



Bacterial Load Reduction Efficacy of the Conjunctive use of the TRIO Rx™ and MIST in a Dental Operator

J.A. Molinari, Ph.D., and D. Graham, B.A.

Purpose:

To evaluate the bacterial load reduction abilities of the conjunctive utilization of the *GenEon TRIO Rx™* and *GenEon MIST* in a dental operator after a typical aerosol generating hygiene procedure.

Challenge Device: The *TRIO Rx™* is a compact on-site generating system that creates a non-toxic cleaning, disinfecting, and deodorizing hypochlorous acid solution using *GenEon's* EPA registered proprietary mineral electrolyte packet and water. This solution has received EPA List N registration. The *MIST* is a handheld sprayer/blower with an adjustable flow rate that is filled with the *TRIO Rx™* solution, allowing for contactless cleaning and disinfecting in three minutes or less.

Experimental Design:

Materials:

1. *TRIO Rx™* (*GenEon Technologies*)
2. *MIST* (*GenEon Technologies*)
3. *GenEon's Mineral Electrolyte Packet* (*GenEon Technologies*)
4. SAS Super 180 Bioaerosol Sampler (*Bioscience International*)
5. TSA with lecithin and poly 90 contact plates
6. AccuPoint® Advanced HC ATP Reader and Surface Samplers (*Neogen*)
7. Cavitron 300 Series Ultrasonic Scaler (*Dentsply Sirona*)
8. Dental hygienist volunteer
9. Patient volunteers

Test Methods

Each aerosol generating procedure was completed while the office was closed, and all procedures were completed in one designated operator. Prior to the first patient, lines were cleaned with an evacuation line cleaner and traps were changed. Monarch Lines (*Air Techniques*) water treatment was utilized in a closed system (water bottle). Cavitron 300 Series Ultrasonic Scaler (*Dentsply Sirona*) was consistently set to 60Hz and was set at the highest water spray level using a Focused Spray 10 S Universal Insert. The same low-speed cordless hygiene handpiece, prophylaxis angle, and coarse prophylaxis paste was used for all polishing procedures. Before testing, all volunteers agreed to participate in the study and to having their photos taken. The same dental professional performed all procedures in this study.

For each procedure, all quadrants of the mouth were treated; anterior and posterior, buccal and lingual. Each hygiene procedure consisted of ten minutes of ultrasonic scaling followed by ten minutes of polishing. After each procedure was finished, the hygienist and patient volunteer exited the room and three separate samples were taken inside the operator. The first of these samples was taken on the operator's handle of the over-the-patient delivery system and utilized the ATP reader with a new surface sampler (ATP sample). A second surface sample was taken by culturing the arm rest of the patient's chair with a TSA with lecithin and Poly 90 contact plate (contact plate sample). Lastly, a sample of the air was taken utilizing the SAS Super 180 Bioaerosol Sampler with a TSA with lecithin and poly 90 contact plate embedded inside. The bioaerosol sampler was positioned over the patient chair and pulled 1000L of air onto a new embedded contact plate in 5.5 minutes during each bioaerosol sample (bioaerosol sample).



Device: MIST with TRIO Rx™ Solution



Device: SAS Super 180 Bioaerosol Sampler



Patient procedure

After each of the three samples were taken, the room was sprayed down using the *MIST* with the solution made from the *TRIO Rx™*. After the appropriate contact time had passed (three minutes), the same three samples were taken using the ATP reader, a contact plate, and the bioaerosol sampler in their respective locations within the operator. This process was repeated for all six patient volunteers. There was 10-20 minutes of room turnaround time between patients. Control samples were taken with the three devices in the same locations when the office was empty before any aerosol generation took place. After each sampling the exposed TSA with lecithin and poly 90 contact plates were immediately processed and incubated at 37°C for 48 hours. Microbial growth was then quantified and recorded for each sampling plate.



Control bioaerosol sample, CFU: 21



Control contact plate sample, CFU: 1



Control ATP sample, RLU: 3472

Results:

Data was analyzed by isolating each patient’s comparative results due to the nature of differing microbiomes between patients. **For all 6 patients, the bacterial loads collected using each of the three sampling devices (the bioaerosol sampler, ATP reader, and contact plate) were lower after the conjunctive use of the *TRIO Rx™* and the *MIST* when compared to the sample taken before disinfecting in all three sample locations.** The percent decrease for each of the six replications was averaged by sampling device/location. On average, using the *TRIO Rx™* and *MIST* after a typical hygiene appointment decreased the number of collected colony forming units (CFU) on the arm rest of the patient’s chair by 82% (Fig. 1). The average percent decrease of bacterial load found in the air from the bioaerosol sampler was 46% after the use of the *MIST* and *TRIO Rx™* (Fig. 2). The sample taken on the handle of the patient delivery system with the ATP reader decreased the collected relative light units (RLU) by an average of 58% after disinfection with the *TRIO Rx™* and *MIST* (Fig. 3).

Figure 1.

Contact Plate Samples Before and After Use of the TRIO Rx™ and MIST (patient chair arm rest)

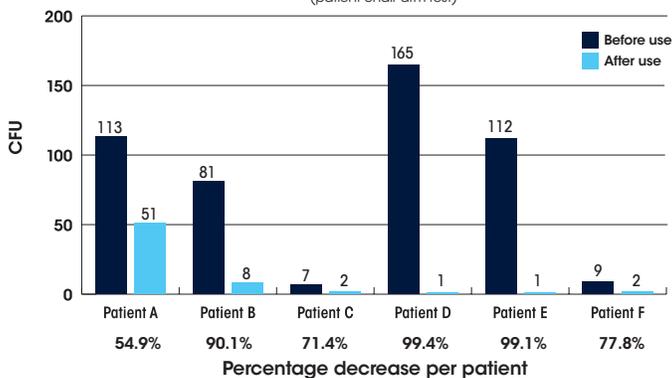
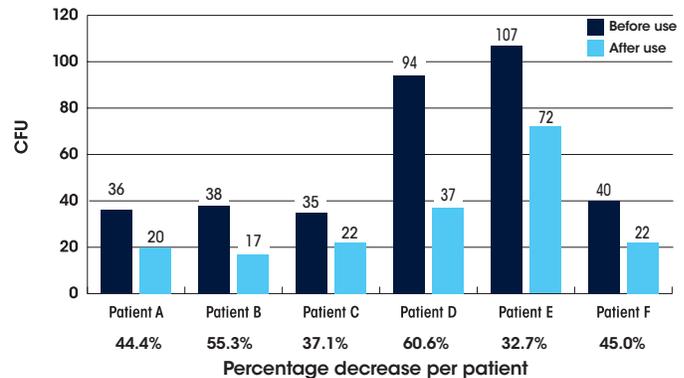


Figure 2.

Bioaerosol Air Sample Plates Before and After Use of the TRIO Rx™ and MIST



Discussion:

In this pilot study, the data showed trends of overall bacterial load reduction after the conjunctive use of the *TRIO Rx™* and *MIST* following a typical aerosol generating dental hygiene procedure. Total bacterial reduction on the plates was not noted due to the natural levels of bacteria in the air. Other contributing factors were likely the number of people occupying the space, the airflow, and having had recent aerosolization in the space. Values from ATP samplings showed trends of decreasing RLUs with every replication, which could imply that a residual effect was taking place with the use of the *TRIO Rx™* solution. A dental operator during an aerosol generating procedure creates a high biomass space. It is presumable that if the *TRIO Rx™* and *MIST* were able to reduce the bacterial load in a high biomass space, then it would also be effective for low biomass spaces. Depending on the current cleaning and disinfecting systems being used in a practice, the *GenEon* devices used conjunctively could also decrease the necessary operator turnaround time between patients resulting in increased productivity. Limitations in this pilot study included a small sample size. Future studies could include a larger sample size.

Conclusion:

The findings from this study showed trends of overall reduced bacterial load after the conjunctive use of the *TRIO Rx™* and *MIST* following a typical hygiene cleaning procedure.

Figure 3.

ATP Readings Before and After Use of the TRIO Rx™ and MIST (handle of delivery system)

