Root of the Matter: Part Two – Sterilization, Disinfection & Environmental Infection Prevention and Control

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In the September 2017 edition of Access, we presented part one of a two-part infection prevention and control (IPAC) article. Part 2 will focus on several important components of sterilization, disinfection and environmental infection and prevention control measures. To ensure client safety, as well as safety for those who work in the dental/dental hygiene office, dental hygiene professionals are responsible for upholding IPAC standards. Instrument reprocessing is a critical component of IPAC and is composed of multiple steps. Client safety can be impacted if IPC processing protocols and disinfection of the operatory are not followed. A commitment to consistently uphold these standards allows clients to have confidence in IPAC measures that occur behind the scenes. To uphold these standards any person involved in the reprocessing of instruments must be trained and remain current in IPAC practices.[1, 2]

It is recommended to have four distinct sections in the instrument reprocessing area to ensure the contaminated instruments and equipment are kept separate from the area where clean processed instruments, equipment and supplies are stored.[1, 3] These distinct areas are classified as follows:

1) receiving, cleaning and decontamination,
2) preparation and packaging,
3) sterilizing, and
4) storage

Before we delve into instrument reprocessing, we will refresh your knowledge related to risk classifications of items used during client care (Table 1). Single-use disposable items are not included in Table 1, as they are to be properly disposed of after use on only one client.

Risk Classification Table [1, 2, 3, 4]

Classification	Definition	Processing Requirements	Risk of Disease Transmission	Client-Care Item Examples
Critical	Penetrate soft tissue or bone, enter into or contact normally sterile tissues or the bloodstream	Cleaning followed by sterilization	Highest risk of transmitting infection	Periodontal debridement instruments, Power instrument inserts/tips, periodontal probe, surgical instruments, surgical burs
Semi-critical	Contact mucous membranes or non-intact skin	Cleaning followed by sterilization (preferred method) or high-level disinfectant* (as a minimum)	Lower risk of transmitting infection	Mouth mirror, impression trays, x-ray film holder including those for digital radiography, handpieces**
Non-critical	Contact intact skin, but not the mucous membrane	Cleaning followed by low-or intermediate-level disinfection	Least risk of transmission of infection	Blood pressure cuff, client safety glasses, X-ray head/cone/collimator, curing lights

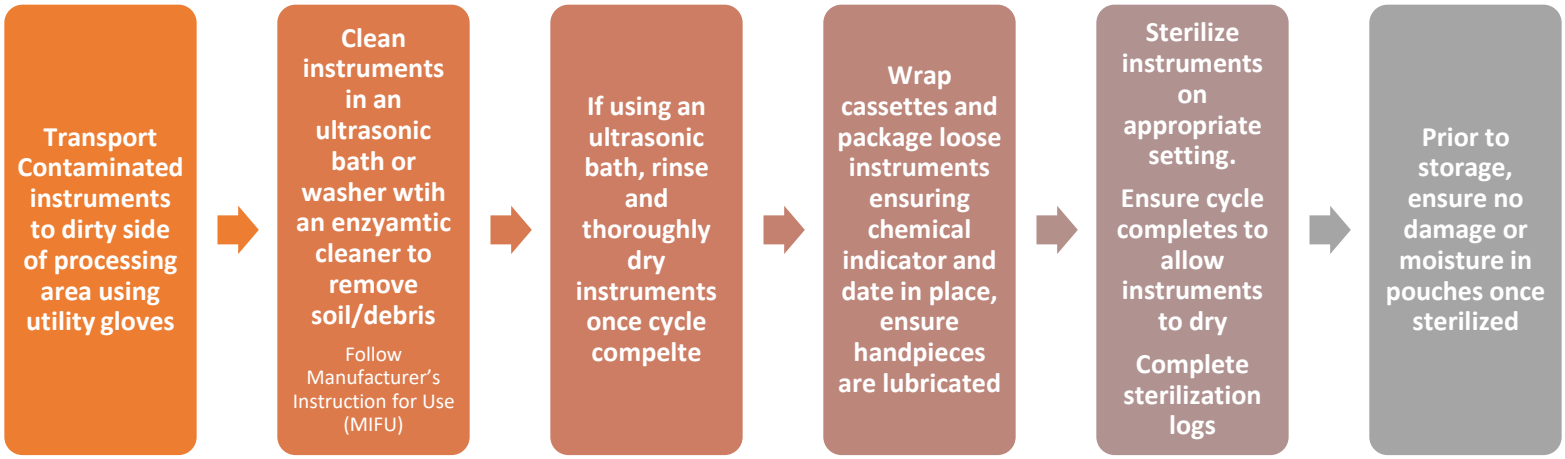
***If semi-critical items are heat-sensitive, at a minimum they should be processed using high-level disinfectant.**
****Handpieces must be sterilized after each client use. Handpieces include high and low speed handpiece, prophylaxis angles, power instrumentation handpieces, air/water syringe, air abrasion devices.**

Receiving, cleaning and decontaminating

To minimize the risk of accidental skin puncture, contaminated instruments should be transported carefully from point of care to the reprocessing area in a puncture-resistant container.[1] When reprocessing appropriate personal protective equipment must be worn.[1, 2]

Cleaning of instruments to remove debris and organic material is important prior to sterilization. This may be accomplished by using an ultrasonic bath or automated instrument washer with a chemical agent or detergent specific for the machine and instruments being cleaned. Always follow the manufactures instructions for use (MIFU) of ultrasonic baths and instrument washer units. This may include instrument load capacity, time, detergent concentration and maintenance. It is imperative to ensure periodic monitoring of these cleaners to ensure effectiveness.

To minimize the risk of a sharps injury during cleaning, avoid hand scrubbing instruments. If manual cleaning of contaminated instruments is the only option for the remove debris, always ensure appropriate use of personal protective equipment (PPE) including puncture resistant utility gloves. It is recommended to use a long-handled brush to avoid sharp instrument tips from puncturing through the utility gloves causing injury. If cleaning cannot be performed immediately, instruments should be soaked in a solution with an enzymatic cleaner to prevent organic materials from hardening onto the instruments. Do not use liquid chemical sterilants or high-level disinfectants for pre-soaking or as a holding solution.[1, 5]



Preparation and packaging

After instruments have been cleaned and dried, they should be inspected to ensure there is no debris or blood remaining as this could compromise the effects of sterilization and/or disinfection.[1, 2] If blood or debris is noted, do not sterilize these instruments, they will need to be re-cleaned to ensure the blood/debris is removed. There is not 100% certainty that areas under the debris will be sterile after sterilization. Before sterilizing, open and unlock all hinged instruments (e.g., forcipes, suture removal scissors locking cotton pliers etc.).[1, 3]

Instruments should be packaged prior to sterilization. Appropriate packaging may include disposable (one-time-use) self-sealing paper/plastic pouches or woven or non-woven sterilization wraps.[1] Packaging must ensure that when stored instruments remain sterile. Packaging may include: perforated cassettes in a sterilization wrap, a combination paper and plastic sterilization pouch, woven, or non-woven sterilization wraps.[1, 2, 3]

Pouches and wraps are meant for single use only and should be chosen based on the sterilization method. Pouches should not be overfilled and must be sealed according to manufactures directions. Packaging material should be specifically designed for steam sterilization and withstand high temperatures. As well, the integrity of the pouch or wrapping material must be such that instruments inside are not contaminated during storage.[4] Instruments in pouches and/or wrapped cassettes should remain sealed until the client is in the chair.[4]

Sterilizing

Sterilization units in BC must be approved by Health Canada and must meet the Canadian Standards Association (CSA) specifications. Sterilization units should be operated in accordance with MIFU and must be able to sterilize packaged instruments.[1, 4] Steam Sterilizers are preferred for sterilizing critical and semi-critical items (e.g., autoclave).[4]

The mere fact that the indicator power light illuminates when the sterilizer unit is on does not guarantee that the unit is functioning in a manner that will kill microorganisms including bacteria, viruses and fungi. With daily wear and tear, over time, mechanical components and parts of a sterilizer deteriorate decreasing effectiveness of sterilization. The dental hygiene professional must be confident that the sterilizer is indeed performing at its optimum. To ensure optimal performance, routine inspection and maintenance of sterilizing equipment as well as routine monitoring must occur. There are three methods for monitoring the sterilizer: mechanical, chemical and biological monitoring.

Sterilization Record Keeping Log Book [1, 2, 4]

- Mechanical indicators for each cycle (e.g., date, temperature, time, maximum pressure, cycle setting, printouts, and malfunctions)
- Chemical indicator results (both external and internal)
- Biological control results and biological indicator results
- Maintenance records
- Cleaning schedule

Mechanical indicators are the monitoring mechanisms built into the sterilizer to ensure the unit reaches the required temperature, pressure and time for each cycle. These may include gauges, displays or printouts. A mechanical indicator does not indicate or guarantee that instruments are sterile and does not replace the need for biological monitoring.[1, 2]

In the daily log, track how each sterilization unit functioned during the day.[1] For example, sterilizer 1- functioned as required, sterilizer 2- malfunctioned error code “X” reprocessed instruments in sterilizer 1 and have called for repairs on sterilizer 2.

Chemical indicators allow the clinician to quickly know if wrapped/packaged instruments have been exposed to the appropriate temperature or chemical during sterilization.[1, 2] They provide a visual cue in the form of a colour change (e.g. heat sensitive tape, or a sterilization pouch with internal and external markers) indicating that high temperature in the sterilizer and within the packaging has been reached. A chemical indicator should be used for each package/pouch being sterilized.[1, 2, 3] In addition to the internal indicator an external chemical indicator should be used when the internal indicator is not visible.[3, 6] A change in the chemical indicator colour does not guarantee sterilization of the contents, it

only indicates sterilization parameters (e.g., time, temperature and presence of steam) have been met.[2] As such, use of chemical indicators does not negate the need for the biological monitoring. If the chemical colour indicator fails to change after the completion of a cycle, the instruments in that load will need to be re-packaged and re- sterilized.[1]

Biological indicators or spore tests are the most accepted method for monitoring sterilization effectiveness. This is due to the spores being used in the tests are in greater numbers and are the most resistant to being killed. [1, 2, 3, 4] Current guidelines by the BC CDC recommend that spore tests be conducted at a minimum of one time per week.[1, 3] However, within the BC Health Authorities it is required to complete biological monitoring every day.[4] Several other provincial jurisdictions also require biological monitoring one time per day. [7, 8] The CDHBC IPAC Guidelines were published in 2012, in future revisions the Collage will take a closer look at this topic. As such, the College encourages that when a sterilizer unit is in high use, that biological testing occur more than one time per week.

Biological monitoring may be performed in one of two ways: an in-office system or by sending the spore indicator to a testing facility.[1] As results are not immediate, mechanical and chemical monitoring must be continued for each sterilization cycle.[3] In the event of a negative spore test, do not use the sterilizer until it is functioning properly. Further details may be found in the CDHBC IPAC Guidelines.

Tips for Loading the Sterilizer [4]

- know the sterilization unit's load capacity
- do not overload the sterilization chamber
- keep packages away from the inside walls of the sterilization chamber
- do not stack rigid sterilization cassettes or sterilization pouch
- place pouches paper side up or if in racks, paper to plastic
- set sterilizer for the correct cycle (according to MIFU), and ensure the full cycle completes prior to unloading

Tips for Unloading the Sterilizer [4]

- ensure no errors occurred in the sterilization cycle
- use log book to record mechanical indicator information for the cycle
- ensure the packaging has not been compromised
- ensure there are no signs of moisture. If either internal or external moisture of the packaging is noted, sterilization has been compromised and these instruments will need to be re-processed
- allow sterilization load to cool down

Flash sterilization is not considered best practice and should not be routinely used. It should only be considered in the event of an urgent need and not for convenience. If a critical instrument is flash sterilized, it needs to be used immediately and not stored.[1, 4] Each flash cycle still requires the use of a chemical indicator and tracking of the mechanical parameters. If using an instrument that has been flash sterilized, transport to chairside must ensure the item remains sterile. Caution should be used to ensure no trauma to the client due to the temperature of the instrument. [1, 4]

Storage

Sterilized instruments must be stored in the sterilization pouch and/or a wrapped cassette. A date on each package indicating when the instruments were sterilized is recommended. Prior to using, always check the integrity of the pouch to ensure damage such as a puncture or rip has not compromised the content sterility. If the package or wrap has been compromised the instruments must go through the full

sterilization process again. This includes pouches or wrapped instruments becoming wet or damaged after the initial full sterilization process.[1, 3, 4]

When retrieving non-critical and disposable items from closed containers or drawers ensure the use of over-gloves or forceps to ensure cross contamination does not occur.

Storage Requirements
1, 2, 3, 4

- moisture resistant and cleanable storage containers
- enclosed, clean, dry, dust free area
- separate from contaminated processing area
- non-porous, smooth and cleanable shelving (wood is not acceptable)
- consider enough space to prevent damage to instrument packages
- a system that allows for rotation (i.e. first in first out)
- processes that prevent contamination or damage of the sterilization package and contents
- do not store packaged instruments in wet areas (e.g., under a sink, near compressor, above sterilization unit)

Environmental Surfaces IPAC

Environmental surfaces are broken into two classifications: clinical contact surfaces and housekeeping surfaces. Clinical contact surfaces are those that do not directly contact the client but can become contaminated with microorganisms during client care.[1, 2] The following are some examples of clinical contact surfaces:[1, 2]

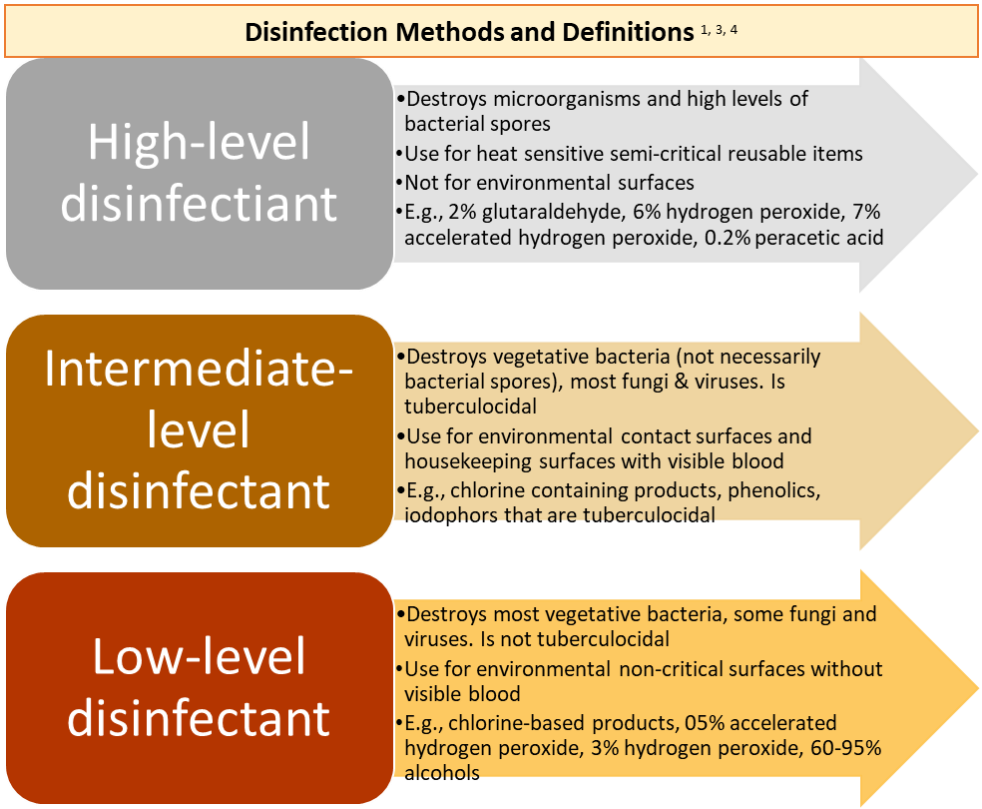
- Chair controls and switches
- Drawers and faucet handles
- Hoses/tubing
- Light handles and switches
- Countertops, bracket trays
- Pens
- Chairside computer equipment (e.g., tablet, monitor, keyboard etc.)
- Door knobs
- Radiography equipment
- Stethoscope ear pieces, floss dispenser, hand held mirrors

Contamination may occur through the generation of aerosols, splatter, contact with contaminated gloves or instruments on the surface. To decrease the number of pathogenic organisms on the contaminated surface, and thereby reducing disease transmission, disinfection needs to occur at the beginning of the day, between clients and at the end of the day.[1]

Steps for disinfection include: first cleaning the surface to remove visible debris, dust or soiled areas, then followed with a low-level disinfectant.[1,2] Prior to using a low-level disinfectant, check the MIFU to determine concentration and contact time, as well, make sure the disinfectant is suitable for the specific surface. Appropriate PPE, such as gloves, mask and eye-wear should be worn during surface cleaning and disinfecting. Once a clinical surface is cleaned, ensure the surface is dry before moving to the disinfection stage to prevent dilution of the disinfectant.[5]

Surfaces that are more challenging to clean and disinfect, due to their shape or material, should be protected with a single use non-permeable barrier. Examples of barriers may include: plastic tubing or

bags, transparent plastic wrap, transparent plastic sheets, over gloves or other moisture-proof barriers.[1] Effective hand hygiene and PPE are still the most effective way to reduce transmission of microorganisms from clinic contact surfaces to hands, eyes, nose, mouth of the clinician and client as well as the client chart.[1, 2] Ensure barriers are in place when working with the clients chart to prevent cross contamination with office staff and transmission of microorganisms through the office via the chart.[1]



Housekeeping surfaces have a lower risk of disease transmission compared to clinical contact surfaces. These surfaces may include floors, walls or sinks etc. Periodic cleaning with soap and water or when visibly contaminated with blood or saliva, cleaning and disinfecting with a low-level disinfectant (LLD) such as household bleach diluted 1:50, 3% hydrogen peroxide or 0.5% accelerated hydrogen peroxide.[1, 2] All LLD with the exception of household bleach, must have a Drug Identification Number (DIN) from Health Canada.[1] Of note, carpet and fabric furniture cannot be reliably disinfected. As such, they should not be in a client treatment or instrument processing area.[1]

As health care professionals, dental hygienists are responsible for ensuring safe care for all clients. This includes proper IPAC being upheld during disinfection of the operatory and any equipment involved in care as well during the processing of instruments. If you are in a practice where you are not directly involved in processing of instruments, we encourage you to take a tour of the instrument processing area and familiarize yourself with the process and standards. This will give you more confidence in the sterilization standards and allow you to share information related to processing with your clients, in the event that they ask questions related to this.

Each dental hygiene practice and dental office should have written policies and procedures in place for IPAC.[1, 4] We encourage each registrant to review the current office polices to ensure they align with the current IPAC guidelines. More comprehensive information may be found in the CDHBC Infection

Prevention and Control Guidelines as this article is not intended to provide detailed information related to all aspects of IPAC.

The CDC has recently developed an Infection Prevention Checklist for Dental Settings . This would be a simple tool to use to see if there are any areas of your practice that need improvements related to IPAC. For easy use the CDC has developed a IPAC Checklist for Dental Setting app for iOS. This may be a more convenient way to incorporate a quality assurance measure in your practice to ensure consistent IPAC standards are being met.

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