

Oral Health Topics

Dental Unit Waterlines

Key Points

- The CDC recommends that dental unit water used in non-surgical procedures measure less than or equal to 500 colony forming units of heterotrophic bacteria per milliliter (<500 CFU/mL) of water, the standard set for drinking water by the Environmental Protection Agency (EPA).
- Use sterile saline or sterile water as a coolant/irrigant when performing surgical procedures.
- Follow dental unit manufacturer's instructions for maintaining and monitoring the quality of dental unit water.

Introduction

Biofilm—a coating of microorganisms—can develop in dental unit waterlines (the tubes connecting instrumentation such as high-speed handpieces, air/water syringes and ultrasonic scalers with a water supply). To deliver water of optimal microbiologic quality, dental unit waterlines must be maintained regularly. Colonization of microorganisms within the waterlines may not pose a concern for healthy individuals, but it may place elderly¹ or immunocompromised patients at unnecessary risk. Although infection associated with microbial contamination of waterlines appears to be rare, dental unit waterlines have been shown to harbor a wide variety of microorganisms including bacteria, fungi, and protozoans in numbers sufficient to cause illness.^{2, 3} These microorganisms colonize and replicate on the interior surfaces of the waterline tubing forming biofilms. Biofilms can serve as a reservoir, amplifying the numbers of free-floating microorganisms in the water.

Water Quality Improvement: The Centers for Disease Control and Prevention (CDC) recommends that dental unit water used in non-surgical procedures measure < 500 CFU/mL.² This is the standard set for drinking water by the Environmental Protection Agency (EPA).² To deliver water of this quality, dental unit waterline systems designed for general dental practice must be regularly maintained, via water treatment and monitoring, performed according to the manufacturer's instructions.

While they will not eliminate biofilms, there are several methods for improving dental unit water quality, including:

- Filtration;
- Chemical treatments;
- Anti-retraction valves;
- Use of water sources separate from the public water system (NOTE: An independent water source also will help offices avoid interruptions in dental care when community "boil water" notices are issued by local health authorities).

Microorganisms not only can be introduced from the water source but can also enter the waterline from patients' mouths during treatment. Efforts to limit this means of exposure include installation of anti-retraction valves and flushing the lines between patients. The CDC recommends that any devices that enter a patient's mouth (e.g. handpieces, ultrasonic scalers, or air/water syringes) should be connected to the waterline and flushed for at



least 20 seconds between patients. In addition, warming dental unit water (with the intent of improving patient comfort) should be avoided because it can augment biofilm formation.⁴

In terms of the best method to maintain waterlines and monitor the water quality, refer to the guidance from the dental unit manufacturer. Once you have established a protocol, educate your staff on how to execute it. Strict adherence to maintenance protocols is necessary to sustain the quality of dental unit water, but simply treating waterlines may not be sufficient to ensure water quality. Determining if the methods being utilized are successful requires a protocol that includes regular monitoring.

Delivery of Sterile Surgical Irrigation: The CDC recommends use of sterile solutions (e.g., sterile saline or sterile water) as a coolant or for irrigation during oral surgical procedures. The CDC defines oral surgical procedures as those that involve the incision, excision, or reflection of tissue that exposes normally sterile areas of the oral cavity. These include procedures such as gingivectomy, extraction of an impacted third molar, soft-tissue biopsy, and bone re-contouring.⁵

Dental units cannot reliably deliver sterile water even when equipped with independent water reservoirs because the water-bearing pathway cannot be reliably sterilized. Delivery devices (e.g., sterile bulb syringe or single-use disposable products) should be used to deliver sterile water.²

Cleaning Dental Unit Waterlines

Check with your dental unit manufacturer for recommendations on how to clean your waterlines, even if you use an independent water source. They may suggest options such as filtration or use of chemicals or a combination of these.

Once you've identified a process that fits your needs and is compatible with your dental unit (per the manufacturer) establish a schedule for waterline maintenance as well as an individual designated for this responsibility.

Water Quality Monitoring

The only way to ensure effectiveness of a dental unit waterline cleaning regimen is to actually test the water coming out of the unit. Simple and inexpensive products are available that estimate the number of free-floating heterotrophic bacteria in dental unit water. A well-designed water quality indicator should accurately detect a wide concentration range and type of aerobic mesophilic heterotrophic waterborne bacteria within a reasonable incubation time at room temperature. In addition to in-office testing kits, laboratories across the U.S. also offer mail-in testing services.

Often, dental unit manufacturers provide a schedule for monitoring their equipment. If they don't, a dental practice may develop its own schedule. For example, the United States Air Force (USAF) recommends that their dental offices monitor their waterlines as follows⁶:

1. When beginning to use a new product (or initiating a monitoring protocol), test the water from each unit monthly for the first three months.
2. If the unit discharges water of <500 CFU/mL consistently during this period, offices can test the units quarterly.
3. In the event that standards are not met when monitoring dental unit water (i.e., ≥ 500 CFU/mL), review work practices, waterline treatment protocols, and waterline treatment and monitoring records. Correct any identified procedural problems, retreat the waterlines, and retest the dental unit. If the test remains positive, a shock treatment of the waterlines may be indicated. Many dental unit waterline product manufacturers offer guidance on initial or periodic shock treatments for the waterlines, which may include

using a higher concentration of their product or an extended treatment time ... In the event that a unit consistently does not meet standards (i.e., ≥ 500 CFU/mL) contact the waterline treatment product manufacturer for guidance.

References

1. Ricci ML, Fontana S, Pinci F, et al. Pneumonia associated with a dental unit waterline. *Lancet* 2012;379(9816):684.
2. Centers for Disease Control and Prevention Guidelines for Infection Control in Dental Health-Care Settings — 2003 (December 19, 2003 / Vol. 52 / No. RR-17). U.S. Department of Health and Human Services 2003. Accessed January 18, 2017.
3. Peralta G, Tobin-D'Angelo M, Parham A, et al. Notes from the Field: Mycobacterium abscessus Infections Among Patients of a Pediatric Dentistry Practice--Georgia, 2015. Accessed September 15, 2016.
4. Organization for Safety, Asepsis and Prevention. Dental Unit Waterlines: Dental Unit Waterline Fact Sheet. Access June 14, 2017.
5. Centers for Disease Control and Prevention Oral Surgical Procedures. Accessed May 8 2017.
6. USAF Dental Evaluation & Consultation Service Dental Unit Waterlines. Accessed June 8 2017.

ADA Resources

- Guidelines for Practice Success. Managing the Regulatory Environment: Dental Unit Waterlines
- See the 2007 ADA Professional Product Review for DUWL evaluations (Vol. 2, Iss. 2)
- Oral Health Topics: Infection Control

Other Resources

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