

Dental Unit Water Lines, Biofilm Formation and Disinfection Measures

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Different organisms are found in dental unit water lines (DUWL) including bacteria, fungi and protozoa. Among bacteria, *Legionella* spp, atypical *Mycobacterium* spp and *Pseudomonas* species cause various respiratory diseases. Occupational asthma in dentists has been a very prevalent disease due to continuous exposure to contaminated DUWL. The air turbines circulates at a very high speed to aerosolize the DUWL microbes facilitating transmission of infectious pathogens. Both patients (short term during treatments) and dental staff (long term during practice) are at risk of inhaling the microbes via droplets or aerosols produced during procedure.

In the absence of any disinfection procure such as NaOCl or UV exposure, bacteria continuous to multiply and form surface associated growth called biofilm. Biofilm mature almost within a week and bacteria start proliferating leading to spread of infectious bacteria. So it is necessary to do a risk analysis of water in dental unit lines.

Various factors such as water stagnation over weekends and nights, larger surface area to volume ratio, unused outlets, no or inappropriate disinfection procedures promote biofilm formation. Dental instruments that are connected to DUWLs and that are used in the patient's mouth (e.g. turbine and conventional handpieces, air/water syringes and ultrasonic scalers) should contain integrated anti-retraction valves or devices that prevent backflow or back siphonage of fluids from the oral cavity into the DUWLs. Reservoir bottles in DCUs can easily become contaminated with skin organisms such as *Staphylococcus epidermidis* and *Staphylococcus aureus*, the latter a significant human pathogen, thus introducing additional human micro-organisms into DUWLs.

Some dental units have heaters to warm water during patients treatment which promotes growth and proliferation of *Legionella* > 20°C. *L. pneumophila* grow best at temperatures between 25°C and 37°C. The Centers for Disease Control and Prevention (CDC) recommends that total viable count (TVC) of DUWL should be between 100 and 200 cfu/ml of bacteria which is equivalent to drinking water standard. There should be separate sterile water supplied for minor dental surgeries and of patients having invasive major surgeries. Furthermore, dental unit waterline water is also a potential source of bacterial endotoxin, composed of lipopolysaccharide released from the cell walls of dead gram-negative bacteria. Endotoxin can cause localized inflammation, fever and shock in elderly and immune compromised patients should be treated with great care and precautions after having complete medical history. Most

importantly, various authentic and scientifically validated disinfection procedures should be practiced ensuring proper sterile conditions in DUWLs. Due to various previous accidents associated with *Legionella* infection, its proper risk assessment must be made. The dental unit manufacturer should be consulted to determine the compatible methods, products and devices to maintain water quality in DUWLs.

Among other day to day practices (1) daily flushing with separate water system for 2 minutes in morning and for 30 sec between patients treatment, (2) Single and two biocides in combination in accordance to compatibility of dental setup, (3) maintenance of anti-retraction valves and DUWL check valves, (4) use of distilled sterile water in self-contained water bottle, (5) proper disinfection of reservoir bottle, (6) flushing sporadically used dental chair once or twice a week, (7) use of heaters in dental setup only proper control measures, (8) training oral health professionals in site-specific DUWL protocols, and monitoring compliance.

Additionally, TVC of DUWLs must be checked monthly applying proper microbiology techniques. This will help to reassure the responsible person that the hygiene regime is adequately practiced, maintaining the water quality within normal drinking water parameters. Evaluating effective and consistent compliance —and periodically monitoring the quality of the dental unit water - are important components of an effective maintenance strategy.

Awareness of the importance of clean DUWLs, and promoting compliance with CDC recommendations for dental unit water quality is responsibility of clinicians, professional organizations, dental educators, and manufacturers/distributors of products and devices due to their daily exposure. Many products that discuss composition, way of microbial attachment, associated health risks and frequency of microbial accumulation in dental units. Any ignorance, in this regard by any contributing factor will put both patients and clinicians at risk.

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