

Evolution from Caries Models to Erosion Evaluation Models

R.V. Faller* and J.V. Hoskins
P&G, Mason, OH, USA



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ABSTRACT

Reported increases in dental erosion have stimulated interest in measuring and assessing erosive damage to dental hard tissues. Though there are similarities, caries (a dieto-bacterial disease) and dental erosion (a condition initiated by external dietary acids from food and drink) are completely different processes; with both processes resulting in net loss of tooth mineral. *In vitro* pH cycling models are useful for demonstrating protective effects of fluoride and mineralizing agents against caries. New models are needed to assess dental erosion, its causes and potential treatment. **Objectives:** The purpose of this study was to determine the feasibility of applying key aspects of a well accepted *in vitro* pH cycling model toward the development of a new model to assess the protective nature of compounds against induced dental erosion. **Methods:** 3mm cores of human enamel were ground and polished to produce a flattened surface, then placed into groups of 4. Each group was exposed for 2hr. to pooled, human saliva to initiate a surface pellicle. Specimens were exposed (10 min.) to either: 1) water (neutral pH) followed by Coke (acid); 2) orange juice (acid) followed by Coke (acid); or 3) 1.0% sodium hexametaphosphate (Glass H), neutral pH, followed by Coke (acid). Coke challenges (10 minutes) followed 5min. after the initial treatment. Specimens soaked in pooled, human saliva during this interim period and for 1hr between each set of treatments. Cycling took place 7x/day/5days, after which specimens were cross-sectioned and assessed via TMR to determine net mineral loss (μm). **Results:** (presented as μm of mineral loss from the original enamel surface) 1)33.4; 2)40.6; 3)4.3, with $3 < 1 < 2$ ($p=0.05$). **Conclusions:** These results demonstrate the usefulness of this new model for measuring relative differences in the protective nature of compounds, such as Glass H, to help protect teeth against dental erosion.

INTRODUCTION

The development of new, predictive models for assessing conditions such as dental erosion can be more easily extrapolated from currently understood models, such as caries models, than starting from a point of relatively unknown performance and developing new model systems from the ground-up. As the progression of dental erosion shares some features similar to that of the caries process (net loss of mineral), the use of a well understood caries model serves as a reasonable starting point for the development of a predictive model to study potential prevention of dental erosion.

PURPOSE

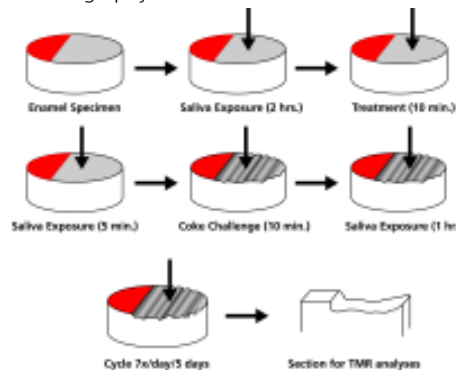
The purpose of this study was to determine the feasibility of using a modified *in vitro* pH cycling model to assess the protective nature of compounds against induced dental erosion.

MATERIALS AND METHODS

Substrate: Cores of sound, human enamel, removed from extracted teeth (incisors, premolars) were ground and polished to produce a flattened surface.

Generalized Cycling Protocol:

- Enamel specimens placed into groups of 4 specimens per test cell
- Each group of specimens exposed to pooled human saliva to initiate pellicle formation
- Enamel specimens exposed for 10 minutes to one of the following treatments:
 1. Water (neutral pH)
 2. Orange Juice (acid)
 3. 1% Glass H (neutral pH)
- 10-minute exposure of each group of specimens to 100ml Coke® (per 4 specimens)
- 1-hour exposure of each group of specimens to pooled, human saliva
- Repeat cycle 7 times per day for 5 treatment days
- Cross-section specimens and assess via Transverse Microradiography



RESULTS

Test Group	Product Tested	Depth of Complete Mineral Loss (m)
1	Water (neutral pH) followed by Coke	33.4
2	Orange Juice (acid pH) followed by Coke	40.6
3	Glass H in water (neutral pH) followed by Coke	4.3



Test Group 1
Water/Coke



Test Group 2
Orange Juice/Coke



Test Group 3
Glass H/Coke

CONCLUSION

These results demonstrate the usefulness of this new model for measuring relative differences in the protective nature of compounds, such as Glass H, to help protect teeth against dental erosion.