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Infection control measures in standard dental practice - Importance of preprocedural rinsing: Information for Dental Practitioners

Colgate Dental Education Programs | Special Topic No.23

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make history.

Infection control in dental practice is of paramount importance to avoid the spread of pathogenic microorganisms such as bacteria, viruses and fungi from one person or item/location to another, including from dental practitioner and dental staff to patients, and from patients to dental practitioner or other dental staff.[1,2] Moreover, it is essential for dental practitioners to maintain items and the practice environment free from infectious agents as much as practicable. Governing dental bodies in both Australia and New Zealand have set up guidelines on infection control for which all registered dental practitioners are legitimately bound to conform to and ensure that such compulsory guidelines are completely established in their practices.[1,2]

Accordingly, the following standard precautions of infection control have been designed to minimise the likelihood of person-to-person transmission of infectious agents assuming that all dental patients are potentially infectious irrespective of whether they are infected with or are carriers of an infectious disease. These precautions have been described in more detail, elsewhere.[1-3]

Hand hygiene

- use plain or antibacterial soap/solution and water followed by drying with single-use linen or disposable paper towels OR
- apply waterless antimicrobial agent such as alcohol-based hand rub (ABHR)

World Health Organization (WHO) has developed a poster for hand hygiene in dental care[4], which has been adapted by Hand Hygiene Australia (Figure 1).[5]

Personal protective equipment (PPE)

Clothing and equipment including gloves, masks, eyewear, protective clothing (gowns) and enclosed footwear that are worn by practitioners (Figure 2) act as a barrier to protect them from being exposed to potentially infectious material.

Surgical procedures and aseptic technique

Use of sterile gloves, drapes, instruments and surgical handwashing with antimicrobial agent.

Safe management of sharps

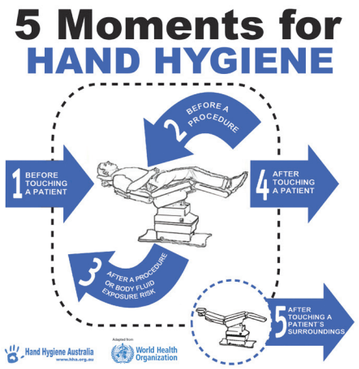
- Adhere to safe handling of sharps to minimise the risk of injuries
- Immediate disposal of single-use sharp items or storing them safely for later disposal

Management of clinical waste

Manage medical and related waste/healthcare waste in compliance with local state or territory regulations (Australia and New Zealand have joint standards in this regard) and conforming to jurisdictional Environmental Protection Agency (EPA) waste management protocols.

Environment control

- Design the dental practice environment by clearly demarcating clean and contaminated zones.
- Maintain a safe and hygienic clinical environment by effective and thorough cleaning of all surfaces, equipment and instruments.



1 BEFORE TOUCHING A PATIENT	When: Clean your hands before touching a patient and their immediate surroundings. Why: To protect the patient against acquiring harmful germs from the hands of the HCW.
2 BEFORE A PROCEDURE	When: Clean your hands immediately before a procedure. Why: To protect the patient from harmful germs (including their own) from entering their body during a procedure.
3 AFTER A PROCEDURE OR BODY FLUID EXPOSURE RISK	When: Clean your hands immediately after a procedure or body fluid exposure risk. Why: To protect the HCW and the healthcare surroundings from harmful patient germs.
4 AFTER TOUCHING A PATIENT	When: Clean your hands after touching a patient and their immediate surroundings. Why: To protect the HCW and the healthcare surroundings from harmful patient germs.
5 AFTER TOUCHING A PATIENT'S SURROUNDINGS	When: Clean your hands after touching any objects in a patient's surroundings when the patient has not been touched. Why: To protect the HCW and the healthcare surroundings from harmful patient germs.

Figure 1: Hand hygiene in dental care

Given the current COVID-19 pandemic situation, national and international dental professionals have developed specific guidelines, supplementary to the standard infection control measures, to combat the spread of COVID-19.[6-8] This is particularly because direct transmission of COVID-19 through inhalation of droplets, produced via coughing and sneezing, has been regarded as one of the three main ways COVID-19 is transmitted in dental settings. The other two main

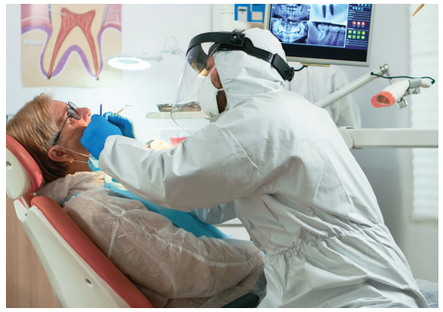


Figure 2: Dental practitioner with PPE treating a patient

ways COVID-19 is transmitted is via mucous membrane exposure to droplets and indirect transmission through contaminated surfaces.[8] Accordingly, the ADA has developed the following transmission based precautions that are recommended when standard infection control measures alone are not sufficient to curb further transmission of infection.[6] These include (but not limited to):

- **Contact precautions**
  Patient isolation, placement of PPE prior to entering the patient room, removal of PPE without causing environmental contamination, strict adherence to hand hygiene procedures and limited patient movement within the healthcare facility.
- **Airborne precautions**
  Wearing a P2 (N95) surgical respirator to form an airtight seal with the face.
- **Droplet precautions**
  Seeing the patient as the last patient of the day, use of a pre-procedural mouth rinse, use of a rubber dam for restorative procedures and minimising the use of aerosol-generating techniques

Preprocedural rinsing

Preprocedural rinsing is considered to be one of the infection control strategies adopted to reduce the extent of contamination within the contamination zone of a dental practice that includes operator's face and arm nearest the patient, assistant's face and arm, and patient's body.[1,2] Microbial load of the oral cavity has been effectively controlled by using mouthrinses.[9,10] Based on this principle, it is envisaged that preprocedural mouthrinsing can reduce the microbial load in the dental aerosol.[10]

Aerosols, spatter and aerosol generating procedures

Liquid and/or solid particles of ≤50µm in diameter are generally regarded as aerosols and they can remain suspended in the air for a prolonged period of time.[10,11] Spatter, on the other hand, consists of relatively heavy particles of >50µm in diameter and is unable to suspend in the air for extended periods.[10,11] However, there are different schools of thought about the particle size of aerosols and splatter.[7,8, 10-14] It is evident that various dental procedures, including the use of handpieces (both slow- and high-speed), ultrasonic scalers, air-polishers, air-water syringes (triple/3 way syringes) and hard tissue lasers, produce aerosols (aerosol generating procedures: Figure 3) that are particularly <10µm in size and respirable.[6,7,12-14]

Dental aerosols that contain microbes (also known as bioaerosols) including oral commensals, pathogenic bacteria as well as viruses, and other infectious agents, can sustain in the air for up to four hours and contaminate distant surfaces about 1-3 meters away from the original source.[10] In contrast, spatter settles rapidly within a shorter distance away from the original source.[11] As such, both dental practitioners and patients are potentially exposed to infected aerosols and are at a risk of contracting and spreading infections.

The significant health concern of contamination by dental aerosols has led to dentistry being recognized as a high-risk occupation for COVID-19 transmission.[14] In this context, use of preprocedural mouthrinses in dental settings as an infection control measure has regained the limelight among the oral health fraternity.

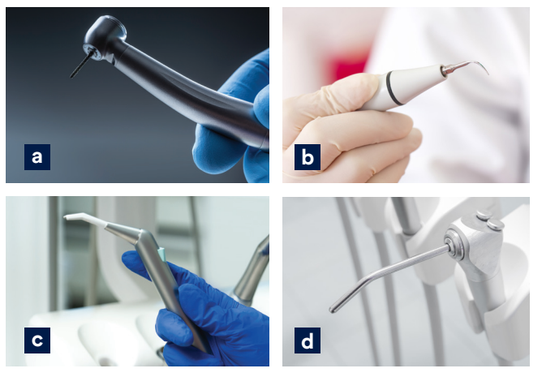


Figure 3: Aerosol generating dental procedures. a) High-speed handpiece, b) Ultrasonic scaler, c) Air-polisher, d) Dental 3-way syringe

Mouthwashes used for prepocedural rinsing

Several mouthwashes have been used for preprocedural rinsing.[10,12,15,16] One recent systematic review showed that the overall effectiveness of preprocedural mouthrinsing in reducing mean number of microbial colony forming units (CFU) was 64.8% [10] while another supported the use of preprocedural rinsing for 30 seconds to 2 minutes as a standard operational procedure to reduce aerosol contamination in the current dental practice.[16] Given that almost all studies have provided evidence for the effectiveness of preprocedural rinsing on bacterial contamination, further studies are pivotal to recognise the pattern of viral spread during dental procedures and the effectiveness of preprocedural rinsing on viral contamination.[13,16] Some of the commonly used solutions for preprocedural rinsing are briefly discussed below.

- **Cetylpyridinium chloride (CPC)**
  CPC as a preprocedural mouthrinse in the concentrations of 0.05%[15] and 0.075%[12] were effective in reducing viable bacteria in dental aerosol generated while using ultrasonic instruments. Authors of these studies also suggested that adverse effects of CPC were fewer, and its cost was less than other solutions. Compared with a control, CPC showed a reduction in mean number of CFU by 61.2%.[10]
- **Essential oils**
  A mouthwash containing essential oils (eucalyptol, thymol, methyl salicylate and menthol combined in an alcohol base) when used as a preprocedural rinse was effective in significantly reducing CFU in dental aerosol by 43% after an oral prophylaxis procedure.[17] However, the authors noted that reduction in CFU attributed to essential oil containing mouthwash was less compared to 0.2% chlorhexidine mouthwash. A meta-analysis revealed that preprocedural rinsing by essential oil containing mouthwash compared to control was effective in reducing mean number of CFU by 61.3%.[10]
- **Herbal products**
  Using an herbal mouthwash containing natural herbal extracts as a preprocedural rinse while performing aerosol generating procedures could significantly reduce the mean number of CFU at three locations (chest area of dentist, patient and assistant) compared to a control.[18] Authors however found that the efficacy of herbal mouthwash in reducing CFU was inferior to that of 0.2% chlorhexidine. Based on the findings of the same study, the overall effectiveness of the herbal mouthwash in reducing mean number of CFU compared to the control was 7.6%, although this was not statistically significant.[10] Given that herbal products include a very broad range it may not be appropriate to use them as a preprocedural rinse in a dental setting.
- **Chlorhexidine**
  Most of the studies on preprocedural rinsing have evaluated the efficacy of chlorhexidine.[10,12,16-18] Some studies have shown that there was no significant difference between chlorhexidine and CPC in reducing CFU[10], while others have found that efficacy of chlorhexidine was superior to essential oils[17] and herbal products.[18] Compared with a control, the overall efficacy of chlorhexidine in reducing CFU was almost 79%.[10] Despite the presence of a substantial amount of risk of bias in more than 3 quarters of the studies, a systematic review supported the effectiveness of chlorhexidine over other solutions, with nearly 50% of studies reporting over a 70% reduction in CFU.[16]
- **Hydrogen peroxide**
  Evidence from recent studies supports that hydrogen peroxide, which has oxidative properties and is commonly used as a debriding agent in dental practice, can be effectively used for preprocedural rinsing.[19,20] At a concentration of 1.5%, hydrogen peroxide has significantly reduced microbial load in saliva for 30 minutes although its effect was transient.[19] ADA COVID-19 risk management guidelines recommend using 1% hydrogen peroxide for 20 seconds prior to starting dental treatment.[20]

Summary

- Infection control in dental practice is a very important measure to prevent the spread of pathogenic microbes including bacteria, viruses and fungi from one person or item/location to another, including from dental practitioner and other dental staff to patients, and from patients to dental practitioner or other dental staff.
- To reduce the risk of person-to-person spread of infectious agents in dental settings, a standard protocol of infection control that encompasses hand hygiene, PPE, surgical procedures and aseptic technique, safe management of sharps, management of clinical waste and environment control has been adopted.
- The most common aerosol generating dental procedures include the use of both high- and low-speed handpieces, ultrasonic scalers, air-polishers and 3-way syringes.
- Amidst the emerging COVID-19 pandemic, contamination by dental aerosols (bioaerosols) has become a significant health issue in dental settings and consequently, use of a preprocedural mouthrinse for 30 seconds to 2 minutes as a standard operational procedure to minimise aerosol contamination has regained limelight.
- CPC, essential oils, herbal products, hydrogen peroxide and chlorhexidine are among the commonly used mouthwashes for preprocedural rinsing. Chlorhexidine, being the most frequently used preprocedural mouthrinse, has been reported to have better effectiveness over other solutions.
- Since nearly all studies have been confined to assessing the effectiveness of preprocedural rinsing on bacterial contamination, further research is required to better comprehend the spread of viruses during dental procedures, and the role preprocedural rinsing has on controlling viral infections such as COVID-19.

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