1999 OSAP Annual Symposium
Infection Control Integration
June 24-27, 1999
Cincinnati, Ohio

Dentacide™-Mediated Control of Dental Unit Waterline Biofilms

Barbara A. Sanford*[3,1], H. Ralph Rawls[2,1], Kay Eskew[1], Gregg Siegel[1] and Wendy D. Warren[1]
Biomedical Development Corp.[1] and UTHSCSA School of Dentistry[2] and Dept. of Microbiology[3], San Antonio, TX

Purpose: It is not uncommon to detect 1,000,000 colony forming units of bacteria per milliliter (CFU/ml) of water in the average dental unit waterline (DUWL). Biofilm formation is the major cause of persistent bacterial contamination of DUWL. Our previous studies demonstrate that Dentacide™, a unique solution developed for chemical disinfection of DUWL, prevents and reduces biofilm formation in DUWL. In this study, Dentacide™ was tested for the capacity to to reduce bacterial counts, eliminate biofilm, and prevent recolonization and reformation of biofilm in the waterlines of dental units equipped with independent water reservoirs.

Methods: Six dental units in five private dental offices were equipped with independent water reservoirs. Using this system, waterlines were treated overnight on a daily basis with Dentacide™. After treatment, lines were flushed with tap water to remove residual Dentacide™. Dentacide™ did not come into contact with patients, and tap water was used for routine operation. Disinfection of DUWL with Dentacide™ was performed by the dental professionals in each office according to a standard procedure. *Quantification*: Water samples (3-5 ml) were collected from the handpiece and syringe of each unit on a regular basis for up to 16 weeks. Samples were quantified for total mean CFUs/ml of water by triplicate culture on R2A agar at 25°C for 7 days. *Scanning Electron Microscopy (SEM)*: DUWL clippings (1 cm) were fixed in 2% glutaraldehyde in 0.2 M cacodylate-HCL, dehydrated, sputter coated with gold-palladium and examined with a LEO 435VP scanning electron microscope.

Results: Baseline water samples of the evaluated DUWLs demonstrated a mean count of ~2,000,000 CFU/ml. Disinfection of DUWL with Dentacide™ dramatically reduced cultivable bacteria by 5-6 logs, and with one exception, to <100 CFU/ml. SEMs of untreated DUWLs demonstrated mature biofilm, as shown in Figure A, comprised of multi-layered microcolonies including: curved rods, cocci, spirochetes and matrix material. Dentacide™ treatment for 12 weeks successfully removed the biofilm, as shown in Figure B.

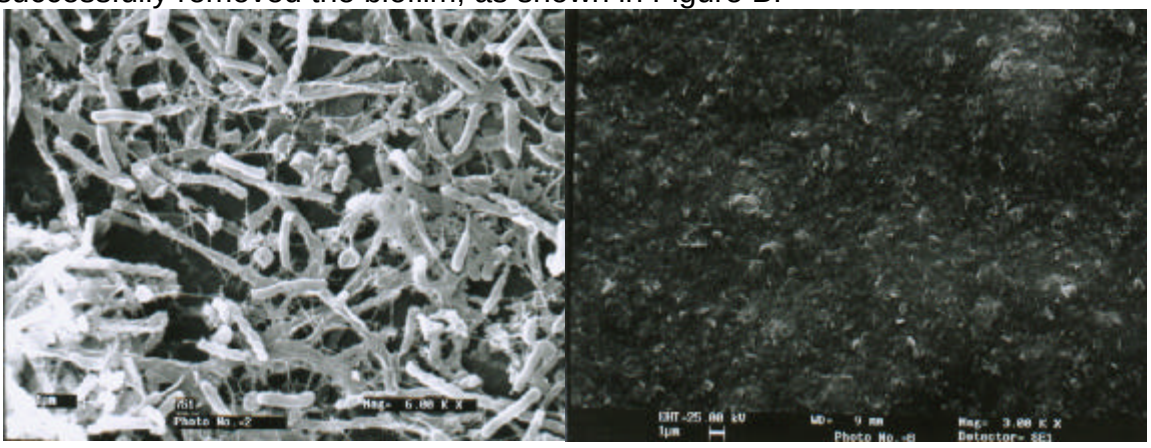

Figure A (left) shows a biofilm of mixed bacteria in the lumen of a DUWL before treatment with Dentacide™(magnification = 6,000X). Figure B (right) demonstrates that Dentacide™ treatment removes biofilm from the same DUWL (magnification = 3,000X).

Conclusions: Treatment of DUWLs with Dentacide™ was successful in reducing bacteria and removing biofilm. Biofilm did not reform on the Dentacide™ treated DUWLs.

Funding was provided to Biomedical Development Corp. by the National Institute of Dental and Craniofacial Research (5R44 DE11221-03)