

# Dental Unit Water Systems and Microbial Contamination

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## Context

Dental Unit Water Systems (DUWS) are used to rinse, clean and cool the operative site and equipment while working on soft and hard tissues. They can either be connected with the local water supply or to a self-contained system using bottled water.

A characteristic feature of a dental unit water line is the capacity to rapidly develop biofilms on the inner surfaces of its tubes and associated containers. Generally, these biofilms contain such microbes, which grow at ambient temperature, are relatively harmless saprophytic organisms. They cause disease only under exceptional circumstances, mainly in immunocompromised hosts.

The major source of microbes for biofilm development in DUWS is considered to be the municipal or the local water supply, which usually provides potable water with extremely low levels of saprophytic bacteria. Another possible source of organisms that may contaminate DUWS is a temporary drop of pressure in the local water supply. Contamination may also be due to retraction of patients' saliva or blood into the DUWS. However, this risk is reduced in modern dental units, which are now routinely fitted with anti-retraction valves.

Patients and oral health care workers are regularly exposed to water and aerosols generated from the dental unit.

## Definitions

### **Biofilm**

A biofilm is a community of microbes growing on a substrate and encased in a matrix of extracellular polymeric material. Biofilms are not very sensitive to disinfection agents. The growth of biofilms in DUWS is enhanced through contamination by retrograde bacterial reflux, (room) temperature ideal for bacterial growth, stop periods (weekends, holiday), high surface-volume-ratio of the water-carrying pipes, pipematerial and low and discontinuous flow rate.

### **Amoeba (also ameba)**

A single-celled (protozoan) organism. Amoeba can infect the bowels causing diarrhea and the liver causing abscess formation. A single amoeba can contain hundreds of Legionellae [1] and set them free when it is dying off or being destroyed.

# Legionella (*Legionella pneumophila*)

Pathogenic group of Gram-negative bacteria. The inhaling of legionella-containing aerosol can cause Legionnaires' Disease or Pontiac Fever. There is one published case of a fatal infection related to a legionella-contaminated dental unit [2].

## Principles

The aim of this Policy Statement is to make dentists aware of the basic principles of the DUWS and provide guidance on how to minimize risk with easy-to-follow procedures.

## Policy

There are no scientific studies on which pathogens (bacteria, fungi, protozoans) in what concentration in the DUWS will cause nosocomial infections. For healthy patients with normal risk for infection, recommendations sometimes use the acceptable amount of heterotrophic bacteria in drinking water, which is less than or equal to 500 colony forming units per milliliter of water [3] in DUWS for all interventions that need rinsing/cooling and for all minor intraoral surgical procedures without further primary wound closure.

For patients with high risk of infections (e.g. by cystic fibrosis, granulocytopenia, aplastic anemia or immunosuppression) and, for all interventions with further primary wound closure, only sterile solutions (external cooling) are advised.

Removing existing biofilm and disinfecting DUWS to prevent the formation of biofilm according to the manufacturers' recommendations together with flushing all water lines every morning (without delivery devices) will significantly reduce the amount of heterotrophic bacteria and hence the probability of disease transmission. Monitoring microbial counts in dental unit water on a routine basis is advised.

It is recommended that all waterlines be discharged after each patient, from any device connected to the dental water system that enters the patient's mouth (e.g. handpieces, ultrasonic scalers, and air/water syringes) [4].

Flushing of suction units is advised in between patients, especially when procedures performed were of a surgical nature.

Dental manufacturers are responsible for equipment construction with materials suitable for disinfection. Furthermore, they should be prompted by legal requirements to use exclusively those materials for water pipes in dental systems that prevent formation of biofilms, or at least highly minimize it.

## Disclaimer

The information in this Policy Statement was based on the best scientific evidence available at the time. It may be interpreted to reflect prevailing cultural sensitivities and socio-economic constraints.

## References

1. Buse, H. Y., Ashbolt, N. J.: Counting Legionella Cells within Single Amoeba Host Cells, *Appl Environ Microbiol.* 2012 Mar; 78(6): 2070–2072.
2. Ricci M.L., Fontana S., Pinc F. et al.: Pneumonia associated with a dental unit waterline. *Lancet* 2012 (379) 684.
3. American Dental Association: <http://ada.org/1856.aspx>
4. Centers for Disease Control and Prevention. Guidelines for Infection Control in Dental-Health Care Settings—2003. *MMWR* 2003;52(No. RR-17):[29-29]