Enamel Stain Removal/Whitening Study (BURST Whitening Gel Pen)

Objective

The objective of this in vitro study was to determine the enamel stain removal/whitening potential of an OTC whitening gel via spectrophotometric and shade guide assessments.

Methods and Materials

Human adult central incisors were cut to obtain labial enamel specimens approximately 8x8 mm^2. The enamel specimens were embedded in an autopolymerizing methacrylate resin so that only the enamel surfaces were exposed. The enamel surfaces were smoothed and polished on a lapidary wheel and lightly etched to expedite stain accumulation and adherence. They were placed on a rotating rod in a 37°C incubator alternately exposing them to air and to a solution consisting of trypticase soy broth, tea, coffee, gastric mucin (protein source) and $FeCl_3$. The specimens remained in the staining regimen from approx. 3-7 days until a darkish pellicle stain was present on the specimens. Specimens were rinsed, placed in plastic containers under humid conditions and refrigerated (4 ^oC) until used. The color of each specimen was determined spectrophotometrically (Minolta CM-26dG, Spectrophotometer) using the L* a* and b* components of the CIELAB Color Space. The area examined was a 3 mm diameter area in the center of the specimen. Two (2) readings per specimen were obtained, turning the specimen 90^O for each reading. All values (L*, a* and b*) were determined and an average L*, a* and b* were calculated. Eight (N=8) specimens were utilized for each treatment group.

The specimens were also scored with a VITA Easyshade® V spectrophotometer (using the output of the VITA Bleachedguide 3D-Master Shade® Guide), for shade evaluation. The VITA Bleachedguide 3D-Master shade guide consists of (29) unique shade values ranging from 29 (darkest) to 1 (lightest).

Individual changes in color (ΔL*, Δa* and Δb*) were determined at Day 1 and Day 7 for each treatment group following the 7--day treatment regimen. The observed L* (0 = black, 100 = white) value from the Spectrophotometer was the primary indicator of pellicle stain accumulation and resultant color change observed in this in vitro assessment. Changes in VITA Bleachedguide 3D-Master Shade Guide shade were reported as Δ Shade. Statistical analyses were performed by two-tailed t-tests at the 0.05 significance level.

Results

Following 2 treatments at Day 1, the mean ΔL* for the BURST Whitening Pen Gel was 3.3 and the Δ Shade was 1.1, while the mean ΔL* for the negative control was 0.1 and the Δ Shade was 0.0. At Day 7 (14 treatments), the mean ΔL* for the BURST Whitening Pen Gel was 15.4 and the Δ Shade was 3.9. For the negative control, the mean ΔL* was 0.3 and the Δ Shade was 0.0. Compared to the negative control, the BURST Whitening Pen Gel provided significantly greater whitening/surface stain removal following both 1-day ($P \leq 0.003$, ΔL* and Δ Shade) and 7-days ($P < 0.001$, ΔL* and Δ Shade).

Conclusions

In this in vitro treatment study, the BURST Whitening Pen Gel was significantly greater than the negative control in dissolving/removing surface (extrinsic) tooth stains, based on increase in whitening measures (ΔL*) and improvement in shade scores following 1 day (2 treatments) and 7 days (14 treatments).