

# Summary of: The erosive effects of saliva following chewing gum on enamel and dentine: an *ex vivo* study

E. M. Paice,<sup>1</sup> R. W. Vowles,<sup>2</sup> N. X. West<sup>3</sup> and S. M. Hooper<sup>4</sup>

## FULL PAPER DETAILS

<sup>1</sup>Assistant Teacher, <sup>2</sup>Dental Materials Support Officer, <sup>3</sup>Professor in Restorative Dentistry, <sup>4</sup>Consultant Senior Lecturer, University of Bristol Dental Hospital, Lower Maudlin Street, Bristol, BS1 2LY  
\*Correspondence to: Miss Susan Hooper  
Email: susan.hooper@bristol.ac.uk  
Tel: +44 (0)117 342 4316

Online article number E3  
Refereed Paper – Accepted 30 September 2010  
DOI: 10.1038/sj.bdj.2011.51  
© British Dental Journal 2011; 210: E3

**Objectives** The primary objective was to determine the erosive effect of expectorated saliva, following chewing acidic gum, on enamel and dentine samples, using a non-acidic gum as a negative control. Secondary objectives were to determine the effect of brushing enamel and dentine samples and the effect of individual saliva pH and buffering. **Design** A single-centre, single-blind, placebo-controlled, two-way crossover study. **Setting** A clinical trial, involving healthy participants, undertaken at Bristol Dental School and Hospital. **Methods** Eight healthy participants expectorated saliva onto prepared enamel and dentine samples while chewing gum (strawberry flavoured acidic gum [active] or peppermint flavoured non-acidic gum [control]). Half of the enamel and dentine samples were brushed before measurement by contact profilometry. **Main outcome measures** Mean enamel and dentine erosion, with and without brushing and the relationship to salivary buffering. **Results** At 10 days, mean depth of surface loss from dentine samples (95% CI), following chewing of acid-containing gum and subsequent brushing, was  $-11.34 \mu\text{m}$  ( $2.22 \mu\text{m}$ ) and from un-brushed dentine samples was  $-11.02 \mu\text{m}$  ( $1.71 \mu\text{m}$ ). No significant erosion was noted for other groups. **Conclusions** Frequent chewers of acid-containing gums are susceptible to dentine erosion even in the presence of good salivary buffering. Enamel erosion was insignificant within the time constraints of the present study but warrants further investigation.

## EDITOR'S SUMMARY

As we have stated so many times in these pages, some of the best research emanates from an observation or experience which has puzzled a clinician or scientist. In the case of this study it was a patient who reported that they chewed a lot of flavoured, acidic chewing gum and who exhibited erosive tooth loss on the occlusal surfaces of their posterior teeth.

The conclusion of the study was indeed that frequent consumers of such chewing gum are more susceptible to dentine erosion, even in the presence of good salivary buffering, although enamel erosion is not significant. Apart from the obvious addition of this specific information to the body of dental literature, the results serve to underline the complexity of messages that we need to impart to our patients in terms of establishing and maintaining good oral health.

So, in the same way that the bland entreaty not to eat sweets is of no value

at all, there is also now a need to be more specific about the use of chewing gum. While there is good evidence that the chewing of gum stimulates saliva, which in turn neutralises plaque acid, we are already aware that we need to specify that sugar-free gum is more beneficial in this respect. In future we also therefore have to caution against the over-use of acid containing flavoured gums for fear of prompting erosive influences.

While highlighting these specifics it also serves to emphasise how our relationship with each patient as an individual is crucial to being able to both understand and guide their oral health. Much time needs to be taken in such a case. There is the time to identify the problem through examination and comparison of the current and previous situations, and to question the patient in an attempt to discover the cause by eliciting information on dietary habits. Then there is the knowledge and expe-

rience needed to make a diagnosis and further, to recommend how to avoid future damage. A simple chew becomes a sophisticated exercise in dental health education.

The full paper can be accessed from the *BDJ* website ([www.bdj.co.uk](http://www.bdj.co.uk)), under 'Research' in the table of contents for Volume 210 issue 3.

Stephen Hancocks  
Editor-in-Chief

DOI: 10.1038/sj.bdj.2011.72

**TO ACCESS THE BDJ WEBSITE TO READ THE FULL PAPER:**

- BDA Members should go to [www.bda.org](http://www.bda.org).
- Click the 'login' button on the right-hand side and enter your BDA login details.
- Once you have logged in click the 'BDJ' tab to transfer to the BDJ website with full access.

**IF YOUR LOGIN DETAILS DO NOT WORK:**

- Get a password reminder: go to [www.bda.org](http://www.bda.org), click the login button on the right-hand side and then click the forgotten password link.
- Use a recommended browser: we recommend Microsoft Internet Explorer or Mozilla Firefox.
- Ensure that the security settings on your browser are set to recommended levels.

**IF YOU HAVE NOT YET SIGNED UP TO USE THE BDA WEBSITE:**

- Go to [www.bda.org/getstarted](http://www.bda.org/getstarted) for information on how to start using the BDA website.

**IN BRIEF**

- Alerts readers to the fact that chewing acidic gums can pose a potential risk of enamel and/or dentine erosion, particularly when individuals repeatedly refresh with new pieces of gum.
- Highlights relationships of enamel and dentine erosion to saliva buffering and tooth brushing.
- The study confirms that non-acidic gum causes no detrimental effects with respect to enamel and dentine erosion.

**COMMENTARY**

The motive for undertaking this laboratory based research was the best – that of clinical curiosity having encountered dental erosion where a flavoured acid chewing gum was frequently used. It would be interesting to know if others, given the large number of sales of such gums, have too seen this in their clinical practice.

Readers of the Journal will no doubt be familiar with the protective functions of saliva upon exposure of the teeth to an acidic challenge. These include dilution, clearance (the transportation of the acid out of the mouth) and buffering (intraoral resistance to the pH change of the acidic challenge) effects. The most significant implication of this study is that the transport function of saliva, when all pH safe compensatory mechanisms are swamped, facilitates the loss of tooth substance by dental erosion as it brings acid into direct contact with the tooth surface. This can potentially arise if an individual, chooses to heed the advice of their dental health professional, and selects the wrong type of gum (an acidic flavoured gum) to chew to promote salivary flow in order to prevent dental caries/erosion.

The use of the profilometer to assess the depth of erosion upon the tooth samples, following exposure to the expectorated saliva from the subjects is standard laboratory practice. It is worth pointing out that the subjects were no doubt asked to attend at standard set times, to produce and apply their saliva to the samples, in order to minimise the

effects of diurnal rhythms upon the salivary constituents.

When viewing the graphs of salivary pH *versus* time, following chewing of the two gums used in the study, the reader should be aware that a shift of one pH unit represents a ten-fold difference in acid hydrogen ion concentration. In relation to the decline seen in salivary pH, following chewing the acidic flavoured gum, this indicates the greater potential of this agent to bring about erosion. The variable rates of salivary pH recovery thereafter are of interest and, though not the purpose of this work, indicate why individuals display different susceptibilities to dental erosion.

**R. G. Chadwick**

Clinical Senior Lecturer and Honorary Consultant in Restorative Dentistry Dundee Dental School and Hospital.

**AUTHOR QUESTIONS AND ANSWERS****1. Why did you undertake this research?**

Interest in the acidity of certain chewing gums and the potential for dental erosion was generated by observation of preferential tooth surface loss affecting the occlusal surfaces of all posterior teeth in a patient admitting to particularly frequent use of flavoured acid chewing gum. There was no relevant medical history or report of gastric erosion. The patient admitted to replacing gum frequently in order to enjoy the taste of the gum. The study aimed to establish the effect of expectorated saliva following chewing acidic gums on enamel and dentine and to investigate how this may have been affected by individual saliva and/or compounded by the abrasive effects of subsequent tooth brushing.

**2. What would you like to do next in this area to follow on from this work?**

Chewing gum has, correctly, largely been considered of benefit to oral health. It is important to communicate any identified risk during health promotion. The pattern of use identified in this study warrants more detailed investigation. The interaction with tooth brushing combined with toothpaste is potentially more damaging than the dry brushing used in this study.

Having established a model for investigation of chewing gum studies *ex vivo*, work is planned to investigate further the role of non-acidic chewing gums in the delivery of beneficial or therapeutic agents.