

INFECTION CONTROL: A PROSTHODONTIST'S APPROACH

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Abstract

Infection control is an important concept in the practice of dentistry. Dental personnels are commonly exposed to blood, saliva and other potentially infectious materials. In case of the Prosthodontists, the risk of disease transmission increases as the laboratory also plays an important role in cross contamination. The use of effective infection control procedures and universal precautions in the dental office as well as the dental laboratory will prevent cross contamination that could extend to dentists, dental office staff, dental technicians and patients.

Key Words Dental laboratory, disinfection, infection control, sterilization.

INTRODUCTION

Infection control is the discipline concerned with preventing nosocomial or health-care associated infection, a practical (rather than academic) sub-discipline of epidemiology. It is important in the field of dentistry as both patients and dental personnel can be exposed to pathogens due to contact with blood, oral and respiratory secretions, and contaminated equipment.

Various modes of disease transmission can be¹:

- Ingestion of micro-organisms
- Direct contact with blood or body fluids
- Indirect contact with a contaminated instrument or surface
- Contact of mucosa of the eyes, nose, or mouth with droplets or spatter
- Inhalation of airborne micro-organisms

Terminologies related to infection control²:

Asepsis : Asepsis is the state of being free from disease-causing micro-organisms (such as pathogenic bacteria, viruses, pathogenic fungi, and parasites). The term asepsis often refers to those practices used to promote or induce asepsis in an operative field in surgery or medicine to prevent infection.

Sterilization : Use of a physical or chemical procedure to destroy all microorganisms including substantial numbers of resistant bacterial spores.

High level Disinfection : May destroy all micro organisms but not necessarily all bacterial spores.

Intermediate-level disinfection : Disinfection process that inactivates vegetative bacteria, the majority of fungi,

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mycobacteria, and the majority of viruses (particularly enveloped viruses) but not bacterial spores.

Low-level disinfection: Process that inactivates the majority of vegetative bacteria, certain fungi, and certain viruses, but cannot be relied on to inactivate resistant microorganisms (e.g. mycobacteria or bacterial spores).

Different methods used to achieve the infection control:

(a) AUTOCLAVING

PRINCIPLE : Heating water in a closed chamber, producing moist heat which rapidly kills the microorganisms in all forms.

- ▶ Standard Cycle:
 - ▶ Temperature = 121°C
 - ▶ Pressure = 15lb/inch²
 - ▶ Time = 20-30 minutes
- ▶ Flash Cycle (for sterilization of unwrapped instruments):
 - ▶ Temperature = 134°C
 - ▶ Pressure = 15lb/inch²
 - ▶ Time = 3-10 minutes
- ▶ Drying of packages inside the steam sterilizer is important to maintain sterility
- ▶ Exposing the wet package to the environment outside the sterilizer may cause wicking.

(b) DRY HEAT STERILIZATION

- ▶ **PRINCIPLE :** Heating air with transfer of energy from air to instruments
- ▶ Temperature requirement: 160-190°C
- ▶ Dry heat is used to sterilize materials that might be damaged by moist heat (e.g. burs and certain orthodontic instruments)
- ▶ Dry Heat Sterilizers:
 - ▶ Static Air-Type
 - ▶ Forced Air-Type

(c) CHEMICALS USED

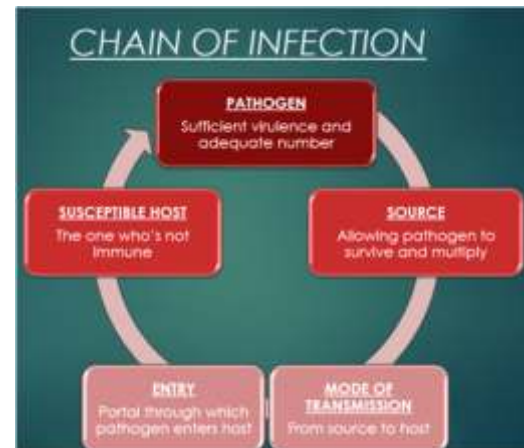
(d) RADIATION

- ▶ **Gamma radiation** It is emitted by a radioisotope, usually Cobalt-60 (⁶⁰Co) or caesium-137 (¹³⁷Cs). Used in sterilising implants, sutures, needle, blades etc.
- ▶ UV chamber
- ▶ Infrared rays

The logic for routinely practiced infection control is that the procedure involved interferes with the steps in development of diseases that may spread in the dental office and laboratory. Hence, this literature review is undertaken to upgrade our knowledge on all the available procedures and techniques in the field of infection control in dental office and laboratory. For convenience, the literature will be discussed under the following broad headings:

- Infection control in dental office.
- Infection control in dental laboratories

MATERIALS	INDICATIONS
ALCOHOLS, eg. isopropyl alcohol	Skin antisepsis prior to injection, cannulation and surgical hand scrubbing
GLUTARALDEHYDES, eg. Cidex	Metal, glass, rubber, plastic, flexible fiber optic & other dental instruments
BISGUANIDES, eg. Chlorhexidine	Anti-microbial hand cleaners (chlorhexidine gluconate)
HALOGEN COMPOUNDS, eg. sodium hypochlorite, povidone iodine	Surface disinfection
PHENOLICS, eg. Dettol	Gross de-contamination
QUATERNARY AMMONIUM COMPOUNDS, eg. benzalkonium chloride	Antiseptic towels
IODOPHORES, eg. Betadine	Surface de-contamination of wounded skin



a. Infection control in the dental office:

Prosthetic patients are a high-risk group relative to their potential to transmit infectious diseases as well as their susceptibility to acquire them. According to Standard Precautions (CDC, 1996), all body fluids, secretions, and excretions except sweat (whether or not they contain blood), non-intact (broken) skin, mucous membranes should be treated as infectious. It is applicable for each and every patient⁽²⁾. Infection control procedures in the clinics include the following:

- Patient Screening
- Personal hygiene
- Personal protection
- Instrument processing
- Surface asepsis
- Patient treatment

❖ **Patient screening:** Initial patient screening is accomplished by the history taking procedures. It helps the dentist to identify the patients who are either particularly susceptible to infection or who are at risk of transmitting infection.

❖ **Personal hygiene:**

- Hair should be kept short or should be kept neatly tied.
- Jewellery is removed from the hands, arms, or facial area during patient treatment.
- Fingernails are kept clean and short.
- Thorough forearm and handwashing is mandatory before and after treatment.^(3,4)

❖ **Personal protection:**

- Current immunizations against communicable diseases, including hepatitis B⁽⁵⁾.
- Personal protective equipments like face masks, gloves, protective eye glasses, plastic face shields are worn at all times when treating patients.
- Sharps disposal protocol is followed, with particular emphasis on the use of a haemostat when handling blades.



❖ **Instrument processing(6)**

Critical

- Penetrate mucous membranes or contact bone, the bloodstream, or other normally sterile tissues (of the mouth). Eg. scalpel blades, surgical dental burs
- Sterilization

Semi-critical

- Contact mucous membranes but do not penetrate soft tissue. Eg. handpieces, amalgam condensers
- High level of disinfection

Non-critical

- Contact intact skin. Eg. Facebows, x-ray heads
- Moderate to low level of disinfection

❖ **SURFACE ASEPSIS⁽⁴⁾**

Categories Of Environmental Surfaces

CLINICAL CONTACT SURFACES:

❖ High potential for direct contamination from spray or spatter or by contact with gloved hands. eg. dental chair, chair lights. Asepsis can be achieved by using surface barriers (which should be changed between patients) or can be cleaned followed by disinfecting using an EPA-registered low- (HIV/ HBV claim) to intermediate-level (tuberculocidal claim) hospital disinfectant

HOUSEKEEPING SURFACES:

❖ Do not come into contact with patients or devices. These have limited risk of disease transmission. Eg. Floors, sinks. These can be routinely cleaned with soap and water or an EPA-registered detergent/hospital disinfectant routinely. eg. ENVASEPTIC

According to Miller and Palenik in 1994 chemicals used for surface and equipment asepsis are

- Chlorine - e.g. sodium hypochlorite.
- Phenolic compounds

- Water based - Water with ortho - phenyl phenol or Tertiary amylphenol or O benzyl - p - chlorophenol
- Alcohol based - Ethyl or iso propyl alcohol with O phenyl phenol or Tertiary amylphenol
- Iodophor - butoxypolypropoxy poly ethoxy ethanol iodine complex

• Dental water unit system should be kept free from infectious organisms by using:

- ❖ Anti-retraction valves
- ❖ Bacterial filters
- ❖ Chemical disinfection regimens
- ❖ Aspirators

There should not be more than 200 cfu/ml of bacteria at any point of time in the water units.

- Patient treatment
- Before seating the patient, the dental chair is covered with a plastic sheet which is changed after each and every patient.
- The clinics area is wiped and the room is sprayed with a disinfectant and kept for 10 minutes.
- After each patient the operatory room is again wiped and sprayed.
- Patient is asked to rinse with a 0.12% chlorhexidine mouthwash before the treatment begins.⁽⁷⁾
- Patient should be asked to wear the drape and protective eye wears.
- Hands should be thoroughly washed with an anti-microbial soap followed by the use of a hand disinfectant.

■ Gloves, face masks, protective clothing, eye wear should be worn.

■ Patient's clinical records, contaminated or uncovered surfaces should not be touched with the gloves.

■ Clinician should not leave the operatory without removing the gloves and protective clothings.

■ All the equipments used in the operatory like impression trays, air rotor, burs, face bow, shade guide etc should be sterilised or disinfected as applicable after each use.

■ All moving parts of the instruments especially hand pieces should be lubricated prior to steam sterilization.

■ The burs should be autoclaved or maintained in high level disinfection for not less than 3 hours

■ After taking the impression, it should be washed thoroughly under water and disinfected accordingly before pouring.

■ All items leaving the operatory and coming from the laboratory should be disinfected accordingly unless the resident is informed otherwise by the dental laboratory. ADA recommends disinfection by spraying until wet or immersing in a 1:10 dilution of sodium hypochlorite or an iodophor (1:213).

■ According to Stern et al⁽⁹⁾ it may be necessary to disinfect the definitive cast at least 7 times with disinfectants from time of fabrication through insertion of complete or removable partial denture.

■ Wax rims, waxbites, customtrays: Disinfected by the spray wipe spray method using an iodophor as recommended by the ADA⁽¹⁰⁾.

■ Iodophor or chlorine compounds are preferred for disinfection of acrylic appliances.⁽¹¹⁾

Material	Method	Recommended Disinfectant	Comments
Alginate	Immersion with caution Use only disinfectant for a short-term exposure time (<10 min for alginate)	Chlorine compounds or iodophors	Short-term glutaraldehyde has been shown to be acceptable, but time is inadequate for disinfection.
Agar			Do not immerse in alkaline glutaraldehyde!
Polysulfide and silicone	Immersion	Glutaraldehydes, chlorine compounds, iodophors, phenolics	Disinfectants requiring more than 30-min exposure times are not recommended.
Polyether	Immerse with caution Use disinfectant only for a short exposure time (<10 min)	Chlorine compounds or iodophors	ADA recommends any of the disinfectant classes; however, short-term exposures are essential to avoid distortion.
ZOE impression paste	Immersion preferred; spraying can be used for bite registrations	Glutaraldehydes or iodophors	Not compatible with chlorine compounds! Phenolic spray can be used.
Impression compound		Iodophors or chlorine compounds	Phenolic spray can be used.

Guide for Selection of Appropriate Disinfection Methods for Impressions transported to a Dental Laboratory(8)

■ Metal denture bases : May be disinfected by spraying with diluted hypochlorite solution or 2% glutaraldehyde solution without any apparent harm to the prosthesis.⁽¹²⁾

■ Fixed metal prosthesis may be disinfected by using glutaraldehyde solution. The higher the content of the noble metal, the less the likelihood of adverse effects on the metals. Studies have shown little effect on chrome cobalt alloys with short term exposure (10 minutes) to iodophors or 1:10 hypochlorite solution. These may be disinfected by using ethylene oxide as well.

Infection control in dental laboratories

The dental laboratory becomes the second line of infection gloves, protective clothings are to be used by the lab persons as well. Laboratory counter tops are cleaned and wiped with disinfectant solution at the end of each day.^(12,13) Individually packaged chemically sterilized laboratory burs are available in the laboratory. After the desired procedure is accomplished, the laboratory bur is cleaned and placed in a new bag for sterilization. The burs are used for one patient only and then resterilized. For polishing procedures unit dose concept should be used.⁽¹⁴⁾



- ❖ Individually packaged sterile polishing wheels, designated for use with pumice, are available.
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- ❖ A phenol solution (Birex) is used to wet the pumice to desired consistency. Benzoic acid or antiseptic containing octenidine may be mixed with conventional pumice⁽¹⁵⁾.
- ❖ Final polish is accomplished using a sterile wheel with non-contaminated acryluster.

CONCLUSION

Every health care setup is a potential source of infections. Dental safety is of high concern and proper measures should be undertaken to prevent the spread of infection. Lack of infection control may be life threatening to both the patients and the dentists.

Hence, it is extremely mandatory to follow certain infection control guidelines to prevent the same.

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