Disease Transmission and Infection Prevention

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Key Terms
- Acquired immunity: Immunity that is developed during a person’s lifetime.
- Acute infection: An infection of short duration that is often severe.
- Anaphylaxis (an-uh-fi-LAK-sis): Extreme hypersensitivity to a substance that can lead to shock and life-threatening respiratory collapse.
- Artificially acquired immunity: Immunity that results from a vaccination.
- Blood-borne disease: Disease such as HBV, HCV, or HIV infection that is caused by microorganisms such as viruses or bacteria that are carried in blood.
- Blood-borne pathogens: Disease-causing organisms transferred through contact with blood or other body fluids.
- Chain of infection: Conditions that all must be present for infection to occur.
- Chronic infection: An infection of long duration.
- Communicable disease: Condition caused by an infection that can be spread from person to person or through contact with body fluids.
- Contaminated waste: Items such as gloves and patient napkins that may contain potentially infectious body fluids of patients.
- Direct contact: Touching or contact with a patient’s blood or saliva.
- Droplet infection: An infection that occurs through mucosal surfaces of the eyes, nose, or mouth.
- Epidemiologic (ep-i-dee-mee-LOJ-ic) studies: Studies of the patterns and causes of diseases.
- Hazardous waste: Waste that poses a danger to humans or to the environment.
- Immunity (i-MYOO-ni-tee): Ability of the body to resist disease.

Learning Outcomes
On completion of this chapter, the student will be able to achieve the following objectives:
- Pronounce, define, and spell the Key Terms.
- Describe the roles of the CDC and OSHA in infection control.
- Explain the difference between Universal Precautions and Standard Precautions.
- Describe the differences between a chronic infection and an acute infection.
- Describe the types of immunity, and give examples of each.
- Give an example of a latent infection.
- Identify links in the chain of infection.
- Describe the methods of disease transmission in a dental office.
- Describe the components of an OSHA exposure control plan.
- Describe the infection control considerations when using high-tech equipment.
The dental assistant is at risk of exposure to disease agents through contact with blood or other potentially infectious body fluids. In this chapter, you will learn how to break the chain of infection, identify methods of disease transmission, and explain how the immune system provides the body with resistance to infection.

This chapter discusses the Centers for Disease Control and Prevention (CDC) Infection Control Guidelines and the requirements of the Occupational Safety and Health Administration (OSHA) Blood-Borne Pathogens (BBP) Standard. By carefully following the infection control recommendations and safety information provided in this chapter, you can minimize the risks of disease transmission to yourself, your patients, and other members of the dental team.

The Chain of Infection

To understand how infection can occur, imagine a chain that has four links. Each link is a condition that must be present for infection or disease to occur. The links in the chain of infection include (1) virulence, (2) number of microorganisms, (3) susceptible host, and (4) portal of entry (Fig. 19-1). Infection control strategies are intended to break a link in the imaginary chain of infection. Break any link in the chain, and you break the infectious process.
Types of Infections

Acute Infection

In acute infection, symptoms often are severe and usually appear soon after the initial infection occurs. Acute infections are of short duration. For example, with a viral infection such as the common cold, the body’s defense mechanisms usually eliminate the virus within two to three weeks.

Chronic Infection

Chronic infections are those in which the microorganism is present for a long duration; some may persist for life. The person may be asymptomatic (not showing symptoms of the disease) but may still be a carrier of the disease, as with hepatitis C virus (HCV) or human immunodeficiency virus (HIV) infection.

Latent Infection

A latent infection is a persistent infection in which the symptoms “come and go.” Cold sores (oral herpes simplex) and genital herpes are latent viral infections.

Opportunistic Infection

Opportunistic infections, which are caused by normally nonpathogenic organisms, occur in individuals whose resistance is decreased or compromised. For example, in an individual who is recovering from influenza, pneumonia or an ear infection may develop. Opportunistic infections are common in patients with autoimmune disease or diabetes and in elderly persons.

Modes of Disease Transmission

Before you can prevent disease transmission in the dental office, you must first understand how infectious diseases are spread.

An infectious disease is one that is communicable or contagious. These terms mean that the disease can be transmitted (spread) in some way from one host to another (Fig. 19-2).
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Indirect Transmission

Indirect transmission occurs when microorganisms first are transmitted to an object or surface, and then are transferred to another person who touches those objects or surfaces. An example would be a dental chart that is handled by a dental assistant while wearing contaminated gloves that is then handled by the receptionist with bare hands. It is important to wash your hands frequently and to carefully disinfect or cover surfaces that can become contaminated to prevent indirect transmission of microorganisms.

Airborne Transmission

Airborne transmission, also known as droplet infection, refers to the spread of disease through droplets of moisture that contain bacteria or viruses. Most of the contagious respiratory diseases are caused by pathogens that are carried in droplets of moisture. Some of these pathogens are carried long distances through the air and through ventilation systems. Airborne transmission also can occur when someone coughs or sneezes.

Aerosol, Spray, or Spatter

Aerosols, sprays, and spatter that are generated during dental treatment can contain blood, saliva, and nasopharyngeal (nasal) secretions. The difference between aerosols, sprays, and spatter is simply the size of the particles. These terms are often used interchangeably to describe droplets of potentially infectious materials.

The finest are the mistlike aerosols. Aerosols can remain airborne for extended periods and can be inhaled. They are not typically visible to the naked eye. Aerosols are created by the use of the high-speed handpiece and the ultrasonic scaler during dental procedures (Fig. 19-3). Inhaling the bacteria in the aerosol (without the protection of a face mask) is comparable to having someone sneeze in your face twice a minute, at a distance of 1 foot. Aerosols can transmit respiratory infections, but they do not transmit HBV or HIV despite the fact that they are inhaled.
Sprays and spatter are also created by the use of the handpiece and the ultrasonic scaler, as well as the air-water syringe, during dental procedures. Spatter consists of larger droplet particles that are contaminated by blood, saliva, and other debris (e.g., calculus, tooth particles).

Spray and spatter droplets travel farther than aerosol mist does and tend to land on the upper surfaces of the wrist and forearms, upper arms, and chest. Droplets also may reach the necktie/collar area of the dentist, assistant, or hygienist.

**Intact skin**, which is not broken in any way, acts as a natural protective barrier. **Nonintact skin**, in which a cut, a scrape, or a needle stick injury has occurred, provides a means of entrance for pathogens into the body.

Good work practices such as the use of dental dams and high-velocity air evacuation will help minimize splashes, spatter, and aerosols. In addition, wearing of gloves, masks, eyewear, and protective clothing will reduce the risk of exposure to pathogens.

### Parenteral Transmission

*Parenteral* means through the skin, as with cuts or punctures. Parenteral transmission of blood-borne pathogens (i.e., disease-causing organisms transferred through contact with blood or other body fluids) can occur through needle stick injuries, human bites, cuts, abrasions, or any break in the skin.

### Blood-Borne Transmission

Certain pathogens, referred to as *blood-borne*, are carried in the blood and body fluids of infected individuals and can be transmitted to others. Blood-borne transmission occurs through direct or indirect contact with blood or other body fluids. Saliva is of particular concern during dental treatment because it frequently is contaminated with blood. Remember, although blood may not be visible in the saliva, it still may be present.

Improperly sterilized instruments and equipment can transfer all blood-borne diseases. Individuals who share needles while using illegal drugs easily transmit these diseases to each other. Unprotected sex is another common method of transmission of blood-borne disease.

Common blood-borne microorganisms of concern in dentistry include HCV, HBV, and HIV. Because dental treatment often involves contact with blood and always with saliva, blood-borne diseases are of major concern in the dental office.

### Food and Water Transmission

Many diseases are transmitted by contaminated food that has not been cooked or refrigerated properly and by water that has been contaminated with human or animal fecal material. For example, tuberculosis, botulism, and staphylococcal and streptococcal infections are spread by contaminated food or water.

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### Fecal-Oral Transmission

Many pathogens are present in fecal matter. If proper sanitation procedures, such as handwashing after use of the toilet, are not followed, these pathogens may be transmitted directly by touching another person, or they may be transmitted indirectly through contact with contaminated surfaces or food.

Fecal-oral transmission occurs most often among healthcare and daycare workers (who frequently change diapers) and among careless food handlers.

### The Immune System

The immune system is responsible for providing resistance to communicable diseases. A **communicable disease** is a condition that is caused by an infection that can be spread from person to person or through contact with body fluids. **Immunity** allows the body to resist disease and prevents foreign bodies from causing infection. When immunity is present at birth, it is called **inherited immunity**. Immunity that is developed during a person’s lifetime is called **acquired immunity**. Acquired immunity can occur naturally or artificially (Fig. 19-4).

### Naturally Acquired Immunity

Naturally acquired immunity occurs when a person has previously contracted a disease and recovered. When the body was fighting the invading pathogen, it formed antibodies that provide future resistance against that particular pathogen. This form of immunity is called **active immunity** because the body of the host is actively involved in the process.

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### Written Exposure Control Plan Required by OSHA

General policy of implementing Centers for Disease Control and Prevention guidelines and American Dental Association infection control recommendations:

- Use of Universal Precautions
- Required use of personal protective equipment
- Standardized housekeeping
- Laundering of contaminated protective clothing
- Standardized policy on cleaning and disinfection
- Policy on general waste disposal
- Labeling procedure (secondary labeling)
- Policy on sterilization (including monitoring) and disinfection
- Use of sharps containers and disposal system
- Standardized handwashing protocol
- Hepatitis B virus (HBV) vaccination
- Postexposure evaluation and medical follow-up

OSHA, Occupational Safety and Health Administration.
Another type, **passive immunity**, occurs during pregnancy when the fetus receives antibodies from the mother's placenta. Passive immunity also occurs when the mother breastfeeds the infant. It is called “passive” immunity because the antibodies are acquired from an outside source.

**Artificially Acquired Immunity**

When the human body has not been exposed to a disease, it has not developed antibodies and is completely defenseless against the disease. However, antibodies can be introduced into the body artificially by **immunization** or **vaccination**.

A vaccine that contains weakened disease-causing organisms or genetically engineered organisms is injected into the body. Harmful characteristics of the disease-producing organisms are eliminated from the vaccine to make them less likely to cause disease. The body then forms antibodies in response to the vaccine, resulting in **artificially acquired immunity**.

**Disease Transmission in the Dental Office**

Disease transmission in the dental office can occur in a variety of ways, as described below:

- Patient to dental team
- Dental team to patient
- Patient to patient
- Dental office to community (includes dental team's family)
- Community to dental office to patient

**Patient to Dental Team**

Microorganisms from the patient's mouth can be passed to the dental team through the following routes:

- The most common route is through direct contact (touching) with the patient's blood or saliva. If the dental team member has cuts, abrasions, or breaks in the skin around the fingernails, microorganisms may gain entrance.
- Droplet infection affects mucosal surfaces of the eyes, nose, and mouth. It can occur when the dental team member inhales aerosol generated by the dental handpiece or the air-water syringe.
- Indirect contact can occur when the team member touches a contaminated surface or instrument. Cuts or punctures with contaminated needles, burs, instruments, or files may also result in disease transmission.

Infection control measures that help prevent disease transmission from the patient to the dental team member...
include (1) gloves, (2) handwashing, (3) masks, (4) rubber dams, and (5) patient mouth rinses.

Always remember, a patient may be a carrier of a disease. Carrier-transmitted diseases include certain types of viral hepatitis, herpes, tuberculosis, typhoid fever, and HIV, among others.

**Dental Team to Patient**

Fortunately, the spread of disease from a member of the dental team to a patient is very unlikely to happen. If proper procedures are not followed, however, disease transmission could occur.

Team-to-patient transmission can result if the dental team member has lesions on the hands, or if the hands are cut while in the patient’s mouth, permitting the transfer of microorganisms. Droplet infection of the patient can occur if the dental team member has a cold, but this can also occur outside the dental office.

Infection control measures that help to prevent team-to-patient transmission include (1) masks, (2) gloves, (3) handwashing, and (4) immunization.

**Patient to Patient**

Patient-to-patient disease transmission has occurred in the medical field, but only one case of this type of transmission has been documented in dentistry. For this type of transmission to occur, contamination from instruments used on one patient would need to be transferred to another patient.

Infection control measures that can prevent patient-to-patient transmission include (1) instrument sterilization, (2) surface barriers, (3) handwashing, (4) gloves, and (5) use of sterile instruments (Box 19-1).

**Dental Office to Community**

Microorganisms can leave the dental office and enter the community in a variety of ways. For example, contaminated impressions may be sent to the dental laboratory, or contaminated equipment may be sent out for repair. Office-to-community transmission also can occur if members of the dental team transport microorganisms out of the office on their clothing or in their hair.

Infection control measures that help prevent organisms from leaving the dental office include (1) handwashing, (2) changing clothes before leaving the office, and (3) disinfecting impressions and contaminated equipment before such items leave the office.

**Community to Dental Office to Patient**

In this type of disease transmission, microorganisms enter the dental office through the municipal water that supplies the dental unit. Waterborne organisms colonize the inside of dental unit waterlines and form *biofilm*. As water flows through the handpiece, air-water syringe, and ultrasonic scaler, a patient can swallow contaminated water (see Chapter 24).

**RECALL**

1. **What is the most common route of contamination?**
2. **What is the term for acquiring an infection through mucosal tissues?**
3. **What infection control measures help prevent disease transmission from the dental team to the patient?**

**Roles and Responsibilities of the CDC and OSHA in Infection Control**

The CDC and the OSHA are federal agencies that play very important roles in infection control for dentistry (see Chapter 22).

The CDC is not a regulatory agency. Its role is to issue specific *recommendations* that are based on sound scientific evidence for health-related matters. In 1986, the CDC...
issued the first recommendations for the dental profession to prevent the transmission of blood-borne disease. OSHA is a regulatory agency. Its role is to issue specific standards designed to protect the health of employees in the United States. In 1991, on the basis of CDC guidelines, OSHA issued the BBP Standard. Failure to comply with OSHA requirements can result in serious consequences, including heavy fines.

As a dental assistant, it is important to follow all of these guidelines and recommendations.

Guidelines for Infection Control in Dental Healthcare Settings (CDC)

In December 2003, the CDC released its Guidelines for Infection Control in Dental Healthcare Settings—2003. Earlier guidelines issued in 1993 had primarily addressed the prevention of blood-borne diseases such as HIV, HBV, and HCV (Fig. 19-5).

The 2003 guidelines expanded upon the existing OSHA BBP Standard and added information on some topics that were not already covered in the 1993 guidelines. In some cases, only a word or two has been added. In others, a significant amount of new information has been added. The guidelines were developed in collaboration with experts on infection control from the CDC and other public agencies; input was also sought from private and professional organizations. These guidelines are based on scientific evidence and are categorized on the basis of existing scientific data, theoretical rationale, and applicability.

The guidelines apply to all paid and unpaid dental health professionals who might be occupationally exposed to blood and body fluids by direct contact or through contact with contaminated environmental surfaces, water, or air.

Although it is not law, the CDC Guidelines for Infection Control in Dental Healthcare Settings now represents the standard of care.

CDC Rankings of Evidence

Each recommendation made by the CDC is categorized on the basis of existing scientific data, theoretical rationale, and applicability. Rankings are based on the following categories:

- **Category IA**: Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies
- **Category IB**: Strongly recommended for implementation and supported by experimental, clinical, or epidemiologic studies and a strong theoretical rationale
- **Category IC**: Required for implementation, as mandated by federal or state regulation or standard
- **Category II**: Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale
- **Unresolved Issue**: No recommendation. Practices for which insufficient evidence or no consensus regarding efficacy exists

OSHA Blood-Borne Pathogens Standard

OSHA’s BBP Standard is the most important infection control law in dentistry. It is designed to protect employees against occupational exposure to blood-borne, disease-causing organisms, such as HBV, HCV, and HIV.

The BBP requires employers to protect their employees from exposure to blood and other potentially infectious...
Follow-Up Measures for Exposed Worker*

- Confidential medical counseling
- Human immunodeficiency virus (HIV) test series immediately and at 6 weeks, 12 weeks, and 6 months
- Hepatitis B virus (HBV) immune globulin (if no prior HBV vaccination)
- Tetanus booster
- Documentation of incident on appropriate Occupational Safety and Health Administration (OSHA) form


*Services must be offered without charge.

Overview of CDC Guidelines for Infection Control in Dental Healthcare Settings—2003

- Use of Standard Precautions rather than Universal Precautions
- Work restrictions for healthcare personnel infected with infectious diseases
- Postexposure management of occupational exposures to blood-borne pathogens (hepatitis B virus [HBV], human immunodeficiency virus [HIV], hepatitis C virus [HCV])
- Selection of devices with sharps injury-prevention features
- Hand hygiene products and surgical hand asepsis
- Contact dermatitis and latex hypersensitivity
- Sterilization of unwrapped instruments
- Dental unit waterline concerns
- Dental radiology infection control
- Aseptic technique for injectable medications
- Preprocedural mouth rinses for patients
- Oral surgical procedures
- Laser/electrosurgery plumes
- Tuberculosis
- Creutzfeldt-Jakob disease and other prion-related diseases
- Infection control program evaluation
- Research considerations

Modified from CDC Guidelines for Infection Control in Dental Healthcare Settings—2003. Copies of these guidelines may be requested at oralhealth@cdc.gov, by phone at 770-488-6054, or by fax at 770-488-6080.

Standard and Universal Precautions

The term Universal Precautions is still referred to in the OSHA BBP Standard. Universal Precautions is based on the concept that all human blood and body fluids (including saliva) are to be treated as if known to be infected with a blood-borne disease such as HBV, HCV, or HIV infection. The rationale for this concept is that it is not possible to identify those individuals who are infectious, so Universal Precautions are to be used for all healthcare personnel and their patients.

The CDC expanded the concept and changed the term to Standard Precautions. Standard Precautions integrate and expand the elements of Universal Precautions into a standard of care that is designed to protect healthcare providers from pathogens that can be spread by blood or any other body fluid, excretion, or secretion. Saliva has always been considered a potentially infectious material in dental infection control; therefore, no difference in clinical dental practices is noted between Universal Precautions and Standard Precautions. Standard Precautions apply to contact with the following:

- Blood
- All body fluids, secretions, and excretions except sweat, regardless of whether or not they contain blood
- Nonintact skin
- Mucous membranes
Categories of Employees

The OSHA BBP Standard requires employers to categorize tasks and procedures during which an employee might experience occupational exposure (Table 19-1).

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Routinely exposed to blood, saliva, or both</td>
<td>Dentist, dental hygienist, dental assistant, sterilization assistant, dental laboratory technician</td>
</tr>
<tr>
<td>II</td>
<td>May on occasion be exposed to blood, saliva, or both</td>
<td>Receptionist or office manager who may occasionally clean a treatment room or handle instruments or impressions</td>
</tr>
<tr>
<td>III</td>
<td>Never exposed to blood, saliva, or both</td>
<td>Financial manager, insurance clerk, or computer operator</td>
</tr>
</tbody>
</table>

OSHA Blood-Borne Pathogens
Standard Training Requirements

- Epidemiology, modes of transmission, and prevention of hepatitis B virus (HBV) and human immunodeficiency virus (HIV)
- Risks to the fetus from HBV and HIV
- Location and proper use of all protective equipment
- Proper work practices using Universal Precautions
- Meaning of color codes, biohazard symbol, and precautions to follow in handling infectious waste
- Procedures to follow if needle stick or other injury occurs


Management of an Exposure Incident*

- Document the route(s) of exposure and the circumstances in which the incident occurred (e.g., cut, needle stick, or blood splash).
- Identify and document the source individual (patient whose blood or body fluid is involved in the exposure incident), unless the employer can establish that identification is not possible or is prohibited by state or local law.
- Request that the source individual have his or her blood tested for human immunodeficiency virus (HIV) and hepatitis B virus (HBV) (the source individual can refuse this request).
- Advise the employee to have his or her blood tested for HIV and HBV. (The employer has the right to refuse to be tested.) By law, the employee’s blood test results are held confidential from the employer.
- Provide medically indicated prophylactic treatment, such as necessary injections of gamma globulin, HBV vaccine booster, tetanus booster, or a combination.
- Provide appropriate counseling.
- Evaluate reported illnesses after the incident.

*Employer actions as required by the OSHA Blood-borne Pathogens (BBP) Standard.

Postexposure Management

Despite efforts to prevent occupational exposure incidents, accidents happen. Therefore, before an accident occurs, the BBP Standard requires the employer to have a written plan. This plan explains exactly what steps the employee must follow after the exposure incident occurs and the type of medical follow-up that will be provided to the employee at no charge.

The employer must provide training to employees on the proper response to an exposure incident. Procedure 19-1 reviews first aid steps to be followed after exposure.

Employee Training

The BBP Standard requires the dentist/employer to provide training in infection control procedures and safety issues to all personnel who may come in contact with blood, saliva, or contaminated instruments or surfaces. The employer must keep records of all training sessions. The record of each training session must include the date of the session, the name of the presenter, the topic, and the names of all employees who attended.
**PROCEDURE 19-1**

**Applying First Aid after an Exposure Incident**

**GOAL**
To perform appropriate first aid after an exposure incident.

**EQUIPMENT AND SUPPLIES**

- Soap and water
- Paper towels
- Antiseptic cream or ointment
- Adhesive bandage
- Exposure incident report form

**PROCEDURAL STEPS**
1. Stop operations immediately.
2. Remove your gloves.
3. If the area of broken skin is bleeding, gently squeeze the site to express a small amount of visible blood.
4. Wash your hands thoroughly, using antimicrobial soap and warm water.
5. Dry your hands.
6. Apply a small amount of antiseptic to the affected area.
   - **Note:** Do not apply caustic agents such as bleach or disinfectant solutions to the wound.
7. Apply an adhesive bandage to the area.
8. Complete applicable postexposure follow-up steps.
   - **Note:** The employer should be notified of the injury immediately after initial first aid is provided.

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**Hepatitis B Immunization**

The BBP Standard requires the dentist/employer to offer the HBV vaccination series to all employees whose jobs include category I and II tasks. The vaccine must be offered within 10 days of assignment to a category I or II job. To document compliance, the dentist/employer must obtain proof from the physician who administered the vaccination to the employee.

The employee has the right to refuse the HBV vaccine for any reason. The employee is then required to sign an informed refusal form that is kept on file in the dental office (Fig. 19-6). Even if the employee originally signed the refusal form, the employee always has the right to reverse the decision and receive the vaccine at a later date at no charge.

The CDC does *not* recommend routine booster doses of the HBV vaccine, nor does it recommend routine blood testing to monitor the HBV antibody level in individuals who have already had the vaccine. This assumes that the individual was tested after receiving the vaccine and was known to have initially developed antibodies. An exception is the immunized individual who has a documented exposure incident for whom the attending physician orders a booster dose.

**Postvaccine Testing**

Between one and two months after the series has been completed, a blood test should be performed to ensure that the individual has developed immunity. Individuals who have not developed immunity should be evaluated by their physician to determine the need for an additional dose of hepatitis B virus (HBV) vaccine. Individuals who do not respond to the second three-dose series of the vaccine should be counseled regarding their susceptibility to HBV infection and precautions to take. (IA and IC)

**Employee Medical Records**

The dentist/employer must keep a confidential medical record for each employee. The employer must store these records in a locked file for the duration of employment plus 30 years.
Managing Contaminated Sharps

Contaminated needles and other disposable sharps, such as scalpel blades, orthodontic wires, and broken glass, must be placed into a sharps container. The sharps container must be puncture-resistant, closable, leakproof, and color-coded or labeled with the biohazard symbol (Fig. 19-7).

Sharps containers must be located as close as possible to the place of immediate disposal. Do not cut, bend, or break the needles before disposal. Never attempt to remove a needle from a disposable-type device.

Requirements for Employee Medical Records

- Employee’s name and Social Security number
- Proof of employee’s hepatitis B virus (HBV) vaccination or signed refusal
- Circumstances of any exposure incident (such as a needle stick) involving the employee and the name of the source individual (e.g., a patient whose blood or bodily fluid was involved in the incident)
- A copy of the postexposure follow-up procedures for any injuries sustained by that employee
- These records must be retained by the employer for the duration of employment plus 30 years.


Guidelines for Needles

Never recap used needles by using both hands or any other technique that involves directing the point of a needle toward any part of the body. (IA and IC)

Preventing Needle Sticks

Some needles on the market have safety guards to prevent accidental needle sticks (Fig. 19-8). Do not bend or break needles before disposal. Always use the single-handed scoop technique or some type of safety device (Fig. 19-9).

RECALL

4 What is the purpose of the BBP?
5 How often should an exposure control plan be reviewed and updated?
6 What does the term Standard Precautions include?
7 What information must be included in the employee training record?
8 What must the employee do if he or she does not want the hepatitis B vaccine?
Infection Control Practices

Hand Hygiene

Handwashing Guidelines

You must wash your hands before you put on gloves (Procedure 19-2) and immediately after you remove gloves. Gloves may have small, unapparent defects or may be torn during use, and your hands can become contaminated during glove removal. In addition, bacteria can multiply rapidly in moist environments underneath gloves; thus, you should dry your hands thoroughly before donning gloves and wash immediately after removing gloves. Handwashing is also required if you inadvertently touch contaminated objects or surfaces while barehanded (Fig. 19-10). You should always use liquid soap during handwashing. Bar soap should never be used because it may transmit contamination.

To minimize cross-contamination, it is preferable that treatment room sinks be equipped with “hands-free” faucets that are activated electronically or with foot pedals (Fig. 19-11).

Alcohol-Based Hand Rubs

A new category of antiseptic products for hand hygiene is now on the market. Waterless antiseptic agents are alcohol-based products that are available in gels, foams, or rinses (Fig. 19-12). They do not require the use of water. The product is simply applied to the hands, which are then rubbed together to allow the product to cover all surfaces.

These products are more effective than plain soap, or even an antimicrobial hand wash, at reducing microbial flora. Concentrations of 60 to 95 percent are most effective. Higher concentrations are actually less effective. In addition, these products are actually good for your skin. They contain emollients that reduce incidences of chapping, irritation, and drying of the skin. These products are very “dose-sensitive.” This means that you must use the amount that is recommended. Using a smaller amount seriously decreases the effectiveness of the product.

Alcohol-based hand rubs are not indicated if your hands are visibly soiled or are contaminated with organic matter, such as blood or saliva. In these cases, you would need to first wash your hands with soap and water, and then follow with use of the alcohol-based product (Procedure 19-3).
PROCEDURE 19-2

Handwashing Before Gloving

**GOAL**
To wash hands properly before gloving.

**EQUIPMENT AND SUPPLIES**
- Sink with running water
- Liquid soap in a dispenser
- Nailbrush or orange stick
- Paper towels in a dispenser

**PROCEDURAL STEPS**

1. Remove all jewelry, including watch and rings.
   *Purpose:* Jewelry is difficult to clean, can harbor microbes, and can puncture the gloves.

2. Use the foot or electronic control to regulate water flow. If this is not available, use a paper towel to grasp the faucets to turn them on and off. Discard the towel after use. Allow your hands to become wet.
   *Purpose:* Faucets may have been contaminated by being touched with soiled or contaminated hands.

3. Apply soap, and lather using a circular motion with friction while holding your fingertips downward. Rub well between your fingers. If this is the first handwashing of the day, use a nailbrush or an orange stick. Inspect and clean under every fingernail during this step.
   *Purpose:* Friction removes soil and contaminants from your hands and wrists.

4. Vigorously rub together the lathered hands under a stream of water to remove surface debris.
   *Purpose:* Scrubbing the first time removes gross debris.

5. Apply more soap, and vigorously rub together lathered hands for a minimum of 10 seconds under a stream of water.
   *Purpose:* Secondary scrubbing removes residual debris and tenacious microorganisms, which thrive under the free edges of the fingernails.

6. Rinse the hands with cool water.
   *Purpose:* Cool water closes the pores.

(continued)
Handwashing Before Gloving

7 Use a paper towel to dry the hands thoroughly, and then dry the forearms.

*Purpose:* Reusable cloth towels remain moist, contribute to microbial growth, and spread contamination.

8 If water faucets are not foot-operated, turn off the faucet with a clean paper towel.

*Purpose:* The faucet is dirty and will contaminate your clean hands.

Hand Care Recommendations

Healthy skin is better able to withstand the damaging effects of repeated washing and of wearing gloves. It is important to dry your hands well before donning gloves. The use of skin cream can help relieve dry, chapped hands caused by the use of latex gloves and frequent handwashing. Select water-based hand care products because petroleum-based products will break down the latex in the glove and compromise its effectiveness (Fig. 19-13).

Personal Protective Equipment

OSHA’s BBP Standard requires the employer to provide employees with appropriate personal protective equipment (PPE) without charge to the employee. Examples of PPE include protective clothing, surgical masks, face shields, protective eyewear, disposable patient treatment gloves, and heavy-duty utility gloves.

Because dental assistants are likely to come in contact with blood and saliva, you must wear PPE whenever you are performing tasks that could produce splash, spatter, aerosol, or other contact with body fluids (Fig. 19-14).

**FIG. 19-13** Water-based hand products will not break down latex gloves. (Courtesy Essential Dental Systems, Hackensack, New Jersey)

9 What is the most effective hand product on the market for use on clean hands?

10 Why should long or artificial nails and rings be avoided when one is working in a dental office?
CHAPTER 19 Disease Transmission and Infection Prevention

Hand Hygiene in Dental Healthcare Settings

For most routine dental procedures, such as examinations and nonsurgical procedures, wash your hands with antimicrobial or nonantimicrobial soap and water. If your hands are not visibly soiled, you may use an alcohol-based, waterless hand rub. For surgical procedures, you should perform a surgical scrub using antimicrobial or nonantimicrobial soap and water, dry your hands, and apply an alcohol-based surgical hand rub with persistent activity. (IA)

Overview of 2002 CDC Hand Hygiene Guidelines

In 2002, the Centers for Disease Control and Prevention released new recommendations for hand hygiene in healthcare settings. Hand hygiene is a term that applies to handwashing, use of an antiseptic hand rub, or surgical hand antisepsis. Evidence suggests that hand antisepsis, the cleansing of hands with an antiseptic hand rub, is more effective in reducing nosocomial infections than is plain handwashing.

Follow these guidelines in the care of all patients:

- Continue to wash hands with antimicrobial or nonantimicrobial soap and water whenever the hands are visibly soiled.
- Use an alcohol-based hand rub to routinely decontaminate the hands in the following clinical situations: (Note: if alcohol-based hand rubs are not available, the alternative is handwashing.)
  - Before and after client contact
  - Before donning sterile gloves when inserting central intravascular catheters
  - Before performing nonsurgical invasive procedures (e.g., urinary catheter insertion, nasotracheal suctioning)
  - After contact with body fluids or excretions, mucous membranes, nonintact skin, and wound dressings
  - When moving from a contaminated body site (rectal area or mouth) to a clean body site (surgical wound, urinary meatus) during client care
  - After contact with inanimate objects (including medical equipment) in the immediate vicinity of the client
  - After removing gloves
- Before eating and after using a restroom, wash hands with a nonantimicrobial or antimicrobial soap and water.
- Antimicrobial-impregnated wipes (i.e., towelettes) are not a substitute for using an alcohol-based hand rub or antimicrobial soap.
- If exposure to Bacillus anthracis is suspected or proven, wash hands with nonantimicrobial or antimicrobial soap and water. The physical action of washing and rinsing hands is recommended because alcohols, chlorhexidine, iodophors, and other antiseptic agents have poor activity against spores.

Method for Decontaminating Hands

When using an alcohol-based hand rub, apply the product to the palm of one hand and rub the hands together, covering all surfaces of the hands and fingers, until hands are dry. Follow the manufacturer’s recommendations regarding the volume of product to use.

Follow these guidelines for surgical hand antisepsis:

- Surgical hand antisepsis reduces the resident microbial count on the hands to a minimum.
- The CDC recommends using an antimicrobial soap and scrubbing hands and forearms for the length of time recommended by the manufacturer, usually 2 to 6 minutes. The Association of Operating Room Nurses recommends 5 to 10 minutes. Refer to agency policy for time required.
- When using an alcohol-based surgical hand rub product with persistent activity, follow the manufacturer’s instructions. Before applying the alcohol solution, prewash hands and forearms with a nonantimicrobial soap, and dry hands and forearms completely. After application of the alcohol-based product as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves.

General Recommendations for Hand Hygiene

- Use hand lotions or creams to minimize the occurrence of irritant contact dermatitis associated with hand antisepsis or handwashing.
- Do not wear artificial fingernails or extenders when having direct contact with clients at high risk (e.g., those in intensive care units or operating rooms).
- Keep natural nail tips less than ¼-inch long.
- Wear gloves when contact with blood or other potentially infectious materials, mucous membranes, and nonintact skin could occur.
- Remove gloves after caring for a client. Do not wear the same pair of gloves for the care of more than one client, and do not wash gloves between uses with different clients.
- Change gloves during client care if moving from a contaminated body site to a clean body site.

Centers for Disease Control and Prevention. Available at: www.cdc.gov/handhygiene.
PROCEDURE 19-3

Applying Alcohol-Based Hand Rubs

GOAL
To apply an alcohol-based hand rub.

EQUIPMENT AND SUPPLIES
✓ Alcohol-based hand rub (60 to 95 percent concentration)

PROCEDURAL STEPS
1. Check your hands to be sure they are not visibly soiled or contaminated with organic matter, such as blood or saliva. If necessary, wash your hands with soap and water, and dry them thoroughly.
   Purpose: Alcohol-based hand rubs are not effective in the presence of organic matter.

2. Read directions carefully to determine the proper amount to dispense.
   Purpose: These products are very dose-sensitive. If you use a smaller amount than is recommended, effectiveness will be seriously decreased.

3. Dispense the proper amount of the product into the palm of one hand.

4. Rub the palms of your hands together.
PROCEDURE 19-3—cont’d

Applying Alcohol-Based Hand Rubs

5 Rub the product between your fingers.

6 Rub the product over the back of your hands.

**Purpose:** It is important to thoroughly cover both of your hands.

---

**Special Considerations for Hand Hygiene**

Because rings and long fingernails can harbor pathogens, nails should be kept short and well manicured. Rings, long nails, and artificial nails are likely to puncture examination gloves and may poke a patient during an examination. In addition, microorganisms thrive around rough cuticles and can enter the body through any break in the skin. The CDC Guidelines recommend that rings, fingernail polish, and artificial nails should not be worn at work. (II)

---

You put on your PPE in the reverse order of what you change most frequently during the day. Gloves are changed most often, face protection less often, and protective clothing least often (Procedure 19-4). You remove your PPE in a manner that prevents contaminating hands, clothing, skin, and mucous membranes (Procedure 19-5).

**Protective Clothing**

The purpose of protective clothing is to protect the skin and underclothing from exposure to saliva, blood, aerosol, and other contaminated materials. Types of protective clothing can include smocks, pants, skirts, laboratory coats, surgical scrubs (hospital operating room clothing), scrub (surgical)
PROCEDURE 19-4

Putting on Personal Protective Equipment

GOAL
To put on PPE before providing patient care.

EQUIPMENT AND SUPPLIES
- Protective clothing
- Protective eyewear
- Surgical mask
- Gloves

PROCEDURAL STEPS
1. Put on your protective clothing over your uniform, street clothes, or scrubs.
   Note: Protective clothing could be long-sleeved lab coats, clinic jackets, or gowns.
2. Put on your surgical mask, and adjust the fit.
3. Put on your protective eyewear.
   Note: Eyewear should be impact-resistant and have side protection. Goggles or face shields are also acceptable.
4. Thoroughly wash and dry your hands.
   Note: If your hands are not visibly soiled, you may use an alcohol-based hand rub.
5. Hold one glove at the cuff, place your opposite hand inside the glove, and pull it onto your hand. Repeat with a new glove for your other hand.
   Important Note: Regarding the sequence of putting on PPE, the most important step is to put on the gloves last to avoid contaminating them before they are placed in the patient's mouth.

Modified from Policy to practice: OSAP's guide to the guidelines, Annapolis, Maryland, 2004, OSAP.
Removing Personal Protective Equipment

**GOAL**
To remove personal protective wear.

**EQUIPMENT AND SUPPLIES**
- Protective clothing
- Surgical mask
- Protective eyewear
- Gloves

**PROCEDURAL STEPS**
1. Use your gloved hand to grasp the other glove at the outside cuff. Pull downward, turning the glove inside out as it pulls away from your hand.

2. For the other hand, use your ungloved fingers to grasp the inside (uncontaminated area) of the cuff of the remaining glove. Pull downward to remove the glove, turning it inside out. Discard the gloves into the waste receptacle.

3. Wash and thoroughly dry hands.
   **Note:** If no visible contamination exists and gloves have not been torn or punctured during the procedure, you may use an alcohol-based hand rub in place of handwashing. However, if your hands are damp from perspiration or have glove powder, you may prefer to wash them with soap and water.

**Eyewear**
4. Remove eyewear by touching it only on the ear rests (which are not contaminated).
PROCEDURE 19-5—cont’d

Removing Personal Protective Equipment

5 Place the eyewear on a disposable towel until it can be properly cleaned and disinfected.

Masks

6 Slide the fingers of each hand under the elastic strap in front of your ears and remove the mask. Discard the mask into the waste receptacle.

Note: Be sure your fingers contact only the mask’s ties or elastic strap.

Protective Clothing

7 Pull the gown off, turning it inside out as it comes off.

Note: Be careful not to allow the gown to touch underlying clothes or skin.

Protective Clothing Requirements

- Protective clothing should be made of fluid-resistant material. Cotton, cotton/polyester, or disposable jackets or gowns usually are satisfactory for routine dental procedures.
- To minimize the amount of uncovered skin, clothing should have long sleeves and a high neckline.
- The design of the sleeve should allow the cuff to be tucked inside the band of the glove.
- During high-risk procedures, protective clothing must cover dental personnel at least to the knees when seated.
- Buttons, trim, zippers, and other ornamentation (which may harbor pathogens) should be kept to a minimum.

Note: The type and characteristics of protective clothing depend on the anticipated degree of exposure.

Handling Contaminated Laundry

As was mentioned earlier, the BBP Standard states that protective clothing may not be taken home and washed by employees. It may be laundered in the office if the equipment is available and if Universal Precautions are followed for handling and laundering the contaminated clothing.

Contaminated linens that are removed from the office for laundering should be placed in a leakproof bag with a

Guidelines for the Use of Protective Clothing

- Because protective clothing can spread contamination, it is not worn out of the office for any reason, including travel to and from the office.
- Protective clothing should be changed at least daily and more often if visibly soiled.
- If a protective garment becomes visibly soiled or saturated with chemicals or body fluids, it should be changed immediately.
- Protective clothing must not be worn in staff lounge areas or when workers are eating or consuming beverages.
FIG. 19-15 Depending on the task, the dental assistant’s attire might consist of scrubs, lab coats, or surgical gowns. A, Dental assistant in scrubs. B, Dental assistant in lab coat. C, Dental assistant in surgical gown.

FIG. 19-16 Containers of contaminated laundry must be labeled with the universal biohazard symbol.

FIG. 19-17 Fluid-impervious gown. (Courtesy CrossTex, Dallas, Texas.)

biohazard label or an appropriately color-coded label (Fig. 19-16). Disposable gowns must be discarded daily and more often if visibly soiled (Fig. 19-17).

Protective Masks

A mask is worn over the nose and mouth to protect the person from inhaling infectious organisms spread by the aerosol spray of the handpiece or air-water syringe and by accidental splashes. A mask with at least 95 percent filtration efficiency for particles 3 to 5 micrometers (µm) in diameter should be worn whenever splash or spatter is likely. Masks do not provide a perfect seal around the edges; therefore, unfiltered air can pass through the edges. For that reason, it is important to select a mask that fits your face well. Masks should be changed between patients, or during patient treatment if the mask becomes wet.

The two most common types of masks are the dome-shaped and flat types. Some operators prefer the dome-shaped type, particularly during lengthy procedures, because it conforms (“molds”) more effectively to the face and creates an air space between the mask and the wearer (Fig. 19-18).

When not in use, face masks should never be worn below the nose or on the chin. Remember, the outer surface of the mask is highly contaminated (Fig. 19-19).

Protective Eyewear

Eyewear is worn to protect the eyes against damage from aerosolized pathogens such as herpes simplex viruses and Staphylococcus and from flying debris such as scrap amalgam and tooth fragments. Protective eyewear also prevents injury from splattered solutions and caustic chemicals. Such damage may be irreparable and may lead to permanent visual impairment or blindness.

The BBP Standard requires the use of eyewear with both front and side protection (solid side shields) during exposure-prone procedures. If you wear prescription glasses, you must add protective side and bottom shields. Protective eyewear that can be worn over prescription glasses is also available.
If you wear contact lenses, you must also wear protective eyewear with side shields or a face shield.

The CDC Guidelines recommend that you clean your eyewear with soap and water, or, if visibly soiled, you can clean and disinfect reusable facial protective wear between patients.

The two types of protective eyewear used during patient care are (1) glasses with protective side shields, and (2) clear face shields (Fig. 19-20).

**Face Shields**

A chin-length plastic face shield may be worn as an alternative to protective eyewear. However, a shield cannot replace a face mask because the shield does not protect against inhalation of contaminated aerosols (Fig. 19-21).
When splashing or spattering of blood or other body fluids is likely to occur during a procedure such as surgery, a face shield is often worn in addition to a protective mask.

**Patient Eyewear**

Patients should be provided with protective eyewear because they also may be subject to eye damage from (1) handpiece spatter, (2) spilled or splashed dental materials such as caustic chemical agents, and (3) airborne bits of acrylic or tooth fragments (Fig. 19-22).

When certain laser treatments are performed, patients must be supplied with special filtered-lens glasses.

**Gloves**

Different types of gloves are used in a dental office. The type of glove you use should be based on the type of procedure to be performed (e.g., surgical vs. nonsurgical, housekeeping procedures). Medical grade nonsterile examination gloves and sterile surgical gloves are medical devices that are regulated by the U.S. Food and Drug Administration (FDA). The FDA does not regulate utility gloves because these are not promoted for medical use. Sterile surgical gloves must meet standards for sterility assurance as established by the FDA (Box 19-2).

**Examination Gloves**

Medical examination gloves usually are latex or vinyl and often are referred to as “exam gloves” or “procedure gloves.” These gloves are most frequently worn by dental personnel during patient care (Fig. 19-23).
BOX 19-2

Types of Gloves in Dentistry

Patient Care Gloves
- Sterile latex surgical gloves
- Sterile neoprene surgical gloves
- Sterile styrene surgical gloves
- Sterile synthetic copolymer gloves
- Sterile reduced-protein latex surgeon's gloves
- Latex examination gloves
- Vinyl examination gloves
- Synthetic copolymer examination gloves
- Nitrile examination gloves
- Styrene-butadiene examination gloves
- Polyurethane gloves
- Powderless gloves
- Flavored gloves
- Low-protein gloves

Utility Gloves
- Heavy latex gloves
- Heavy nitrile gloves
- Thin copolymer gloves
- Thin plastic (“food handler”) gloves

Other Gloves
- Heat-resistant gloves
- Dermal (cotton) gloves

*Nonlatex gloves; one should review the labeling or check with the manufacturer to confirm.

From Miller CH, Palenik CJ: Infection control and management of hazardous materials for the dental team, ed 3, St Louis, 2005, Mosby.

Guidelines for the Use of Gloves

All gloves used in patient care must be discarded after a single use. These gloves may not be washed, disinfected, or sterilized, although they may be rinsed with water to remove excess powder.

Latex, vinyl, or other disposable medical quality gloves may be used for patient examinations and dental procedures. Replace torn or damaged gloves immediately.

Do not wear jewelry under gloves. (Rings harbor pathogens and may tear the glove.)

Change gloves frequently. (If the procedure is long, change gloves about once each hour.)

Remove contaminated gloves before leaving the chairside during patient care, and replace them with new gloves before returning to patient care (see “Guidelines for the Use of Overgloves”).

Wash hands after glove removal and before regloving.

Examination gloves are inexpensive, are available in a range of sizes from extra small to extra large, and fit either hand. These gloves are nonsterile and serve strictly as a protective barrier for the wearer.

Gloves Damaged During Treatment

Gloves are effective only when they are intact (not damaged, torn, ripped, or punctured). If gloves are damaged during treatment, change them immediately and wash your hands before regloving. The procedure for regloving in this situation is as follows:

- Excuse yourself and leave the chairside.
- Remove and discard the damaged gloves.
- Wash hands thoroughly.
- Reglove before returning to the chairside to resume the dental procedure.

If you leave the chairside for any reason during the treatment of a patient, overgloves should be used. You must remove your contaminated examination gloves and wash your hands before you leave the chairside. When you return, you should wash and dry your hands and use fresh examination gloves.

Gloves Damaged by Dental Materials

The chemicals you come in contact with on a daily basis may damage your gloves. For example, exposure to glutaraldehyde, hydrogen peroxide, and alcohol preparations may weaken latex, vinyl, nitrile, and other synthetic glove materials. Other chemicals in dental materials that may weaken gloves include acrylic monomer, chloroform, orange solvent, eugenol, cavity varnish, and acid etch.

Because so many dental materials are available on the market, you should consult the glove manufacturer about the compatibility of the glove material with various chemicals.
Infection control procedures for use in the mixing and passing of dental materials are discussed in greater detail in Chapter 47.

Sterile Surgical Gloves
Sterile gloves, which are the type used in hospital operating rooms, should be worn for invasive procedures involving the cutting of bone or significant amounts of blood or saliva, such as oral surgery or periodontal treatment.

Sterile gloves are supplied in prepackaged units to maintain sterility before use. They are provided in specific sizes and are fitted to the left or right hand. Hand preparation and the use of surgical gloves are discussed in Chapter 56.

Overgloves
Overgloves, also known as “food handler gloves,” are made of lightweight, inexpensive, clear plastic. These may be worn over contaminated treatment gloves (overgloving) to prevent the contamination of clean objects handled during treatment (Fig. 19-24).

Utility Gloves
Utility gloves are not used for direct patient care. Utility gloves are worn (1) when the treatment room is cleaned and disinfected between patients, (2) while contaminated instruments are being cleaned or handled, and (3) for surface cleaning and disinfecting (Fig. 19-25). Utility gloves may be washed, disinfected, or sterilized and reused. Utility gloves must be discarded, however, when they become worn and no longer have the ability to provide barrier protection. After use, utility gloves must be considered contaminated and must be handled appropriately until they have been properly disinfected or sterilized. Each staff member responsible for cleanup procedures must have his or her own designated pair of utility gloves.

Non–Latex-Containing Gloves
Occasionally, healthcare providers or patients may experience serious allergic reactions to latex (see Latex Allergies section). The person who is sensitive to latex can substitute with gloves made from vinyl, nitrile, and other non–latex-containing materials (Fig. 19-26).

Maintaining Infection Control While Gloved
During a dental procedure, it may be necessary to touch surfaces or objects such as drawer handles or material containers. If you touch these with a gloved hand, both the surface and the glove become contaminated. To minimize
the possibility of cross-contamination, you can use an over-glove when it is necessary to touch a surface.

**Opening Drawers and Cabinets**

If you anticipate what materials you will need and have those items ready and easily accessible for each procedure, you will save time and minimize cross-contamination. Each surface you touch with contaminated gloves also becomes contaminated. By eliminating the need to open drawers and cabinets, you limit operatory contamination.

Set up instruments, medications, and impression materials ahead of time, and use disposable and unit-dose items whenever possible. Keep a pair of salad tongs or forceps within reach in the operatory. These simple tools can be used to open cabinets, pull out drawers, and obtain any unanticipated yet necessary items without contaminating additional items and surfaces. Appropriately disinfect the tongs or forceps between patients.

**Opening Containers**

During the procedure, it may become necessary to open containers of materials or supplies. When opening a container, use overgloves, a paper towel, or a sterile gauze sponge to remove the lid or cap. In doing this, take care not to touch any surface of the container.

Use sterile cotton pliers to remove an item from the container. If the container or bottle is touched, it becomes contaminated and must be disinfected at the end of the procedure.

**High-Tech Equipment**

Every aspect of dentistry is entering the arena of high-technology equipment and devices. You must carefully consider what infection control procedures are needed to make each piece of equipment safe for use. Some devices become contaminated from use in a patient’s mouth. Other types may not be used in the mouth but may be held or touched with contaminated gloved hands (Fig. 19-27).

**Examples of High-Tech Equipment**

<table>
<thead>
<tr>
<th>Caries detection devices</th>
<th>Computer keyboards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoral cameras</td>
<td>CAD/CAM systems</td>
</tr>
<tr>
<td>Extraoral cameras</td>
<td>Curing lights</td>
</tr>
<tr>
<td>Microscopes</td>
<td>Digital sensors</td>
</tr>
<tr>
<td>Lasers</td>
<td>Air-abrasion units</td>
</tr>
<tr>
<td>Ultrasonic and piezo scalers</td>
<td>Magnification loupes</td>
</tr>
<tr>
<td>Electric handpieces</td>
<td>X-ray scanners</td>
</tr>
<tr>
<td>Optical illumination devices</td>
<td></td>
</tr>
</tbody>
</table>

Always follow the manufacturer’s infection control recommendations for every device and piece of equipment. If these procedures are not followed carefully, the equipment warranty and patient and office staff may be jeopardized.

Some infection control considerations when working with high-tech equipment and devices are provided in Box 19-3.
Latex Allergies

The use of natural rubber latex gloves has proved to be one of the most effective means of protecting the dental worker and the patient from transmission of disease. However, increased use of latex gloves and other products that contain latex in the dental office and other healthcare settings has created other problems. The numbers of healthcare workers and patients who have become hypersensitive to latex have increased dramatically (Box 19-4).

Three common types of allergic reactions to latex have been identified. Irritant dermatitis involves only a surface irritation. Type I and type IV allergies involve an immune reaction.

Irritant Dermatitis

Irritant dermatitis is a nonimmunologic process (does not involve the body’s immune system). It is caused by contact with a substance that produces a chemical irritation to the skin. The skin becomes reddened, dry, irritated, and, in severe cases, cracked (Fig. 19-28).

Identifying and correcting the causes, which include the following, can reverse irritant dermatitis:

- Frequent handwashing with soaps or antimicrobial agents
- Failure to rinse soaps or microbial agents completely from the hands
- Irritation caused by the cornstarch powder in gloves
- Excessive perspiration on the hands while wearing gloves
- Failure to dry hands thoroughly after rinsing

CDC Guidelines for Contact Dermatitis and Latex Hypersensitivity

Educate dental healthcare workers regarding the signs, symptoms, and diagnoses of skin reactions associated with frequent hand hygiene and glove use. (IB)

Screen all patients for latex allergy (e.g., take health history and refer patient for medical consultation when latex allergy is suspected). (IB)

Ensure a latex-safe environment for patients and dental healthcare personnel. (IB)

Have emergency treatment kits with latex-free products available at all times. (II)

Type IV Allergic Reaction

Type IV allergic reaction, the most common type of latex allergy, is a delayed contact reaction that involves the immune system. It may take 48 to 72 hours for the red, itchy rash to appear. Reactions are limited to the areas of contact...
avoid latex in all aspects of their personal and professional lives.  

**Note:** When one employee in the dental office has been diagnosed as having a latex allergy, all staff members should follow practices to minimize the use of latex-containing products. These measures include use of powderless gloves by all dental staff members to minimize the risk of airborne latex particles.

### Latex-Sensitive Patients

In the healthcare setting, patients with latex allergies should be treated with alternatives to latex. Vinyl gloves and a nonlatex rubber dam should be available in all dental offices.

### Type I Allergic Reaction

Type I allergic reaction is the most serious type of latex allergy and can result in death. This reaction occurs in response to the latex proteins in the glove, in contrast to the reaction to chemical additives in type IV. A severe immunologic response occurs, usually two to three minutes after latex allergens contact the skin or mucous membranes.

Proteins from the latex adhere to the cornstarch powder particles inside the gloves. Frequent handling of powdered latex gloves, such as during donning, and frequent removal of powdered gloves from boxes during the day cause the proteins, which are bound to the powder, to remain suspended in the air for prolonged periods. Sensitized persons can experience coughing, wheezing, runny eyes and nose, shortness of breath, and respiratory distress.

The primary cause of death associated with latex allergies is anaphylaxis. **Anaphylaxis** is the most severe form of immediate allergic reaction. Death results from closure of the airway caused by swelling (see Chapter 31).

### Treatment

No specific cure has been identified for latex allergy. The only options are prevention, avoidance of latex-containing products, and treatment of the symptoms. Persons who suspect that they are allergic to latex should see a qualified healthcare provider for a test to confirm the allergy. Once diagnosed as having a latex allergy, patients should

---

**RECALL**

18. What type of response is irritant dermatitis?
19. What is the most common type of latex allergy?
20. What is the most serious type of latex allergy?
21. What type of gloves should be used for a latex-sensitive patient?

### Waste Management in the Dental Office

Dental practices are subject to a wide variety of federal, state, and local regulations regarding waste management issues. Waste management can be confusing because agencies do not always use a consistent glossary of terms and definitions (Table 19-2).

For example, the Environmental Protection Agency (EPA) and most state and local regulations do not categorize saliva or saliva-soaked items as infectious waste. However, because of the high probability that blood may be carried in saliva during dental procedures, CDC Guidelines and OSHA BBP Standard regulations consider saliva in dentistry to be a potentially infectious body fluid. As such, saliva-coated items should be treated as **potentially infectious waste** and disposed of as contaminated waste.

The OSHA BBP Standard requires that all waste be disposed of according to applicable federal, state, and local regulations.

### Classification of Waste

The handling, storage, labeling, and disposal of waste depend entirely on the type of waste. For example, when a dental treatment room is reprocessed, the waste should be separated into general waste containers and hazardous waste containers. The dental assistant must understand the types of waste to know what items are discarded in which container.
### TABLE 19-2

**Classification of Waste**

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
<th>Handling Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>General waste</td>
<td>Paper towels, paper mixing pads, empty food containers</td>
<td>Discard in covered containers made of durable materials such as plastic or metal. Follow your specific state and local regulations.</td>
</tr>
<tr>
<td>Hazardous waste</td>
<td>Waste that presents a danger to humans or to the environment (toxic chemicals)</td>
<td>In most states, dispose of with the general waste.</td>
</tr>
<tr>
<td>Contaminated waste</td>
<td>Waste that has been in contact with blood or other body fluids (used barriers, patient napkins)</td>
<td>Follow your specific state and local regulations.</td>
</tr>
<tr>
<td>Infectious or regulated waste (biohazard)</td>
<td>Waste that is capable of transmitting an infectious disease</td>
<td>Containers for all three types of infectious waste must be labeled with the biohazard label.</td>
</tr>
<tr>
<td>Blood and blood-soaked materials</td>
<td>Blood or saliva that can be squeezed out, or dried blood that may flake off of an item</td>
<td>Closable, leakproof, puncture-resistant containers. Containers should be color-coded red and marked with the biohazard symbol. Sharps containers should be located as close as possible to the work area.</td>
</tr>
<tr>
<td>Pathologic waste</td>
<td>Soft tissue and extracted teeth</td>
<td></td>
</tr>
<tr>
<td>Sharps</td>
<td>Contaminated needles, scalpel blades, orthodontic wires, endodontic instruments (reamers and files)</td>
<td></td>
</tr>
</tbody>
</table>

### CDC Guidelines for Regulated Medical Waste

- **General Waste**
  - General waste consists of all nonhazardous, nonregulated waste and should be discarded in covered containers made of durable material such as plastic or metal. For ease in handling, general waste receptacles should be lined with plastic bags. General waste includes disposable paper towels, paper mixing pads, and empty food containers.

- **Contaminated Waste**
  - Waste that has been in contact with blood or other body fluids is considered **contaminated waste**; this includes used barriers and patient napkins. In most states, contaminated waste is disposed of as general waste (regular household-type waste). In a few states, however, it may be considered and defined as regulated, or infectious, waste.

  - Appropriate PPE should be worn when handling or disposing of contaminated waste.

- **Hazardous Waste**
  - **Hazardous waste** poses a risk to humans and to the environment. Toxic chemicals and materials are hazardous waste. Examples include scrap amalgam, spent fixer solution, and lead foil from x-ray film packets. Some items, such as extracted teeth with amalgam restorations, may be both hazardous waste (because of the amalgam) and infectious waste (because of the blood).

### CDC Guidelines for Handling Extracted Teeth

- **General Waste**
  - General waste consists of all nonhazardous, nonregulated waste and should be discarded in covered containers made of durable material such as plastic or metal. For ease in handling, general waste receptacles should be lined with plastic bags. General waste includes disposable paper towels, paper mixing pads, and empty food containers.

- **Contaminated Waste**
  - Waste that has been in contact with blood or other body fluids is considered **contaminated waste**; this includes used barriers and patient napkins. In most states, contaminated waste is disposed of as general waste (regular household-type waste). In a few states, however, it may be considered and defined as regulated, or infectious, waste.

  - Appropriate PPE should be worn when handling or disposing of contaminated waste.

- **Hazardous Waste**
  - **Hazardous waste** poses a risk to humans and to the environment. Toxic chemicals and materials are hazardous waste. Examples include scrap amalgam, spent fixer solution, and lead foil from x-ray film packets. Some items, such as extracted teeth with amalgam restorations, may be both hazardous waste (because of the amalgam) and infectious waste (because of the blood).

- **Infectious or Regulated Waste (Biohazard)**
  - **Infectious waste**, also called **regulated waste or biohazardous waste**, is contaminated waste that is capable of transmitting an infectious disease. For waste to be infectious, pathogens must be strong enough and must be present in sufficient numbers to infect a susceptible individual.
Infectious waste is never disposed of as general waste. It requires special handling and disposal. Most dental offices are exposed to the following three types of infectious waste:

**Blood and blood-soaked materials.** Blood or saliva can be squeezed out, or dried blood may flake off from the item. Gauze dripping with blood is such an item. **Pathologic waste.** Soft tissue and extracted teeth are examples.

**Sharps.** Examples include all contaminated sharp objects used for patient care.

### Handling Extracted Teeth

Dispose of extracted teeth as regulated medical waste unless returned to the patient. When teeth are returned to the patient, the provisions of the standard no longer apply. Do not dispose of extracted teeth that contain amalgam with regulated medical waste that will be incinerated. Because of the mercury that is present in amalgam fillings, you should check your state and local regulations regarding disposal of teeth that contain amalgam.

### Handling Contaminated Waste

Contaminated items that may contain the body fluids of patients, such as gloves and patient napkins, should be placed in a lined trash receptacle. Receptacles for contaminated waste should be covered with a properly fitted lid that can be opened with a foot pedal. Keeping the lid closed prevents air movement and the spread of contaminants. This receptacle should not be overfilled, and it should be emptied at least once daily.

Red bags or containers should *not* be used for unregulated waste. Check the specific requirements of your local state or county health department (Fig. 19-29).

### Handling Medical Waste

Medical waste is any solid waste that is generated in the diagnosis, treatment, or immunization of humans or animals in research. Infectious waste is a subset of medical waste. Only a small percentage of medical waste is infectious and has to be regulated.

### Infectious Waste

Containers of infectious waste (regulated waste), as defined earlier, must be labeled with the universal biohazard symbol, identified in compliance with local regulations, or both. Local regulations may vary regarding the return of extracted teeth to patients, especially for young children who give their tooth to the “tooth fairy.”

**Note:** Containers used for holding contaminated items also must be labeled. Examples of such containers are contaminated sharps containers, pans or trays used for holding contaminated instruments, bags of contaminated laundry, specimen containers, and storage containers.

### Disposal of Medical Waste

Once contaminated waste leaves the office, it is then regulated by the EPA and by state and local laws. Under most regulations, the manner of disposal is determined by the quantity (weight) of infectious materials for disposal.

The average dental practice is categorized as a “small producer” of infectious waste, and disposal is regulated accordingly. The law requires the dentist to maintain records of the final disposal of this medical waste, including documentation of how, when, and where it was disposed.

### RECALL

22. *What are three examples of contaminated waste?*
23. *What are three examples of general waste?*
24. *What is another term for infectious waste?*
25. *Which type of waste must be identified with the biohazard label?*

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### Additional Infection Control Practices

#### OSHA Blood-Borne Pathogens Standard

Never eat, drink, smoke, apply cosmetics or lip balm, or handle contact lenses in any area of the dental office where possible contamination is present, such as dental treatment rooms, dental laboratory, sterilization area, or x-ray processing area.

Never store food or drink in refrigerators that contain potentially contaminated items.
FIG. 19-30 Pouch for lab cases with the biohazard label. (Courtesy CrossTex, Dallas, Texas.)
Disinfecting an Alginate Impression

**GOAL**
To disinfect an alginate impression.

**EQUIPMENT AND SUPPLIES**
- Protective clothing
- Surgical mask
- Protective eyewear
- Chemical-resistant utility gloves
- Disinfectant solution

**PROCEDURAL STEPS**
1. Rinse the impression under running tap water to clean it. If necessary, use a soft, camel-hair brush to remove debris. **Purpose:** To remove any blood and/or saliva.
2. Disinfect the impression using an intermediate-level hospital disinfectant for the contact time recommended on the germicide's label.
3. If spraying is used, spray the impression thoroughly and wrap it with well-moistened paper towels. Unwrap the impression after the manufacturer’s recommended contact time has elapsed. **Note:** Follow the manufacturer’s recommendations for disinfection. Spraying uses less solution, and often, you can use the same disinfectant that you use for the operatory. However, sprayed disinfectants may pool, which may prevent some surfaces from being adequately exposed to the germicide.
4. If immersion is used, remove the impression after the manufacturer’s recommended contact time has elapsed.
5. Rinse the disinfected impression under tap water to remove any residual germicide.
6. After a thorough rinse, gently shake the impression within the sink basin to remove the remaining water with minimal spatter. **Note:** Always check the recommendations of the impression manufacturer as to the stability of the impression material during disinfection.

Modified from Policy to practice: OSAP’s guide to the guidelines, Annapolis, Maryland, 2004, OSAP.

Preprocedural Mouth Rinses

Some dental practitioners have their patients rinse with an antimicrobial mouth rinse before dental procedures. This procedure is intended to reduce the number of microorganisms released in the form of aerosol or spatter. In addition, preprocedural mouth rinsing can decrease the number of microorganisms introduced into the patient’s bloodstream during invasive dental procedures. The scientific evidence is inconclusive that preprocedural mouth rinsing prevents clinical infection among dental health professionals or patients. Therefore, the CDC identifies the use of a preprocedural mouth rinse as an unresolved issue.

Mycobacterium tuberculosis

Patients infected with *M. tuberculosis* (the microorganism that causes tuberculosis [TB]) may seek dental treatment in private offices. It is important for the dental assistant to understand how to manage these patients. *M. tuberculosis* is a bacterium that is spread by airborne infective particles when the patient sneezes, coughs, or even speaks. The small
particles can remain airborne for hours. Infection occurs when a susceptible person inhales the bacteria, which then travel to the lungs. TB bacteria can remain alive in the lungs for years, a condition called latent TB infection. Persons with latent TB usually have a reactive tuberculin skin test (TST), but they have no symptoms of active disease and are not infectious. However, they can develop disease later in life if they do not receive treatment for their latent infection. For patients with known or suspected active TB, the CDC recommends that elective dental treatment be delayed until the patient is noninfectious. For patients who require urgent dental care, the CDC recommends referring the patient to a facility with TB engineering controls and a respiratory protection program.

**Creutzfeldt-Jakob Disease**  
Potential infectivity of oral tissues in patients with Creutzfeldt-Jakob disease is an unresolved issue. Scientific data indicate that the risk, if any, of sporadic transmission of the disease during dental and oral surgical procedures is low to nil. No recommendation is offered regarding use of special precautions in addition to Standard Precautions when treating patients known to have Creutzfeldt-Jakob disease. (Unresolved issue)

**Laser/Electrosurgery Plumes or Surgical Smoke**  
During surgical procedures in which a laser or an electrosurgical unit is used, a smoke by-product is created through thermal destruction of the tissue. Laser plumes and surgical smoke create additional potential risks for dental healthcare professionals. One concern is that aerosolized infectious material in the laser plume may reach the nasal mucosa of the operator or other members of the dental team. However, the presence of an infectious agent within a laser plume might not be enough to cause disease from airborne exposure, especially if the agent’s normal mode of transmission is not airborne. Because the effect of exposure on dental personnel from the use of dental lasers has not yet been adequately evaluated, the CDC offers no recommendations, and this remains an unresolved issue.

**CDC Guidelines for Mycobacterium tuberculosis**  
All dental healthcare professionals (DHCPs) should be educated regarding the signs, symptoms, and transmission of tuberculosis (TB). (IB)
All DHCPs who could have contact with persons with suspected or confirmed cases of TB should have a baseline tuberculin skin test (TST). (IB)
Assess each patient for a history of TB, and document it on the medical history. (IB)
Follow CDC recommendations for developing, maintaining, and implementing a TB infection control plan. (IB)
The following applies to patients known or suspected to have active TB:
   - The patient should be evaluated away from other patients and personnel. (IB)
   - Elective dental treatment should be deferred until the patient is noninfectious. (IB)
   - Patients who require urgent dental treatment should be referred to a facility with TB engineering controls and a respiratory protection program. (IB)

**Creutzfeldt-Jakob Disease and Other Prion Diseases**

Creutzfeldt-Jakob disease (CJD) belongs to a group of rapidly progressive, invariably fatal, degenerative neurologic disorders. The disease can affect both humans and animals. It is thought that the disease is caused by a prion infection (see Chapter 18). Prion diseases have an incubation period (time between infection and signs of disease) of years and are usually fatal within one year of diagnosis. The CDC offers no recommendation regarding the use of special precautions in addition to Standard Precautions when one is treating known patients with CJD. This remains an unresolved issue.

**RECALL**

26 What is the BBP Standard rule regarding refrigerators in dental offices?
27 What is the CDC guideline for using saliva ejectors?
28 How does tuberculosis infection occur?
29 What is the CDC recommendation on the use of preprocedural mouth rinses?
30 Did the CDC make a recommendation regarding the effects of exposure to laser plumes on dental healthcare professionals? Why or why not?
The area of infection prevention in dentistry is continually evolving, and as new diseases are identified, new practices and techniques will be developed to prevent their spread. Although some concepts of dental infection control may seem confusing, the basic principles serve as the cornerstone for preventing disease transmission in the dental setting.

Dental professionals must remain vigilant and must keep current on the latest information to ensure the health of patients, their families, and themselves.

**Critical Thinking**

1. How would you handle a situation in which you knew that a co-worker was not routinely following infection control policies?
2. Mrs. James becomes offended when you put on gloves before taking her radiographs. She insists that she does not have a disease, and that her previous dental assistant never wore gloves. What would you explain to her?
3. What precautions would you take if a new patient in your office said that he was allergic to latex?
4. How would you explain the CDC Guidelines and the OSHA Blood-borne Pathogens Standard to a new employee who has no formal dental-assisting education?

**Legal and Ethical Implications**

The CDC Guidelines for Infection Control in Dental Healthcare Settings—2003 apply to approximately 168,000 dentists, 218,000 dental assistants, 112,000 dental hygienists, and 53,000 dental laboratory technicians. They also apply to students, trainees, and other persons not directly involved in patient care but who are potentially exposed to infectious agents (e.g., administrative, clerical, housekeeping, maintenance, volunteers). Remember that these guidelines have established the standard of care for infection control in dentistry.

Infection prevention is also an ethical issue for the dental assistant. Often, the dental assistant is alone when performing infection control procedures; if cross-contamination occurs, no one else may know. Always following proper infection control procedures is a matter of personal commitment and integrity.

Patients should have absolute confidence that the infection control procedures followed in the office are never compromised. This confidence is as important for the protection of dental team members as it is for the patient.

**Eye to the Future**

The area of infection prevention in dentistry is continually evolving, and as new diseases are identified, new practices and techniques will be developed to prevent their spread. Although some concepts of dental infection control may seem confusing, the basic principles serve as the cornerstone for preventing disease transmission in the dental setting.

Dental professionals must remain vigilant and must keep current on the latest information to ensure the health of patients, their families, and themselves.
Dear Author

During the preparation of your manuscript for publication, the questions listed below have arisen. Please attend to these matters and return this form with your proof.

Many thanks for your assistance.

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