

CONSUMING CHEESE AFTER SUGAR CHALLENGE PREVENTS FURTHER PLAQUE pH DROP

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Background

Dental caries is a multifactorial disease. Diet plays an important role in the etiology of dental caries. When food is ingested, plaque bacteria ferment the carbohydrates to produce acids leading to a drop in plaque pH. Plaque acidogenicity plays an important role in carious lesions formation.

Dietary recommendations for caries prevention have emphasized avoidance of cariogenic diet and limiting the frequent intake of sugars. However, focus on how the choice, combination and sequence of consumed foods may help prevent plaque acidogenic changes has been emphasized. Cariogenic potential of sugars may be modified by the ingestion of non-cariogenic foods or by altering the position of sugary foods in a meal relative to other foods. Wu's laboratory has shown that adults or children drinking milk after consuming dried ready-to-eat sugar-added cereal prevented further plaque pH drop and returned plaque pH to above baseline of 6.5, compared to other beverages.

Milk has been shown to be “mouth friendly” and cariostatic due to its ability to promote enamel remineralization and many other beneficial properties including its neutral pH, antimicrobial enzymes and high levels of milk proteins, calcium and phosphorus. Cheese, a dairy product, has similar properties as milk but limited studies are available regarding protective effects against plaque pH drop after a sugar challenge.

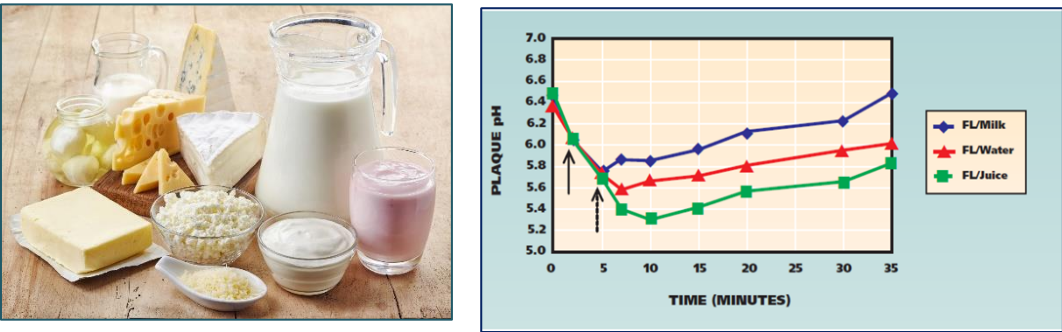


Figure 1. Milk, water, and juice effects on plaque pH

Hypothesis and Objective

We **hypothesize** that consuming dairy products such as cheese has a similar protective effect as drinking milk in reducing *in vivo* plaque pH drop following a sugary challenge.

This study examined the effect of consuming cheese or Gummy Bear candies after eating dried ready-to-eat sugar-added cereal (Froot Loops) on *in vivo* dental plaque pH in adults. Non-flavored gum base was used as a control.

Methods

Study Design: Ten adults (18-64 years) participated in this randomized crossover study with Institutional Review Board (IRB) Approval (ID: 2015-1046)

***In vivo* plaque pH measurements:** A touch microelectrode was used to take *in vivo* plaque pH readings at the interproximal between the maxillary premolars (or primary molars) on both sides at 2, 5, and up to 30 mins after foods consumption. The plaque pH was measured at baseline at every visit.

Test Visits: (Randomized selection of test group at every visit)

- Dry sugar added cereal Froot Loops (FL, 20g)
- FL followed by low fat Swiss cheese (5g)
- FL followed by two pieces Haribo® Gummi-Bears
- FL followed by non-flavored Gum Base (1g)
- 10ml 10% sorbitol solution as negative control
- 10ml 10% sucrose solution as positive control

Statistical Analysis: completed using SPSS software version 28

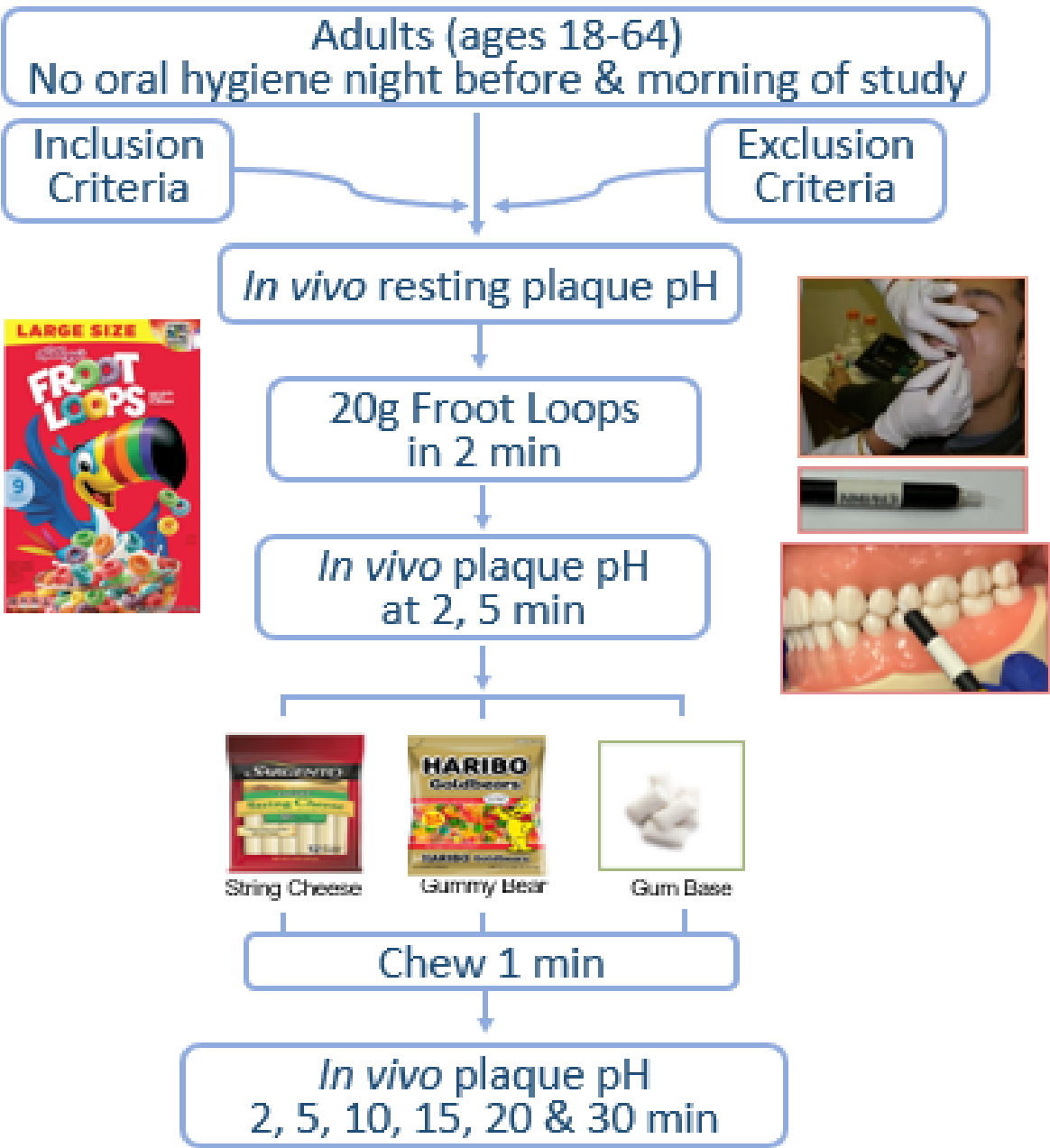


Figure 2. Study design

Results

Figure 3. *In vivo* dental plaque pH after 10% sucrose or sorbitol

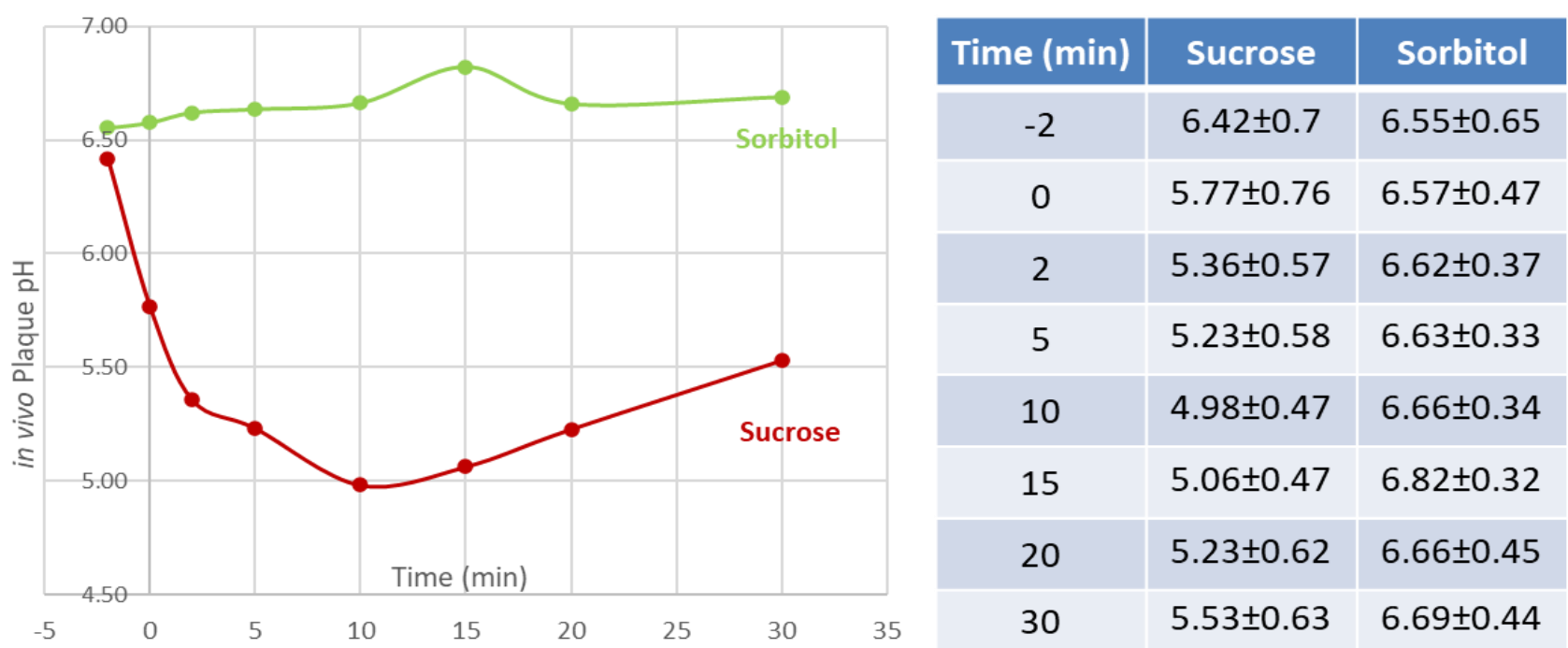
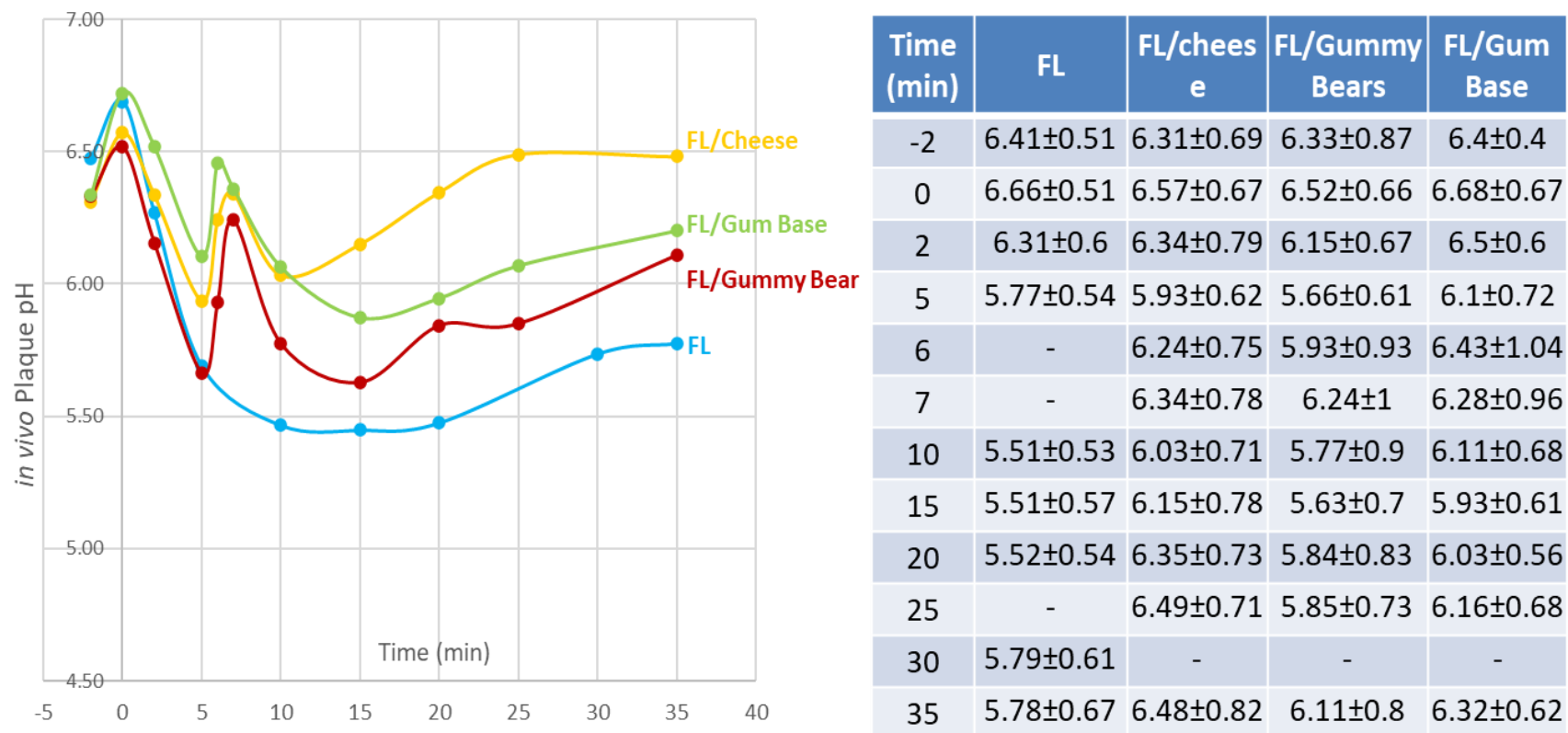


Figure 4. *In vivo* dental plaque pH after consuming test foods



Findings:

- After consuming FL, the averaged plaque pH dropped to 5.48±0.55 and did not fully recover over the 35-minute testing period.
- For FL/Gummi-Bears, the lowest plaque pH was reached at 5.63±0.70 and recovered to 6.11±0.80.
- Consuming cheese after FL resulted in an immediate pH rise to 6.34±0.78 reaching pH 6.48±0.82, fully recovered to baseline. This represented the highest plaque pH increase compared to all other test food combinations (p<0.05).
- Chewing gum base caused immediate pH rise but was followed by pH drop to below 6 and slowly recovered to 6.32±0.62.

Conclusions

- Chewing and consuming cheese after a sugar challenge reduced the drop in plaque pH caused by sugar consumption.
- Cheese, like milk, represents a healthy food/snack and benefits human dental health if sequenced appropriately between or after sugary snacks
- Dentists and health care professionals may be encouraged to recommend non-sweetened dairy products such as milk and cheese after sugary snacks.
- Further *in vivo* studies are warranted to assess the protective effects of cheese on dental caries

Acknowledgements

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