

LOW CURRENT ELECTRICAL ENHANCEMENT OF A DENTAL UNIT WATERLINE CLEANER

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Objective: This study monitored by microbiological methods the planktonic effluent and biofilm formation from a simulated dental unit waterline (DUWL) inoculated with *Pseudomonas aeruginosa*.

Methods: The 15' distance of a DUWL from reservoir to air-water syringe was simulated by three 5' sections of 1/8" polyurethane tubing joined by barb fittings. One 15' length was for tests and another parallel length for control. Test tubing contained a 0.2mm dia. platinum wire. Tubings were joined by a Y-fitting to a peristaltic pump and thence to a 10L carboy of sterilized tap water. The pump was run for 5min every half-hour from 0900 to 1700hrs, 5 days a week. The water was initially inoculated with *P. aeruginosa* to 10⁴CFU/ml and the system was run for 5 days, then it was supplied with sterile tap water. Water effluent was sampled every other day, serially diluted and plated on *Pseudomonas* selective agar, incubated aerobically at 22°C 2 days, counted at 10X and expressed as CFU/ml. The pH and redox potential were measured. A steady state was determined when succeeding counts were within one log of each other, usually 7 days. An electrical potential of 15 V DC, 10mA was then applied to the wire as cathode and to barb fittings as anodes. At end of a trial 2.1cm long tubing sections were assessed for counts of biofilm, expressed as CFU/cm². Trials with tap water were contrasted to a trial with 10:1 dilution of a buffer-stabilized chlorine dioxide waterline cleaner.†

Results: Effluent counts of trials with tap water did not differ consistently, however the biofilm counts near the anode were 3.7x10¹±.03CFU/cm² with 10mA current, and 2.0x10⁴±9.5x10³CFU/cm² in control (*P*.022). Effluent counts of trial with ClO₂ +10mA were always zero, mean control counts ranged 1.40x10² to 3.06x10³CFU/ml (*P*.047 or less). Current had no effect on pH, but with ClO₂ perturbed the ORP. Biofilm counts were 0 at all dilutions for test near the anode, and 4.50x10²CFU/cm² for control (*P* .000).

Conclusion: A continuous low 10ma current significantly enhanced the efficacy of a buffered chlorine dioxide waterline cleaner against planktonic and biofilm *Pseudomonads* in a simulated DUWL.

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