The Effect of Sodium Hypochlorite Pre-Rinse on Caries Susceptibility Testing

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INTRODUCTION

SARS-Cov-19, the virus that causes COVID-19, is transmitted via aerosols, droplets and contact. Concerns that aerosol-producing dental procedures may spread the transmission of the virus has alerted the dental community.

As such, the American Dental Association and

Centers for Disease Control have requested that a ***pre-rinse*** be used prior to all dental procedures.

The active ingredient of pre-rinses may be one of the following common ***antimicrobial agents***:

- Chlorhexidine gluconate
- Cetylpyridinium chloride
- Hydrogen peroxide
- Povidone-iodine
- Sodium hypochlorite
- Essential oils

There is strong evidence to support that pre-rinsing with antimicrobial rinses are effective in reducing aerosol contamination when performing periodontal prophylaxis compared to not rinsing. However, there is no evidence supporting the efficacy of pre-rinsing in reducing SARS-CoV-2 viral loads or transmission specifically.

There is also ***lack of information*** on whether the use of a pre-rinse should be used with caution when performing certain baseline assessment procedures such as ***caries susceptibility testing***.

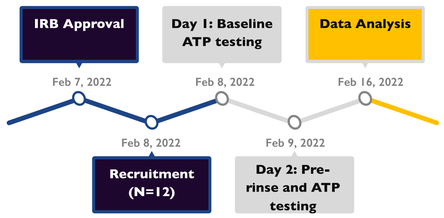
The ***objective*** of this clinical study was to evaluate the effect of a sodium hypochlorite rinse on Adenosine Triphosphate (ATP) caries susceptibility testing.

We ***hypothesized*** that the use of a pre-rinse would affect caries susceptibility test readings.

This study has ***practical significance***, because the findings may provide enough evidence to alter clinic preventative measure protocols.

METHODS

The study was approved by the Institutional Review Board (IRB #5210424). The research design and experimental procedures are illustrated in Flowchart 1.



Flowchart 1. Research Design and Procedures

Potential candidates were screened as follows,

Inclusion Criteria

- Able to fast from 10:00 PM the night before to 9:00 AM the next morning
- Not on antibiotics
- Have 20-32 natural teeth
- Willing to comply with study protocol

Exclusion Criteria

- Pregnant or nursing
- Severe periodontitis and abscess
- Frank cavitations
- Orthodontic appliances & removable dentures

Day 1. Baseline Reading

One examiner performed the swab tests on the patient and the ATP caries susceptibility tester was used to obtain the reading.

Day 2. Pre-rinse and ATP Reading

One examiner performed the ATP caries susceptibility test after the subjects used the pre-rinse for 60 seconds.

Statistical Analysis

Sample size was calculated using Gpower without estimated mean difference of 35% between the baseline and pre-rinse tests, yielding an effect size of 0.875. Difference in ATP readings was evaluated with paired T-test with α=0.05.

RESULTS

A total of twelve subjects participated in the clinical trial.

The age range was 20 to 29 years (Mean age=26).

The female and male ratio was 1:11.

ATP Reading Interpretation

- Range: 1–9999
- 1500 or below: Low biofilm challenge
- Above 1500: High caries risk

Mean ATP readings at baseline and second testing were 3999 and 6710, respectively. There was a statistically significant difference between baseline and second testing levels (P=0.014). The descriptive data are summarized in Table 1. and illustrated as plots in Figure 1.

Table 1. Descriptive Summary of ATP Readings

	N	Mean	SD	Mean Difference	p-value
Baseline ATP Reading	12	3999	3194	-2711	0.014
Pre-Rinse & ATP Reading	12	6710	2238		

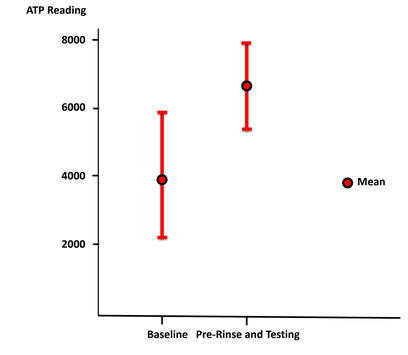


Figure 1. Plots of baseline and pre-rinse ATP Readings

DISCUSSION

Dental caries is a multifactorial disease that involves many complex risk and protective factors. As such it is vital to assess caries risk predictors that can be found among the oral microflora, diet, and host in addition to social, behavioral, environmental and clinical variables.

As part of the comprehensive oral examination, our Institution utilizes a Caries Susceptibility Test to measure the levels of ATP in plaque biofilm.

Rapid ATP driven bioluminescence assays have long been used in the quantitative determination of bacterial numbers and most recently also used in dental plaque. Using the luciferin substrate and luciferase enzyme, bacterial ATP can be quantified by measuring the release of visible light using the following formula:

$$ATP + Luciferin + 0_2 + Luciferase + Mg^{2+} \rightarrow AMP + oxyluciferin + PPi + CO_2 + \underline{\textbf{light (560 nm)}}$$

Studies have shown that ATP bioluminescence values were statistically correlated to the total oral bacteria and oral streptococci, with correlation coefficients of 0.895 and 0.843, respectively.

It is important to perform the caries susceptibility test correctly and also identify factors that may affect its readings and henceforth also the validity of its use.

Based on our results we ***accepted our hypothesis.*** There was a significant change in ATP readings with the use of a sodium hypochlorite pre-rinse. However, it important to note that based on the reading interpretation, readings at or below 1500 is considered low biofilm challenge while reading above 1500 is considered an indicator for high caries risk. Therefore, the use of a pre-rinse did not affect the caries risk interpretation.

Our study prompts to re-evaluate the sequencing of the use of pre-rinse for diagnostic caries risk assessments and more comprehensive studies on the influence of different types of pre-rinses used in dentistry.

CONCLUSION

COVID-19 mandated many changes in patient clinic protocols. The use of a pre-rinse is one example. Our study results are ***highly significant*** in highlighting the importance of evaluating the impact of clinical protocol changes.

The ***major limitations*** of our study included sample size and not categorizing baseline readings into low caries and high caries risk. Additionally, we only assessed a sodium hypochlorite rinse and did not evaluate the effect of pre-rinses with different antimicrobial agents.

Within the limitations of our study, we ***conclude*** that the use of a pre-rinse may affect ATP caries susceptibility readings but did not change the caries risk interpretation.

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