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A Quantitative Assessment of the Effect of Various Antimicrobial Therapies on *Porphymonas Gingivalis* Contamination on the Implant Surface: A SEM Study

Brian Sang, Harold Reed, Geoff Cunningham, John Thomas
West Virginia University (WVU), Morgantown, West Virginia, United States

Principal Investigators: Brian Sang, Dental Student at WVU School of Dentistry; Harold Reed DDS, MS; Geoff Cunningham, DDS, John Thomas, PhD; Dana Gray, PhD

Introduction
Previous studies have discussed treatment methods for ailing implants, but none have compared methods for efficacy. Our educational objective was to determine if laser is the preeminent treatment method for eliminating of *P. gingivalis* from the hydroxyapatite (HA)-coated titanium surface.

Materials and Methods
BioSurface Technologies Corp. (Bozeman, Mont.) HA coupons were added to a petri dish containing 1 ml of *P. gingivalis*, and cultured in an anaerobic environmental chamber (BD Bio-Bag™, Becton, Dickinson and Company, Franklin Lakes, N.J.). The six coupons were then treated using an Er:YAG laser (DELight, HOYA ConBio, Fremont, Calif.), 0.12% chlorhexidine, 0.62 pH citric acid, 1.0 pH doxycycline solution, saline, and a no-treatment control group. Discs were imaged at 35-5,000 magnification using the Hitachi S-4700 cold field emission scanning electron microscope (SEM). Bacteria from each treatment group were used to perform serial dilutions. From the 1:10 and 1:1000 dilutions, a common streak plate method was conducted on blood agar plates to perform a colony-forming unit (CFU) count.

Results
The CFU count concluded that the laser was the most effective treatment with a total number of organisms per ml of 5.20×10^2. Following the laser was tetracycline with a total CFU of 5.4×10^2. Chlorhexidine was slightly more bactericidal than saline with total counts of 9.8×10^2 and 1.36×10^3, respectively. Citric acid proved to be the most ineffective treatment at 2.52×10^3 organisms per 1 ml. Visual examination of the SEM images was also used to estimate the most efficacious treatment, and confirmed the findings from the CFU count.

Conclusion
The laser treatment group had the greatest impact on the *P. gingivalis* biofilm, proving our hypothesis. The SEM images show almost complete elimination of all bacteria, with minimal surface damage to the HA-coated surface. A small biofilm remained on the surface of the laser-treated disc, possibly from an inaccurate exposure to the laser beam. As with any scientific experiment the possibility of operator error must always be considered. A possible limitation to the citric acid treatment group was the use of an expired solution.

What you will take away from this presentation: Dental implants are considered a standard of care today, but a certain percentage may still fail prior to loading or after loading of the prosthesis due to peri-implantitis. Our experiment shows that exposure of bacteria to an Er:YAG laser is the preeminent treatment for eradicating bacteria from an implant surface. If there is one thing to be taken from our presentation, it is that today's standard of care for replacing teeth should be treated with the standard of care for eliminating bacteria.

Biography: *Brian Sang is a fourth-year dental student at the West Virginia University School of Dentistry. He attended undergraduate school at Marshall University in Huntington, West Virginia, where he majored in biological sciences. As an undergraduate student, Mr. Sang enjoyed research in the paleontological field. Now, as a dental student, his research interest has shifted to the eradication of bacteria from implant surfaces using laser technology.*

Disclosure: *Dr. Sang has no commercial affiliations.*

Mr. Sang may be contacted by e-mail at bsang@sole.wvu.edu.