Evaluation of two methods in controlling dental treatment water contamination.

Bansal R, Puttaiah R, Harris R, Reddy A.

Source

Masters Program in Public Health, University of Texas-Houston School of Public Health, Dallas, TX, USA.

Abstract

Dental unit water systems are contaminated with biofilms that amplify bacterial counts in dental treatment water in excess of a million colony forming units per milliliter (cfu/ml). The Centers for Disease Control and Prevention and the American Dental Association have agreed that the maximum allowable contamination of dental treatment water not exceed 500 cfu/ml. This study was conducted to evaluate two protocols in controlling contamination of dental unit water systems and dental treatment water. Both methods used an antimicrobial self-dissolving chlorine dioxide (ClO₂) tablet at a high concentration (50 ppm) to shock the dental unit water system biofilms initially followed by periodic exposure. To treat dental treatment source water for patient care, 3 parts per million (ppm) ClO₂ in municipal/tap water was compared to use of a citrus botanical extract dissolved in municipal water. Heterotrophic microbial counts of effluent water and laser scanning confocal microscopy were performed to evaluate effects of the two treatments. Results from this study indicated that both treatments were effective in controlling biofilm contamination and reducing heterotrophic plate counts <500 cfu/ml. A comprehensive study addressing compatibility of 50 ppm ClO₂ on the metals and nonmetal components of the dental water system and effects of low-grade chemicals used on composite bonding to dentin and enamel is warranted before translation from efficacy studies to common clinical use. Clinical significance: This study provides evidence-based information of using two methods of controlling dental treatment water contamination. The study was conducted in a clinical practice setting in an active dental clinic and the results are meaningful to a clinician who is interested in providing safe dental treatment water for patient care.

Keywords: Dental waterline biofilms, Dental treatment water contamination control, Chlorine dioxide, Emulsifiers, Heterotrophic plate counts, Laser scanning confocal microscopy.

Management of dental unit waterline biofilms in the 21st century.

O’Donnell MJ, Boyle MA, Russell RJ, Coleman DC.

Source

Microbiology Research Unit, Division of Oral Biosciences, Dublin Dental University Hospital, University of Dublin, Trinity College Dublin, Dublin 2, Republic of Ireland.

Abstract

Dental chair units (DCUs) use water to cool and irrigate DCU-supplied instruments and tooth surfaces, and provide rinsewater during dental treatment. A complex network of interconnected plastic dental unit
waterlines (DUWLs) supply water to these instruments. DUWLs are universally prone to microbial biofilm contamination seeded predominantly from microorganisms in supply water. Consequently, DUWL output water invariably becomes contaminated by high densities of microorganisms, principally Gram-negative environmental bacteria including Pseudomonas aeruginosa and Legionella species, but sometimes contain human-derived pathogens such as Staphylococcus aureus. Patients and staff are exposed to microorganisms from DUWL output water and to contaminated aerosols generated by DCU instruments. A wide variety of approaches, many unsuccessful, have been proposed to control DUWL biofilm. More recently, advances in biofilm science, chemical DUWL biofilm treatment agents, DCU design, supply water treatment and development of automated DUWL biofilm control systems have provided effective long-term solutions to DUWL biofilm control.

PMID: 22004039
[PubMed - indexed for MEDLINE]
Free full text


Biofilm problems in dental unit water systems and its practical control.

Coleman DC, O'Donnell MJ, Shore AC, Russell RJ.

Source

Microbiology Research Unit, Division of Oral Biosciences, Dublin Dental School & Hospital, University of Dublin, Trinity College Dublin, Lincoln Place, Dublin 2, Ireland.
david.coleman@dental.tcd.ie

Abstract

Dental chair units (DCUs) contain integrated systems that provide the instruments and services for a wide range of dental procedures. DCUs use water to cool and irrigate DCU-supplied instruments and tooth surfaces during dental treatment. Water is supplied to these instruments by a network of interconnected narrow-bore (2-3 mm) plastic tubes called dental unit waterlines (DUWLs). Many studies over the last 40 years demonstrated that DUWL output water is often contaminated with high densities of micro-organisms, predominantly Gram-negative aerobic heterotrophic environmental bacteria, including Legionella and Pseudomonas species. Untreated DUWLs host biofilms that permit micro-organisms to multiply and disperse through the water network and which are aerosolized by DCU instrument use, thus exposing patients and staff to these micro-organisms, to fragments of biofilm and bacterial endotoxins. This review concentrates on how practical developments and innovations in specific areas can contribute to effective DUWL biofilm control. These include the use of effective DUWL treatment agents, improvements to DCU supply water quality, DCU design changes, development of automated DUWL treatment procedures that are effective at controlling biofilm in the long-term and require minimal human intervention, are safe for patients and staff, and which do not cause deterioration of DCU components following prolonged use.

PMID:
Formation and decontamination of biofilms in dental unit waterlines.

Wirthlin MR, Marshall GW Jr, Rowland RW.

Source

Department of Stomatology, Division of Periodontology, University of California-San Francisco, San Francisco, CA 94143-0762, USA.

Abstract

BACKGROUND:

Biofilms are a natural occurrence in aquatic environments, including community drinking water systems. The interior of small-diameter tubings in dental unit waterlines (DUWL) are also sites of biofilm formation. In the lumen of the tubings, the flow is minimal, and the water becomes stagnant when the units are not in use. Molecules precipitate from the water onto the interior wall and promote the adherence of planktonic microorganisms from the water. Once they become sessile, the microorganisms change their phenotype. After adherence, there is a so-called surface-associated lag time, and the organisms then enter a growth phase and produce exopolysaccharides that coat the organisms in a slime layer. Within the biofilm, the microorganisms can signal one another, transfer nutrients, and exchange genetic material. The insoluble exopolysaccharides shield the microorganisms from displacement and from penetration by predator organisms, antibiotics, and disinfectants. The external surface layer of microorganisms is faster growing and may detach as "swarmer" cells. Detachment of microorganisms from dental unit biofilm flushed into the oral cavity could theoretically infect the patient. Splatter and aerosols from dental procedures may possibly infect health care personnel.

METHODS:

This study compared three DUWL cleaners (an alkaline peroxide product, a freshly mixed chlorine dioxide product, and a buffer-stabilized chlorine dioxide product) in 16 dental units with self-contained water systems, 6 months after installation in a periodontal teaching clinic. One unit treated by flushing and drying served as a control. Units were sampled daily for 10 days with heterotrophic plate count (HPC) sampler plates. The plates were incubated for 7 days at room temperature, and colonies were counted at 10.5x magnification. Samples of internal water tubing before and after the use of waterline cleaners were processed and examined by scanning electron microscopy.

RESULTS:
The estimated mean HPC was derived from original and replicate independent counts of two investigators of undiluted and diluted samples, reported as colony forming units (CFU)/ml. Shock treatments with the alkaline peroxide product (n = 5) reduced the HPC from baseline, but in the ratio of daily counts to control, there was a large variance and a trend to return of high counts as days passed. The mean daily HPC was significantly better than the control for only 3 of the 9 days of treatment and exceeded the goal of 200 on 3 days. Freshly mixed chlorine dioxide (n = 4) and the buffer-stabilized chlorine dioxide (n = 5) both reduced HPC to near 0 on all days. Their ratios of daily estimated means to that of the control were significantly (P < 0.001) better at all times. In comparing treatments, the freshly mixed chlorine dioxide was better (P < 0.001) than the alkaline peroxide on 8 of 9 days. The buffered chlorine dioxide treatment was better than the alkaline peroxide at all times. The two chlorine dioxide treatments each had so many HPC counts of 0 that a meaningful statistical difference between them was not calculated. Scanning electron microscopy of plastic waterline tubing samples taken before and after treatments showed reductions in biofilm coverage, but the differences were not statistically significant.

**CONCLUSIONS:**

Chlorine dioxide waterline cleaners are effective in decontaminating DUWL biofilm. Chlorine dioxide has advantages over other chlorine products. Controlling DUWL biofilm may have beneficial effects on nosocomial infections.


**Effects of hydrogen peroxide on dental unit biofilms and treatment water contamination.**

Lin SM, Svoboda KK, Giletto A, Seibert J, Puttaiah R.

**Source**

Graduate student, Biomedical Sciences, TAMHSC Baylor College of Dentistry, Texas, USA.

**Abstract**

**OBJECTIVES:**

To study effects of various concentrations of hydrogen peroxide on mature waterline biofilms and in controlling planktonic (free-floating) organisms in simulated dental treatment water systems; and to study in vitro the effects of 2%, 3%, and 7% hydrogen peroxide on the removal of mature biofilms and inorganic compounds in dental waterlines.

**METHODS:**

Four units of an automated dental unit water system simulation device was used for 12 weeks. All units were initially cleaned to control biofilms and inorganic deposits. H2O(2) at concentrations of 1%, 2%, 3% was used weekly for periodic cleaning in three treatment group
units (units 1, 2 & 3), with 0.05%, 0.15% and 0.25% H(2)O(2) in municipal water used as irrigant respectively. The control unit (unit 4) did not have weekly cleanings and used municipal water as irrigant. Laser Scanning Confocal Microscopy and Scanning Electron Microscopy were used to study deposits on lines, and weekly heterotrophic plate counts done to study effluent water contamination. A 24 hour in vitro challenge test with 7%, 3% and 2% H(2)O(2) on mature biofilms was conducted using harvested waterlines to study biofilm and inorganic deposit removal.

RESULTS:

Heterotrophic plate counts of effluent water showed that the control unit reached contamination levels in excess of 400,000 CFU/mL while all treatment units showed contamination levels <500 CFU/mL through most of the 12 weeks. All treatment units showed varying levels of biofilm and inorganic deposit control in this short 12 week study. The in vitro challenge test showed although there was biofilm control, there was no eradication even when 7% H(2)O(2) was used for 24 hours.

CONCLUSIONS:

2% H(2)O(2) used as a periodic cleaner, and diluted to 0.05% in municipal water for irrigation was beneficial in controlling biofilm and planktonic contamination in dental unit water systems. However, to remove well established biofilms, it may take more than 2 months when initial and multiple periodic cleanings are performed using H(2)O(2).


Dental unit waterline contamination--a review.

Porteous N.

Source

Department of Comprehensive Dentistry, University of Texas Health Science Center at San Antonio Dental School, USA. porteous@uthscsa.edu

Abstract

Manufacturers of dental units have responded positively to the challenge from the American Dental Association (ADA) and the subsequent guidelines issued by the Centers for Disease Control and Prevention (CDC) to deliver patient treatment water that is at least as pure as drinking water. Dental units are now routinely manufactured with anti-retraction devices that are designed to control oral fluids from being aspirated into the lines during treatment and many units have water systems that isolate source water from municipal water supply. The dental industry has also produced an array of devices and cleaning/disinfectant products to further facilitate the use of clean patient treatment water. Products that claim disinfectant efficacy must be registered with the Environmental Protection Agency (EPA). If they are not EPA-registered, they can be labeled as waterline cleaners only. Waterline treatment devices that are sold separately and require connection to dental units must be registered with the Food and Drug Administration (FDA) as medical devices. Patient treatment
Dental unit waterlines: source of contamination and cross-infection.

Kumar S, Atray D, Paiwal D, Balasubramanyam G, Duraiswamy P, Kulkarni S.

Source
Department of Preventive and Community Dentistry, Darshan Dental College and Hospital, Loyara, Ranakpur road, Udaipur 313001, India.

Abstract
Dental chair units (DCUs) are used in the treatment of many patients throughout each day and microbial contamination of specific component parts is an important potential source of cross-infection. The quality of dental unit water is of considerable importance since patients and dental staff are regularly exposed to water and aerosols generated from the dental unit. This water hosts a diverse microflora of bacteria, yeasts, fungi, viruses, protozoa, unicellular algae and nematodes which may be contaminated with microorganisms found in the biofilm formed due to water stagnation in the narrow-bore dental unit waterline (DUWL) tubings. The water thus contaminated, when used for various treatment procedures through dental handpieces, air/water/three-in-one syringe, etc., produces aerosols that can cause infection. The present review emphasises the risks of infection from DUWL and various water treatment procedures available to disinfect the DUWLs.

The influence of dental unit waterline cleaners on composite-to-dentin bond strengths.

Ritter AV, Ghaname E, Leonard RH.

Source
Department of Operative Dentistry, University of North Carolina School of Dentistry, Chapel Hill, USA.

Abstract
BACKGROUND:
One approach to controlling dental unit waterline (DUWL) contamination by microorganisms is the addition of chemical cleaners to the treatment water. Yet, there is concern that these cleaners might affect the bonding of resin-based composites to enamel and dentin. The authors evaluated the influence of DUWL cleaners on composite-to-dentin bond strengths.

METHODS:
The authors tested the strength of resin-based composite bonded to dentin in specimens treated with distilled water (control) or one of four cleaners. They tested a total-etch adhesive, a self-etching primer/adhesive and an experimental self-etching primer/adhesive. The authors stored the specimens for 24 hours at 37 C and tested them to determine their bond strengths.

RESULTS:

The mean shear bond strengths (SBSs) varied according to the cleaner and adhesive used, ranging from 14.7 to 21.9 megapascals. However, the authors found no statistically significant differences and/or interactions between mean SBSs of specimens treated with the various DUWL cleaners and adhesives (P > or = .05).

CONCLUSIONS:

The tested DUWL cleaners did not significantly influence composite-to-dentin bond strengths for the total-etch adhesive and self-etching primer/adhesives used in this study. CLINICAL IMPLICATIONS. The conclusions imply that bonding of resin-based composites to dentin is not affected by the cleaners tested when they are used to treat DUWL contamination.


Measuring the validity of two in-office water test kits.

Bartoloni JA, Porteous NB, Zarzabal LA.

Source

University of Texas Health Science Center, San Antonio, USA. joseph.bartoloni@brooks.af.mil

Abstract

BACKGROUND:

The authors conducted a study to determine the validity of two commercially available in-office water test kits compared with a spread plate technique using the gold standard dehydrated culture medium R2A agar for monitoring the quality of dental treatment water.

METHODS:

Over a 12-week period, one author monitored nine dental units in a dental school that each were equipped with an independent water reservoir. The author collected 351 split samples, cultured them using three test methods, counted bacterial colonies manually and assessed validity using two cutoff values: < or = 200 colony-forming units per milliliter (CFU/mL) (an American Dental Association goal) and < or = 500 CFU/mL (a Centers for Disease Control and Prevention [CDC] recommendation and a U.S. Environmental Protection Agency [EPA] mandate).
RESULTS:

Of the 351 split samples processed, the in-office test kits' accuracy ranged from 25 to 69 percent, according to the ADA and CDC/EPA recommendations, compared with the R2A agar.

CONCLUSIONS:

Overall, the in-office test kits underestimated bacteria levels, producing inaccurate measurements of bacterial levels compared with the R2A agar.

CLINICAL IMPLICATIONS:

The data suggest that use of the two in-office test kits could result in a lack of compliance, owing to underestimating bacterial contamination with recognized recommendations for dental unit waterline quality.


Evaluation of mycological contamination of dental unit waterlines.

Szymańska J.

Source

Department of Paedodontics, Medical University of Lublin, Poland. adpunctum@adres.pl

Abstract

The quality of dental unit water is of great importance since patients and dental staff are regularly exposed to water from aerosols generated during work. The main purpose of this investigation was mycological evaluation of dental unit waterlines (DUWL). The author determined the number and species of fungi present in the water from a unit reservoir which is the source of water for a dental unit, in the water flowing from a high-speed handpiece of a unit, and in the swab sample collected from the wall of a waterline connecting a unit reservoir and dental handpieces. The following mould fungi were identified: Aspergillus amstelodami, Aspergillus fumigatus, Aspergillus spp. from Aspergillus glaucus group, Aspergillus repens, Citromyces spp., Geotrichum candidum, Penicillium aspergilliforme, Penicillium pusillum, Penicillium turolense, Sclerotium sclerotiorum; yeast-like fungi: Candida albicans, Candida curvata and other yeasts. Some of them, in certain circumstances, especially in people with immunological disorders, may be a cause of opportunistic infections. Thus, it is necessary that the DUWL should be submitted to a decontamination protocol and to routine microbial monitoring to guarantee an appropriate quality of water used in dental treatment.

Exposure to bacterial endotoxin during conservative dental treatment.

Szymańska J.

Source

Department of Paedodontics, Medical University of Lublin, Poland. adpunctum@adres.pl

Abstract

The aim of the study was to determine bacterial endotoxin concentration in the water flowing from a high-speed handpiece of a dental unit and in the air contained in the bioaerosol formed during dental conservative treatment. The air was collected in the space between the patient and dentist. The study was conducted on 25 operative sites (units) and had two stages: before application of a dental unit waterline (DUWL) disinfectant and after a 2-week application of disinfection procedure. The research showed that the mean concentration of bacterial endotoxin in the water flowing from high-speed handpieces was significantly reduced after the use of a disinfectant. The mean concentration of bacterial endotoxin in the air was similar at both stages - before and after application of waterline decontamination procedure. The study showed that in dental air-water aerosol, water is the main source of bacterial endotoxin contaminating the aerosol during the work with dental handpieces. Application of a user-friendly water disinfectant to significantly decrease endotoxin concentration in the DUWL water and in the aerosol, is one of recommended methods to reduce health risk.

PMID: 16028879

[PubMed - indexed for MEDLINE]

Free full text


The effect of distillation and line cleaning on the quality of water emitted from dental units.

Palenik CJ, Miller CH.

Source

Infection Control Research & Services, Indiana University School of Dentistry, Indianapolis 46202, USA. cpalenik@iupui.edu

Abstract

PURPOSE:

To monitor water emitted from dental units connected to centralized water distillation units fitted with reservoirs for dispensing chemicals designed to control biofilms.
METHODS:

Three private practice dental offices participated in the study. None of the office operatories had independent water reservoir (bottle) systems or any other type of water treatment equipment. Initially, 5.0 mL water specimens were obtained from the handpiece and three-way syringe service lines as well as from the sink faucets in three operatories in each office. Specimens were collected at the end of the workweek. Specimens were neutralized for residual chlorine, diluted and spiral plated onto R2A agar. Aerobic incubation was allowed for 7 days at 21 degrees C. Numbers of colonies were then determined and expressed as CFU/mL. If water specimens containing more than 200 CFU/mL were detected, the offices were equipped with water distillers with attached cleaning solution dispensers. The units allowed distilled water to move under normal pressure to all connected dental units. When cleaning, the distillers were inactivated, which allowed cleaning fluid to move under pressure from the dispensers through all unit waterlines. The waterline-cleaning scheme followed the manufacturer recommendations. The presence of no more than 200 CFU/mL in emitted water was then established and a regimen of weekly cleanings applied for 3 weeks. Water specimens were always collected on the last workday of the week. Then, cleaning was suspended and weekly monitoring performed. Cleaning was restored immediately after detection of more than 200 CFU/mL.

RESULTS:

Levels of microbial contamination prior to the initiation of cleaning indicated marked variability (720-332,000 CFU/mL) and that water containing less than 200 CFU/mL was not being emitted from any operatory water source. However, sought-after water was consistently obtained over a period of 3 weeks from all unit sources after line-cleaning processes were completed. Water containing less than 200 CFU/mL was obtained from all unit sources in the three offices after skipping of one weekly cleaning. In one office, cleaning was suspended for 3 weeks without affecting water quality. Resumption of weekly cleanings produced desirable water from all sources in the three offices within 2 weeks. Results indicate that dental units attached to centralized combined water distillation-cleaning solution distribution systems can produce water with less than 200 CFU/mL and that the missing of one weekly cleaning did not negatively affect water quality.


Waterborne biofilms and dentistry: the changing face of infection control.

Barbeau J.

Source

Department of Stomatology, Faculty of Dentistry, University of Montreal, PO Box 6128, Centre-ville, Montreal, QC H3C 3J7. barbeauj@medent.umontreal.ca

Abstract
Interest in and concern about the biofilms that occur in dental equipment and waterlines have been increasing in recent years. Dental unit waterlines are ideal environments for the growth of microorganisms entering dental units from the municipal water supply. This article describes the conditions in waterline tubing that favour development of biofilms and discusses the level of risk that such microbial growth poses for both dental professionals and their patients. It is stressed that very few cases of infection have been linked directly to contamination in dental unit waterlines. Finally, potential solutions for minimizing risks are presented and discussed.

PMID:
12584771
[PubMed - indexed for MEDLINE]
Free full text

Effective control of dental chair unit waterline biofilm and marked reduction of bacterial contamination of output water using two peroxide-based disinfectants.

Tuttlebee CM, O'Donnell MJ, Keane CT, Russell RJ, Sullivan DJ, Falkiner F, Coleman DC.

Source
Microbiology Research Unit, Department of Oral Surgery, Oral Medicine and Pathology, School of Dental Science, Trinity College, University of Dublin, Ireland.

Abstract
Bacterial biofilm in dental unit waterlines (DUWs) is a widespread problem, and poses a potentially significant risk of infection to dental staff and patients, particularly those who are medically compromised or immunocompromised. The purpose of the present study was to investigate the level of bacterial contamination of dental chair unit output water in the Dublin Dental Hospital, and to investigate the efficacy of two hydrogen peroxide-based disinfectants in reducing bacterial loads to \( \leq 200 \) cfu/mL as recommended by the American Dental Association. The chemical quality of dental chair unit input and output water was well within the limits recommended for potable water. Water supplied to the units yielded an average aerobic heterotrophic bacterial cell density of 184 cfu/mL. However, the corresponding density in output water was considerably higher; the average cell density in water from the three-in-one air/water syringes and cup fillers in 12 chairs was 8200 and 4300 cfu/mL, respectively. Dental unit water obtained from 18 separate reservoir-supplied units in general practices in the Dublin area yielded an average of 66000 cfu/mL. The bacterial species found were predominantly environmental organisms, which were also present at low levels in the input water. Some of the species identified (e.g., Burkholderia cepacia and Pseudomonas fluorescens) are known opportunistic pathogens. The capacity of two disinfectants, Sterilex Ultra and Sanosil, to reduce bacterial contamination to safe levels was compared. In a controlled study, once weekly overnight (15 h) disinfection using either agent reduced the bacterial density to below the American Dental Association recommended level of 200 cfu/mL. However, once disinfection ceased the bacterial loads increased to unacceptably high levels within three weeks. Electron microscopic analysis
showed that both disinfectants markedly reduced biofilm in the DUWs, but the biofilm rapidly became extensive again when once weekly disinfection ceased. While both disinfectants were equally effective in lowering the bacterial counts to acceptable levels, Sterilex Ultra was associated with clogging of DUWs in some dental chair units after repeated usage, suggesting that Sanosil is a more suitable agent for routine use.

Copyright 2002 The Hospital Infection Society


Reducing bacterial counts in dental unit waterlines: distilled water vs. antimicrobial agents.

Kettering JD, Muñoz-Viveros CA, Stephens JA, Naylor WP, Zhang W.

Source

School of Medicine at Loma Linda University, CA 92350, USA. jkettering@som.llu.edu

Abstract

BACKGROUND:

This study evaluated five chemical disinfectants to compare their abilities to improve dental unit waterline quality and assess their effects, if any, on the biofilm layer.

METHODS:

Sixty new dental units, with a closed-circuit water system, were used to compare microbial levels in DUWLs treated with five antimicrobials: Listerine, Bio 2000, Rembrandt, Dentosept, and sodium fluoride to a control group of sterile distilled water alone over a six-week period. For all units, the waterlines were filled with solution, left overnight, and then flushed for 30 seconds with sterile distilled water the following morning prior to patient treatment. Waterlines were examined for biofilm buildup using scanning electron microscopy and colony-forming-unit counts.

RESULTS:

The sodium fluoride and the four chemical antimicrobials reduced the microbial count to 200 cfu/ml or less. Only samples taken from dental units receiving the control treatment (distilled water with no added antimicrobial) failed to meet ADA's stated goal. Examination of the SEMs revealed an apparent decrease in the biofilm mass but not elimination, despite repeated treatment with the four antimicrobial materials.

CONCLUSIONS:
Even in a closed-circuit water system, distilled water alone cannot reduce microbial contamination of dental treatment water from dental unit waterlines to the 200 cfu/ml ADA stated goal. However, water treated with Listerine mouthrinse, Rembrandt mouthrinse, Bio 2000, 0.5 percent sodium fluoride and Dentosept, did meet the microbial reduction goal. The biofilm apparently was reduced in volume, but not entirely eliminated.

**CLINICAL SIGNIFICANCE:**

The ADA goal of a maximum of 200 cfu/ml was achieved using any of five chemical antimicrobials and distilled water in a closed-water system. Despite the successful reduction in microbial contamination of the dental treatment water, the biofilm was not completely eliminated. Biofilm elimination and prevention would be needed through some other means.


**Dental unit water contamination.**

*Molinari JA.*

**Abstract**

Choices are available for preventing and controlling waterline contamination, but some of them require a substantial commitment by personnel charged with maintenance of the waterlines. Other approaches and technologies are being developed and tested. If approved by the appropriate agencies, they will offer even more preventive choices. It is fortunate that we have multiple options available, but each requires a serious commitment for follow-through. My money is on dentists, hygienists, and assistants to continue to respond professionally and proactively.


**Evaluation of a hydrogen peroxide disinfectant for dental unit waterlines.**

*Linger JB, Molinari JA, Forbes WC, Farthing CF, Winget WJ.*

**Source**

Department of Restorative Dentistry, University of Detroit Mercy, School of Dentistry, 8200 W. Outer Drive, Detroit, Mich. 48219-0900, USA. lingerjb@udmercy.edu

**Abstract**

**BACKGROUND:**
The purpose of this study was to investigate the use of a hydrogen peroxide-based dental unit waterline, or DUWL, treatment to reduce the colonization and growth of heterotrophic bacteria.

METHODS:

Twenty-three dental units with self-contained water systems were randomly selected. Three of the units and tap water served as controls. Twenty-four water samples were taken at baseline and once a week for five weeks. They were serially diluted, spread-plated in duplicate onto R2A agar plates and incubated at 37 C for seven days.

RESULTS:

At baseline, the tap water control had a mean count of 0 colony-forming units/milliliter, or CFU/mL, the three control DUWLs had a median count of 8,440 CFU/mL and the 20 treated DUWLs had a median count of 9,760 CFU/mL. By week 1, 19 (95 percent) of the 20 treated DUWLs had counts of less than 200 CFU/mL, and by week 4, the median count for all of the treated DUWLs was 0 CFU/mL. The measurement at week 5 showed that the reduction to below 200 CFU/mL had been maintained. Scanning electron micrographs from processed DUWL tubing samples revealed a similar pattern of results, with biofilm accumulation more evident in the untreated control specimens.

CONCLUSIONS:

Following the parameters of this study, the authors used a hydrogen peroxide-based disinfectant to achieve the ADA goal of no more than 200 CFU of heterotrophic, mesophilic bacteria per milliliter of unfiltered output water.

CLINICAL IMPLICATIONS:

An easy-to-use hydrogen peroxide-based DUWL disinfectant demonstrated effectiveness in improving the quality of water used for intraoral procedures. Protocol compliance meets the ADA year 2000 goal.

PMID: 11665356

[PubMed - indexed for MEDLINE]

Free full text


Evaluation of ultrasonic scaling unit waterline contamination after use of chlorine dioxide mouthrinse lavage.

Wirthlin MR, Marshall GW JR.

Source
Abstract

BACKGROUND:

An infection control problem in dental operatories which is not fully controlled is waterline contamination by heterotrophic mesophilic bacteria. These bacteria are present in water supplies as a planktonic phase and adhere to the lumen of tubings as a biofilm comprised of their external cell surface glycocalyx and by production of extracellular carbohydrate polymers. The adherent film is most difficult to remove. The accumulated planktonic phase can be reduced significantly by flushing water from the lines before use in patient treatment, but will return when the equipment is idle through the accumulation of more planktonic phase and by slough of the biofilm surface-adsorbed phase not yet enmeshed in the carbohydrate matrix. Chlorine dioxide has antimicrobial activity against many bacteria, spores, and viruses. It is used in water supply treatment as a disinfectant and slime preventive and has an advantage over chlorine in that carcinogenic trihalomethanes are not generated.

METHODS:

This study compared use of phosphate buffer-stabilized chlorine dioxide (0.1%) mouthrinse as a lavage in ultrasonic dental scaler units with the use of tap water as a control. Sterile water flushed through the units onto heterotrophic plate count (HPC) sampler plates was cultured 7 days at room temperature and colonies were counted at 12x. One test and one control unit were used for biopsy of internal tubing and scanning electron microscopy imaging.

RESULTS:

The HPC counts, in colony forming units (CFU)/ml, were reduced 3- to 5-fold by flushing tap water through the units, but they returned after units were idle overnight. When phosphate-buffered chlorine dioxide mouthrinse was used as a lavage, CFU/ml were reduced 12- to 20-fold. Holding chlorine dioxide in waterlines overnight reduced recurrent buildup compared to water (P<0.05). Scanning electron microscopy images indicated a significant reduction of biofilm coverage by chlorine dioxide as compared to water (P<0.001).

CONCLUSIONS:

Phosphate-buffered chlorine dioxide mouthrinse was effective in these short-term trials for control of waterline contamination in ultrasonic dental scaling units. It should prove as...