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Recommended Infection-Control Practices for Dentistry, 1993

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Recommended Infection-Control Practices for Dentistry, 1993

Summary

This document updates previously published CDC recommendations for infection-control practices in dentistry to reflect new data, materials, technology, and equipment. When implemented, these recommendations should reduce the risk of disease transmission in the dental environment, from patient to dental health-care worker (DHCW), from DHCW to patient, and from patient to patient. Based on principles of infection control, the document delineates specific recommendations related to vaccination of DHCWs; protective attire and barrier techniques; handwashing and care of hands; the use and care of sharp instruments and needles; sterilization or disinfection of instruments; cleaning and disinfection of the dental unit and environmental surfaces; disinfection and the dental laboratory; use and care of handpieces, antiretraction valves, and other intraoral dental devices attached to air and water lines of dental units; single-use disposable instruments; the handling of biopsy specimens; use of extracted teeth in dental educational settings; disposal of waste materials; and implementation of recommendations.

INTRODUCTION

This document updates previously published CDC recommendations for infection-control practices for dentistry (*1–3*) and offers guidance for reducing the risks of disease transmission among dental health-care workers (DHCWs) and their patients. Although the principles of infection control remain unchanged, new technologies, materials, equipment, and data require continuous evaluation of current infection-control practices. The unique nature of most dental procedures, instrumentation, and patient-care settings also may require specific strategies directed to the prevention of transmission of pathogens among DHCWs and their patients. Recommended infection-control practices are applicable to all settings in which dental treatment is provided. These recommended practices should be observed in addition to the practices and procedures for worker protection required by the Occupational Safety and Health Administration (OSHA) final rule on Occupational Exposure to Bloodborne Pathogens (29 CFR 1910.1030), which was published in the *Federal Register* on December 6, 1991 (*4*).

Dental patients and DHCWs may be exposed to a variety of microorganisms via blood or oral or respiratory secretions. These microorganisms may include cytomegalovirus, hepatitis B virus (HBV), hepatitis C virus (HCV), herpes simplex virus types 1 and 2, human immunodeficiency virus (HIV), *Mycobacterium tuberculosis*, staphylococci, streptococci, and other viruses and bacteria — specifically, those that infect the upper respiratory tract. Infections may be transmitted in the dental operatory through several routes, including direct contact with blood, oral fluids, or other secretions; indirect contact with contaminated instruments, operatory equipment, or environmental surfaces; or contact with airborne contaminants present in either droplet

spatter or aerosols of oral and respiratory fluids. Infection via any of these routes requires that all three of the following conditions be present (commonly referred to as "the chain of infection"): a susceptible host; a pathogen with sufficient infectivity and numbers to cause infection; and a portal through which the pathogen may enter the host. Effective infection-control strategies are intended to break one or more of these "links" in the chain, thereby preventing infection.

A set of infection-control strategies common to all health-care delivery settings should reduce the risk of transmission of infectious diseases caused by bloodborne pathogens such as HBV and HIV (*2,5–10*). Because all infected patients cannot be identified by medical history, physical examination, or laboratory tests, CDC recommends that blood and body fluid precautions be used consistently for all patients (*2,5*). This extension of blood and body fluid precautions, referred to as "universal precautions," must be observed routinely in the care of all dental patients (*2*). In addition, specific actions have been recommended to reduce the risk of tuberculosis transmission in dental and other ambulatory health-care facilities (*11*).

CONFIRMED TRANSMISSION OF HBV AND HIV IN DENTISTRY

Although the possibility of transmission of bloodborne infections from DHCWs to patients is considered to be small (*12–15*), precise risks have not been quantified in the dental setting by carefully designed epidemiologic studies. Reports published from 1970 through 1987 indicate nine clusters in which patients were infected with HBV associated with treatment by an infected DHCW (*16–25*). In addition, transmission of HIV to six patients of a dentist with acquired immunodeficiency syndrome has been reported (*26,27*). Transmission of HBV from dentists to patients has not been reported since 1987, possibly reflecting such factors as incomplete ascertainment and reporting, increased adherence to universal precautions — including routine glove use by dentists — and increased levels of immunity due to use of hepatitis B vaccine. However, isolated sporadic cases of infection are more difficult to link with a health-care worker than are outbreaks involving multiple patients. For both HBV and HIV, the precise event or events resulting in transmission of infection in the dental setting have not been determined; epidemiologic and laboratory data indicate that these infections probably were transmitted from the DHCWs to patients, rather than from one patient to another (*26,28*). Patient-to-patient transmission of bloodborne pathogens has been reported, however, in several medical settings (*29–31*).

VACCINES FOR DENTAL HEALTH-CARE WORKERS

Although HBV infection is uncommon among adults in the United States (1%–2%), serologic surveys have indicated that 10%–30% of health-care or dental workers show evidence of past or present HBV infection (*6,32*). The OSHA bloodborne pathogens final rule requires that employers make hepatitis B vaccinations available without cost to their employees who may be exposed to blood or other infectious materials (*4*). In addition, CDC recommends that all workers, including DHCWs, who might be exposed to blood or blood-contaminated substances in an occupational setting be vaccinated for HBV (*6–8*). DHCWs also are at risk for exposure to and possible transmission of

other vaccine-preventable diseases (*33*); accordingly, vaccination against influenza, measles, mumps, rubella, and tetanus may be appropriate for DHCWs.

PROTECTIVE ATTIRE AND BARRIER TECHNIQUES

For protection of personnel and patients in dental-care settings, medical gloves (latex or vinyl) always must be worn by DHCWs when there is potential for contacting blood, blood-contaminated saliva, or mucous membranes (*1,2,4–6*). Nonsterile gloves are appropriate for examinations and other nonsurgical procedures (*5*); sterile gloves should be used for surgical procedures. Before treatment of each patient, DHCWs should wash their hands and put on new gloves; after treatment of each patient or before leaving the dental operatory, DHCWs should remove and discard gloves, then wash their hands. DHCWs always should wash their hands and reglove between patients. Surgical or examination gloves should not be washed before use; nor should they be washed, disinfected, or sterilized for reuse. Washing of gloves may cause "wicking" (penetration of liquids through undetected holes in the gloves) and is not recommended (*5*). Deterioration of gloves may be caused by disinfecting agents, oils, certain oil-based lotions, and heat treatments, such as autoclaving.

Chin-length plastic face shields or surgical masks and protective eyewear should be worn when splashing or spattering of blood or other body fluids is likely, as is common in dentistry (*2,5,6,34,35*). When a mask is used, it should be changed between patients or during patient treatment if it becomes wet or moist. Face shields or protective eyewear should be washed with an appropriate cleaning agent and, when visibly soiled, disinfected between patients.

Protective clothing such as reusable or disposable gowns, laboratory coats, or uniforms should be worn when clothing is likely to be soiled with blood or other body fluids (*2,5,6*). Reusable protective clothing should be washed, using a normal laundry cycle, according to the instructions of detergent and machine manufacturers. Protective clothing should be changed at least daily or as soon as it becomes visibly soiled (*9*). Protective garments and devices (including gloves, masks, and eye and face protection) should be removed before personnel exit areas of the dental office used for laboratory or patient-care activities.

Impervious-backed paper, aluminum foil, or plastic covers should be used to protect items and surfaces (e.g., light handles or x-ray unit heads) that may become contaminated by blood or saliva during use and that are difficult or impossible to clean and disinfect. Between patients, the coverings should be removed (while DHCWs are gloved), discarded, and replaced (after ungloving and washing of hands) with clean material.

Appropriate use of rubber dams, high-velocity air evacuation, and proper patient positioning should minimize the formation of droplets, spatter, and aerosols during patient treatment. In addition, splash shields should be used in the dental laboratory.

HANDWASHING AND CARE OF HANDS

DHCWs should wash their hands before and after treating each patient (i.e., before glove placement and after glove removal) and after barehanded touching of inanimate objects likely to be contaminated by blood, saliva, or respiratory secretions (*2,5,6,9*).

Hands should be washed after removal of gloves because gloves may become perforated during use, and DHCWs' hands may become contaminated through contact with patient material. Soap and water will remove transient microorganisms acquired directly or indirectly from patient contact (*9*); therefore, for many routine dental procedures, such as examinations and nonsurgical techniques, handwashing with plain soap is adequate. For surgical procedures, an antimicrobial surgical handscrub should be used (*10*).

When gloves are torn, cut, or punctured, they should be removed as soon as patient safety permits. DHCWs then should wash their hands thoroughly and reglove to complete the dental procedure. DHCWs who have exudative lesions or weeping dermatitis, particularly on the hands, should refrain from all direct patient care and from handling dental patient-care equipment until the condition resolves (*12*). Guidelines addressing management of occupational exposures to blood and other fluids to which universal precautions apply have been published previously (*6–8,36*).

USE AND CARE OF SHARP INSTRUMENTS AND NEEDLES

Sharp items (e.g., needles, scalpel blades, wires) contaminated with patient blood and saliva should be considered as potentially infective and handled with care to prevent injuries (*2,5,6*).

Used needles should never be recapped or otherwise manipulated utilizing both hands, or any other technique that involves directing the point of a needle toward any part of the body (*2,5,6*). Either a one-handed "scoop" technique or a mechanical device designed for holding the needle sheath should be employed. Used disposable syringes and needles, scalpel blades, and other sharp items should be placed in appropriate puncture-resistant containers located as close as is practical to the area in which the items were used (*2,5,6*). Bending or breaking of needles before disposal requires unnecessary manipulation and thus is not recommended.

Before attempting to remove needles from nondisposable aspirating syringes, DHCWs should recap them to prevent injuries. Either of the two acceptable techniques may be used. For procedures involving multiple injections with a single needle, the unsheathed needle should be placed in a location where it will not become contaminated or contribute to unintentional needlesticks between injections. If the decision is made to recap a needle between injections, a one-handed "scoop" technique or a mechanical device designed to hold the needle sheath is recommended.

STERILIZATION OR DISINFECTION OF INSTRUMENTS

Indications for Sterilization or Disinfection of Dental Instruments

As with other medical and surgical instruments, dental instruments are classified into three categories — critical, semicritical, or noncritical — depending on their risk of transmitting infection and the need to sterilize them between uses (*9,37–40*). Each dental practice should classify all instruments as follows:

- **Critical.** Surgical and other instruments used to *penetrate soft tissue or bone* are classified as critical and should be sterilized after each use. These devices include forceps, scalpels, bone chisels, scalers, and burs.
- **Semicritical.** Instruments such as mirrors and amalgam condensers that *do not penetrate soft tissues or bone but contact oral tissues* are classified as semicritical. These devices should be sterilized after each use. If, however, sterilization is not feasible because the instrument will be damaged by heat, the instrument should receive, at a minimum, high-level disinfection.
- **Noncritical.** Instruments or medical devices such as external components of x-ray heads that *come into contact only with intact skin* are classified as noncritical. Because these noncritical surfaces have a relatively low risk of transmitting infection, they may be reprocessed between patients with intermediate-level or low-level disinfection (see Cleaning and Disinfection of Dental Unit and Environmental Surfaces) or detergent and water washing, depending on the nature of the surface and the degree and nature of the contamination (*9,38*).

Methods of Sterilization or Disinfection of Dental Instruments

Before sterilization or high-level disinfection, instruments should be cleaned thoroughly to remove debris. Persons involved in cleaning and reprocessing instruments should wear heavy-duty (reusable utility) gloves to lessen the risk of hand injuries. Placing instruments into a container of water or disinfectant/detergent as soon as possible after use will prevent drying of patient material and make cleaning easier and more efficient. Cleaning may be accomplished by thorough scrubbing with soap and water or a detergent solution, or with a mechanical device (e.g., an ultrasonic cleaner). The use of covered ultrasonic cleaners, when possible, is recommended to increase efficiency of cleaning and to reduce handling of sharp instruments.

All critical and semicritical dental instruments that are heat stable should be sterilized routinely between uses by steam under pressure (autoclaving), dry heat, or chemical vapor, following the instructions of the manufacturers of the instruments and the sterilizers. Critical and semicritical instruments that will not be used immediately should be packaged before sterilization.

Proper functioning of sterilization cycles should be verified by the periodic use (at least weekly) of biologic indicators (i.e., spore tests) (*3,9*). Heat-sensitive chemical indicators (e.g., those that change color after exposure to heat) alone do not ensure adequacy 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. A simple and inexpensive method to confirm heat penetration to all instruments during each cycle is the use of a chemical indicator inside and in the center of either a load of unwrapped instruments or in each multiple instrument pack (*41*); this procedure is recommended for use in all dental practices. Instructions provided by the manufacturers of medical/dental instruments and sterilization devices should be followed closely.

In all dental and other health-care settings, indications for the use of liquid chemical germicides to sterilize instruments (i.e., "cold sterilization") are limited. For heat-sensitive instruments, this procedure may require up to 10 hours of exposure to a liquid

chemical agent registered with the U.S. Environmental Protection Agency (EPA) as a "sterilant/disinfectant." This sterilization process should be followed by aseptic rinsing with sterile water, drying, and, if the instrument is not used immediately, placement in a sterile container.

EPA-registered "sterilant/disinfectant" chemicals are used to attain high-level disinfection of heat-sensitive semicritical medical and dental instruments. The product manufacturers' directions regarding appropriate concentration and exposure time should be followed closely. The EPA classification of the liquid chemical agent (i.e., "sterilant/disinfectant") will be shown on the chemical label. Liquid chemical agents that are less potent than the "sterilant/disinfectant" category are *not* appropriate for reprocessing critical or semicritical dental instruments.

CLEANING AND DISINFECTION OF DENTAL UNIT AND ENVIRONMENTAL SURFACES

After treatment of each patient and at the completion of daily work activities, countertops and dental unit surfaces that may have become contaminated with patient material should be cleaned with disposable toweling, using an appropriate cleaning agent and water as necessary. Surfaces then should be disinfected with a suitable chemical germicide.

A chemical germicide registered with the EPA as a "hospital disinfectant" and labeled for "tuberculocidal" (i.e., mycobactericidal) activity is recommended for disinfecting surfaces that have been soiled with patient material. These intermediate-level disinfectants include phenolics, iodophors, and chlorine-containing compounds. Because mycobacteria are among the most resistant groups of microorganisms, germicides effective against mycobacteria should be effective against many other bacterial and viral pathogens (*9,38–40,42*). A fresh solution of sodium hypochlorite (household bleach) prepared daily is an inexpensive and effective intermediate-level germicide. Concentrations ranging from 500 to 800 ppm of chlorine (a 1:100 dilution of bleach and tap water or 1/4 cup of bleach to 1 gallon of water) are effective on environmental surfaces that have been cleaned of visible contamination. Caution should be exercised, since chlorine solutions are corrosive to metals, especially aluminum.

Low-level disinfectants — EPA-registered "hospital disinfectants" that are not labeled for "tuberculocidal" activity (e.g., quaternary ammonium compounds) — are appropriate for general housekeeping purposes such as cleaning floors, walls, and other housekeeping surfaces. Intermediate- and low-level disinfectants are *not* recommended for reprocessing critical or semicritical dental instruments.

DISINFECTION AND THE DENTAL LABORATORY

Laboratory materials and other items that have been used in the mouth (e.g., impressions, bite registrations, fixed and removable prostheses, orthodontic appliances) should be cleaned and disinfected before being manipulated in the laboratory, whether an on-site or remote location (*43*). These items also should be cleaned and disinfected after being manipulated in the dental laboratory and before placement in the patient's mouth (*2*). Because of the increasing variety of dental materials used

intraorally, DHCWs are advised to consult with manufacturers regarding the stability of specific materials relative to disinfection procedures. A chemical germicide having at least an intermediate level of activity (i.e., "tuberculocidal hospital disinfectant") is appropriate for such disinfection. Communication between dental office and dental laboratory personnel regarding the handling and decontamination of supplies and materials is important.

USE AND CARE OF HANDPIECES, ANTIRETRACTION VALVES, AND OTHER INTRAORAL DENTAL DEVICES ATTACHED TO AIR AND WATER LINES OF DENTAL UNITS

Routine between-patient use of a heating process capable of sterilization (i.e., steam under pressure [autoclaving], dry heat, or heat/chemical vapor) is recommended for all high-speed dental handpieces, low-speed handpiece components used intraorally, and reusable prophylaxis angles. Manufacturers' instructions for cleaning, lubrication, and sterilization procedures should be followed closely to ensure both the effectiveness of the sterilization process and the longevity of these instruments. According to manufacturers, virtually all high-speed and low-speed handpieces in production today are heat tolerant, and most heat-sensitive models manufactured earlier can be retrofitted with heat-stable components.

Internal surfaces of high-speed handpieces, low-speed handpiece components, and prophylaxis angles may become contaminated with patient material during use. This retained patient material then may be expelled intraorally during subsequent uses (*44–46*). Restricted physical access — particularly to internal surfaces of these instruments — limits cleaning and disinfection or sterilization with liquid chemical germicides. Surface disinfection by wiping or soaking in liquid chemical germicides is *not* an acceptable method for reprocessing high-speed handpieces, low-speed handpiece components used intraorally, or reusable prophylaxis angles.

Because retraction valves in dental unit water lines may cause aspiration of patient material back into the handpiece and water lines, antiretraction valves (one-way flow check valves) should be installed to prevent fluid aspiration and to reduce the risk of transfer of potentially infective material (*47*). Routine maintenance of antiretraction valves is necessary to ensure effectiveness; the dental unit manufacturer should be consulted to establish an appropriate maintenance routine.

High-speed handpieces should be run to discharge water and air for a minimum of 20–30 seconds after use on each patient. This procedure is intended to aid in physically flushing out patient material that may have entered the turbine and air or water lines (*46*). Use of an enclosed container or high-velocity evacuation should be considered to minimize the spread of spray, spatter, and aerosols generated during discharge procedures. Additionally, there is evidence that overnight or weekend microbial accumulation in water lines can be reduced substantially by removing the handpiece and allowing water lines to run and to discharge water for several minutes at the beginning of each clinic day (*48*). Sterile saline or sterile water should be used as a coolant/irrigator when surgical procedures involving the cutting of bone are performed.

Other reusable intraoral instruments attached to, but removable from, the dental unit air or water lines — such as ultrasonic scaler tips and component parts and air/water syringe tips — should be cleaned and sterilized after treatment of each patient in the same manner as handpieces, which was described previously. Manufacturers' directions for reprocessing should be followed to ensure effectiveness of the process as well as longevity of the instruments.

Some dental instruments have components that are heat sensitive or are permanently attached to dental unit water lines. Some items may not enter the patient's oral cavity, but are likely to become contaminated with oral fluids during treatment procedures, including, for example, handles or dental unit attachments of saliva ejectors, high-speed air evacuators, and air/water syringes. These components should be covered with impervious barriers that are changed after each use or, if the surface permits, carefully cleaned and then treated with a chemical germicide having at least an intermediate level of activity. As with high-speed dental handpieces, water lines to all instruments should be flushed thoroughly after the treatment of each patient; flushing at the beginning of each clinic day also is recommended.

SINGLE-USE DISPOSABLE INSTRUMENTS

Single-use disposable instruments (e.g., prophylaxis angles; prophylaxis cups and brushes; tips for high-speed air evacuators, saliva ejectors, and air/water syringes) should be used for one patient only and discarded appropriately. These items are neither designed nor intended to be cleaned, disinfected, or sterilized for reuse.

HANDLING OF BIOPSY SPECIMENS

In general, each biopsy specimen should be put in a sturdy container with a secure lid to prevent leaking during transport. Care should be taken when collecting specimens to avoid contamination of the outside of the container. If the outside of the container is visibly contaminated, it should be cleaned and disinfected or placed in an impervious bag (*49*).

USE OF EXTRACTED TEETH IN DENTAL EDUCATIONAL SETTINGS

Extracted teeth used for the education of DHCWs should be considered infective and classified as clinical specimens because they contain blood. All persons who collect, transport, or manipulate extracted teeth should handle them with the same precautions as a specimen for biopsy (*2*). Universal precautions should be adhered to whenever extracted teeth are handled; because preclinical educational exercises simulate clinical experiences, students enrolled in dental educational programs should adhere to universal precautions in both preclinical and clinical settings. In addition, all persons who handle extracted teeth in dental educational settings should receive hepatitis B vaccine (*6–8*).

Before extracted teeth are manipulated in dental educational exercises, the teeth first should be cleaned of adherent patient material by scrubbing with detergent and

water or by using an ultrasonic cleaner. Teeth should then be stored, immersed in a fresh solution of sodium hypochlorite (household bleach diluted 1:10 with tap water) or any liquid chemical germicide suitable for clinical specimen fixation (*50*).

Persons handling extracted teeth should wear gloves. Gloves should be disposed of properly and hands washed after completion of work activities. Additional personal protective equipment (e.g., face shield or surgical mask and protective eyewear) should be worn if mucous membrane contact with debris or spatter is anticipated when the specimen is handled, cleaned, or manipulated. Work surfaces and equipment should be cleaned and decontaminated with an appropriate liquid chemical germicide after completion of work activities (*37,38,40,51*).

The handling of extracted teeth used in dental educational settings differs from giving patients their own extracted teeth. Several states allow patients to keep such teeth, because these teeth are not considered to be regulated (pathologic) waste (*52*) or because the removed body part (tooth) becomes the property of the patient and does not enter the waste system (*53*).

DISPOSAL OF WASTE MATERIALS

Blood, suctioned fluids, or other liquid waste may be poured carefully into a drain connected to a sanitary sewer system. Disposable needles, scalpels, or other sharp items should be placed intact into puncture-resistant containers before disposal. Solid waste contaminated with blood or other body fluids should be placed in sealed, sturdy impervious bags to prevent leakage of the contained items. All contained solid waste should then be disposed of according to requirements established by local, state, or federal environmental regulatory agencies and published recommendations (*9,49*).

IMPLEMENTATION OF RECOMMENDED INFECTION-CONTROL PRACTICES FOR DENTISTRY

Emphasis should be placed on consistent adherence to recommended infection-control strategies, including the use of protective barriers and appropriate methods of sterilizing or disinfecting instruments and environmental surfaces. Each dental facility should develop a written protocol for instrument reprocessing, operatory cleanup, and management of injuries (*3*). Training of all DHCWs in proper infection-control practices should begin in professional and vocational schools and be updated with continuing education.

ADDITIONAL NEEDS IN DENTISTRY

Additional information is needed for accurate assessment of factors that may increase the risk for transmission of bloodborne pathogens and other infectious agents in a dental setting. Studies should address the nature, frequency, and circumstances of occupational exposures. Such information may lead to the development and evaluation of improved designs for dental instruments, equipment, and personal protective devices. In addition, more efficient reprocessing techniques should be considered in the design of future dental instruments and equipment. Efforts to protect both pa-

tients and DHCWs should include improved surveillance, risk assessment, evaluation of measures to prevent exposure, and studies of postexposure prophylaxis. Such efforts may lead to development of safer and more effective medical devices, work practices, and personal protective equipment that are acceptable to DHCWs, are practical and economical, and do not adversely affect patient care (*54,55*).

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