

Dental unit water quality

Research has shown that in newly installed dental unit waterlines, microbial counts can reach a count of 200,000 CFU/ml within five days.¹ In fact, counts as high as 10⁶ CFU/ml of dental unit water have been found in unmonitored dental unit waterlines.^{2,3} Bacteria and other microorganisms form a [biofilm](#) which adheres to the inside of the tubing that supplies water to the dental instruments. As water moves through the tubing, or waterline, microorganisms slough off into the water, thus contaminating it.

Drinking water must meet a certain standard for concentrations of contaminants and chemicals. The maximum concentration of [heterotrophic bacteria](#) set by the EPA, the American Public Health Association (APHA) and the American Water Works Association (AWWA) is 500 [colony forming units](#) per milliliter (CFU/ml) of drinking water. Appropriate infection control measures should be implemented to meet this standard. Additionally, the quality of water delivered by dental units should be regularly monitored to ensure standards compliance.

There is no evidence that dental unit water is harmful to patients.⁴ Nevertheless, the CDC (Centers for Disease Control and Prevention) states that “Exposing patients or dental health care personnel to water of uncertain microbiological quality, despite the lack of documented adverse health effects, is inconsistent with generally accepted infection control principles.”⁵

Cleaning dental unit waterlines

1. Identify the source of water for your dental unit.

Municipal water supply This source may provide limited access to the waterline, but in such instances there are options for controlling water quality: 1) install a [point of use filter](#) between the dental instrument and the waterline tubing, 2) retrofit the dental unit so that the water is supplied by a self-contained water system for easy delivery of chemical treatments (contact the dental unit manufacturer about installing a self-contained water system), or 3) install a system that allows delivery of cleaning agents at the junction box.

Self-contained water system A reservoir (bottle) attaches to the dental unit waterline, which isolates it from the municipal water supply. Water (tap, distilled, sterile, etc.) must be manually added. The simple task of regularly adding cleaning agents to the bottle make this a convenient system.

2. Identify [products](#) that fit your needs and are compatible with your dental unit (contact the dental unit manufacturer). Some cleaning agents, like bleach, can corrode parts of the dental unit.

3. Develop a schedule for waterline maintenance (based on manufacturer recommended treatment methods) and assign that duty to a particular person.
4. Establish a protocol for [monitoring](#) the quality of dental unit water.

Products

Inclusion or omission of any product in the following tables does not imply its endorsement, approval, or disapproval by the ADA (report omissions to science@ada.org). This information was collected from public documents.

Filters may be installed in-line near the point-of-use (e.g. between the waterline and the dental instrument) to block the passage of microorganisms. Filters will have no effect on the development of biofilm in the waterlines but will remove microorganisms as the water is delivered to the patient. Filters must be periodically replaced, the frequency of which will depend on the amount of biofilm in the waterlines. Filters may or may not remove [endotoxin](#).

Product	Mode of action	Contact information
Pall-Aquasafe™	In-line filter 0.22 micron pore size	Pall Corporation Ann Arbor, MI 800-645-6578
DentaPure®	In-line filter that continuously releases iodine 0.22 micron pore size	DentaPure Fergus Falls, MN 800-972-3543

Chemicals remove, inactivate or prevent formation of biofilm. Chemical treatments are either continuously infused into, or are intermittently added to, the dental unit water.

Dentacide	Iodine-based for intermittent use	Frio Technologies San Antonio, TX 210-308-5635
ICX™	Sodium percarbonate, cationic surfactants, silver nitrate and proprietary ingredients for continuous use	A-dec, Inc. Newberg, OR 800-547-1883
Lines	Chlorhexidine-based for intermittent use	Micrylium Niagara Falls, NY 800-489-8868
Mint-A-Kleen	Mint flavored solution for continuous or intermittent use. Recommended for use with ultraviolet and filtering systems.	Anodia Systems Danville, KY 866-246-2548
PureTube™ PureTube PLUS™	In-line cartridges or tablets that deliver the chemical	Sterisil, Inc. Palmer Lake, CO

CitriSif™	treatment	877-755-7873
Sterilex Ultra	Liquid or powder alkaline peroxide based for intermittent use	Sterilex Corporation Owings Mills, MD 800-511-1659
VistaClean™ VistaTab™	Solution derived from natural citrus botanicals for continuous or intermittent use Tablet dissolves in water creating chlorine dioxide for intermittent use	Vista Research Group Ashland, OH 419-281-3927

Water purifiers treat the water entering the dental unit (source water). These systems treat the source water by a method that kills/removes microorganisms (e.g. filtration, heat, UV light). For these systems to deliver clean water at the point of use (to the patient), a chemical treatment must be used to remove/inactivate biofilm in addition to intermittent chemical treatments to maintain waterlines. The advantage of purified water systems is that they may delay formation of biofilm or enhance the effectiveness of other treatment methods. **However, these systems will not result in delivery of purified water should the water pass through waterlines containing biofilm.**

Waterclave®	Purifies source water with heat and pressure	Waterclave L.L.C. Overland Park, KS 913-312-5860
VistaClear™	Filtration combined with other proprietary technologies	Vista Research Group Ashland, OH 419-281-3927
PureLine Systems™	Filtration designed for use with PureTube™ to keep waterlines clean	Sterisil, Inc. Palmer Lake, CO 877-755-7873

Monitoring

To ensure that your waterline cleaning regimen is effective, you must regularly monitor, or test, the quality of the water coming out of the dental unit using in-office dental water testing products and/or outside professional monitoring services. Whatever your monitoring method, mechanism, tests usually require three samples of water from the same dental unit. Dental equipment (e.g. handpieces) should be removed before the samples are taken. To avoid contaminating the water during sampling, wear gloves and carefully follow the directions of the product manufacturer or outside service provider.

The following dental unit water testing products and services are available. Inclusion or omission of any product and service in the following tables does not imply its endorsement, approval, or disapproval by the Association (report omissions to science@ada.org). Because not all biological monitors work with all sterilization devices, you should contact the manufacturer regarding their proper use.

Dental Unit Water Quality Testing Services

[Loma Linda University School of Dentistry](#)

Email: SAS@sd.llu.edu

Phone: 909-558-8069

[MicroTest Laboratories](#)

E-Mail: microtestlabsinc@yahoo.com

Phone: 916-567-9808

[Texas A&M University System Health Science Center](#)

[Baylor College of Dentistry](#)

E-mail: cdms@bcd.tamhsc.edu

Phone: 214-370-7214

Dental Unit Water Quality Testing Products (for in-office use)

Aquasafe Water Test Kit (product # 5010104)

Pall Medical Corp.

Phone: 800-645-6578

[HPC Total Count Sampler](#) (product id MHPC10025)

Millipore

Phone: 800-645-5476

[Disinfection Paddle Tester, Total Aerobic Bacteria](#) (product # 2619510)

Hach Company

Phone: 800-227-4224

Waterclave Dental Waterline Test Kit

Waterclave

913-312-5860

Glossary

Biofilm – Slime producing bacterial communities that also may harbor fungi, algae and protozoa. These microorganisms colonize and replicate on the interior surfaces of waterline tubing, creating adherent microbial accumulations.

Colony forming unit – The minimum number of separable cells that can give rise to a visible colony.

Endotoxin – Part of the outer layer of the cell wall of Gram-negative bacteria that is associated with the lipopolysaccharide complex. Pathogenic and non-pathogenic bacteria can release endotoxins. Endotoxins are heat stable but can be degraded by oxidizing agents (e.g. peroxide and hypochlorite).

Heterotrophic bacteria – Bacteria that require a carbon source to grow. These bacteria are not necessarily harmful, but the heterotrophic plate count is used as an indication of the amount of residual disinfectant present in a water supply.

Point-of-use filters – Filter water exiting the dental unit. Usually installed between the waterline and the dental instrument.

References

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2. Mayo JA, Oertling KM, Andrieu SC. Bacterial biofilm: a source of contamination in dental air-water syringes. *Clin Prev Dent* 1990;12(2):13-20.
3. Santiago JI, Huntington MK, Johnston AM, Quinn RS, Williams JF. Microbial contamination of dental unit waterlines: short- and long-term effects of flushing. *Gen Dent* 1994;42:528-35.
4. Mills SE. The dental unit waterline controversy: defusing the myths, defining the solutions. *J Am Dent Assoc* 2000;131(10):1427-41.
5. CDC Guidelines for infection control in dental health-care settings – 2003. *MMWR* 2003; 52(No. RR-17):1-66.