



Principles of dental waterline asepsis

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The **FIRST REPORT** describing a high level of microbial accumulation in the **coolant waterlines** for high speed handpieces was published in 1963. Despite that fact, the majority of studies investigating the quality and potential hazards from dental water didn't begin to appear in the literature until the 1990s.

The accumulated data are relatively recent in comparison to the extensive epidemiological, scientific, and clinical literature surrounding occupational risks for bloodborne infections. Much of the work pertaining to microbial contamination of water used in dental treatment was initiated following published reports by the Centers for Disease Control and Prevention. These described community and hospital outbreaks caused by waterborne bacterial pathogens, including *Legionella pneumophila*, *Escherichia coli*, *Pseudomonas sp.*, and a highly resistant protozoan, *Cryptosporidium*.

Investigations looking at the microbial composition and colonization of dental unit waterlines (DUWL) demonstrated that, among other factors, the narrow hollow bore design of plastic tubing plays a major role in promoting stagnation and microbial accumulation. Many dental waterline systems have been found to contain very high levels of bacteria, ranging from 1,000 to 10,000 colony forming units (CFU)/mL water. Some reports document concentrations as high as 1 million CFU/mL.

In contrast, the standard level established by the Environmental Protection Agency, the American Public Health Association, and the American Waterworks Association for potable water is 500 CFU/mL. Potable water is defined as "water suitable for drinking as per applicable public health standards." The ADA and the CDC have reinforced the attainment of this goal for dentistry by making periodic DUWL infection control recommendations.

The CDC *Guidelines for Infection Control in Dental Health-care Settings – 2003* provide the most recent update: "Use water that meets EPA regulatory standards for drinking water (i.e., <500 CFU/mL of heterotrophic water bacteria) for routine dental treatment output water." In addition, the use of sterile water or saline is recommended for irrigation of surgical sites where bone is exposed.

Although there is little epidemiological evidence to suggest that biofilms in DUWL have been responsible for widespread clinical infections in dental patients or dental

care providers, a variety of commercially available products have been introduced in an effort to improve the quality of dental water. Many products fall into one of the following major categories:

- chemical germicides or cleaners that remove microbial accumulations. These products can provide periodic or intermittent "shock" treatments to clean DUWL.
- chemical germicides that prevent attachment of microorganisms in new or cleaned dental water systems. Often these provide continuous treatment of DUWL to accomplish the objective and may be added to or used as the irrigating solution during treatment.
- filtration devices capable of producing treatment water that meets drinking water standards.
- devices or containers that slowly release low concentrations of chemicals into treatment water. Approved products in this category are designed to prevent microbial attachment onto tubing surfaces.

A number of strategies are available using either single or combinations of products. When a complete dental water system is utilized, one can minimize or prevent waterborne organisms from attaching, colonizing, and proliferating on the inner surfaces of the tubing. Because ongoing DUWL infection control protocols may require a substantial commitment on the part of responsible personnel, it is important to remember that basic tenets of asepsis should be routinely considered when evaluating and selecting a treatment product or system to improve dental water quality.

In this instance, the phrase *Clean It First* is applicable. We clean hands before donning gloves, clean contaminated instruments prior to heat sterilization, and clean environmental surfaces before disinfection. In a similar fashion, newly installed DUWL — or those that are initially and periodically cleaned in conjunction with routine use of chemical germicides — can ultimately deliver treatment water that is better able to meet established standards. Keep this basic principle in mind as you consider the products and treatment systems that become available. **DE**

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