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Research Report

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BurButler Block Cleaning and Sterilization Study

Purpose:

1. To investigate the ability of ***BurButler*** *(Shofu Dental Corp.)* silicone bur blocks to facilitate cleaning and sterilization of soil- and bacterial-contaminated dental burs.
2. To compare the cleaning and sterilization capabilities of ***BurButler*** blocks with metal bur blocks.
3. To ascertain the ability of ***BurButler*** blocks to facilitate sterilization of "worst case" soiled dental burs.

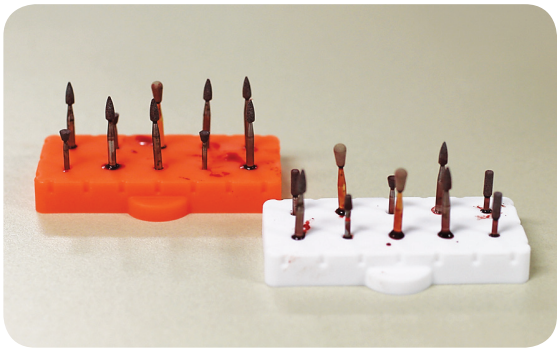
Phase 1

Commercially purchased Artificial Test Soil (ATS) *(Healthmark Industries Company, Inc.)* was chosen as the primary organic load on tested burs to challenge ultrasonic cleaning effectiveness. ATS has historically been shown to contain physiological components found in blood which are likely to remain on medical instruments and devices after clinical use. These include a mixture of purified bovine proteins (hemoglobin, albumin), amino acids, vitamins, and carbohydrates. Testing for removal of ATS during decontamination procedures of medical and dental devices and instruments has therefore been routinely used to provide a standard challenge for cleaning heat-stable items prior to sterilization. In the present study, bur contamination was further enhanced by adding freshly collected saliva to the soil suspension (1:1 ratio). This modified ATS therefore provided an experimental "worst case" for removal of biological debris.

New contra-angle, friction-grip, and short-shank dental burs were chosen for evaluation. Burs were immersed in the ATS/saliva mixture for 15 minutes at room temperature, and then placed in a 37C incubator for 30 additional minutes. This procedure sequence served to facilitate adherence and drying of debris on bur surfaces and also to maintain salivary bacteria viability for subsequent testing. Control, untreated, soiled burs were aseptically placed in trypticase soy broth and incubated at 37C for 24-48 hours. The resultant microbial growth was used as a baseline positive control for bur contamination.

Contaminated burs were loaded into 3 ***BurButler (Figure 1)*** and 3 metal (non-silicone) blocks and placed in a basket in a ***Midmark 250*** *(Midmark)* ultrasonic unit containing freshly prepared cleaning solution (***ReSurge Ultrasonic Cleaning Solution,*** *Dentsply Sultan*). Soiled burs in the blocks were cleaned using a 12-minute ultrasonic cycle, and subsequently rinsed with tap water. "Cleaned" burs were removed and inspected to assess the presence of any residual debris. Following this step, the burs were returned to the holes in the containers, loaded blocks placed in sterilization pouches, and processed in a ***Tuttnauer*** gravity autoclave. Burs were aseptically removed from the blocks at the conclusion of the sterilization cycle, placed in tubes of tryptic soy broth, and incubated for 24-48 hours. Cultures were observed after the incubation interval for microbial turbidity and/or presence of residual debris. Ten (10) soiled burs were used as positive controls for this phase of the study. In addition, sterile swabs wetted with sterile physiological saline were used to collect samples from the fluted holes in the ***BurButler*** blocks. These specimens were also cultured on trypticase soy agar plates containing 5% sheep blood at 37C for 24-48 hours, and observed for any bacterial growth.

Figure 1. ***BurButler*** blocks with burs



Phase 2

This phase of the investigation was organized using the same basic framework as that described for Phase 1, except burs and bur blocks were not ultrasonically cleaned prior to heat sterilization. In these experiments, soiled, autoclaved burs were removed from the blocks and cultured for residual microbial contamination as described above in tryptic soy broth.

Results:

Phase 1

Inspection of burs after ultrasonic processing showed that burs housed in ***BurButler*** blocks were visibly clean ***(Figure 2).*** Similar findings were obtained when burs placed in the metal blocks were examined. It was also observed that the ***BurButler*** block was able to hold treated burs more securely than when standard metal blocks were processed. Subsequent broth cultures of cleaned burs processed after a heat sterilization cycle also demonstrated no evidence of microbial contamination ***(Table 1).*** When "sterile" broth cultures were inspected for suspended debris, 4/70 BurButler tubes and 1/70 non-silicone bur block tubes showed small amounts of suspended debris ***(Figure 3).***

Sterile swabs with pointed tips were used to also obtain debris and culture samples from the fluted holes in the ***BurButler*** blocks. No visible debris was observed on cotton tipped applicators after sampling both ***BurBulter*** and metal blocks blocks. In addition no viable bacteria were found in cultured samples.

Table 1. Remaining microbial and debris after phase 1 processing

Bur Block Type	Visible debris after cleaning	Bacterial growth
BurButler	0/70	0/70
Non-silicone bur blocks	0/70	0/70
Control soiled burs	n/a	5/5

n/a = not applicable

Phase 2

In this phase of the study burs were coated with the ATS/saliva mixture, and the debris was allowed to harden on the bur surfaces before be placed in the ***BurButler*** and metal blocks ***(Figure 4).*** Subsequent culture of the soiled autoclaved bur in trypticase soy broth indicated that, despite the presence of extensive amounts of ATS and saliva, all culture tubes were negative for bacterial growth ***(Table 2).***

Table 2. Culture Results for Heat-Sterilized, Soiled Burs in Burs Blocks

Bur Block Type	Bacterial growth
BurButler	0/70
Non-silicone bur blocks	0/70
Control soiled burs	10/10

Sterile swabs with pointed tips were used to also obtain culture samples from the fluted holes in the ***BurButler*** blocks ***(Figure 5).*** As expected, debris was collected on all swab tips from both ***BurButler*** blocks and metal blocks ***(Figure 6).*** None of the resultant agar cultures using samples collected on the swabs yielded any bacterial growth.

Figure 2. Appearance of ***BurButler*** blocks after phase 1 processing

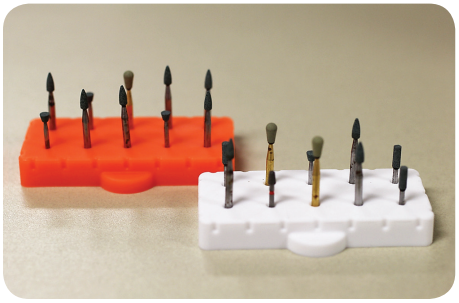


Figure 3. Residual debris on burs after phase 1 processing

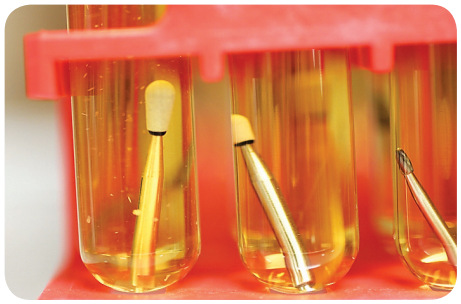


Figure 4. Heavily soiled burs in ***BurButler*** block prior to heat processing in autoclave.

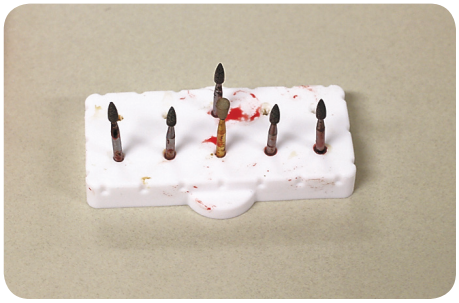


Figure 5. Collection of samples from BurButler block holes after autoclave cycle

Figure 6. Presence of debris on tip of swab.

Discussion and Summary

In this investigation, ***BurButler*** and metal bur blocks were challenged with copious amounts for organic debris and then reprocessed with either of two methods. Observational and microbial results showed that the burs held in both the BurButler and metal blocks were able to be successfully ultrasonically cleaned and heat sterilized. Only a few test burs demonstrated retention of debris in broth after processing. In a similar fashion, soiled burs processed only by heat sterilization also were shown to be sterile. As expected swab samples collected from both ***BurButler*** and metal block holes contained residual debris. However, no microbial contamination was found upon culturing. Overall, ***BurButler*** blocks appear to be an effective option for reprocessing burs used in patient treatment.

Note: *This study was funded in part by Shofu Dental Corp.*

