Helping the Infection Control Coordinator Build a Framework for the safestdentalvisit™

OSAP continues to support The Safest Dental Visit, an educational program based on authoritative best practices and supported by behavioral change tools including Infection Control in Practice. This year Infection Control in Practice will provide the infection control coordinator with a framework to establish a high-quality infection control program and maintain the Safest Dental Visit. This guide can be used as a tool to spark discussion during a morning team huddle, at a staff meeting or within an educational presentation.

TEAM HUDDLE: The Plan for Establishing a High Quality Infection Control Program - Building a Framework for the Safest Dental Visit™

Set a Goal to Have Safe Dental Unit Water
Persons desiring to become an Infection Control Coordinator (ICC) may need to propose such a position to their employer. The ICC needs to take ownership of the coordinator responsibilities, assess the current status of the infection control program, set some measurable goals for the coming year and develop a plan to achieve those goals, and will need to evaluate the effectiveness of the program. This issue of ICIP will concentrate on dental unit water safety and the culmination of your annual plan to build a framework for the Safest Dental Visit™.

LEARNING OBJECTIVES
After reading this publication, the reader should be able to:
- describe dental unit waterline biofilm and explain how it is formed.
- list important opportunistic pathogens that may be present in dental unit water.
- describe incidents where dental unit water has caused infections in dental patients.
- outline a plan to establish a high quality infection prevention program.
Infection Control In Practice Team Huddle™ is a resource prepared for clinicians by the Organization for Safety, Asepsis and Prevention (OSAP) with the assistance and expertise of its members. OSAP is a nonprofit, independent organization providing information and education on infection control and prevention and patient and provider safety to dental care settings worldwide. ICP Team Huddle™ is published six times per year and is a trademark belonging to OSAP. OSAP assumes no liability for actions taken based on information herein.

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The Incident

Dr. Gust and his office staff (two assistants and a hygienist) just returned from the 2016 OSAP Conference and were enthused about making sure their office is in compliance with the updated infection prevention guidelines from the Centers for Disease Control and Prevention (CDC). In particular they wanted to ensure the quality of their dental unit water, for they were shocked when a conference speaker described what happened in Georgia from contaminated dental unit waterlines.

Dr. G and his staff all reviewed the current CDC guidelines1, 2 and their ICC used the new infection prevention checklist1 to monitor their compliance. There were three minor problems detected and all were easily corrected. Regarding their dental unit water, they used a waterline treatment product in an independent reservoir (water bottle) that was recommended by the dental unit manufacturer. So they reviewed the dental unit manufacturer’s instructions for use (IFU), and since they had never tested the water, they contacted the manufacturer for procedures to determine the quality of the water. When they tested the output water from all their dental units it was less than the CDC-recommended maximum level of 500 colony-forming units per milliliter [CFU/mL] of heterotrophic bacteria. Everyone was pleased with and proud of the results, and they were happy with OSAP for stimulating their interest in water quality and compliance efforts.

Potential Consequences

Dental unit waterline biofilm

Municipal water entering dental units is usually of good quality and meets drinking water standards. However, it can contain low numbers of many different bacteria and occasionally a few fungi and protozoa.3 So there is a continuous inoculation of the dental unit waterlines with a low number of microbes from the incoming water. These waterborne bacteria have evolved mechanisms that allow them to attach to and accumulate on surfaces. This results in the formation of biofilm on the inner walls of the waterlines. Biofilm is readily formed in small diameter lines like those in dental units, for they offer a large surface-to-volume ratio. This gives the bacteria a greater chance to contact (and attach to) the waterline walls. This process is similar to the mechanisms of oral biofilm (plaque) formation on teeth. Biofilm gives a nutritional advantage to the bacteria for it stabilizes them allowing the nutrients in the passing fluids to come to them. So they don’t have to search for nutrients, as do unattached, free-floating, planktonic bacteria in the water.

As water passes by the dental unit waterline biofilm it picks up bacteria from that biofilm and flushes them downstream into the patients’ mouths. So the good quality drinking water that enters the dental unit can become highly contaminated as it passes through the dental unit into the patients’ mouths. Even if the incoming water is sterile, it is not sterile when it comes out into the patient’s mouth. Water from untreated dental units can reach microbial levels well above 1,000,000 per mL, which is about 1/3 of a teaspoon. While most of the waterborne bacteria are harmless, there is concern for the opportunistic pathogens that may be present. These include Pseudomonas aeruginosa, Legionella pneumophila, and mycobacteria. These and other bacteria in the water can accumulate in biofilm that forms inside dental unit waterlines unless those lines are effectively treated. Opportunistic pathogens usually do not
cause problems in healthy dental patients, but the risk of infection may increase if the patients are immunocompromised (e.g., cancer treatments, anti-inflammatory therapy, immunosuppressant therapy in implant/transplant patients) or exposed to contaminated water used in surgical procedures involving open tissue (e.g., biopsy, periodontal surgery, apical surgery, implant surgery, and surgical extraction of teeth).”

Endotoxin has been shown to be present in dental unit water. It is a cell wall component of gram-negative bacteria that can be released into the environment. Endotoxin can cause inflammation and shock and has been implicated in a variety of harmful infections including periodontal diseases.4

**Transmission of waterborne bacteria in dental facilities**

*Mycobacterium abscessus*: In 2015 the Georgia Department of Public Health (GDPH) was notified by a hospital of a cluster of nine children with *Mycobacterium abscessus* odontogenic infections. The children developed the infections after having pulpotomies at a private pediatric dental practice. The GDPH’s investigation showed that the dental practice performed 1,386 pulpotomies over a two-year period from 2014 to 2016. As of January 2016 the GDPH identified a total of 20 of these patients (11 confirmed and 9 probable) with *M. abscessus* infections. The patients’ ages ranged from 3 to 11 years, and all were severely ill requiring hospitalization, but there were no deaths as of April 5, 2016. The probable cases were defined as having facial or neck granulomatous swellings. The confirmed cases were those in which *M. abscessus* was isolated and identified by laboratory culture.

Water samples were taken from the seven dental stations in the pediatric dental practice for microbiological analyses. All samples had microbial counts above the recommended maximum of 500 CFU/mL with an average of 93,333 CFU/mL. *M. abscessus* was isolated from all of the water samples, and laboratory analysis conducted by the CDC showed that all water and patient isolates of the bacterium were indistinguishable. The dental practice used tap water for irrigation during the pulpotomies, and did not perform any microbial water analyses or completely follow the dental unit manufacturer's directions for bleach treatment of the waterlines.5

This outbreak was caused by contaminated dental unit water used during pulpotomies, which introduced *M. abscessus* into the pulp chamber of the tooth during irrigation and drilling. This bacterium is referred to as a nontuberculous mycobacterium that is a common inhabitant of water, soil, and dust and can cause skin and soft tissue infections. It is an important cause of lung infections in patients with cystic fibrosis or chronic pulmonary disease and is one of the most resistant bacterium to chemotherapeutic agents.

Another incident involving oral infections from dental unit water was reported this past October.6 Forty-three children who received pulpotomies at the same dental office in Anaheim, CA have developed oral cellulitis consistent with *M. abscessus* infection. Fifteen of the cases have been confirmed by culture to have *M. abscessus* infections. Initial testing indicated that the facility’s on-site water system was the apparent source of infection.


**Legionella pneumophila**: An 82-year-old woman died in Rome, Italy, in 2011, from Legionnaires disease (a noncommunicable pneumonia) that was contracted from a dental office.6 During the incubation period for this disease (2 to 10 days), the woman only left her home to attend two dental appointments and apparently had no other risks of exposure to this bacterium. Testing of water in her home was negative for Legionella. However, three different methods of testing showed the same genetic form of *L. pneumophila* serogroup 1 in the patient's bronchial aspirate and the dental office's tap water, dental unit waterline, and high-speed handpiece turbine. Although no other cases of Legionnaires disease or Pontiac fever were discovered among the patients of this dental practice, this incident shows that this disease can be acquired from dental unit water during routine dental treatment.6

**Pseudomonas aeruginosa**: A report from England in 1987 described how two cancer-weakened dental patients acquired oral infections with *P. aeruginosa* that originated from dental unit water.7 The bacterium isolated from the patients and from the dental unit water were shown by laboratory tests to be the same type. The same study also showed that an additional 78 patients treated from the same dental unit were colonized orally for 4 to 10 weeks by the *P. aeruginosa* present in the dental unit water. However, none of these patients developed harmful infections with the *Pseudomonas* bacterium, presumably because they were not cancer-weakened or otherwise compromised.7

**Some Related CDC Recommendations**:1,2

1. Use water that meets regulatory standards set by the Environmental Protection Agency (EPA) for drinking water (500 colony-forming units per milliliter [CFU/mL] of heterotrophic water bacteria) for routine dental treatment output water.

2. Consult with the dental unit manufacturer for appropriate methods and equipment to maintain the recommended quality of dental water.

3. Follow recommendations for monitoring water quality provided by the manufacturer of the unit or waterline treatment product. Consider testing the various waterlines (e.g., handpiece, air/water syringe, scaler) separately, for the level of contamination that may be present can vary.

4. Discharge water and air for a minimum of 20-30 seconds, after each patient, from any dental device connected to the dental water system that enters the patient’s mouth (e.g., handpieces, ultrasonic scalers, air/water syringe).

5. Consult with the dental unit manufacturer on the need for periodic maintenance of anti-retraction mechanisms.

6. Use sterile saline or sterile water as a coolant/irrigator when performing oral surgical procedures*. Use devices specifically designed for the delivery of sterile irrigating fluids (e.g., bulb syringes, single-use disposable products, and sterilizable tubing).

*Definition from 2003 CDC Dental Guidelines — Oral surgical procedures involve the incision, excision, or reflection of tissue that exposes the normally sterile areas of the oral cavity. Examples include biopsy, periodontal surgery, apical surgery, implant surgery, and surgical extractions of teeth (e.g., removal of erupted or nonerupted tooth requiring elevation of mucoperiosteal flap, removal of bone or section of tooth, and suturing if needed).*

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**Biofilm formation on inner walls of dental unit water lines**

[Diagram showing stages of biofilm formation]

**Stage 1:** planktonic bacteria adhere to surface

**Stage 2:** sessile bacteria begin to secrete extracellular polymeric substance (EPS)

**Stage 3:** developing biofilm

**Stage 4:** planktonic bacteria released from mature biofilm

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**INFECTION CONTROL IN PRACTICE Team Huddle™**

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This past year OSAP’s *Infection Control In Practice: TEAM HUDDLE* publication has presented the following plan for ICCs to build a framework for a high quality infection prevention program.

- Understand and take ownership of the ICC role;
- Assess your current infection prevention program and identify issues to address;
- Set two infection prevention goals based on the identified issues;
- Evaluate progress as you complete the goals (see Table 1); and
- Celebrate the success.

**Congratulations for following this plan and establishing a high quality infection prevention program.**

**Reminder: 12-Month Planning Guide**

OSAP can help you manage your infection control and safety program goals. Login to www.OSAP.org and click on “Publications” on the homepage, then click the Infection Control in Practice “Learn More” box, then the “Members Click Here” bubble. The planning guides are included in “Related Resources” in 2016.

**Table 1: EVALUATE YOUR PROGRESS BASED ON THE PLAN** Check Yes/No in each box to indicate if item has been completed.

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* If no, describe how to achieve: ____________________________

**THE FLU SEASON IS NOT OVER YET!**

The CDC recommends influenza vaccination for all healthcare workers. You can get influenza from anyone, and you can spread it to others even when you don’t feel sick. If you get influenza you can spread it to your patients, your family at home, and also your colleagues at work.

**Get Vaccinated!**
What’s Wrong With This Picture?

Can you identify the breach(s) in infection prevention and safety procedures in this photo taken during a treatment procedure? Check your answer below.

**Answer:**
- The dentist’s facemask is not covering his nose. It is uncertain if the dental assistant is wearing protective eyewear.
- The dentist and the assistant appear to be wearing work clothes and not protective clothing during a procedure that will create spatter.
- The microscope and other equipment (e.g., air/water syringe hose) are not barrier protected; it is hoped they were properly disinfected between patient visits.

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**OSAP 2017 Dental Infection Control Boot Camp**

The OSAP Dental Infection Control Boot Camp™ runs from Monday-Wednesday, January 9-11, 2017 in Atlanta, GA.

Additional CE for Federal Services is on January 12.

This educational course is a comprehensive training event for infection control coordinators that covers every aspect of dental infection control, including instrument processing, water quality monitoring, sterilization failures and how to prevent them, OSHA regulations, the new CDC summary, checklist and app and much more. Earn CE credits and join your colleagues and peers as national and international experts in infection prevention and patient safety deliver a fast-paced, comprehensive curriculum.

For details visit: [http://www.osap.org/page/2017BootCamp](http://www.osap.org/page/2017BootCamp)

Deadline for hotel and course registration is December 16, 2016.

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OSAP thanks the following companies that help to underwrite each issue of this special series of *Infection Control in Practice* Team Huddle™ in 2016.

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TEAM HUDDLE DISCUSSION GUIDE

1. Are you using good quality dental unit water?
2. Are you following the dental unit manufacturer’s recommendations for maintaining good quality dental unit water?
3. Are you following the dental unit manufacturer’s recommendations for monitoring the quality of your dental unit water?
4. Have you built a high quality infection prevention program?

Looking Ahead to 2017!

OSAP is hard at work creating new resources and continuing education opportunities to support the Safest Dental Visit™ and the role of Infection Control Coordinator (ICC), including a member-led initiative to reach new ICC members in 2017. Thanks for being an important member of the OSAP community as we advance our mission to ensure that every visit is a safe dental visit.

Glossary

**CFU/mL:** Colony-forming units per milliliter. This is translated as the number of bacteria per milliliter of fluid.

**Heterotrophic bacteria:** They use organic carbon for growth and make up most of the bacteria in natural and domestic waters.

**Planktonic bacteria:** These are free-floating bacteria (not attached to surfaces) in their fluid environments in contrast to sessile (attached, immobile) bacteria present in biofilms.

Links to Resources


KEY TAKEAWAYS

1. Untreated dental unit water is capable of causing infections in some patients.
2. Follow the CDC infection prevention guidelines and checklist to establish and maintain good quality dental unit water.
3. Develop and complete a plan to establish and maintain a high quality infection prevention program.

QUESTIONS FOR ONLINE QUIZ

1. What are planktonic bacteria?
   a. They attach to surfaces in a fluid environment
   b. They are only present in biofilms
   c. They are free-floating bacteria
   d. They are sessile bacteria

2. CFU means:
   a. certified fluoride units.
   b. colony-forming units.
   c. complete facultative units.
   d. chemical formulating units.

3. What type of disease is caused by Legionella pneumophila?
   a. A highly contagious pneumonia
   b. A noncommunicable pneumonia
   c. A pneumonia that only affects males
   d. A pneumonia that occurs only in children under the age of 5

4. What is the CDC’s recommendation for the maximum number of colony-forming units that should be present in a milliliter of dental unit water?
   a. 5
   b. 50
   c. 500
   d. 5000

5. What agency set the microbiological standard for drinking water?
   a. CDC
   b. OSHA
   c. ADA
   d. EPA

6. The CDC recommends discharging water and air for a minimum of ________, after each patient, from any dental device connected to the dental water system that enters the patient’s mouth.
   a. 5-10 seconds
   b. 20-30 seconds
   c. 1-2 minutes
   d. 3-4 minutes

7. The CDC recommends using what kind of water as a coolant/irrigator when performing oral surgical procedures?
   a. Drinking water
   b. Potable water
   c. Sterile water
   d. Regular dental unit water

8. What bacterium from dental unit water infected 20 children receiving pulpotomies in Georgia?
   a. Mycobacterium abscessus
   b. Pseudomonas aeruginosa
   c. Legionella pneumophila
   d. Streptococcus mutans

9. What bacterium from dental unit water infected two cancer-weakened patients in England?
   a. Mycobacterium abscessus
   b. Pseudomonas aeruginosa
   c. Legionella pneumophila
   d. Streptococcus mutans

10. Which of the following components of gram-negative bacteria has been found in dental unit water and can cause inflammation and shock?
    a. Fats
    b. Flagella
    c. Endotoxin
    d. Capsules

GET YOUR CE CREDIT ONLINE

OSAP is recognized by the American Dental Association as a CERP provider.*

Follow the instructions below to purchase and complete the quiz to receive 1 hour of CE credit.


Step 2: OSAP will send you a purchase confirmation email and a separate email with the link to the online CE exam. Click on that link to access the exam.

Step 3: Complete the online exam. You have 2 attempts to pass with 7 out of 10 correct answers. When finished, you can print out or download your CE record of completion for your records. Your record of completion will also be emailed to you.

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TEAM HUDDLE HIGHLIGHTS

1. Are you building a framework for the Safest Dental Visit™?

2. Does your dental unit water meet the EPA standard for drinking water?

3. Have you assessed your infection prevention program using the CDC's infection prevention checklist?

Read on!