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# Infection Control OSHA Focus

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## COURSE DESCRIPTION

This course meets and exceeds the minimum requirements for Infection Control in the clinical dental setting for all US state dental boards. Many state dental licensing boards, including the Dental Board of California, require that licensed and non-licensed dental professionals meet minimum requirements of their individual state's laws and regulations in infection control. The goal is for the safety and protection of the public and the dental clinician. Successful completion of this course will fulfill the mandatory requirement for two (2) units of continuing education in infection control for dental license renewal in all states.

This course includes a historic overview of infection control, a review of important terms, discussion of the chain of infection, typical pathogens, discussion about and application of Standard Precautions, sterilization techniques and monitoring of effectiveness, personal protection equipment (PPE), review of bloodborne pathogens, post-exposure protocols and a review of infectious diseases relevant in dentistry.

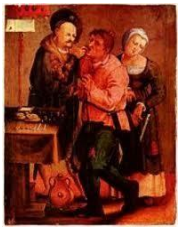
The material in this course is current as per the Centers for Disease Control, 2014-2015 and professional academic resources. This course is suitable for all members of the dental team for license renewal.

## LEARNING OBJECTIVES

- Review important terms and concepts in infection control.
- Know routes of transmission for disease causing microorganisms.
- Know Standard Precaution measures mandated by state and federal guidelines.
- Identify strategies to prevent occupational exposures to bloodborne pathogens.
- Know post-accidental exposure protocols per OSHA.
- Identify Personal Protection Equipment (PPE) for dental personnel.
- Describe various sterilization methods for non-critical, semi and critical instruments and devices.
- Know how to monitor sterilization effectiveness.
- Understand dental office infection control programs.

## INTRODUCTION: THE HISTORY AND FUTURE OF INFECTION CONTROL IN DENTISTRY

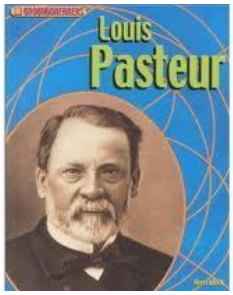
For dental healthcare personnel (DHCP), infection and communicable disease can lead to illness, disability and loss of work time. In addition, patients, family members, and community contacts can become exposed and may become ill or suffer permanent after-effects. Dental office teams must practice stringent infection control protocols or risk liabilities such as OSHA fines, lawsuits, and unacceptable health risks for patients and dental clinicians. Standard precautions for infection control management make sense, because they are based on microbial science and evidence based medical concepts.



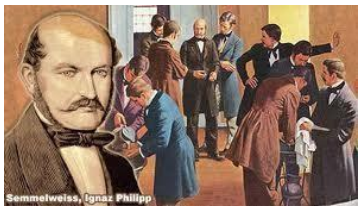
There were no universal precautions or standards for infection control in dentistry until the 19th century when Alcock (1827) and Lister (1860's-1870's) advocated disinfection with chemicals—the first being carbolic acid made from creosote. The importance of hand washing as an important infection control measure was first advocated by Ignaz Semmelweis in 1861. Pasteur's new science of microbiology (1860-1880) and Koch's postulates for infectious disease investigation (1870's-1880s) advanced the understanding of pathogenic microbes and the transmission of disease. The most important advances in infection control really occurred in the 20th century.

Joseph Lister

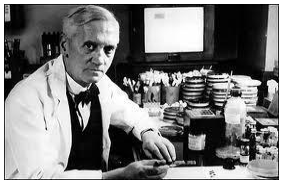
Louis Pasteur




Ignaz Semmelweis




Alexander Fleming



In 1929, Alexander Fleming discovered penicillin, revolutionizing the treatment of simple infections (which were commonly fatal). Since then, many antibiotics have been discovered, and death from dental infections today is a rarity.

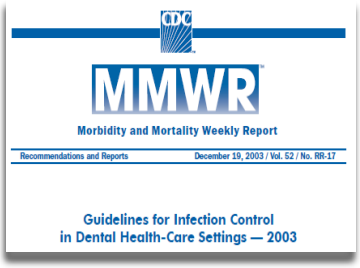
Sterilization techniques for dental instruments improved during the 20th century. In 1950, Appleton was the first to declare that sterilization by heat is the optimum method for sterilizing dental equipment. The AIDS epidemic has had a major influence on infection control practices in all medical and dental settings. Since 1991, Universal Precautions (now referred to as Standard Precautions, such as the application of latex gloves and improved management of infectious waste and sharps), has advanced both patient and clinician in the modern dental office to a much safer place.

## THE FUTURE FOR DENTAL PROFESSIONALS-DENTAL PRACTICE TRENDS

Major changes have occurred in the number and distribution of dental personnel over the past 60 years. We have moved from a model typically comprised of one dentist and one assistant per practice to one with a much larger and more diverse group of personnel. In 1950, there were approximately 155,000 dental personnel, who included dentists, dental hygienists, dental assistants, and other staff (e.g., receptionists, office managers, bookkeepers, sterilization assistants, laboratory technicians). Just over 50% of these individuals were dentists. By 2015, the total number of dental personnel had risen to almost one million, nearly a six-fold increase.

The US Bureau of Labor Statistics Outlook Handbook 2016-2017, indicated the total number of dental professionals currently in practice in a clinical setting as:

| | |
|---|---|
| Dentists | 151,000 |
| Dental Hygienists | 200,500 |
| Dental Assistants | 318,000 |




These statistical numbers tell us that, potentially, over **670,000** dental professionals and patients may be exposed to pathogens when in contact with saliva, blood, aerosols and airborne secretions. The Center for Disease Control and Prevention's 2003 *Guidelines for Infection Control in the Dental Health-Care Setting* is the foundation upon which standardized applications of infection control protocols are used in the US in all healthcare professions. This course uses these guidelines to specifically address dental healthcare setting protocols. The CDC is set to update these Guidelines in 2016. The CDC material is not regulatory, yet some infection control practices are mandated by federal, state or local regulations, or by OSHA and the federal Department of Labor. www.cdc.gov/oralhealth/infectioncontrol/guidelines.

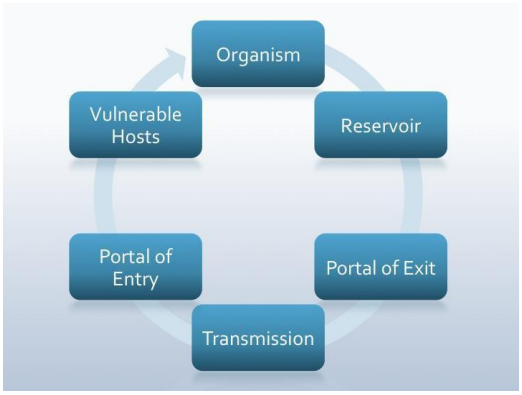
## STANDARD PRECAUTIONS

Medical histories and symptomology, whether written or verbal, physical examinations and laboratory tests may not always reveal the presence of an infectious process, disease, carrier state or pre- symptomatic phases of disease in individuals. Thus, the same infection prevention and standard precaution control protocols should be used for all patients regardless of known or suspected infectious status.
Previous US Centers for Disease Control and Prevention (CDC) infection control recommendations were focused on the risk of transfer of blood-borne pathogens such as HIV and HBV. The term, universal precautions, was used. The all-inclusive term is currently standard precautions.
Standard precautions apply to contact with:

- Blood.
- All body fluids, secretions and excretions (except sweat), regardless of whether they contain blood.
- Non-intact skin.
- Mucous membranes.

## THE INFECTION PROCESS/CHAIN OF INFECTION PRINCIPLES

Infectious processes or the chain of infection is the chain of events required for the spread of infection. The six essential links are represented below:



## *Terms in Chain of Infection*

**Infectious Agent/Pathogen:** A micro-organism that causes infection such as bacteria, viruses, fungi and parasites. There must be an adequate number of pathogens to cause disease.

**Reservoir:** A place where micro-organisms live, such as in humans, animals, soils, food, plants, air or water. In the dental workplace, the most common reservoirs are humans, water, and on dental equipment.

**Portal of Exit:** Mode of escape from a reservoir. Organisms exit through various body systems, such as the respiratory tract or skin lesions. Escape from the blood stream may be through skin abrasions, hypodermic needles or dental instruments.

**Precise Terminology in the Dental Environment:**

**An Item is Clean** if all visible soil (organic and inorganic) debris and OPIM are removed by manually or mechanically using water with detergents or enzymatic products.
**True Sterilization** involves killing all microorganisms including hardy bacterial spores on a surface or instrument.
**Disinfection** lies somewhere in between these two. Disinfection may kill all kinds of disease producing microorganisms but cannot kill bacterial spores.

**Modes of Transmission:**

- Direct contact.
- Indirect contact by an intermediate vehicle, like contaminated hands or hypodermic needles.
- Airborne.

**Portal of Entry:** Mode of entry of an infectious agent into a subsequent host. Examples are broken skin, respiratory tract mucous membranes.
**Susceptible Host:** A host that does not have immunity to an invading infectious agent.

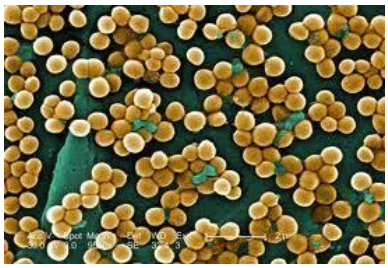
Patients' complete medical and dental records are reviewed to identify specific problems and take necessary precautions.

| FACTORS THAT ALTER NORMAL DEFENSES | EXAMPLES |
|---|---|
| **Abnormal Physical Conditions** | • Defective heart valve. |
| **Systemic Diseases** | • Diabetes mellitus.<br>• Alcoholism.<br>• Leukemia.<br>• Glomerulonephritis.<br>• Acquired immune deficiency.<br>• Various causes of immunosuppression. |
| **Drug Therapy** (Antibiotics may be required to prevent infection) | • Steroids.<br>• Chemotherapeutics. |
| **Prostheses and Transplants** | • Joint replacement.<br>• Cardiac prosthesis.<br>• Organ transplant. |

## AIRBORNE INFECTION

### *Dust-Borne*

Tetanus bacillus



Staphylococcus aureus

Clostridium tetani (tetanus bacillus), Staphylococcus aureus, and enteric bacteria are among organisms that may travel within dust. Airborne organisms can be sources of contamination on dental instruments and on hands of dental personnel. Surface disinfection of all equipment contacted during an appointment may help control dust-borne pathogens.

### *Aerosol Production*

**Aerosols**

A particle of a true aerosol is less than 50 µm in diameter and nearly all are less than 5 µm. Tiny particles may contain respiratory disease-producing organisms or traces of mercury or amalgam that may collect in lungs, because they are not biodegradable.

**Spatter**

These are heavier, larger particles that may remain airborne for a relatively short time because of their weight and size. They drop or spatter on people, objects and floors. Spatter particles are greater than 50 µm. Unlike aerosols, spatter may be visible on skin, hair, clothing or environmental surfaces resulting in gross contamination. Aerosols and spatter are created during breathing, speaking, coughing or sneezing. They are produced during all intraoral procedures, including examination and scaling. When produced by air spray, air-water spray, hand piece activity, or ultrasonic scaling, the numbers of aerosols increase to tremendous proportions.

### *Interruption of Transmission*

Use water that meets EPA regulatory standards and run though all water systems entering patients' mouths, including hand pieces, ultrasonic scalers and air-water syringes. Clean water should run for at least 2 minutes at the start of each day and 20-30 seconds after each patient during the day. Other considerations include:

- Rubber dams which reduce aerosols containing blood and particles.
- Air-control methods to supply adequate ventilation.

## MICROORGANISMS AND PATHOGENS TRANSMISSIBLE BY THE ORAL CAVITY

The human oral cavity microbiological environment is very complex. Many salivary bacteria come from the dorsum of the tongue, but some come from mucous membranes and gingival/periodontal tissues. High total microorganism counts are found in dental biofilm, periodontal pockets, and periapical lesions and in carious lesions. An inadvertent transmission to susceptible patients or to dental clinicians may occur as a result of inappropriate work practices, such as careless handwashing, non-hygienic personal habits or inadequate sterilization and handling of sterile instruments and materials.

## TUBERCULOSIS

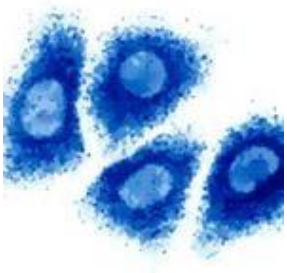
Rates of tuberculosis in the U.S. have declined in recent years, although disparities still exist between U.S. and foreign-born people. Additionally, the number of TB outbreaks among health-care personnel and patients has declined since the implementation of the 1994 Centers for Disease Control and Prevention guidelines to prevent transmission of Mycobacterium tuberculosis. (USAF, 2009).

Symptoms of active tuberculosis disease include a productive cough, night sweats, fatigue, malaise, fever and unexplained weight loss. Although the overall risk of TB transmission in dentistry is likely very low, policies should be in place to help dental team members detect and refer patients with active tuberculosis for immediate medical care. Refer patients requiring urgent dental treatment to a previously identified facility (such as a hospital) with TB engineering controls and a respiratory protection program.

## VIRAL HEPATITIS

Of all types of hepatitis, Hepatitis B remains the greatest threat to dental personnel who are not immunized. The significance of Hepatitis C for dental professionals is as yet undetermined.

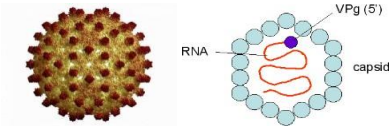
Transmission varies, based on type of hepatitis. Four ways the disease may spread include:



- Infected stool (fecal-oral transmission).
- Infected blood products.
- Other infected bodily fluids, such as semen, vaginal fluids or saliva.
- During delivery of a baby.

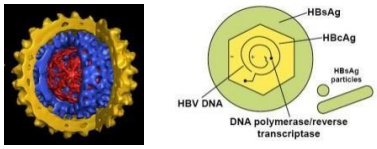
### *Hepatitis A*

Hepatitis A virus (HAV) is a commonly occurring viral hepatitis, with worldwide distribution. It is endemic in most countries. Hepatitis A occurs more frequently in children and young adults and is more severe in adults. The most common transmission is through contact with unsanitary conditions. Unwashed hands of infected persons cause transmission of Hepatitis A through the fecal-oral route of transmission. Hepatitis A is also waterborne and food-borne. Food handlers who are infected can contaminate food before or after cooking. The role of handwashing in prevention of Hepatitis A cannot be overstated.




### *Hepatitis B*

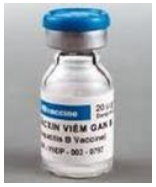
Hepatitis B virus (HBV) is a bloodborne virus of major concern in dental infection control. However, since standard precautions and routine vaccinations for dental workers were adopted, HBV transmission in dental health care settings is rare. There have been no reported transmissions of Hepatitis B from a dental worker to a patient since 1987.




### *Hepatitis B Vaccination, Screening, and Employees*

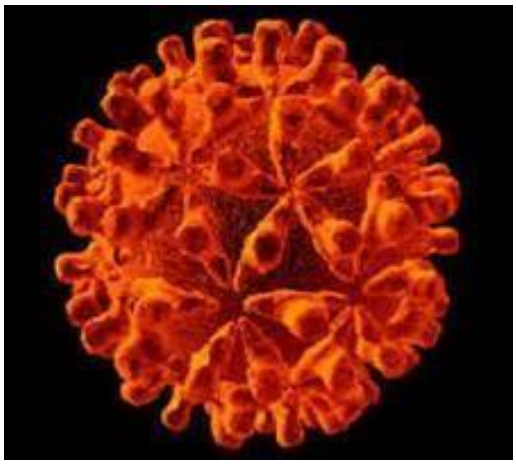
All dental healthcare providers (DCHP) exposed to blood or other potentially infectious materials (OPIM) should receive a Hepatitis B vaccine according to current CDC recommendations and per OSHA regulations.

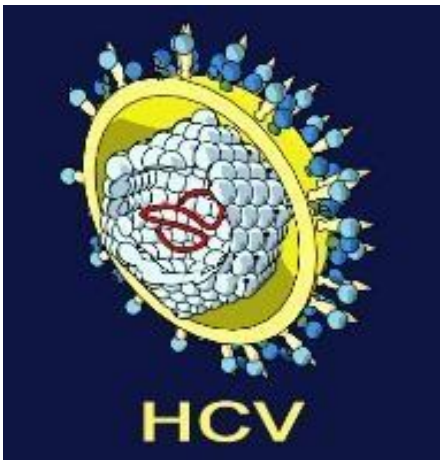
Vaccination (3-dose series) should be followed by an assessment of the Hepatitis B surface antibody to determine vaccination immunogenicity and, if necessary, revaccinate. Federal OSHA regulations require all employees, who may become exposed to certain chemicals or who interact with patients either in the front office or during any aspect of treatment, must be offered a Hepatitis B vaccination within 10 days of employment. Dentists are required to provide the Hepatitis B vaccination to employees at no charge. If an employee declines to receive the vaccination, a form must be signed as proof. If the employee decides later to receive the vaccination, dentists are required to follow the same guidelines. Healthcare personnel who have received a Hepatitis B vaccine and developed immunity to the virus are at virtually no risk for infection. For a susceptible person risk from a single needle stick or cut with exposure to HBV-infected blood ranges from 6-30% and depends on the Hepatitis B antigen (HBeAg) status of the source individual.



### *Hepatitis C*

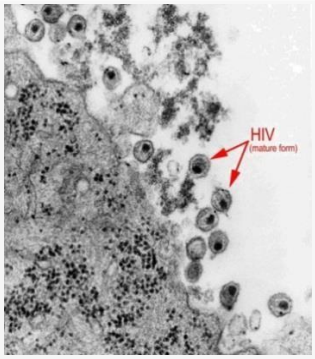
Hepatitis that cannot be classified as Hepatitis A or Hepatitis B is classified as Hepatitis C (HCV) Hepatitis is now recognized as the most common chronic bloodborne infection, and is the most frequent indication for liver transplant. There is no vaccine for Hepatitis C, so behavior modification for risk factors, including strict adherence to standard infection control procedures, is advised. Transmission is through percutaneous exposure to contaminated blood and plasma derivatives, contaminated needles and syringes, transfusion, or through accidental needle sticks. HCV has been demonstrated in saliva. Non-percutaneous routes include sexual transmission and perinatal exposure. Although only 849 cases of confirmed acute Hepatitis C were reported in the United States in 2007, the CDC estimates approximately 17,000 new HCV infections occurred that year (after adjusting for asymptomatic infection and underreporting). People who are newly infected with HCV are usually asymptomatic, so acute Hepatitis C is rarely identified or reported. Approximately 3.2 million people in the United States have chronic HCV infection. Infection is most prevalent among those born between 1945–1965, the majority of whom were likely infected during the 1970s and 1980s when rates were highest (CDC, 2012).





### *HIV/AIDS*

Human immunodeficiency virus (HIV) is the virus that can lead to AIDS. HIV transmission occurs when blood, semen, pre-seminal fluid, vaginal fluid or breast milk from an infected person enters the body of an uninfected person.




This highly magnified transmission electron micrographic (TEM) image revealed the presence of mature forms of the human immunodeficiency virus (HIV) in a tissue sample under investigation. Photo courtesy

HIV can enter the body through a vein (e.g., injection drug use), the lining of the anus or rectum, the lining of the vagina and/or cervix, the opening to the penis, the mouth, other mucous membranes (e.g., eyes or inside the nose) or cuts and sores. Intact, healthy skin is an excellent barrier against HIV and other viruses and bacteria. HIV can be transmitted through receipt of infected blood or blood clotting factors. However, since 1985, all donated blood in the United States has been tested for HIV. Therefore, the risk of infection through transfusion of blood or blood products is extremely low. The U.S. blood supply is considered to be among the safest in the world. Despite the tremendous public health education efforts toward HIV prevention, the number of people with HIV continues to grow, and approximately 56,000 newly diagnosed HIV infections in the US annually (CDC, 2012).

## RECOMMENDED IMMUNIZATIONS FOR DENTAL PERSONNEL

Immunizations substantially reduce both the number of DHCP susceptible to infectious diseases and the potential for disease transmission to other DHCP and patients.
All dental care workers should be adequately immunized against:

- Hepatitis B.
- Measles.
- Mumps.
- Rubella.
- Varicella.
- Influenza.

## DHCP EXPOSURE TO BLOODBORNE PATHOGENS

Reducing bloodborne pathogen exposures helps provide a safe and healthful workplace for dental employers and employees. In addition, reducing exposure can help reduce costs and increase productivity and employee morale.

### *Clinical Frequencies of Transmission*

Percutaneous injuries and blood splashes to the eyes, nose or mouth occur frequently during dental treatment. A study of practicing Canadian dentists reported an average of three percutaneous injuries and mucous-membrane exposures per year. The highest frequencies of percutaneous injuries were reported by orthodontists (4.9 per year) and the highest frequencies of blood splashes to the eyes, nose or mouth were reported by oral surgeons (1.8 per year). In a one-year period, 0.5% of dentists in Canada reported exposure to HIV, and an additional 14% were uncertain if the source patient was HIV zero-positive. Similarly, 0.8% of dentists reported exposure to HBV (15% uncertain) and 1.9% reported exposure to the blood of a high-risk patient (17% uncertain). These frequencies of known exposure to HIV and HBV are likely to be underestimates as a result of uncertainty related to the zero-status of the patient and non-reporting bias (Canadian Dental Association, 2008). Summary of risks of transmission of HBV, HCV and HIV with a contaminated needle are approximately:

| | |
|---|---|
| **30%** | **(HBV) (When the source is e-antigen positive.)-Hepatitis B Virus** |
| **3.0%** | **(HCV)-Hepatitis C Virus** |
| **0.3%** | **(HIV)-Human Immunodeficiency Virus** |

## INFECTION CONTROL: REGULATIONS AND GUIDELINES

### *Occupational Safety and Health Administration (OSHA)*

The Occupational Safety and Health Administration (OSHA) regulate workplace safety in the United States either through federal regulation or state-sponsored OSHA programs. In dentistry, one of the areas addressed by the Bloodborne Pathogens Rule 1 is the use of personal protective equipment (PPE). There are no specific requirements regarding the types of materials used for PPE.

Rather, regulations require employers assess employees' potential for exposure based on procedures performed in a particular practice when selecting appropriate protective attire. The intention of PPE is to prevent workers' skin, eyes, nose, mouths and other mucous membranes from coming into contact with a patient's blood or other potentially infectious materials (OPIM), including saliva. Other requirements include providing PPE in appropriate sizes, replacing when necessary, and maintaining and laundering items as needed. All responsibility for providing and maintaining PPE and ensuring its use lies with the employer. Dentists/employers may not allow employees to decline use of PPE when there are potential risks for exposure. For instance, employers may not allow assistants or hygienists to skip wearing masks during procedures in which there will be spray or spatter.

### *Centers for Disease Control and Prevention (CDC)*

The Centers for Disease Control and Prevention issues guidelines and recommendations on numerous topics, including infection control. The *Guidelines for Infection Control in Dental Health-Care Settings, 2003* explain various types of PPE and provide guidance in use and selection of gloves, gowns, masks and eyewear. In addition, the guidelines address issues such as jewelry, fingernails and the storing and dispensing of hand care products. Although the CDC is not a regulatory agency, guidelines from the CDC often serve as the basis for regulations by federal and state agencies.

## INFECTION EXPOSURE CONTROL IN THE CLINICAL SETTING

### *Blood Exposure: Clinical Considerations*

The CDC guidelines for infection control in dentistry emphasize the importance of Standard Precautions. Standard Precautions include not only blood and body fluids suspected of containing blood, but all body fluids, excretions, and secretions with the exception of sweat. Infection control precautions taken by dental personnel should be consistent for all patients and not based on the infectious status of the patient.

### *Dental Healthcare Personnel (DHCP)*

In dental health-care settings, exposure to blood through percutaneous injury or by contact with mucous membranes of the eye, nose or mouth, or by contact with non-intact skin is the primary method DHCP are exposed to blood-borne pathogens such as HBV, HCV, and HIV. Percutaneous exposures involve the greatest risk for transmission, and include needle-sticks or cuts with contaminated sharp objects. Non-intact skin includes all exposed skin that is chapped, abraded or has dermatitis. The majority of exposures in a dental health-care setting are preventable by using:

### *Personal Protection Equipment (PPE)*

PPE is a major component of Standard Precautions. Exposure control refers to protection from exposure to infectious agents for dental personnel and patients.

### *Engineering Controls*

Engineering controls are technology-based safer designs for equipment and devices intended to reduce percutaneous exposure. Examples: needle guards, self-sheathing anesthetic needles, dental units designed to shield burs on hand pieces.

### *Work-Practice Controls*

Work-practice controls are those practices established to avoid handling, using, assembling or cleaning contaminated sharp instruments, equipment or appliances and the use of sharps containers. Sharps include all needles, scalers, laboratory knives, burs, explorers and endodontic files and reamers.


## PERSONAL PROTECTION EQUIPMENT (PPE) FOR THE DENTAL TEAM

The continuing health and productivity of DHCP depend on control of cross-contamination. Loss of work time, personal suffering, long-term systemic effects and even exclusion from continued practice in dentistry are possible results from communicable disease. The ONLY safe practice is to act defensively at all times, in a professional manner using specific personal protection precautions. PPE is designed to protect skin and the mucous membranes of the eyes, nose, and mouths of dental personnel from exposure to blood or other potentially infectious material. OSHA mandates that dental health care workers wear gloves, surgical masks, protective eyewear and protective clothing in specified circumstances to reduce the risk of exposure to bloodborne pathogens.

### *Clinical Attire*

Clinicians and assistants are vulnerable to exposure and contamination from splash, spatter, aerosols and patient contact. Recommended uniforms are designed in a manner that minimizes contamination. Various types of protective clothing (e.g., gowns, jackets) are worn to prevent contamination of street clothing and to protect dental personnel from exposure to blood and body fluids.

When gowns are worn as personal protective equipment (i.e., when spatter and blood spray, saliva or other potentially infectious material are anticipated), sleeves should be long enough to protect forearms. Protective clothing should be changed daily or more often if visibly soiled. Personnel should remove protective clothing before leaving work areas.

### *Gowns/Uniforms*

Gowns or uniforms are expected to be clean and maintained as free as possible from contamination. Clinical clothing over street clothes is not recommended because of exposure to infectious material while seeing patients. Commercial laundering services are preferred for gowns or uniforms. If laundering at home, separate gowns/uniforms from personal clothing. Wash with hot water and bleach. Exercise great diligence. Gowns/uniforms should have:

- Solid closed fronts.
- Length enough to cover arms and legs.
- No pockets.

### *Use of Face Mask and Respiratory Protection*

Basic personal protection is composed of a face mask, protective eyewear and gloves. Face masks are put on first. Protective eyewear is placed second. Hands are washed prior to gloving. Dental health-care personnel should wear a surgical mask that covers both their nose and mouth during procedures and patient-care activities that are likely to generate blood or body fluid splashes or sprays. When a surgical mask is used, it should be changed between patients or during patient treatment if it becomes wet.

The ideal mask:

- Has no contact with nostrils or lips.
- Has a high bacterial filtration efficiency rate.
- Fits snugly around the entire edge.
- Does not fog eyewear.
- Is convenient to put on and remove.
- Is made of non-irritating, non-allergic material.
- Does not collapse during wear.
- Is easily disinfected.

### *Protective Eyewear*

Eye protection for DHCP and patients is necessary to prevent physical injuries and eye infections. Protective eyewear is worn for all procedures. Protective eyewear for patients is also strongly recommended.

### *Hand Hygiene*

Hand hygiene is a general term that applies to routine hand washing, antiseptic hand wash, antiseptic hand rub or surgical hand antisepsis.

### *Hand Washing Principles*


Hand hygiene substantially reduces potential pathogens on the hands and is considered a primary measure for reducing the risk of transmitting organisms to patients and dental

health care personnel. Indications for hand hygiene include the following:

- Before and after treating each patient (e.g., before glove placement and after glove removal).
- After barehanded touching of inanimate objects likely to be contaminated by blood, saliva or respiratory secretions.
- Before leaving the dental operatory.
- When hands are visibly soiled.
- Before re-gloving, and after removing gloves that are torn, cut or punctured.

For oral surgical procedures, perform surgical hand antisepsis before donning sterile surgical gloves.

### *Methods of Hand Washing*

| Methods | Agent | Area | Minimum Duration |
|---|---|---|---|
| **Routine Hand Wash**  | Water and non-antimicrobial soap (i.e., plain soap). | All surfaces of the hands and fingers. | 15 seconds. |
| **Antiseptic Hand Wash**  | Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan). | All surfaces of the hands and fingers. | 15 seconds. |
| **Antiseptic Hand Rub**  | Alcohol-based hand rub. | All surfaces of the hands and fingers. | Until the hands are dry. |
| **Surgical Antisepsis**  | Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan). | Hands and forearms. | 2–6 minutes. |

## GLOVES AND GLOVING

Dental professionals wear gloves to prevent contamination of their hands when touching mucous membranes, blood, saliva or other potentially infectious materials and to reduce the likelihood that microorganisms on their hands will be transmitted to patients during dental patient-care procedures. Wearing gloves does not replace hand washing. Personnel should wash their hands immediately before donning gloves. If the integrity of a glove is compromised (e.g., if the glove is punctured), the glove should be changed as soon as possible. Exposure to glutaraldehyde, hydrogen peroxide and alcohol preparations may weaken latex, vinyl, nitrile and other synthetic glove materials. Other chemicals associated with dental materials that may weaken gloves include acrylic monomer, chloroform, orange solvent, eugenol, cavity varnish, acid etch, and dimethacrylates. Because of the diversity of dental materials on the market, glove users should consult glove manufacturers about compatibility of glove material with various chemicals.

## *Glove Types and Indications*

| Glove Type | Indications | Comments | Common Glove Materials |
|---|---|---|---|
| **Patient Examination Gloves**<br>  <br>  | Examinations and other nonsurgical procedures involving contact with mucous membranes; laboratory procedures. | Medical device regulated by the FDA.<br>Non-sterile and sterile, single-use disposable. Use for one patient and discard appropriately. | Natural rubber latex.<br>(NRL) Nitrile.<br>Polyvinyl chloride (vinyl) and other synthetics.<br>Polyethylene (plastic). |
| **Surgeon's Gloves**<br>  | Surgical procedures. | Medical device regulated by the FDA.<br>Sterile and single-use disposable. Use for one patient and discard appropriately. | Natural rubber latex (NRL)<br>Nitrile.<br>Combinations of latex and/or synthetics. |
| **Non-Medical Gloves**<br>  | Housekeeping procedures (e.g., cleaning and disinfection).<br>Handling contaminated sharps or chemicals.<br>Not for use during patient care. | Not a medical device regulated by the FDA.<br>General purpose utility gloves that are puncture or chemical resistant.<br>Sanitize after use. | NRL and nitrile or chloroprene blends.<br>Neoprene.<br>Nitrile.<br>Butyl Rubber. |

## *Contact Dermatitis and Latex Hypersensitivity*

Occupationally related contact dermatitis can develop from frequent and repeated use of hand hygiene products, exposure to chemicals and glove use. Contact dermatitis is classified as either irritant or allergic. Irritant contact dermatitis is common, non-allergic, and develops as dry, itchy, irritated areas on the skin around the area of contact. Latex allergy (type I hypersensitivity to latex proteins) can be a more serious systemic allergic reaction. It usually begins within minutes of exposure but can sometimes occur hours later. It produces varied symptoms which commonly include runny nose, sneezing, itchy eyes, scratchy throat, hives and itchy burning sensations. However, it can involve more severe symptoms including asthma marked by difficult breathing, coughing spells, and wheezing; cardiovascular and gastrointestinal ailments; and in rare cases, anaphylaxis and death.

### *Categories of Glove-Associated Skin Reactions*

| | Irritant Contact Dermatitis | Allergic Contact Dermatitis (Type IV [delayed] Hypersensitivity) | Latex Allergy (Type I [immediate] Hypersensitivity or NRL-protein allergy) |
|---|---|---|---|
| **Causative Agents** | Toxic chemicals (e.g., biocides, detergents); excessive perspiration; irritating chemicals used in hand products and in glove manufacture. | Accelerators and other chemicals used in glove manufacture; sterilants and disinfectants (e.g. glutaraldehyde); bonding agents (e.g. methracrylates); local anesthetics. | Latex proteins from Hevea brasiliensis (rubber tree). |
| **Reactions** | Skin reactions usually confined to the area of contact. | Skin reactions usually confined to the area of contact. | Skin and systemic reactions can occur as soon as 2–3 minutes, or as long as several hours after skin or mucous membrane contact with the protein allergens. |
| | **Acute:** Red, dry, itchy irritated areas. | **Acute:** Red, dry, itchy irritated areas. | **Acute:** Hives, swelling, runny nose, nausea, abdominal cramps, dizziness, low blood pressure, bronchospasm, anaphylaxis (shock). |
| | **Chronic:** Dry, thickened skin, crusting, deep painful cracking, scabbing sores, peeling. | **Chronic:** Dry thickened skin, crusting, scabbing sores, vesicles, peeling (appears 4–96 hours after exposure). | **Chronic:** As above, increased potential for extensive, more severe reaction. |

Patients with a latex allergy should not have direct contact with latex containing materials and should be treated in a "latex safe" environment. Such patients also may be allergic to the chemicals used in manufacturing natural rubber latex gloves, as well as to metals, plastics, or other materials used to provide dental care.

## TREATMENT ROOM FEATURES

Notable features for a treatment room which is ideally planned for infection control are included in this section. The design of many treatment rooms may not be conducive to infection control. Renovation plans and design should reflect the most advanced knowledge and design available with respect to safety and disease control. The objective is to include materials, shapes, and surface textures that facilitate effective use of infection control measures:

- Design for easy cleaning and disinfection; smooth and uncluttered surfaces.
- Removable hoses that can be cleaned and disinfected.
- Syringes with autoclavable tips or fitted for single use, disposable tips.
- No carpeting.
- All foot-operated controls for chairs, lights and dental units.

- Avoid upholstery.
- Sink should be made of a smooth material like stainless steel.
- Water faucets and soap dispensers should be automatic.
- All supplies should be sterilizable or disposable.
- Sharps and biohazard disposal should be convenient and available.

### *Barrier Protection*

Clinical contact surfaces and equipment can be protected from contamination using barrier protection. Barrier protection is particularly effective for clinical contact surfaces that are difficult to clean and disinfect due to surface topography or material chemical incompatibilities. Barrier protection materials include:

- Clear plastic wrap.
- Plastic bags.
- Plastic sheets.
- Plastic tubing.
- Plastic-backed paper.
- Other materials impervious to moisture.

Barriers become contaminated during patient care. Using gloves, barriers should be removed and discarded between patients. After removing barriers, clinical contact surfaces should be examined for contamination. Surfaces should be cleaned and disinfected. After removing barriers, gloves should be removed, hand hygiene should be performed and clean barriers should be placed prior to the next patient treatment.

## SHARPS

Contaminated sharps must be placed immediately (or as soon as possible after use) in sharps disposal containers. Sharps containers must be labeled and easily accessible to employees. They must be located as close as feasible to the immediate area where the sharps are used or can be reasonably anticipated to be found (e.g., dental operatory).


Sharps containers must be:

- Rigid.
- Closeable and sealable.
- Puncture resistant.
- Leak proof.
- Portable.
- Kept in an upright position.
- Closed immediately prior to their removal or replacement.
- Placed in a secondary container if leakage is possible.
- Replaced as needed to prevent overfilling.

## INSTRUMENT PROCESSING

All instrument cleaning, disinfecting and sterilizing should occur in a designated central processing area in order to more easily control quality and ensure safety. The instrument processing area should be physically divided into sections:

- Receiving.
- Cleaning.
- Decontamination.
- Preparation and packaging.
- Sterilization.
- Storage.

### *Cleaning Procedures*

Cleaning should precede all disinfection and sterilization processes. Cleaning involves the removal of debris (organic or inorganic) from an instrument or device. If visible debris is not removed, it will interfere with microbial inactivation and can compromise the disinfection or sterilization process. Dental instruments are classified into three categories depending on the risk of transmitting infection.

**Critical Instruments:** Used to penetrate soft tissue or bone, or enter into or contact the bloodstream or other normally sterile tissue. They should be sterilized after each use. Sterilization is achieved by steam under pressure (autoclaving), dry heat or heat/chemical vapor. Critical instruments include forceps, scalpels, bone chisels, scalers and surgical burs.

**Semi-Critical Instruments:** Do not penetrate soft tissues or bone but contact mucous membranes or non-intact skin. These devices also should be sterilized after each use. In some cases, sterilization is not feasible and therefore, high-level disinfection is appropriate. Instruments include mirrors, reusable impression trays and amalgam condensers.

**Non-Critical Instruments:** Come into contact only with intact skin such as external components of x-ray heads, blood pressure cuffs and pulse oximeters. Such devices have a relatively low risk of transmitting infection and may be reprocessed between patients by intermediate- level or low-level disinfection.

### *Exposure Prevention and Personnel Safety per CDC and OSHA*

The Centers for Disease Control and Prevention (CDC) states that, “Contaminated instruments should be handled carefully to prevent exposure to sharp instruments that can cause percutaneous injury. Instruments should be placed in an appropriate container at the point of use to prevent percutaneous injuries during transport to the instrument processing area.”

In addition, the Occupational Safety and Health Administration (OSHA) says, “The person handling instruments through removal, cleaning, packaging and sterilization needs to use heavy-duty gloves to help prevent injury with sharp, contaminated instruments.”

### Manual Cleaning/Pre-Soaking

If manual cleaning is not performed immediately, instruments should be placed into containers and soaked with a detergent, a disinfectant/detergent or an enzymatic cleaner to prevent drying of infectious material and to make manual cleaning easier and less time consuming. Mechanically cleaning instruments rather than hand scrubbing them should minimize instrument handling. If hand scrubbing is necessary, heavy-duty (utility) gloves, mask, eyewear and gowns should always be worn. Minimize the risk of puncture injury by scrubbing only one instrument at a time while holding it low in the sink. Locked cassettes eliminate the need to sort, handle and hand scrub individual instruments.

## *Mechanical Cleaning Devices*

### Ultrasonic Cleaners

Ultrasonic cleaners employ sound waves in a chamber of liquid to create cavitation. When the cavitation comes into contact with the instruments, it dislodges debris. Although more study is needed, there is some evidence that ultrasonic cleaners may be more effective in cleaning small items with complex shapes, such as endodontic files, than are washer/disinfectors.

### Instrument Washers

Instrument washers use high-velocity hot water and a detergent to clean instruments. Widely used for decades in hospitals and large facilities as part of the central sterilization process, these devices have recently become available for the dental office.

### Instrument Examination and Care

Cleaning instruments provides a good opportunity to examine, replace or remove damaged instruments; lubricate items such as hand pieces; and otherwise prepare instruments for sterilization. Instruments must be dry before packaging. If drying is not part of the cleaning process, time must be taken to dry instruments completely. High-quality, metal dental cassettes specially designed to withstand high temperatures are preferred for use with steam and chemical vapor sterilizers. Most sterilizers on the market today offer a cassette rack which helps to prevent over-loading in the sterilizer, thereby reducing the risk of ineffective sterilization and ultimately of infection and cross-infection.

**Packaging**

Packaging materials (wrapped or container systems) allow penetration of sterilization agents and maintain sterility of processed items after sterilization. Materials for maintaining sterility of instruments during transport and storage include wrapped, perforated instrument cassettes, peel pouches of plastic or paper, and sterilization wraps (which can be either woven or unwoven). A chemical indicator/integrator should be placed among instruments, inside the package, as well as on the outside of each package.

### *Types and Use of Sterilization Packaging Materials*

| Sterilization Method | Packaging Material Requirements | Acceptable Materials |
|---|---|---|
| **Steam Autoclave** | • Should allow steam to penetrate. | • Paper.<br>• Plastic.<br>• Cloth.<br>• Paper peelpackages.<br>• Wrapped perforated cassettes. |
| **Dry Heat** | • Should not insulate items from heat.<br>• Should not be destroyed by temperature used. | • Paper bags.<br>• Polyfilm plastictubing.<br>• Wrapped perforated cassettes. |
| **Unsaturated Chemical Vapor** | • Vapors should be allowed to precipitate on contents.<br>• Vapors should not react with packaging material.<br>• Plastics should not contact sides of sterilizer. | • Wrapped perforated cassettes.<br>• Paper.<br>• Paper peelpouches. |

## STERILIZATION

Time, pressure and temperature vary according to the type of sterilizer, materials being sterilized and individual models within sterilizer brands. Sterilizers are medical devices requiring clearance by the Food and Drug Administration before manufacturers may offer them for sale. The FDA requires rigorous testing to ensure an adequate margin of safety in each cycle type described in instructions.

### *Moist Heat: Steam under Pressure/Steam Autoclave*

Steam autoclaves are the most commonly used type of heat sterilizer in dental practices. Two processes employ steam under pressure.

The difference between them is the manner in which the machine evacuates air from the sterilization chamber and then how it introduces steam. A typical cycle for wrapped instruments includes heat-up and pressurization time, followed by a 15-to-30-minute cycle during which sterilization is takes place (121°C at 15 psi). Sterilization cycle time decreases as temperature increases. It is important to use cycle times and temperatures described in the owner's manual. Never interrupt sterilization cycles to remove or add items or for any other reason. Interruption of a cycle will result in unsterile instruments not safe for use on patients. The unit must only be opened only after completion of the drying cycle. Upon removal from the sterilizer, sterile packs must be stored in a clean, dry area. Packs that become wet, torn, contaminated or otherwise compromised require re-sterilization.

### *Dry Heat: Convection and Static Air*

Dry-heat sterilization employs high temperatures for extended periods to achieve instrument sterilization. The method of heat circulation in dry-heat sterilizers is usually convection which helps ensure heat circulation throughout the sterilization chamber. Mechanical convection is more effective. A mechanical convection sterilizer chamber contains a fan or blower that continually circulates heated air to maintain a uniform temperature throughout. Most commercially available dry-heat sterilizers on the market today are of this type. Higher temperatures in dry-heat sterilizers mean that paper will scorch and plastic will melt. Specialized packaging materials are available for dry-heat sterilizers. Most hand pieces will not tolerate a dry-heat sterilizer.

### *Chemical Vapor Sterilizer*

Unsaturated chemical vapor sterilization relies upon use of a proprietary chemical that contains formaldehyde, alcohol and other inert ingredients instead of water to produce vapor to promote sterilization. Use of this proprietary chemical also results in less humidity and less corrosiveness to sensitive instruments than if water were used.

### *Sterility Assurance*

### *Operator Error*

Most sterilizers have a system which notifies operators of mechanical malfunctions, but sterilizers cannot notify the operator whether or not the contents of the instrument packs or cassettes are sterile. Operator error while loading sterilizers could result in failure to sterilize all the packs in spite of the proper time, temperature and/or pressure. It is important to avoid overloading the sterilizer or loading packs and cassettes on top of one another; use of a cassette system helps to reduce operator error due to overloading.

## Chemical Indicators

Chemical indicators indicate the presence of certain conditions during the sterilization cycle, such as the presence of heat and steam. There are five classifications of indicators recognized by the FDA, and it is important to note it is recommended that all packs or cassettes include internal and external indicators.


Class 1


Class 2


Class 3


Class 4


Class 5

## Class 1-Process Indicators

These are placed on the outside of packs and are useful in determining which packs have been properly processed versus those that have not. Class 1 process indicators include autoclave tape and the color change indicators embedded on the outside of sterilization packaging materials.

## Class 2-Bowie-Dick Indicators

These show pass/fail in pre-vacuum sterilizers. This test is conducted daily with the chamber empty, during the first cycle of the sterilizer, and is available as a kit from commercial sterilization monitoring companies.

## Class 3-Temperature-Specific Indicators

These react to one of the critical parameters of sterilization and indicate exposure to a specific value such as temperature or psi.

## Class 4-Multi-Parameter Indicators

These react to two or more of the critical parameters in the same manner as Class 3 indicators.

## Class 5-Integrating indicators

These are designed to react to all critical parameters of sterilization cycles. When used properly, integrating indicators may serve as the basis for the release of processed items, excluding implants. It is important to follow the manufacturer's specific instructions for use regarding a test challenge pack.

### *Biological Monitoring*

The use of biological monitors (spore tests) is the most reliable method to validate that the sterilizer is functioning and that the instrument sterilization is effective. These monitors consist of paper strips or vials impregnated with bacterial spores that are specifically resistant to the sterilization process. New spore tests have been developed that enable completion of biological monitoring in-office and yield results in as little as 24 hours. These tests allow quick remediation and validate proper infection control procedures without a long lag time (during which the sterilization procedure may have become ineffective but is not known. It is recommended that biological monitoring be conducted at least weekly and with every load that includes an implantable device.

### *Care of Sterile Instruments*

Sterile items and disposable (single-use) items should be stored in an enclosed storage area (e.g., cabinet or drawer). Dental supplies and instruments should not be stored under sinks or in other locations where they might become wet. Sterilized items should remain wrapped until they are needed for use. Unwrapped items are susceptible to contamination. Avoid storing items loose in drawers or cabinets because unwrapped items cannot be kept sterile. Items stored in this manner are subject to contamination from dust, aerosols generated during treatment, and the hands of personnel who must handle them.

Sterilized instruments should be stored in a manner that preserves the integrity of the packaging material. Storage practices can be either date-or event-related. Although some facilities continue to date every sterilized package and use shelf-life practices (first in, first out), other facilities have switched to event-related practices.

This approach recognizes that the product should remain sterile until some event causes the item to become contaminated (e.g., a package becomes torn or wet). The quality of the packaging material, the conditions under which items are stored and transported and how much they are handled all affect package sterilization integrity. All packages containing sterile items should be inspected before use to verify barrier integrity and dryness. Any package that is wet, torn, dropped on the floor or damaged in any way should not be used. The instruments should be re-cleaned, packaged in new wrap and sterilized again.

****My Dental CE does not have any commercial interest, nor do we accept payment from commercial suppliers, for any dental product used in the sterilization process. Photos used with permission and are included for illustrative purposes only and does not constitute a product endorsement.****

## Chemical Disinfectants

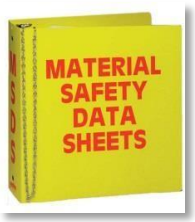
Chemical disinfectants are used on clinical contact surfaces that come in contact with contaminated instruments, devices, hands, or gloves. Examples of clinical contact surfaces include light handles, switches, reusable containers of dental materials, countertops and telephone handles. Use barriers to protect these surfaces from contamination during treatment or clean and disinfect them between patients.

## *Safe Use of Chemical Disinfectants*

- Read and follow label instructions.
- Read and maintain copies of Material Safety Data Sheets (MSDS).
- Don appropriate Personal Protective Equipment (PPE), usually heavy duty gloves, face mask and protective apparel.

## *Material Safety Data Sheets*

All chemical products should have a Material Safety Data Sheet (MSDS) that details types of hazardous exposures associated with a product (e.g. damage to eyes, ingestion hazard, skin irritation, etc.), and the appropriate protective measures. Many materials used in the manufacture of medical gloves will not protect against chemical exposures.




## *Overview of Chemical Disinfectants Used in Dentistry*

## *(CDC, 2008)*

### Alcohol

In the healthcare setting, “alcohol” refers to two water-soluble chemical compounds: ethyl alcohol and isopropyl alcohol—that have germicidal characteristics. FDA has not cleared any liquid chemical sterilants or high-level disinfectants that list alcohol as the main active ingredient. These alcohols are rapidly bactericidal rather than bacteriostatic against vegetative forms of bacteria; they also are tuberculocidal, fungicidal and virucidal but do not destroy bacterial spores.

### Chlorine and Chlorine Compounds

Hypochlorite, the most widely used of the chlorine disinfectants, is available as liquid (calcium hypochlorite). Most chlorine products in the United States are aqueous solutions of 5.25–6.15% sodium hypochlorite, usually called household bleach. They have a broad spectrum of antimicrobial activity, do not leave toxic residues, are unaffected by water hardness, are inexpensive and fast acting, remove dried or fixed organisms and biofilms from surfaces and have a low incidence of serious toxicity. Disadvantages include corrosiveness to metals in high concentrations (>500 ppm), inactivation by organic matter, discoloring or “bleaching” of fabrics, release of toxic chlorine gas when mixed with ammonia or acid.

### Formaldehyde

Formaldehyde is used as a disinfectant and sterilant in both its liquid and gaseous states. Formaldehyde is sold, and principally used, as a water-based solution called formalin, which is 37% formaldehyde by weight. The aqueous solution is a bactericide, tuberculocide, fungicide, virucide and sporicide. OSHA indicates formaldehyde should be handled in the workplace as a potential carcinogen and has set an employee exposure standard for formaldehyde that limits an 8-hour time-weighted average exposure concentration to 0.75 ppm.

### Glutaraldehyde

Glutaraldehyde is a saturated dialdehyde that has gained wide acceptance as a high-level disinfectant and chemical sterilant. Aqueous solutions of glutaraldehyde are acidic and generally not sporicidal. Only when solutions are “activated” (made alkaline) by alkalinizing agents to pH 7.5–8.5 does glutaraldehyde become sporicidal. Once activated, these glutaraldehyde solutions have a shelf-life of 14 days or more, because glutaraldehyde molecules polymerize at alkaline pH levels.

### Iodophors

Iodine solutions or tinctures long have been used by health professionals primarily as antiseptics on skin or tissue. Iodophors, on the other hand, have been used both as antiseptics and disinfectants. The FDA has not cleared any liquid chemical sterilant or high-level disinfectants with iodophors as the main active ingredient.

### Quaternary Ammonium Compounds

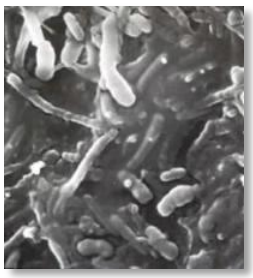
Quaternary ammonium compounds are widely used as disinfectants. EPA-registered quaternary ammonium compounds are appropriate to use for disinfecting medical equipment that contacts intact skin (e.g., blood pressure cuffs). The quaternaries are commonly used on noncritical surfaces, such as floors, furniture, and walls.

### *Properties of an Ideal Chemical Disinfectant*

- Broad spectrum.
- Fast acting environmental factors; active in the presence of organic matter.
- Non-toxic.
- Surface compatibility, non-corrosive.
- Residual anti-microbial effects.
- Odorless.
- Economical.
- Soluble in water.
- Good cleaning properties.
- Environmentally friendly.

## Dental Unit Waterlines

Dental unit waterlines (DUW) (i.e., narrow-bore plastic tubing that carries water to hand pieces, air/water syringes and ultrasonic scalers) can become heavily colonized with waterborne microorganisms, including bacteria, fungi and protozoa. This bacterial aggregation is called biofilm. However, DUWs are not a conducive environment for bacterial floral commonly found in the oral cavity.



High numbers of these opportunistic microorganisms are not necessarily dangerous to the general population, unless the DHCP or patient is a susceptible host. Susceptible hosts would include DHCP or patients who are immune-compromised (those living with HIV and people undergoing oncology treatment or organ transplantation procedures), those with cystic fibrosis, chronic bronchitis and bronchiectasis. The potential risk of infection from DUW microorganisms can be reduced to counts equivalent to potable water standards (i.e., less than 500 cfu/ml) by following regular waterline maintenance procedures. These procedures are as follows:

- Waterline heaters should not be used with a dental unit or in dental equipment, as they encourage waterline microorganism growth.
- All waterlines should be purged at the beginning of each workday by flushing lines thoroughly with water for at least 2-3 minutes. Purging should be done with hand pieces, air/water syringe tips and ultrasonic tips not attached to waterlines.
- Hand pieces utilizing water coolant should be run for 20-30 seconds after patient care, in order to purge all potentially contaminated air and water.
- Sterile water or sterile saline should be used when irrigating open vascular sites and whenever bone is cut during invasive surgical procedures.

Several dental devices contact mucous membranes and expel air and water into the patient's mouth and potentially into open wounds. These devices are attached to dental unit air or waterlines and include:

- High- and low-speed hand pieces, including low-speed motors.
- Prophylaxis angles.
- Ultrasonic and sonic scaling tips.
- Ultrasonic and sonic endodontic devices.
- Air abrasion devices.
- Air and water syringe tips.

## Occupational Accidental Exposure Management

### *Percutaneous Injury*

Exposure to blood or saliva by percutaneous injury is the greatest risk for acquiring a blood-borne pathogen in the dental health-care setting. Every effort should be made by all DHCP to avoid percutaneous injury. Significant exposures should be dealt with immediately. A significant exposure exists whenever any of the following events occur:

- Percutaneous injury, where DHCP skin is punctured.
- Blood, saliva or other body fluid is splashed onto non-intact skin (dermatitis, cuts or abrasions).
- Blood, saliva or other body fluid is splashed onto mucosa of the eyes, mouth or nose.

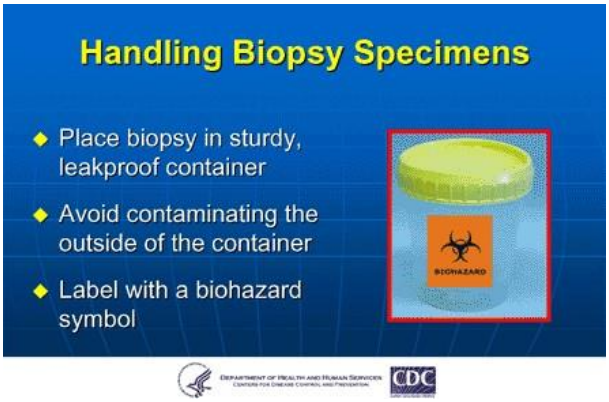
The steps in managing a significant exposure are:


- Remove gloves or immediate clothing to assess the extent of the injury.
- First-aid should be administered for percutaneous exposures (if necessary).
- Immediately wash the area including the puncture or wound using antimicrobial soap and water. Exposed eye, mouth or nose mucosa should be flushed with copious amounts of water. The application of caustic agents such as bleach or the injection of antiseptic agents into wounds is not advisable.
- Report the injury to the Office Infection Prevention and Control Officer.

## Biohazardous Material

### *Biopsy Specimens*

Biopsy specimens should be placed in sturdy, leak-proof containers with a secure lid for transportation. DHCP should take care when collecting specimens to avoid contaminating the outside




of containers. If the outside of the container becomes, or is suspected to be contaminated, it should be cleaned and disinfected or placed in an impervious bag prior to transportation. Local state regulations may require a biopsy container to be labeled with the biohazard symbol during storage, transport, shipment and disposal.

### *Extracted Teeth*

Extracted teeth may be returned to patient without any special considerations for infection prevention and control. Extracted teeth that are being discarded should be handled carefully and disposed in general waste. Extracted teeth sent to a dental laboratory for shade or size comparisons should be cleaned and surface-disinfected with a hospital-grade tuberculocidal intermediate-level disinfectant. Extracted teeth containing dental amalgam should not be placed in waste containers that are subsequently incinerated. (CDA, 2008) Medical waste of concern requires special storage, handling, neutralization and disposal, according to state regulations. Such waste includes:

- Solid waste soaked or saturated with blood or saliva.
- Surgically removed hard or soft tissue (not including extracted teeth).
- Contaminated sharp items (e.g., needles, scalpel blades, wires).

All containers with blood or saliva (e.g., suctioned fluids) may be safely poured into a utility sink, drain or toilet, which drains into a sanitary sewer system or septic tank. DHCP should wear appropriate PPE during this task.

## Dental Prostheses and the Dental Laboratory

Dental prostheses, appliances or impressions brought into the laboratory may be contaminated with microorganisms. Dental prostheses, impressions, orthodontic appliances and other prosthodontic materials (e.g., occlusal rims, temporary prostheses, face bow forks or bite registrations) should be thoroughly cleaned of all debris, disinfected with a hospital-grade tuberculocidal intermediate-level disinfectant and thoroughly rinsed before being handled in the in-office laboratory or sent to an off-site laboratory. Cleaning and disinfection should be done as soon as possible after removal from the patient's mouth and before drying of blood or other organic debris occurs. “Wet” impressions or appliances should be placed in an impervious bag prior to transportation to an off-site laboratory. Dental laboratory staff should wear appropriate PPE (mask, gloves and protective eyewear) until cleaning and disinfection is completed.

## Lasers and Thermal Tissue Changes

Thermal destruction of tissue during procedures that use a laser or electrosurgical unit creates a smoke by-product which may contain viable microorganisms. Lasers transfer electromagnetic energy into tissue resulting in the release of a heated plume that includes particles, gases (e.g., hydrogen cyanide, benzene and formaldehyde), tissue debris, viruses and offensive odors. DHCP should use work practice and engineering controls to avoid inhaling or otherwise coming in contact with laser and electrosurgical plumes and surgical smoke. These practices include using:

- Standard Precautions (e.g., high-filtration surgical masks and possibly full face shields).
- Central room suction units with in-line filters to collect particulate matter from minimal plumes.
- Dedicated mechanical smoke exhaust systems with high-efficiency filters to remove substantial amounts of laser plume particles.

## Summary of Infection Control Program Principles

The goal of a dental infection-control program is to provide a safe treatment environment for patients and a safe working environment for DHCP. This is accomplished by reducing the risk of health-care associated (nosocomial) infections in patients and occupational exposures in DHCP. Errors in infection prevention and control practices are caused by faulty systems, processes and conditions that lead DHCP to make mistakes or fail to prevent errors being made by others. Effective program evaluation is a systematic way to ensure procedures are useful, feasible, ethical and accurate.

Program evaluation is an essential organizational practice. A successful infection prevention and control program depends on developing standard operating procedures, evaluating practices, routinely documenting adverse outcomes (e.g., occupational exposures to blood) and work-related illnesses in DHCP and monitoring health-care associated infections in patients. Strategies and tools to evaluate the infection-control program can include:

- Periodic observational assessments.
- Checklists to document procedures.
- Routine review of occupational exposures to blood-borne pathogens.

## FAQs | CDC Information Links

Bead Sterilizer

Bloodborne Pathogens and Aerosols

Bloodborne Pathogens—Occupational Exposure

- What is an occupational exposure?
- Infectious body fluids.
- Risk of infection.
- Steps following exposure.
- Medical follow-up and management.
- Measures to reduce the risk of exposure.
- Safety devices.

Bone Allografts

Carpeting/Cloth Furnishings

Contact Dermatitis and Latex Allergy

- Contact dermatitis.
- Latex allergy.
- Glove-associated skin reactions.
- Dental healthcare personnel with latex allergy.
- Powder-free gloves.
- Patients with latex allergy.

Extracted Teeth

- Disposing of teeth.
- Giving teeth to patients.
- Extracted teeth in educational settings.

Hand Hygiene

- What is hand hygiene?
- Indications for hand hygiene.
- Types of hand hygiene.
- Storing hand care products.
- Do lotions affect gloves?

## IV Solution Reuse

## Personal Protective Equipment (PPE)

- Purpose of PPE.
- Surgical masks.
- Protective eyewear.
- Clothing, gloves.
- Handwashing.
- Washing gloves.
- Glove exposure.
- Types of gloves.

## Pre-Procedural Mouth Rinse

- Contamination from aerosols and spatter.
- Procedure-induced bacteremias.
- Recommendations.

## Saliva Ejector and Backflow

## Sterilization—Cleaning

- Central instrument processing area.
- Pre-sterilization cleaning.
- Cleaning methods (automated and manual).
- Performing manual cleaning.
- Personal protective equipment (PPE).

## Sterilization—Monitoring

- Monitoring methods.
- Frequency of monitoring.
- Sterilization of implants.
- Procedures for positive spore test.
- Factors influencing effectiveness.

## Sterilization—Packaging and Storage

- Types and use of packaging materials.
- Cassettes storage shelf-life of instruments (date-related versus event-related).

## Appendices-Resources for Staff

Guidelines for Infection Control in Dental Health-Care Settings, 2003. *MMWR*, December 19, 2003:52(RR-17).View PDF file [PDF- 1.2M] *Updated version due late 2016

- **Appendix A:** Regulatory Framework for Disinfectants and Sterilants, includes Figure: Decreasing Order of Resistance of Micro-organisms to Germicidal Chemicals.
- **Appendix B:** Immunizations Strongly Recommended for Health-Care Personnel (HCP).
- **Appendix C:** Methods for Sterilizing and Disinfecting Patient-Care Items and Environmental Surfaces.

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## About the Author

MaryLou Austin, RDH, M.Sc., practiced dental hygiene for over 20 years, and recently completed a hospital rotation on a dental trauma surgical team. Also a long time Health Science and Dental Educator, Ms. Austin has developed learning systems for dental professionals, created rural dental clinic delivery models, and has authored and edited many dental publications. She graduated from the University of Nevada, summa cum laude, and is the current Director of Education for My Dental CE & OSHA Training.

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## Exam-Infection Control in Clinical Dentistry

1. The term “Standard Precautions” replaces an older term, “Universal Precautions”.

    a. True
    b. False

2. An example of a mode of transmission is:

    a. Direct contact.
    b. Indirect contact.
    c. Airborne.
    d. All of the above.

3. Spatters are heavier and larger particles that may remain airborne for a relatively short time because of their own weight and size.

    a. True
    b. False

4. Hepatitis B is an airborne and foodborne virus.

    a. True
    b. False

5. All DHCP who are exposed to blood or other potentially infectious materials should receive the Hepatitis B vaccine according to the current CDC recommendations.

    a. True
    b. False

6. Of the various hepatitis viruses, the one of most concern in dentistry is:

    a. Hepatitis A.
    b. Hepatitis B.
    c. Hepatitis C.
    d. A & B.

7. All of the following are examples of PPE (Personal Protection Equipment), EXCEPT:

    a. Needle guards.
    b. Face shields.
    c. Clinical gowns.
    d. Latex or nitrile gloves.

8. Face masks continue to be effective even if wet.

    a. True
    b. False

9. Hand hygiene is considered the most effective measure for reducing the risk of transmitting organisms to patients and DHCP.

    a. True
    b. False

10. A latex allergy may include the following symptoms, EXCEPT:

    a. Hives.
    b. Dilated pupils.
    c. Itchy eyes.
    d. Coughing spells.

11. Contaminated sharps are considered biohazardous waste.

    a. True
    b. False

12. Packaging precedes all disinfection and sterilization processes.

    a. True
    b. False

13. Dental instruments are classified into three categories depending on the risk of transmission. Those categories include all EXCEPT:

    a. Critical.
    b. Temperature critical.
    c. Semi-critical.
    d. Non-critical.

14. Ultrasonic cleaners use sound waves in a chamber of liquid to create cavitation.

    a. True
    b. False

15. The sterilization cycle time increases as the temperature is increased.

    a. True
    b. False

16. The number of chemical indicator classes recognized by the FDA and used in dentistry to indicate the presence of conditions in the sterilization process, is:

    a. 3
    b. 4
    c. 5
    d. None of the above.

17. Biological monitors or “spore tests” should be used:

    a. Daily.
    b. Weekly.
    c. Monthly.
    d. Semi-annually.

18. The properties of an ideal chemical disinfectant include:

    a. Broad spectrum.
    b. Fast acting.
    c. Odorless.
    d. Soluble.
    e. All of the above.

19. The colonies which grow in dental unit water lines are known as:

    a. Protozoans.
    b. Oral pathogens.
    c. Biofilm.
    d. Generally harmless.

20. Exposure to blood or saliva by percutaneous injury is the greatest risk for acquiring a blood-borne pathogen in the dental health-care setting. Every effort should be made by all DHCP to avoid percutaneous injury.

    a. True
    b. False

21. Tuberculosis is an airborne caused disease. Most exposed persons do not become infected.

    a. True
    b. False

22. It is against the law to give extracted teeth back to patients.

    a. True
    b. False

23. Dental prostheses, appliances or impressions brought into the laboratory may be contaminated with microorganisms.

    a. True
    b. False

24. The thermal destruction of tissue, during procedures that use a laser or electrosurgical unit, creates a smoke by-product that does not contain viable microorganisms.

    a. True
    b. False

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# Infection Control OSHA Focus

**Please complete & fax this form only to (888) 727-0013. Print your answers clearly.**

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Phone:_____ Fax:_____ Email: _____

***Print Clearly***

**Please print the corresponding letter for each answer below:**

| | | | | |
|---|---|---|---|---|
| 1. _____ | 6. _____ | 11. _____ | 16. _____ | 21. _____ |
| 2. _____ | 7. _____ | 12. _____ | 17. _____ | 22. _____ |
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