Project Report

Compatibility of Optim 33 TB – Accelerated Hydrogen Peroxide based disinfectant (or: Optim 33 TB – 0.5% Hydrogen Peroxide based disinfectant) with Elastomeric Impression Materials

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--Study Period--
May 01, 2007 – June 30, 2007
Safety and Regulatory Issues:

Use of Animal Species?  NO
Use of Microbes?  NO
Use of Human Subjects?  NO
Chemical Hazards?  NO

Note:
The formulation is a weak acid (H2O2 0.5% and Personal Protective Equipment will be used per institutional rules)

Safety Requirements for Chemical Disposal?  NO
Compatibility of Optim 33 TB - 0.5% Hydrogen Peroxide-Based Disinfectant with Elastomeric Impression Materials

Purpose:
To evaluate material compatibility (a. surface detail reproduction and b. dimensional stability) of three commonly used elastomeric dental impression materials (high and low viscosity) — Aquasil® (Caulk-Dentsply); Imprint® (3M); and Take-1® (KERR-Sybron SDS) with Optim 33 TB - Accelerated Hydrogen Peroxide based disinfectant (or: Optim 33 TB – 0.5% Hydrogen Peroxide based disinfectant)

Background:
Dental impression materials need to be rinsed in water and disinfected immediately after making to control transfer of infectious materials from saliva and blood to casts and to dental healthcare workers.1, 2, 3, 4 The ADA has recommended that impressions made be decontaminated.5, 6, 7, 8 There are many commonly used disinfectants in dentistry.9 Studies have shown that bacterial and viral contaminants can be effectively controlled by disinfection.10, 11, 12 Disinfection process may sometimes affect material properties of impression materials.13, 14 The Council on Dental Materials and Devices has methods for testing surface detail and dimensional stability of materials, and these test methods with greater samples can be used to study the effects of disinfectants on elastomeric impression materials.15

Methods
ANSI/ADA specification #19 test methods for elastomeric impression materials and 4 ANSI/ADA spec. 18 & 19 dies were used in this evaluation. Three popular vinyl polysiloxane (VPS) were used in this study [Aquasil® (Caulk-Dentsply); Imprint® (3M); and Take-1® (KERR-Sybron SDS)]. Very special die separator was applied on to the surface of the dies between each impression.

Figure 1. ANSI/ADA Spec. #18/19 Die

The light body material was initially applied on the lines followed by the heavy body material. All impressions were made and allowed to polymerize at 35± 1oC to replicate the temperature in the mouth (set in water under a 1 Kilogram weight). The impression material remained in the bath three minutes longer than the manufacturer recommended time for setting. The treatment samples were rinsed in water and sprayed with Optim 33 TB - Accelerated Hydrogen Peroxide based disinfectant and exposed to the latter for the disinfection time of 5 minutes (TB kill time or disinfection time) while the control were immersed in tap water for the same time. All treatment
and control samples were die matched. The dies were cleaned with a steam gun between each set of impressions.

**Surface Detail Reproduction**

Once the impression material set, reproductions of the 25 micron line on to elastomeric impressions were studied under 20X magnification and rated from 1-4 (refer images and rating below). Outcomes recorded as— 1) Line reproduced completely; 2) Line not completely reproduced. The entire length of the 25 micron line was observed at 20X and given an ordinal score as follows—

Figure 2. Rating of the 25 micron line

1. Well defined, sharp, continuous line
2. Continuous line but with some loss of sharpness
3. Significant deterioration of edge detail or loss of continuity of the line
4. Failure to reproduce the line

Sixteen (16) impressions each, per material, per treatment group and control group rated by three raters were used in this study. This interval level data was used to comparing differences if any between the treatment and control groups with the statistic “comparison of group means” at an alpha of 0.05.

**Dimensional Stability**

Sixteen (16) impressions each per treatment and control groups were used in this study. Immediately after air drying, a stage graticule with micron markings was placed on the impression and the surface scanned using an optical image scanner under a very high resolution to capture the impression surface, the grid on the stage graticule. These images were saved as jpeg tagged image files and imported into ImageTool Software (UTHSCSA)

Figure 3. Image of Impression with micron measures of the stage graticule as a standard.
and the length of the line measured. After baseline measurement the impressions placed on a
glass slab with adequate amount of boric powder between the impression and the glass slab to
facilitate the flow or creep without hindrance, for a period of 24 hours and scanned again and
the length of the line between the cross-hatches measured using Image-Tool Software
(UTHSCSA Dental School, San Antonio, USA).
Differences in measurements between the groups were determined using “student’s t-test” at an
alpha of 0.05 to study adverse effects if any due to the use of the disinfectant.

Results & Discussions

Surface detail reproduction--A total of 288 lines (N) were rated by 3 raters (n1=96; n2=96;
n3=96) from a scale of 1-4. No significant difference (F=0.275; df=1; p>0.05) was noted in the
ratings of the 25 micron line between the Treatment Group (n=144; mean=1.29; SD=0.456) and
the Control Group (n=144; mean=1.26; SD=0.442). These results demonstrate that exposure of
vinyl polysiloxane impression materials that were exposed 5 minutes to Optim 33 TB -
Accelerated Hydrogen Peroxide based disinfectant showed no deleterious effects (p>0.05).
When the different brands were compared, Take-1 (n=96; mean=1.19; SD=0.449), Imprint
(n=96; mean=1.26; SD=0.441), and Aquasil (n=96; mean=1.39; SD=0.489) a significant
difference was noted between the groups in surface detail reproduction of the 25 micron line
(F=4.91; df=2; p < 0.05) irrespective of belonging to the treatment or control groups.
Scores given did not differ significantly (F=0.120; df=2; p>0.05) between the raters (Rater 1
[n1=96; mean=1.29; SD=0.457], Rater 2 [n2=96; mean=1.26; SD=0.441], and Rater 3 [n3=96;
mean=1.28; SD=0.452]). Based on these results of this study, one may infer that Optim 33 TB -
Accelerated Hydrogen Peroxide based disinfectant did not have any deleterious effect on
surface detail reproduction of the vinyl polysiloxane dental impression materials.

Dimensional Stability-- A total of 96 lines (N) were measured (48 baseline and 48 post
exposure to Optim 33 TB - Accelerated Hydrogen Peroxide based disinfectant).

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Based on these results of this study, one may infer that Optim 33 TB - Accelerated Hydrogen
Peroxide based disinfectant did not have any deleterious effect on the dimensional stability of
the vinyl polysiloxane dental impression materials.

Conclusions

In this study we found that Optim 33 TB - Accelerated Hydrogen Peroxide based disinfectant did
not have any deleterious effect on vinyl polysiloxane dental impression materials surface detail
reproduction and dimensional stability, when used per manufacturer’s recommended exposure
time of 5 minutes.
References