








Oral Presentation

 0109 - Efficacy and Peroxide Diffusion of Ultrasound Enhanced Tooth Whitening 

 10:30 am–10:45 am 25 July

 Capital Suite 12, Level 3 

## Description

**Title:** 0109 - Efficacy and Peroxide Diffusion of Ultrasound Enhanced Tooth Whitening

### Authors:

Linchuan Wang, University of Rochester

Xiaoyi Zhao, University of Rochester

Songmei Zhang, University of Rochester

Hans Malmström, University of Rochester Eastman Institute for Oral Health

Yan-Fang Ren (**Presenter**)

University of Rochester

### Abstract:

**Objectives:** To assess the efficacy of a novel ultrasound enhanced tooth whitening technology and evaluate its effect on diffusion of hydrogen peroxide through dental enamel.

**Methods:** Fifty-four enamel disks 1.0mm in thickness were prepared from bovine incisors. Half of the enamel disks were immersed in coffee solution (55°C) for 24h, washed for 30s to create discolored enamel specimens, which were divided into 3 groups and subjected to whitening with 35% H<sub>2</sub>O<sub>2</sub> gel alone (GEL), 35% H<sub>2</sub>O<sub>2</sub>+light (GEL/LT), and 35% H<sub>2</sub>O<sub>2</sub>+light+40KHz ultrasound (GEL/LT/US), respectively. Whitening efficacies were measured with a spectrophotometer at 5, 15, 30, 45 and 60 minutes. The remaining 27 specimens were divided into 3 groups and mounted on artificial pulp chambers placed in sterile cells containing 1.0ml acetate buffer. To assess peroxide diffusion, enamel surfaces were treated with GEL, GEL/LT and GEL/LT/US as above, and diffused peroxide concentration (µg/ml) was calculated at different treatment intervals using

a leucocrystal violet/horseradish peroxidase assay. CIE Lab color changes ( $\Delta E$ ) and peroxide diffusion were compared among the 3 groups.

**Results:** There were no significant differences in  $\Delta E$  at 5 minutes among the three groups, but  $\Delta E$  were statistically significant higher in GEL/LT and GEL/LT/US than in GEL at 15 minutes, and higher in GEL/LT/US than in GEL and GEL/LT at 30, 45 and 60 minutes. It took 30 minutes for  $\Delta E$  to reach 17.5 in GEL/LT/US (an equivalent of 10 shades change from A4 to A2), as compared to 60 minutes in GEL/LT group (Table 1). Diffusion of peroxide through enamel was significantly higher in GEL/LT/US than in GEL and GEL/LT at 5 and 10 minutes. GEL/LT and GEL/LT/US showed significantly higher diffusion of peroxide than in GEL throughout experimental period (Table 2).

**Conclusions:** Ultrasound enhanced efficacy of light-assisted tooth whitening and accelerated diffusion of hydrogen peroxide through dental enamel *in vitro*.

**Table(s):**

Group**	5 min	15 min	30 min	45 min	60 min	
GEL	3.8±3.1a	7.3±2.8b	9.3±3.2d	11.5±4.3e	13.2±4.0f	
GEL/LT	4.7±1.6a	9.2±1.4c	11.6±2.3d	13.7±3.3e	17.5±4.5f	
GEL/LT/US	4.4±2.7a	11.8±4.0c	17.6±6.5e	21.3±8.0f	23.5±8.7g	
Group	5 min	10 min	15 min	30 min	45 min	60 min
GEL	0.3±0.1a	0.9±0.5b	1.2±0.5e	4.6±0.9g	6.6±0.9j	8.6±0.5m
GEL/LT	1.4±0.6b	2.2±1.2c	5.4±1.2f	6.8±0.9h	9.3±0.8k	10.2±0.7n
GEL/LT/US	3.2±0.6c	4.6±1.1d	5.5±1.0f	6.9±0.5h	9.4±0.6k	10.2±0.6n

**This abstract is based on research that was funded entirely or partially by an outside source:**

This study is a trainee research project funded by the authors' institution. We thank Beyond International Inc. Stafford, TX for donating the study materials.

**Disclosure Statement:**

The submitter must disclose the names of the organizations with which any author have a relationship, the nature of the relationship, and the clinical or research area involved. The following is submitted: **None**