Infection Control in Dentistry

Blood borne Disease Transmission

General Information for Patients

Cleanliness and proper sterilization techniques have been a part of dental practices for many years, but recently a number of disease causing organisms such as HIV/AIDS, hepatitis B and C, and herpes viruses have made these techniques even more important. Dental professionals are concerned about the possibility of disease transmission and are making several visible changes in the way dental services are provided. For example,

1. More dentists are using the proper infection control procedures for all patients.
2. Dentists, hygienists, and assistants are routinely wearing surgical gloves, protective eye wear, and masks during treatment of patients. The use of these barriers, greatly reduces the risk of transmission of microorganisms between patients and health-care workers.
3. More dental personnel are receiving vaccination against the hepatitis B virus.
4. Dentists are becoming more educated about the best methods to protect their patients

These safeguards will benefit everyone — patients, families, and dental personnel. These infection control techniques are not costly and are of great value, considering the amount of protection that is provided. Many of these techniques have been practiced in the dental office for years.

The use of these infection control techniques and practices is strongly supported by organizations such as the Centers for Disease Control and Prevention, the American Dental Association, state boards of health, schools of dentistry, and many other health agencies and professional associations.

You can help your dental health professional by reporting any changes in your health status at each dental visit. Doing so will help your dental health professional provide the best treatment based on your health needs. And if you wish to know more about infection control issues, your dentist should be able to provide you with additional information.

Blood borne Disease Transmission

Hepatitis B (HBV) and C viruses (HCV) and HIV are important blood borne diseases. Although the potential for HBV transmission in the workplace setting is greater than for HCV or HIV, the modes of transmission for these three viruses are similar. All have been transmitted in occupational settings. Blood is the single most important source of these viruses in the workplace setting. Protective measures against the transmission of HIV, HBV and HCV for dental workers should focus primarily on preventing exposures to blood as well as receiving the HBV vaccination.

The risk of hepatitis B infection following a potential (i.e., needle stick or cut) exposure to blood is directly proportional to the probability that the blood contains hepatitis B surface antigen, the immunity status of the recipient, and the efficiency of transmission. The probability of the source of the blood being positive for hepatitis B varies from 1 to 3 per thousand in the general population to 5% - 15% in groups at high risk for HBV infection, such as:

1. Immigrants from areas of high endemic (China and Southeast Asia, sub-Saharan Africa, most Pacific islands, and the Amazon Basin).
2. Clients in institutions for the mentally retarded.
3. Intravenous drug users; homosexually active males,
4. Household (sexual and nonsexual) contacts of HBV carriers.
Of persons who have not had prior hepatitis B vaccination or post exposure prophylaxis, 6% - 30% of persons who receive a needle stick exposure from an individual who is hepatitis B-positive will become infected. The risk of infection with HCV following one needle stick exposure to blood from a patient known to be infected with HCV is approximately 3-10%; for HIV, the risk is even lower at 0.3%. This rate of transmission is considerably lower than that for HBV, probably as a result of the significantly lower concentrations of virus in the blood of HIV-infected persons. An effective hepatitis B vaccine has been developed and is recommended for any health care provider, including all dental personnel. Also, hepatitis B immune globulin is available as a treatment in post exposure situations. However, the most important way to prevent blood borne disease transmission is through safe handling of sharp instruments, use of barrier protection, and following disinfection and sterilization practices.

**Barrier Precautions**

The following information summarizes the use of gloves, masks, protective eyewear, gowns, and the protection of equipment that is hard to disinfect.

1. During dental procedures, dental health-care workers must wear gloves when they put their hands into any patient's mouth, and change these gloves between patients. They should also wear gloves when they touch instruments, equipment, or surfaces that may be contaminated with blood or saliva.
2. Hands must be washed and regloved before performing procedures on another patient. Repeated use of a single pair of gloves or washing of gloves between patients is not recommended, since such practice is likely to produce defects in the glove material, which will diminish its value as an effective barrier.
3. Surgical masks and protective eyewear or chin-length plastic face shields must be worn when splashing or spattering of blood, saliva, or oral secretions is likely, as is common during dental procedures.
4. Reusable or disposable gowns, laboratory coats, or uniforms must be worn when clothing is likely to be soiled with blood, saliva, or oral secretions. If reusable gowns are worn, they should be washed, using a normal laundry cycle. Gowns should be changed at least daily or when visibly soiled with blood.
5. Disposable waterproof coverings such as impervious-backed paper, aluminum foil, or clear plastic wrap may be used to wrap hard-to-clean surfaces such as light handles or x-ray unit heads, etc. These surfaces may be contaminated by blood or saliva and are difficult or impossible to clean and disinfect. To replace the covering between patients, the coverings should be removed with gloved hands and discarded. Then, after removing the soiled gloves, the coverings can be replaced with clean material.

**Gloves**

You are most likely to contact blood with your hands. If the skin of your hands is intact, it provides good protection from microorganisms that may be in blood. Frequently, however, there may be small unapparent breaks in the skin on your hands. Wearing gloves will provide an extra barrier against the entry of microorganisms through any breaks in your skin.

Wear gloves whenever you put your hands into any patient's mouth or touch instruments, equipment, or surfaces that may be contaminated with blood. Use a new pair of gloves for every patient.

Three types of gloves are commonly available:

1. Disposable examination gloves made of either vinyl or latex for procedures involving contact with oral mucous membranes.
2. Sterile disposable gloves for use when sterility is necessary, such as during surgical procedures.
3. General purpose utility gloves for use when cleaning instruments, equipment, and contaminated surfaces. Rubber household gloves are suitable, and can be decontaminated and reused. NEVER reuse surgical or examination gloves. Washing these gloves may damage them and actually cause "wicking," which increases the flow of liquid through undetected holes in the gloves. Utility gloves may be reused if they are not punctured or torn. They should be properly decontaminated before reuse. If your gloves are torn, cut, or punctured, remove them immediately and dispose of them properly. Then wash your hands thoroughly with soap and water and put on a new pair of gloves. As a barrier, there is no difference between an intact vinyl glove and an intact latex glove. However, any type of glove may be defective. It would be prudent, therefore, to make sure your gloves are intact before using them. As a public health measure, it is not necessary to double-glove, as long as the glove is intact. 

Eyewear
Wear either a mask and protective glasses or goggles, or a chin-length face shield that protects your eyes, nose, and mouth from spatter. Wear facial protection whenever blood or oral fluids contaminated by blood may be spattered, for example during patient treatment, while cleaning instruments, or when disposing of contaminated fluids. Use a new surgical mask for every patient. If the mask becomes wet during the single treatment of a patient, the mask should be replaced. Wash nondisposable facial protective equipment with detergent and water between patients and disinfect it with a tuberculocidal "hospital disinfectant" that is registered with the Environmental Protection Agency (EPA).

Gowns
Protect your street clothes from contamination by covering them with a gown or coat or wearing a uniform. The sleeve length of these work clothes may be long, medium, or short. Long sleeves will provide the most protection, but may become soiled and need to be changed more often during the course of the work day. If medium or short sleeves are used, be sure to wash your arms up to the sleeve length, while washing your hands before gloving. Change these work clothes at least daily, or more often if soiled, especially if they become visibly contaminated with blood. Work clothes soiled by blood, saliva, or oral secretions should be placed and transported in bags that prevent leakage. Wash soiled linens in hot or cold water with detergent and, if possible, chlorine bleach. Normal washing and drying cycles will remove or kill potentially harmful microorganisms, including viruses. Be sure to follow the instructions of the detergent and machine manufacturers.

Needlestick Precautions
You, as a health-care workers, should take precautions to prevent injuries caused by needles and other sharp instruments. You should adhere to the following precautions during all procedures in which you may handle sharp instruments, including clean-up and disposal of used needles and other disposable sharp items.
1. A disposable syringe with a disposable needle:
A disposable syringe with a disposable needle is designed for single use only. The disposable needle should never be separated from its disposable syringe. Once used, this type of syringe and needle should be disposed of promptly and properly.
2. A nondisposable aspirating syringe with a disposable needle:
One exception to the rule against recapping is aspirating syringes, which are not fully disposable. You can injure yourself with one of these syringes if you remove the disposable needle without recapping it. Until aspirating syringes are fully disposable or some new technology develops, recap them using a one-handed technique. A one-handed technique is that in which one hand holds the syringe, and the needle is recapped by stabilizing the cap with a set of forceps or other
appropriate device. A second method is the "scoop" technique, whereby the cap is laid upon the
instrument tray and the needle is guided and "scooped" into the cap until the cap can be
completely seated.
When giving multiple injections on a patient with a single needle, either place the unsheathed
needle out of your way in a safe, clean area where it cannot be contaminated, or use a one-
handed recapping technique between injections.
3. A nondisposable syringe with a non-disposable needle:
A nondisposable syringe with a non-disposable needle should not be used for administering local
anesthesia in the dental officer.

Disinfection and Sterilization Practices

Cleaning, disinfection, and sterilization are all decontamination processes. These processes differ
in the number and types of microorganisms killed. By knowing the differences between these
processes, you will know how to choose the right way to reprocess reusable instruments and
equipment.
Cleaning is the basic first step for all decontamination. When you clean, you physically remove
debris and reduce the number of microorganisms present. You always need to clean before you
disinfect or sterilize.
Disinfection is a process that kills disease-causing microorganisms, but not necessarily all
microorganisms. There are three levels of disinfection: low, intermediate, and high.
1. Low-level disinfection is the least effective disinfection process. It does not kill bacterial
spores or Mycobacterium tuberculosis var. bovis, a laboratory test microorganism that is used to
classify the strength of disinfectant chemicals.
2. Intermediate-level disinfection is a disinfection process that does kill M. tuberculosis var.
bovis, but not bacterial spores. If you use a process that kills M. tuberculosis var. bovis, you will
also kill organisms that are easier to kill, such as the ones that cause hepatitis B and AIDS.
3. High-level disinfection is a disinfection process that kills some, but not necessarily all,
bacterial spores. This powerful process will also kill M. tuberculosis var. bovis, as well as other
bacteria, fungi, and viruses.
Sterilization is a process that kills all microbial life, including bacterial spores, which are the most
difficult form of microorganism to kill.
The choice of how to decontaminate anything should be based on how it will be used.
Instruments that will touch bone or penetrate tissue are called CRITICAL. Forceps, scalpels, and
scalers are examples of critical items. Sterilize these critical instruments. Heat sterilization
methods are preferable.
Instruments that will touch mucous membranes but will not touch bone or penetrate tissue are
called SEMI-CRITICAL. Mirrors and amalgam condensers are examples of semi-critical items.
Sterilize these semi-critical instruments in an autoclave if they will not be damaged by heat. If
they will be damaged by heat, USE HIGH-LEVEL DISINFECTION.
Equipment and environmental surfaces that will come into contact only with intact skin are called
NON-CRITICAL. For non-critical equipment and surfaces that will touch only intact skin, USE
INTERMEDIATE OR LOW-LEVEL DISINFECTION.
There may be ways to avoid having to decontaminate items with irregular surfaces that cannot be
cleaned and disinfected easily. Some, such as saliva ejectors, are available in a disposable form
and can be thrown away after a single use. Others, such as light handles and hand-operated
chair controls, can be covered to avoid contamination altogether. Still others, however, such as
light-curing wands, are not disposable and cannot be covered. Your dental supplier and the
manufacturer of a particular piece of equipment or material are the best sources of information for
decontaminating these items.

How to Sterilize

To sterilize, do the following:
1. Cleaning is the first step in sterilization. Always wear heavy-duty (reusable utility type) gloves to lessen the risk of hand injuries. Do not use disposable examination gloves during cleaning. Before sterilization or high-level disinfection, instruments must be thoroughly cleaned to remove debris. Placing instruments into a container of water or disinfectant/detergent as soon as possible after use will prevent drying of patient materials and make cleaning easier and more efficient. Cleaning may be accomplished by thorough scrubbing with soap and water or a detergent solution, or by using a mechanical device (e.g., an ultrasonic cleaner). The use of covered ultrasonic cleaners, where possible, is recommended to increase efficiency of cleaning and to reduce handling of sharp instruments. All critical and semi-critical dental instruments that are heat-stable must be routinely heat sterilized between uses. Be sure to follow the instructions of the manufacturers of the instruments and the sterilizers.

2. Sterilize by using one of the following methods:
   - Steam under pressure (steam autoclave)
   - Dry heat
   - Chemical under pressure (chemical autoclave)

Critical and semi-critical instruments that are not going to be used immediately should be packaged prior to sterilization. The adequacy of sterilization cycles should be verified by the periodic use (e.g., at least weekly) of biologic indicators. Heat-sensitive chemical indicators (e.g., those that change color after exposure to heat) do not assure efficacy of a sterilization cycle but may be used on the outside of each pack to identify packs that have been processed through the heating cycle, or on the inside and center of instrument packs to assure heat penetration. These procedures are recommended for all dental practices. The instructions of the manufacturers of medical/dental instruments and sterilization devices must be closely followed. Sterilizing methods which use heat are preferred. However, there is a fourth sterilization method using a liquid "disinfectant/sterilant" that has been registered by the Environment Protection Agency (EPA) and also cleared for marketing by the Food and Drug Administration (FDA) for use on medical and dental instruments. This method is sometimes referred to as "cold sterilization". This procedure:
   - Requires that the dental instruments be immersed up to 10 hours in the chemical agent
   - Can not be verified by biologic monitors (ie, spore tests)

Thus indications for use of liquid germicides to sterilize instruments are limited. If this method must be used for heat sensitive instruments, follow with aseptic rinsing (using sterile water), drying, and placement in a sterile container if the instrument is not used immediately.

To disinfect semi-critical items that are damaged by heat, do the following:
1. Clean by rinsing under a stream of water and scrubbing thoroughly with detergent and water. You can also use an ultrasonic cleaner. Rinse and dry the items completely. Remember that cleaning is the first step in decontamination.
2. Sterilize items not damaged by heat and use high-level disinfection on other items. High-level disinfection can be carried out by soaking them in a liquid chemical germicide registered with the Environmental Protection Agency (EPA) as a "disinfectant/sterilant" and cleared by the FDA for use in sterilizing or disinfecting medical and dental instruments. Soak these items for the amount of time listed by the manufacturer.

Anything that will touch only intact skin is a non-critical item. Chairs and counter tops are examples of non-critical items. You can clean non-critical items using absorbent towels, water, and either soap or a disinfectant product registered by the Environmental Protection Agency (EPA) for cleaning. Scrubbing itself removes microorganisms very well, however, and is probably as important as the cleaning agent used.

If a non-critical item is contaminated, do the following:
1. Remove any visible contamination with a paper towel or moist cloth.
2. Clean the item well with detergent and water.
3. If there is visible blood or bloody saliva, carry out intermediate-level disinfection using a liquid chemical germicide registered with the EPA as a tuberculocidal "hospital disinfectant," or a solution of bleach.

To disinfect with bleach, do the following:
• Mix a fresh solution daily, using household bleach and water. Either 1 part bleach to 100 parts water or 1/4 cup bleach in 1 gallon of water will provide a solution that is strong enough. Wipe the cleaned item with the bleach solution and allow to air dry. Alcohol is not recommended for disinfecting contaminated environmental surfaces because it evaporates quickly and does not allow sufficient contact time for effective action.

Chemical Germicides / FDA and EPA Classifications
The Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) coregulate liquid chemical germicides.

Any chemical you use should have a label that shows the following:
1) Either the FDA or EPA classification
2) EPA registration and establishment numbers
3) Directions for use and disposal

The FDA is the principal regulator for chemicals used as "sterilants/disinfectants." If "sterilant/disinfectant" and the word "sporicidal," (kills spores) are on the label, you can use the chemical for either sterilization or high-level disinfection. The same concentration of the chemical is used for both processes. Be sure to follow closely the instructions on the label regarding appropriate contact times, temperature, and concentration. Chemical germicides that are less potent than the "sterilant/disinfectant" category are not appropriate for reprocessing dental instruments that have contacted oral tissues.

The Environmental Protection Agency (EPA) is the principle regulator for chemicals used to disinfect contaminated environmental surfaces. These chemicals fall into two categories:
1) For intermediate level disinfection, use EPA Classification: Hospital disinfectants with tuberculocidal activity label claims. Look for the terms "tuberculocidal" and "hospital disinfectant" on the label of any chemical you use for intermediate-level disinfection.
2) For low-level disinfection, use EPA Classification: non-tuberculocidal hospital disinfectant. If the label reads "hospital disinfectant", but does not indicate that it is tuberculocidal, then use this chemical for low-level disinfection.

Handpieces

Handpieces should be sterilized by heat.
Water lines connecting to the handpieces should be thoroughly flushed between patients, and at the beginning and end of each day. Because handpieces come in contact with mucous membranes, and because the structure of handpieces limit cleaning and disinfection or sterilization of both the internal and external surfaces, handpieces should be cleaned and then treated between patients by a heat sterilization process (i.e. steam under pressure [autoclaving], dry heat, or heat/chemical vapor). Manufacturer's instructions for cleaning, lubrication, and sterilization procedures should be followed closely to ensure both the effectiveness of the process and the longevity of handpieces. Virtually all high-speed and low-speed handpieces in production today are claimed by manufacturers to be heat-tolerant, and most older models that are damaged by heat can be retrofitted with heat-stable components. Surface disinfection by wiping or soaking in liquid chemical germicides is not an acceptable method for reprocessing handpieces or other intraoral dental instruments that are attached to air/water lines of dental units.
To further reduce the potential risk of transfer of infective material from one patient to another, the water lines attached to handpieces should be handled as follows:
1. Because water retraction valves in dental-unit water lines may aspirate patient materials back into the handpiece and water lines, check valves should be installed to prevent fluid aspiration. Routine maintenance of check valves is necessary to ensure effectiveness; the dental-unit manufacturer should be consulted to establish an appropriate maintenance routine.
2. After each patient use, high-speed handpiece water lines should be thoroughly flushed to aid in removal of patient material. It is prudent for water-cooled handpieces to be run and to discharge
water and air into a sink or container for a minimum of 20-30 seconds after use on each patient is completed. This is intended to aid in physically flushing out patient material that may have been aspirated into the handpiece or water line. Additionally, there is evidence that overnight or weekend microbial accumulation in water lines can be significantly reduced by removing the handpiece and allowing open water lines to run and to discharge water for several minutes at the beginning of each clinic day.

3. Sterile saline or sterile water should be used as a coolant/irrigator when performing surgical procedures involving the cutting of bone.

Disposal of Sharp Instruments and Infectious Waste

Sharp items (e.g., needles, scalp blades, wires, and other sharp instruments) contaminated with patient blood and saliva should be considered as potentially infective and must be handled with care to prevent injuries. To prevent needlestick injuries, needles should not be recapped by hand using a two-handed recapping technique; needles should not be purposely bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand. After they are used, disposable syringes and needles and other disposable sharp items should be placed in puncture-resistant containers for disposal. The puncture-resistant containers should be located as close as practical to the use area. All needles should be placed in a puncture-resistant container.

Disposal of Solid or Liquid Waste

Solid waste such as blood contaminated gauze, cotton rolls, disposable gowns, and masks should be placed and secured in a leakproof plastic bag. When putting waste in the bag take care not to contaminate the outside of the bag. Dispose of the bag as outlined by your state, local, or institutional requirements.

The risk of transmission of any microorganism from clothing is extremely low. Therefore, good cleaning rather than sterilization is the proper method of treating soiled linens. Wash soiled linens in hot or cold water with detergent and, if possible, chlorine bleach. Use normal washing and drying cycles. Handle the soiled linens as little as possible. Wash your hands after handling soiled linens.

Whenever blood, suctioned fluids, or other liquid waste is handled, wear gloves. Pour liquids down a drain that is connected to a sanitary sewer. Be careful not to spill or splash any liquid.

Management of Exposures

An occupational exposure that may place a worker at risk of HIV or HBV infection is defined as follows:

Contact with blood, tissues, or other body fluids to which universal precautions apply, including laboratory specimens that contain HIV or HBV with:

1. An injury to the skin (e.g., a needlestick or cut with a sharp object).
2. Mucous membranes, or
3. Skin (especially when the exposed skin is chapped, abraded, or afflicted with dermatitis, or the contact is prolonged or involves an extensive area).

After an occupational exposure, the source patient should be informed of the incident and tested for serologic evidence of HIV infection and hepatitis B surface antigen after consent is obtained. Health-care workers who have received an occupational injury should contact their personal physician as soon as possible, or contact their local health department.

Further information on postexposure management is provided by CDC’s Hospital Infections Program, National Center for Infectious Diseases.

Centers for Disease Control and Prevention
National Center for Chronic Disease Prevention and Health Promotion
Division of Oral Health
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