

2819. Breakdown of Hydrogen Peroxide Gel in the Mouth

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Introduction

The technology of tooth whitening is constantly evolving. Crest Whitestrips Premium (CWSP) containing 10% w/w hydrogen peroxide has demonstrated effective tooth-whitening results in 1 week compared with the 6% w/w hydrogen peroxide strip product used for 2 weeks^{1,2}. Studies with an experimental tooth whitening system (10% w/w hydrogen peroxide gel pre-dosed in a flexible tray; **Figure 1**) demonstrated similar changes in shade improvement (lighter shades) from baseline after 7 and 14 days of product use³. This study will examine the peroxide degradation rates after applying the experimental tooth whitening system at predetermined time intervals utilizing validated chemical assay methodologies similar to previous studies with CWSP^{4,5}.



Figure 1. Experimental tooth whitening system.

Objective

To evaluate the degradation rates of hydrogen peroxide on the teeth, the gingiva, in saliva, and remaining in the product during single use of an experimental tooth whitening system.

Methods

Clinical procedure

A total of 16 healthy volunteers between the ages of 19 and 72 years were randomized into this crossover, single-center study. Subjects wore the experimental tooth whitening system at each study visit for 1, 5, 30, 45, or 60 minutes. After the specified time period, the tray was removed and the gel was sampled from the product tray, teeth, and gingiva, and a saliva sample was collected.

Peroxide assay

Samples were dissolved and diluted in water. Hydrogen peroxide content was determined using the commercially available PeroXOquant Quantitative Peroxide Assay Kit (Pierce Biotechnology) according to the manufacturer's instructions. Peroxide was quantified by ultraviolet-visible spectroscopy at 560 nm with reference to standard solutions.

Statistical methods

Area under curves (AUCs) for % w/w hydrogen peroxide were calculated at 1, 5, 30, 45, and 60 minutes. The concentrations of hydrogen peroxide in the analyzed solution, in the sample, and the % w/w hydrogen peroxide was also calculated at each timepoint.

Results

- The median AUCs for % w/w hydrogen peroxide levels over time in the saliva, gel on teeth, gel on gingiva, and gel in product are presented in **Table 1** and **Figure 2**.
- Salivary hydrogen peroxide levels decreased over time and the median values were not above 0.024% w/w hydrogen peroxide at any sampling timepoint.
- Substantial levels of hydrogen peroxide remained on the teeth through 60 minutes.
- Gingival hydrogen peroxide levels decreased over time and post the 1 minute sampling point; the median values were not above 2.503% w/w hydrogen peroxide.
- After an initial drop, levels of hydrogen peroxide in the product tray remained fairly stable over time.

Table 1. Median AUCs for % w/w Hydrogen Peroxide

	AUC ₀₋₁	AUC ₀₋₅	AUC ₀₋₃₀	AUC ₀₋₄₅	AUC ₀₋₆₀
Saliva	0.00	0.07	0.66	0.94	1.25
Teeth	8.16	26.10	114.96	159.65	200.88
Gingiva	6.37	12.75	52.69	61.59	88.42
Product	9.03	35.28	185.76	280.00	356.64

AUC, area under curve.

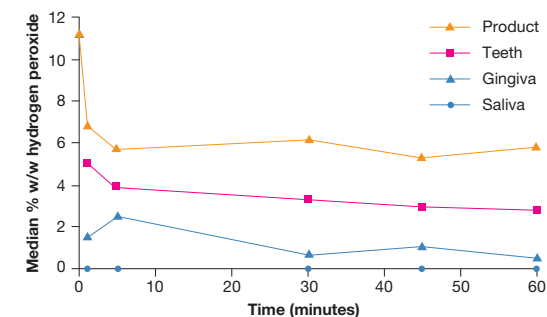


Figure 2. Hydrogen peroxide levels by sample type and time.

Conclusions

- Low salivary peroxide levels indicated minimal systemic exposure to hydrogen peroxide from saliva.
- Degradation of hydrogen peroxide on the gingiva and teeth decreased over time.
- Significant peroxide remained in the product at 60 minutes, sustaining a higher concentration that could be delivered to the teeth.

References

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