



**Infection Control Assessment
and Promotion Program**

Dental Unit Waterline Toolkit

Created by Nebraska ICAP to assist facilities in creating an effective dental unit waterline program using recommendations from the Centers for Disease Control and Prevention, the Organization for Safety, Asepsis and Prevention and the Food and Drug Administration.

November 2022

Contents

| | |
|---|---|
| Understanding the Risks of Dental Unit Waterlines | 2 |
| References: | 2 |
| What is a Dental Unit? | 3 |
| References: | 3 |
| Dental Unit Waterline Maintenance, Testing and Monitoring Best Practice | 4 |
| DUWL Maintenance: | 4 |
| DUWL Testing:..... | 5 |
| Monitoring Dental Unit Water Quality: | 6 |
| General Tips: | 6 |
| Glossary of Terms: | 6 |
| References: | 7 |



Understanding the Risks of Dental Unit Waterlines

On October 31, 2022 the Centers for Disease Control and Prevention (CDC) released a Health Alert Network advisory on the risks of dental unit waterlines. There have been multiple outbreaks of non-tuberculosis *Mycobacteria* (NTM) in 2015, 2016 and most recently in 2022, specifically in pediatric settings. These outbreaks all have confirmed high levels of bacteria originating from their waterlines that caused infections in children highlighting the need for a comprehensive dental unit waterline maintenance, testing and monitoring program.

Dental units, or dental delivery systems, are equipment that is used during a dental procedure. The dental unit provides tubing for water and compressed air to travel through to operate certain instrumentation that is used in dental procedures. This piece of equipment is essential to complete dental procedures as it is what powers the handpieces and suction for the dentist and team.

Dental unit waterlines are the tubing or hosing lines that run from the dental unit water source to the instrumentation that uses water (e.g., air/ water syringe, handpiece or ultrasonic scaler tip) during a procedure. The water used in dental procedures has the potential to encounter a procedural field allowing direct contact to the bloodstream or other sterile tissue. Ensuring that dental unit water is safe before use is an important part of infection prevention and patient safety.

The tubing in dental units is particularly narrow, usually at only 1/8-1/16 of an inch. The narrow tubing provides a high surface area that water comes into contact with on a constant basis for extended periods of time. The high surface area, in addition to low water pressure, low flow rates, and frequent stagnation make dental unit waterlines a suitable place for microbial biofilm growth.

Biofilm contains microorganisms that have the potential to cause human disease. In addition to non-tuberculosis *Mycobacteria*, some of the more common pathogens identified in dental unit waterlines are *Pseudomonas* and *Legionella*. All of these pathogens have been associated with outbreaks and traced back to dental unit waterlines.

A comprehensive maintenance, testing, and monitoring program specific to dental unit waterlines is the best way to mitigate the risk of biofilm growth in dental unit waterlines.

References:






Centers for Disease Control and Prevention. (2022). Health Alert Network: Outbreaks of Non-tuberculosis *Mycobacteria* Infections Highlight Importance of Maintaining and Monitoring Dental Waterlines. Retrieved from <https://emergency.cdc.gov/han/2022/han00478.asp>

Organization for Safety, Asepsis and Prevention. (2022). Dental Unit Waterlines: Questions and Answers. Retrieved from <https://www.osap.org/topics-duwl-questions-and-answers>

What is a Dental Unit?

Dental units, or dental delivery systems, are a piece of equipment that is used during a dental procedure. The dental unit provides tubing for water and compressed air to travel through to operate certain instrumentation that is used in dental procedures.

Main components of a dental unit:

1. Air/ water syringe 
2. Handpiece coupler 
3. Vacuum lines 
4. Water bottle 
5. Rheostat 



Dental units come in many different configurations. Dental units in an operating room setting are most likely a mobile cart that can be removed from the area and stored in another location. Below are some examples to help you recognize a dental unit in your facility. Better photos and more examples of dental units can be found at the link listed in the references.



References:

DentalCompare. (2022). Dental Delivery Systems. Retrieved from https://www.dentalcompare.com/Restorative-Dentistry/4728-Dental-Delivery-System-Dental-Delivery-Units/?vmpi_3437=4



Dental Unit Waterline Maintenance, Testing and Monitoring Best Practice

This document has been developed by Nebraska ICAP to assist facilities in their dental unit waterline maintenance, testing and monitoring protocols and includes best practices as outlined by CDC, OSAP and FDA.

DUWL Maintenance:

- All staff responsible for waterline maintenance should be trained and competent on the maintenance system used by the practice
- Flush all DUWLs for 2 minute sat the beginning and end of every day and 20-30 seconds between every patient, this helps to flush any patient materials that may have gotten in the waterlines during a procedure (OSAP, 2018)
- Beware of waterlines that may not get used, but are still a part of the system
 - They are a high-risk for water to sit and biofilm to grow, contaminating the rest of the system
 - Ensure that flushing includes these unused waterlines
 - If appropriate, steps should be taken to remove waterlines from units if they are not being used
- Chemical disinfection of source water should be a part of the maintenance program for DUWLs
 - Practices should use an FDA approved product to disinfect source water and improve water quality (CDC, 2022)
 - Filter disinfectant: A water filter attaches directly to the DUWL input line and filters the water through a silver or iodide compound to act as a disinfectant
 - Pros: A filter can provide long term disinfection of source water, easy to install, very little maintenance
 - Cons: High initial set up cost
 - Tablet disinfectant: A chemical disinfectant tablet is added to the dental unit water bottle every time it is filled
 - Pros: Cost effective
 - Cons: Complicated manufacturer IFUs, labor intensive
- Chemical shocking should be a part of the maintenance program for DUWLs
 - Shocking a system uses a chemical to dislodge any biofilm that may be in the dental unit waterlines
 - The shock chemical sits in the lines for a period of time (according to manufacturer IFU) before being flushed to remove the bioburden from the lines
 - Any newly installed DUWLs should be chemically shocked
 - DUWLs that have failed a test should be chemically shocked to remove bacterial colonies and biofilm from the lines before being tested again (see testing algorithm)

- Regular shocking of DUWLs should take place based on the manufacturer's IFUs of the dental unit, chemical disinfectant, and shock chemical
- Purging of all shock chemical from the waterlines according to manufacturer IFU is critical as the chemical can be harmful to humans and should not be present in the waterlines during patient treatment
- Dental unit water bottles should be removed at the end of each day
 - Bottles should be cleaned and dried according to manufacturer IFU
 - All DUWLs should be purged to prevent water from sitting in the lines, this is done by expressing water from all waterlines, even unused waterlines, until they run dry
- Standard operating procedures (SOP) for DUWL maintenance should include:
 - Source water specifications (OSAP, 2018)
 - Check with unit manufacturer on the type of water to be used
 - Generally, municipal water is not recommended for use in DUWLs
 - Instructions for inspecting and maintaining any equipment that prepares or treats water prior to use in a dental unit (Reverse osmosis (R/O) filters, deionizers, distillers, etc.) (OSAP, 2018)
 - Instructions and schedule for regular use of chemical disinfectants and shocks used in DUWLs (OSAP, 2018)

DUWL Testing:

- All staff responsible for waterline testing should be trained and competent on the maintenance system used by the practice
- Water used for dental procedures should meet EPA regulatory standards for drinking water of <500 Colony Forming Units (CFU)/ mL for routine dental care (CDC, 2022)
- Water testing should be done on a regular basis to ensure acceptable water quality (CDC, 2022)
 - External lab testing: mail in sample that will issue a quantitative lab report with a total CFU, provides external validation and a baseline value for waterline quality (OSAP, 2018)
 - Provides a third party, quantitative report
 - In office/ chairside testing: Water is tested in office and CFU levels are interpreted by a staff member, there is no quantitative lab report provided, may be used more often than lab testing to provide an early indication of biofilm growth (OSAP, 2018)
 - If manufacturer IFUs do not specify testing frequency, Nebraska ICAP has created a testing frequency algorithm that can be used. [*See Image 1.*](#) (OSAP, 2018)
- Samples should be collected from every source of water on a dental unit (OSAP, 2018)
 - Sources include: Air/ water syringe, handpiece hoses, ultrasonic scaler hoses, etc., and any "dead legs" in the system that are not actively being used
 - Samples can be pooled from multiple lines on the same water bottle system
 - Pooled samples should contain equal amounts of water from each line on a single dental unit

- Do not pool samples together from different dental units
- SOP for DUWL Testing should include (OSAP, 2018)
 - Type of testing used
 - Instructions for the type of test used, including:
 - Sample collection and labeling source
 - Storage and shipping, if applicable
 - In-office test kit procedure, if applicable
 - Action limits of testing and recommended interventions when test results exceed limits

Monitoring Dental Unit Water Quality:

- Documentation of DUWL maintenance and testing is a critical part of a successful DUWL program
- The following should be documented in regard to the testing program: (OSAP, 2018)
 - Source, date and time of sample collection
 - Identity of person testing
 - Type of test (in-office or lab)
 - Test results
 - Remediation efforts for failed tests and follow up testing results
- Trend test results (if you have a quantitative lab report) over time to be able to take early action on DUWLs that indicate biofilm growth

General Tips:

- Monitor waterline tubing for damage or visible contamination and replace as needed or directed by a manufacturer (FDA, 2022)
- Stay alert to signs that may indicate biofilm growth in waterlines, this includes musty odor, cloudiness, or clogging of waterlines (FDA, 2022)

*Best practice is always to follow the manufacturer’s instructions for use (IFUs) for all equipment and instrumentation. In the absence of explicit dental unit waterline (DUWL) maintenance, testing, and monitoring IFUs, the following can be considered best practice.

Glossary of Terms:

- Source Water: Any water used as a source for DUWLs
- Filtered Water: Water that has been filtered
- Distilled Water: Water that has been distilled
- Municipal Water: Any water coming from a municipal water source (tap water or plumbed water)
- Chemical Shock: Harsh chemical used specifically to disinfect and clear biofilm growth from the inside of DUWLs for either maintenance or in the case of a failed test
- Chemical Disinfectant: Chemical used specifically to disinfect source water to increase the water quality for use in dental procedures

References:

- Centers for Disease Control and Prevention (CDC). (2022). Dental Unit Water Quality. Retrieved from <https://www.cdc.gov/oralhealth/infectioncontrol/summary-infection-prevention-practices/dental-unit-water-quality.html>
- Food and Drug Administration (FDA). (2022). Dental Unit Waterlines. Retrieved from <https://www.fda.gov/medical-devices/dental-devices/dental-unit-waterlines>
- Organization for Safety, Asepsis and Prevention (OSAP). (2018). Dental Unit Water Quality: Organization for Safety, Asepsis and Prevention White Paper and Recommendations. Retrieved from <https://www.osap.org/assets/docs/resources/toolkits-topics/dental-unit-water-quality-organization-for-safety-asepsis-and-prevention-white-paper-and-recommendations-2018.pdf>

Image 1:

