

Aerosol Reduction Efficacy of Vanguard Gold Mobile

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Purpose:

A pilot study to assess the amount of collected bacterial load derived from aerosol and spatter when using *Vanguard Gold Mobile* (Vaniman Manufacturing Co.) compared to a high-volume evacuation system (HVE) alone.

Challenge Device:

Vanguard Gold Mobile is a mobile extraoral suction device. The flexible hose attaches to a high-suction turbine motor vacuum unit. The capture mouth on the end of the hose is placed next to the patient's head and the suction then vacuums the surrounding air. The air is then filtered using two filters, including a HEPA filter, and then exhausted back into the operatory. *Vanguard Gold Mobile* is designed to help protect the operatory from airborne contaminants.

Experimental Design:

Materials:

Vanguard Gold Mobile (Vaniman Manufacturing Co.), Cavitron ultrasonic scaling unit with Cavitron FSI 10S 30K insert (Dentsply Sirona), standard HVE with suction tips, SAS Super 180 Bioaerosol Sampler, TSA with Lecithin and Poly 90 Contact plates, TSA Settling plates, patient volunteers (A, B, and C), licensed dental hygienist volunteer wearing PPE, including a face shield and a level 3 mask.

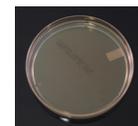
Methods:

Each ultrasonic scaling procedure was completed while the office was closed, and all procedures were completed in one designated operatory. Prior to the first patient, HVE lines were cleaned with an evacuation line cleaner and traps were changed. The dental unit waterlines are routinely maintained and tested. A *DentaPure™ DP365B* cartridge (HuFriedyGroup) was utilized in a closed system (water bottle). Additional SE and HVE lines were running in all four operatories during the study to simulate simultaneous treatment in each operatory. The same dental hygienist performed all ultrasonic scaling procedures in this study. The ultrasonic scaler was consistently set to 60Hz and operated at the highest water spray level. A control sample of the operatory air was taken for 5 minutes while patient A and the dental hygienist were in the room, prior to any aerosol generation, using the ASP Super 180 Bioaerosol Sampler with a TSA with Lecithin and Poly 90 Contact Plate (ASP) placed 18 inches from the patient's mouth, a TSA Settling Plate was placed on the patient's chest 8 inches from their mouth (Chest SP). The positioning of each plate was consistent for all testing for the duration of the study. For each ultrasonic scaling procedure, all quadrants of the mouth were treated, anterior and posterior, buccal and lingual. The ASP in the bioaerosol sampler and the Chest SP were used to routinely collect air quality samples for 5 minutes during each procedure. All three plates were replaced after each new condition. Two separate conditions were utilized for comparison purposes on each of the three patient volunteers. The first condition utilized a standard HVE alone and the second condition utilized the *Vanguard Gold Mobile* together with an HVE. The *Vanguard Gold Mobile* was consistently placed 4 inches from the patient's mouth on the opposite side of the clinician. A decibel (dB) measurement was taken during each condition to compare combined noise levels. There was a 10-minute room turnaround time between each patient, during which appropriate clinical contact surface cleaning and disinfection, and other recommended protocols were followed. After each test run, the

Device



Control



Control: Chest
(CFU = 0)



Control: ASP
(CFU = 156)

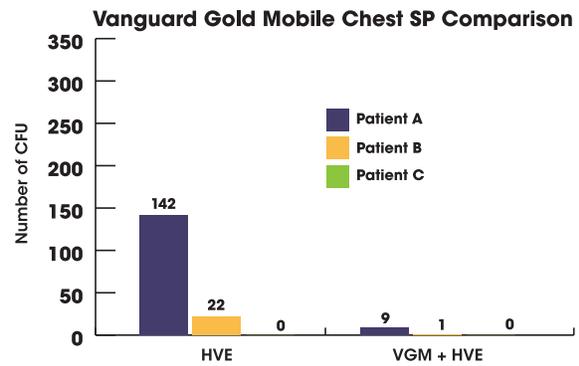
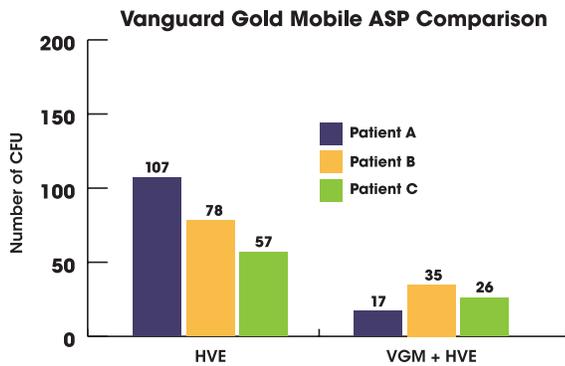


Control: Exhaust
(CFU = 18)

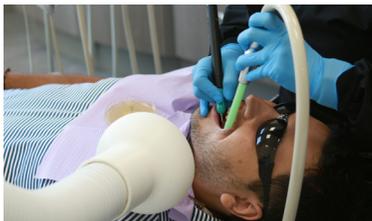
exposed plates were immediately processed and incubated at 37°C for 48 hours. Microbial growth was analyzed and recorded for all plates. All testing procedures were repeated on all three patient volunteers. Before testing, all volunteers agreed to participate in the study and to having their photos taken.

Results:

Observed trends showed that the use of *Vanguard Gold Mobile* in conjunction with HVE resulted in lower, or equal to, collected bacterial loads on the ASPs and Chest SPs during the procedure for all three patients compared to using HVE alone. The reductions on the ASPs for *Vanguard Gold Mobile* in conjunction with HVE compared to HVE alone were 84%, 55% and 54%, respectively, for patients A, B and C. The reductions on the Chest SPs for *Vanguard Gold Mobile* in conjunction with HVE compared to HVE alone were 94%, 95% and 0%, respectively, for patients A, B and C. For all three patients the lowest collected bacterial load levels were found when using *Vanguard Gold Mobile* in conjunction with HVE. The difference in sample decibel levels was negligible at 1dB higher when *Vanguard Gold Mobile* was added.



Patient A



Patient A: Vanguard Gold Mobile + HVE

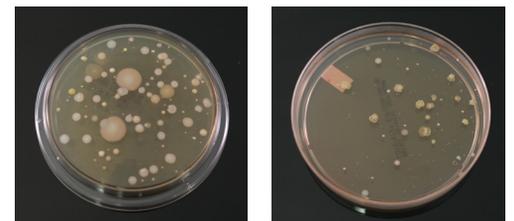
Vanguard Gold Mobile + HVE:



ASP (CFU = 17)

Chest (CFU = 9)

HVE Alone:



ASP (CFU = 107)

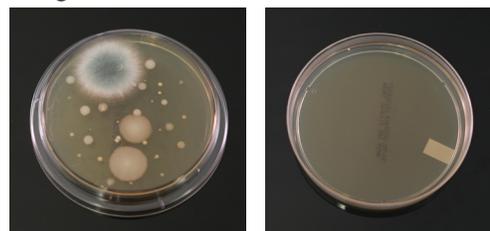
Chest (CFU = 142)

Patient B



Patient B: Vanguard Gold Mobile + HVE

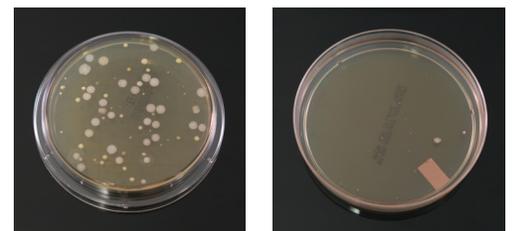
Vanguard Gold Mobile + HVE:



ASP (CFU = 35)

Chest (CFU = 1)

HVE Alone:



ASP (CFU = 78)

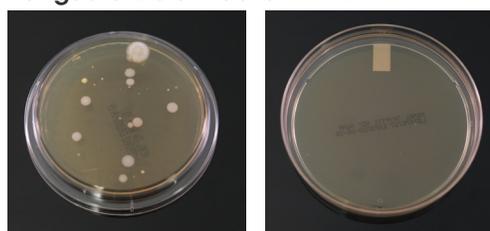
Chest (CFU = 22)

Patient C



Patient C: Vanguard Gold Mobile + HVE

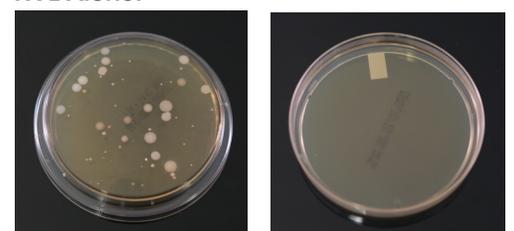
Vanguard Gold Mobile + HVE:



ASP (CFU = 26)

Chest (CFU = 0)

HVE Alone:



ASP (CFU = 57)

Chest (CFU = 0)

Discussion:

Based on the data in this pilot study, there were trends showing reduced bacterial loads with adjunctive use of *Vanguard Gold Mobile* and HVE. When *Vanguard Gold Mobile* was used adjunctively, minimal difference in noise level was found compared to use of HVE alone. This difference may have been due to normal variations during use of all devices; the reported noise level for the device itself is 53 dB. There were some limitations in this study, including the limited number of patients.

Conclusions:

Based on the preliminary data from this pilot study, adjunctive use of *Vanguard Gold Mobile* would be helpful in reducing microbial contamination during an aerosol generating procedure.

Future Directions for Research:

A larger sample size would be beneficial, provide better representation in providing data comparing conditions and would permit identification of outliers and determination of statistical significance. Standardized laboratory in conjunction with clinical testing would also be useful in future research. Future studies could include use of an isolation box to measure bacterial load in the exhaust air from the *Vanguard Gold Mobile* after capture, filtration and release.

Clinician and Patient Feedback on External Suction Devices

Patient Comments:

- *“Felt like a nice cool breeze, even though it was suctioning.”*
- *“When I walked in the room and saw it, I expected it to be loud and get in the way, but it was not obtrusive.”*

Clinician Comments:

- *“Quieter than I expected for an external suction system.”*
- *“Finding the ideal position for each patient takes some practice.”*
- *“Easy-to-use interface. Just plug it in, turn it on and select your suction power level.”*
- *“Footprint is not large and it’s easy to move the device around.”*