

Comparative Evaluation of Effect of Different Dairy Products on Salivary pH – An In-Vivo Study

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ABSTRACT

Introduction: Milk and milk products are an important part of the human diet. Especially for children it is the only source of essential nutrients. Consuming dairy products is vital to maintaining good overall health. In 1958, the Research Committee of the Canadian Dental Association (1958) reviewed the evidence that milk consumption was associated with a reduction in caries incidence. However, there has been little research about how dairy products affect oral health in particular. Aim of the study was to evaluate the effect of different dairy products on the oral health of children between the age of 6 to 12yrs.

Material and Method: Forty caries free children in the age group of 6-12 years were selected and divided randomly into 4 groups. Group I was given sugar free milk, Group II was given sugar free yogurt and Group III was given processed cheese and Group IV served as the control group and was given paraffin to chew. After determining the resting salivary pH using digital salivary pH meter, each group consumed their product for three minutes and then swished with water. pH level of each subject's saliva was measured again at an interval of 10, 20 and 30 minutes to record the time taken for the salivary pH to come to the baseline values after consuming different dairy products.

Results: Subjects who ate cheese showed a rapid increase in pH levels at each time interval, suggesting that cheese has anti- caries property.

Conclusion: Dairy products without added sugar can be recommended as after meal, especially to school children, which would help to reduce the incidence of dental caries.

Keywords: Dental Caries, Milk Products, Salivary pH

INTRODUCTION

Dairy products are recognized as an important for one's overall and dental health.¹ There is sufficient evidence regarding the effect of saliva in controlling plaque pH, and that stimulation of saliva by foods is an important factor in determining their acidogenic potential. This is especially important when saliva is stimulated after plaque pH is lowered by an acidogenic challenge. Chewing of certain foods, such as dairy products promotes a rapid recovery of plaque pH following an acidogenic challenge thereby exerting a caries protective effect.¹

Dental caries is an infectious and nutrition-related disease. Eating patterns and especially consumption of sugar rich foods between meals can result in tooth decay.² Diet counselling forms an important part of preventive dentistry and as dentists are encountered with caries-prone patients they are increasingly called upon to identify and give advice on foods that inhibit and reduce the carious process, rather than,

systemic nutritional counselling for developing a caries free tooth.

Prevention of excess sucrose consumption appears to be a reasonable component of a caries prevention program. Yet, there is presently no evidence demonstrating the effectiveness of this restrictive approach of dietary counselling on caries reduction in children due to poor compliance. Although dairy products are proven to be caries protective foods, individuals make food choices in the context of their culture, region and owing to the lack of availability. Thus the present study sought to assess the variation in salivary pH in vivo, following the consumption of different dairy products (cheese, milk, yogurt with paraffin used as control).

MATERIALS AND METHODS

A sample of 40 healthy subjects (6-12 years old) was randomly selected for this study. All the subjects were caries free, that is, with no decayed, missing, or filled teeth (DMFT). Eligible participants were given an informational summary to read with their parents, and the study was also explained verbally. Subjects with missing teeth were excluded from this study, as were those undergoing orthodontic treatment, antibiotic therapy or other chemotherapeutic procedures with a potential effect on salivary secretion. Subjects with caries, history to food allergies especially to dairy products and were unwilling to participate were also excluded. All appointments took place in the morning. Oral prophylaxis had been done in all the children. Each subject was then assigned randomly to one of four groups:

Group I:- Sugar free milk (n = 10),

Group II:- Sugar free yogurt (n = 10),

Group III:- Processed cheese (n = 10),

Group IV:- Control (paraffin) (n = 10).

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After the baseline estimation of salivary pH, the subjects in each groups were allowed to consume their respective products: cheese(10 g), milk (15 ml),sugarless yogurt (10 g), or paraffin (5 g) for 3 minutes. They were then asked to swish their mouths with deionized water. The pH was measured after intervals of 10, 20, and 30 minutes, with the help of digital pH meter on all subjects. This aspect of time has been shown to be adequate for significant buffering of salivary pH.

During the entire study, salivary pH was assessed directly using a pH electrode (Sigma Instruments, Inc.) connected to a display unit. This miniature wire electrode was designed to measure the fast pH changes in small samples. Initially, the tips of new and sterilized electrode pH sensors were soaked in distilled water for several hours prior to use. Once prepared, the electrodes were stored in a reference buffer (pH = 7), where calibrations were performed before assessment of each subject. Saliva was collected in test tube and salivary pH was assessed.

The electrode was rinsed in distilled deionized water between each reading to protect against cross-contamination. Difference in mean salivary pH values between the groups and at different time intervals were statistically analyzed using one-way ANOVA.

RESULT

Groups	Baseline pH	pH at 10 min	pH at 20 min	pH at 30 min
Group I (Milk)	6.90±0.45	6.70±0.35	6.69±0.43	6.56±0.45
Group II (Yogurt)	6.59±1.03	6.47± 0.90	6.34±0.88	6.34±0.83
Group III (Cheese)	7.04± 0.28	7.27±0.14	7.27± 0.21	7.21±0.19
Group IV (Control)	6.93±0.26	6.99±0.31	6.91±0.27	6.89±0.24
Annova	1.022	4.514	5.570	5.762
P value <0.05 = Significant	0.394	0.009	0.003	0.003

One way ANNOVA

Table above summarizes data recorded for the 4 groups analyzed at baseline, 10, 20, and 30 minutes. The results showed a statistically significant difference in mean salivary pH between baseline, 10 minutes, 20 minutes and 30 minutes. Following the consumption of dairy products, it was found that the mean salivary pH in the cheese group rose rapidly after 10 minutes 20 and 30 minutes compared to baseline values. However, the salivary pH at 20 minutes was highest than baseline, 10 and 30 minutes. These variations were found to be statistically significant ($P < 0.003$). Among those who drank milk, salivary pH decreased after 10, 20 and 30 minutes; however, the variations at the different time intervals were also found to be significant. Among the subjects who consumed yogurt, salivary pH dropped rapidly after 10, 20 and 30 minutes. In this case, the variations at different time intervals were found to be significant. Results showed significant differences in the yogurt group between, baseline and 10, 20 and 30 minutes.

DISCUSSION

Various studies have demonstrated that Dairy products have low cariogenic potential and demonstrate anticaries activity, although additional investigations are required.^{3,4,5}

One approach to estimate the acidogenic potential of food involves evaluation of the magnitude of the pH response following ingestion of food.

Although salivary pH is not the only criteria or parameter that predispose to dental caries, it is an effective tool at the chair side and in school health education programs to educate smaller and larger groups on the nutritional and protective aspects of food as part of diet counselling.

Prior to consumption of test foods resting salivary pH was recorded to provide baseline values against which their rise and drop in pH could be evaluated. The baseline values thus, measured were in the range of 6.5 to 7.4 and are similar to earlier reports.¹ The results tend to confirm previous reports of salivary testing showing a subject-to-subject variation in response to test foods as individuals in a population differ considerably in salivary pH due to variation in caries susceptibility.

The results of the present study revealed that the cheese consumption led to an increase in salivary pH at various time intervals, but cheese showed a greater increase in salivary pH even at 30 minutes, while the salivary pH of milk and yogurt decreased at 10 and 20 minutes, 30 minutes compared to baseline level, the salivary pH in the milk group was decrease to that of the base line pH, while in the yogurt group, it was lowered more.

pH values after cheese consumption seems to be the reduction of critical salivary pH. The anti-cariogenic properties of cheese can be This reduction occurred due to diffusion of calcium and phosphorus into the saliva from the cheese; the buffering of the salivary pH by, which was stimulated by chewing cheese (a strong sialagogue); the fact that cheese contains a significant amount of tyramine, which could be used by microorganisms to raise the pH value of saliva; and the accelerated rise in pH (similar to a plaque pH rise) due to the peptides in the cheese.^{6,7,8}

Milk fermentation leads to the production of lactic acid and the resulting pH decrease inhibits growth of many pathogenic organisms. The reduction in the milk group may be due to direct chemical effect of Casein, Phosphopeptides, Calcium and Phosphate.⁴ One of the most popular fermented foods is yogurt, which traditionally has been fermented with *L.bulgaricus*. Yogurt consumption in this study led to a rapid drop in

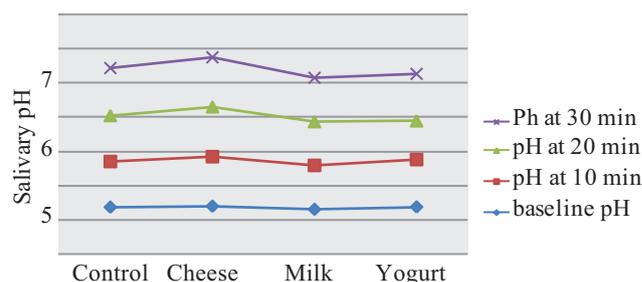


Figure-1: Salivary pH

the salivary pH; however, the decrease did not drive it below the critical pH of 5.5 at 10 minutes, similar to the results of previous studies. The initial fall in salivary pH was due to the acidic nature of the yogurt (4.0-4.5 pH).^{1,9,10}

CONCLUSION

Among the three dairy products consumed cheese showed the highest salivary pH 30 minutes after consumption, followed by milk and yogurt. These suggest that cheese has the highest anti cariogenic property among these dairy products. The pH levels of milk and yogurt grouped approached baseline or neutrality. None of the milk products in this study lowered the salivary pH below the critical pH of 5.5, where enamel demineralization and dissolution are expected even at 10 minutes interval. These findings confirm that these dairy products without sugar are noncariogenic and to some extent cariostatic. Hence it can be concluded that dairy products without added sugar can be used as substitute for carbohydrate laden desserts and snacks, which may help reduce the incidence of dental caries.

REFERENCES

1. Ravishankar Lingesh Telgi, Vipul Yadav, Chaitra Ravishankar Telgi, Naveen Boppana. In vivo dental plaque pH after consumption of dairy products. *General dentistry* 2013;56-59.
2. Ece Koparal, Fhinur Ertugrul, Ertugrul Sabah. Effect of chewing gum on plaque acidogenicity. *J Clin Pediatr* 2000;24:131-134.
3. Aimutis WR. Bioactive properties of milk proteins with particular focus on anticariogenesis. *J Nutr*. 2004;134:989S-995S.
4. Reynolds EC. Remineralization of enamel subsurface lesions by casein phosphopeptide-stabilized calcium phosphate solutions. *J Dent Res*. 1997;76:1587-1595.
5. Curzon ME. Food and dental caries. *BNF Nutrition Bulletin*. 1989;55:36-45.
6. William H Brown. Effect of dairy products on oral health. *Scandinavian Journal Of Nutrition* 2002;46:178-179.
7. Birkhed D, Imfeld T, Edwardsson S. pH changes in human dental plaque from lactose and milk before and after adaptation. *Caries Res*. 1993;27:43-50.
8. Jenkins GN, Hargreaves JA. Effects of eating cheese on Ca and P concentrations of whole mouth saliva and plaque. *Caries Res* 1989;23: 159-164.
9. Sonmez IS, Aras S. Effect of white cheese and sugarless yoghurt on dental plaque acidogenicity. *Caries Res*. 2007;41:208-211.
10. Southgate DA. Milk and milk products, fats and oils. In: Garrow JS, James WPT, Ralph A, eds. *Human Nutrition and Dietetics*. Edinburgh, Scotland: Churchill Livingstone; 2000:375-383.

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