Summary of: A laboratory investigation of consumer addition of UHT milk to lessen the erosive potential of fizzy drinks

J. Syed¹ and R. G. Chadwick²

VERIFIABLE CPD PAPER

FULL PAPER DETAILS

¹Lecturer in the Department of Oral Biology, DOW University of Health Sciences, Pakistan/Formerly Postgraduate Research Student, The Dental School and Hospital, Dundee, UK; ²Clinical Senior Lecturer in Restorative Dentistry/Honorary Consultant in Restorative Dentistry, The Dental School and Hospital, Park Place, Dundee, DD1 4HN

*Correspondence to: Dr R. G. Chadwick
Email: r.g.chadwick@dundee.ac.uk

Online article number E6

Refereed Paper – accepted 28 August 2008

DOI: 10.1038/sj.bdj.2009.8

©British Dental Journal 2009; 206: E6

Introduction Much recent attention has been given to the erosive potential of carbonated beverages. Some have shown that the risks of developing erosion, if such drinks are consumed once daily and four times daily, are respectively 2.2 and 5.13 times greater than if they are not consumed at all. The addition of ultra-heat treated (UHT) milk to such beverages has been identified by a survey as common practice in Pakistan. It is known that the addition of calcium to orange juice and acidic candies reduces the capacity of these dietary items to produce dental erosion by the law of mass action. While potentially helpful, such a practice at manufacture may affect adversely product stability and flavour, thus compromising market share. As a result an alternative approach is for the consumer to carry out such modification. The addition of milk is one such potential means. **Objective** To assess the capacity of six brands of carbonated drinks to bring about dental erosion and determine if consumer modification by the addition of milk affected this. **Design** *In vitro* study. **Method** For each drink in both manufactured and consumer modified (25 ml of drink with 6.25 ml UHT milk) states, the pH and titratable acidity were measured. These assessments were also made for distilled water dilution of the manufactured drinks in the ratio of 1 part drink to 0.25 parts water. In addition, the effects of a 60 min exposure to the drinks in manufactured and consumer modified states, upon the surface microhardness and profile of human molar buccal tooth substance were determined. **Results** The addition of milk significantly increased the mean pH ($p < 0.001$) and decreased the mean titratable acidity ($p < 0.001$). Its addition had significantly more ($p < 0.001$) than a simple dilution effect upon these values. Milk addition significantly lessened ($p < 0.001$) the reductions in surface microhardness of tooth substance when exposed to the drinks except in the case of one beverage. There was, however, no significant effect ($p = 0.0732$) of its inclusion upon the depth loss of tooth substance. **Conclusions** Within the limitations of this study, the addition of milk to carbonated beverages reduced overall their capacity to bring about dental erosion.

EDITOR'S SUMMARY

The increase in tooth surface loss has been well documented not only in the UK but around the world, with erosion as the primary candidate. Changes in diet and lifestyle are often cited as the reasons for these developments and consumer choice in terms of fizzy drinks but also for 'healthier' options such as fruit and vegetables in the form of food and drinks also doubtless contributes to this trend.

This piece of research was built on the observation that people in Pakistan, and now the UK, add UHT milk to fizzy drinks. The authors pondered what the effect of that might be in relation to altering the pH of the resulting beverage and consequently whether there may be a beneficial effect on tooth tissue erosion. Indeed, as

far as this *in vitro* research model is able to gauge, it seems as if there may be an advantage to be gained as the presence of calcium in the milk helps to reduce the potential damage. Such an effect has been recognised for many years but the apparently unusual use of it in this context was certainly worthy of following-up and in the light of this work warrants further investigation.

What is interesting is the juxtaposition of science, habit and psychology. Even if the addition of milk proves to be beneficial for oral health what are the chances that patients and parents are likely to take the message on board, let alone practice it? As Dr Milosevic suggests in the Commentary, readers might like to try it for themselves! So the next question is

whether manufacturers are likely to incorporate a similar change in their formulations and ingredients. The answer, one supposes, depends on whether customers will buy it, which in turn depends on their perception as to whether or not it is 'healthy' and beneficial to them personally. As well as valuable science this paper also reminds us that we are dealing with both biology and humankind – a mixture that provides constant challenges for us in trying to keep one step ahead.

The full paper can be accessed from the BDJ website (www.bdj.co.uk), under 'Research' in the table of contents for Volume 206 issue 3.

Stephen Hancocks,
Editor-in-Chief

DOI: 10.1038/sj.bdj.2009.79

TO ACCESS THE BDJ WEBSITE TO READ THE FULL PAPER:

- BDA members should go to www.bda.org
- Do not login on the BDA home page, if you are already logged in, please log out.
- Then, in www.bda.org click on the link to the BDJ in the top left of the screen. A new window will open. If a new window fails to open please check the settings of any pop up blocker software that you have installed on your computer.
- You will now be asked to login with your BDA website login details which are on your BDA membership card.
- Once your details have been entered you will be transferred to the BDJ website. If your login does not work please contact the BDA Membership Department on 020 7563 4550.
- If you are not able to access the article on the BDJ website there may be an issue with your system's firewall. If so, return to the BDA homepage and click on the link 'BDJ access problems' and follow the step by step guide.

IN BRIEF

- Illustrates the erosive capacity of a range of carbonated drinks.
- Describes a readily accessible form of consumer modification to such drinks.
- Indicates that the addition of 6.25 ml of UHT milk to 25 ml of drink significantly reduces the erosive potential of the majority of the carbonated drinks studied.

COMMENT

The association between dietary acid and dental erosion is still a fertile ground for research. Drinks modification in order to reduce erosive potential is not new and has resulted in at least one commercially available product. The beneficial properties of milk are also well established but this study has uniquely assessed various carbonated drinks modified by the addition of UHT milk. Although this may be common practice in some parts of the world, it is novel in the West. The results show significant increases in pH and decreases in the standardised titratable acidity of all six popular drink brands that were tested. The milk modified drinks reduced surface softening of enamel by approximately 50% as measured by the Vickers micro-hardness test. However, the mean loss of enamel depth following 60 minute immersion in milk modified drinks was greater for four out of the six drinks compared to regular varieties, which although not statistically significant, is surprising and contrary to the overall results.

The authors acknowledge that the test conditions were not representative of the oral environment but the results allow relative comparisons to be made. The temperature of the drinks and at which the experiment was conducted should have been stated as the acid dissociation constant is temperature dependent. Presumably the study was carried out at ambient room temperature with a lower erosive potential than at higher intra-oral temperatures. The results may have been more marked.

Hopefully, drinks manufacturers will take heed and aim to develop products with low erosive potential.

It is unlikely, in my opinion, that teenagers or adults would add milk to carbonated drinks. Dentists may wish to try this out for themselves by adding milk to fizzy drinks to see and taste the difference! But on a practical note, such a recommendation to patients with erosion would at least highlight the benefits of milk, as either an alternative or as an additive.

Dr A. Milosevic,
Liverpool University Dental Hospital

AUTHOR QUESTIONS AND ANSWERS

1. Why did you undertake this research?

It is well documented that the consumption of fizzy drinks increases the chances of dental erosion developing. The levels of worldwide sales suggest that these drinks are very popular. Though some manufacturers have attempted to reduce their erosive potential, such modification can affect both shelf life and product taste. It is also likely to raise regulatory obstacles. A potential solution is to promote consumer modification of the drink. We were both interested in the practice, popular amongst British Asians and also prevalent in Pakistan, of adding UHT milk to carbonated beverages. In view of the calcium content of milk we thought such practice may offer the potential to reduce the erosive potential of such beverages.

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

Our *in vitro* study demonstrates clearly that addition of UHT milk to the beverages studied reduces their capacity to bring about dental erosion. Ongoing work seeks to establish the mechanisms of this effect. We also wish to scientifically evaluate its acceptability to individuals and, together with this, carry out an *in vivo* study to ensure that the potential benefits are realised under such circumstances and not adversely affected by possible reductions in saliva production.