inoculated yeast from the mouth. *J. Am. Dent. Assoc.* 1942: 29: 2012–2018.
- LANKE, L. S.: Oral carbohydrate clearance. In: BLIX, G. (ed.): *Nutrition and caries-prevention*. Almquist & Wiksell, Uppsala 1965, p. 53–59.
- LINDHE, J. & WICÉN, P.-O.: The effects on the gingivae of chewing fibrous foods. *J. Periodontal Res.* 1969: 4: 193–201.
- LÖE, H., THEILADE, E. & JENSEN, S. B.: Experimental gingivitis in man. *J. Periodontol.* 1965: 36: 177–187.
- MARTHALER, T.: Apfel, Gesundheit und Kauorgan. *Schweiz. Monatsschr. Zahnheilkd.* 1968: 78: 823–836.
- SANGNES, G., ZACHRISSON, B. & GJERMO, P.: Effectiveness of vertical and horizontal brushing techniques in plaque removal. *J. Dent. Child.* 1972: 39: 94–97.
- SLACK, G. L. & MARTIN, W. J.: Apples and dental health. *Br. Dent. J.* 1958: 105: 366–371.
- SILNESS, J. & LÖE, H.: Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol. Scand.* 1964: 22: 121–135.
- WADE, A. B.: Effect on dental plaque of chewing apples. *Dent. Pract. Dent. Rec.* 1971: 21: 1974–196.

Address:

Dental Institute of Experimental Research  
Blindern  
Oslo 3  
Norway

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.