

Chapter 2: Hazard Recognition and Controls

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Objectives

After completing this chapter, participants should be able to:

1. List and describe the six general hazard categories on an infectious disease worksite.
2. Describe the key elements of an infectious disease occupational exposure control plan.
3. Explain the importance of workplace control methods, including substitution, engineering controls, administrative controls, and PPE (known as the Hierarchy of Controls).
4. List and demonstrate the key components of Standard Precautions.
5. Explain the key components of the three categories of Expanded Precautions.
6. Describe hazards and controls related to chemical use on infectious disease worksites.
7. Explain the importance of using EPA-approved chemical disinfectants on an infectious disease worksite.
8. Describe physical hazards and controls related to work on infectious disease worksites.
9. Describe ergonomic hazards and controls related to work on infectious disease worksites.
10. Describe psychosocial hazards and controls related to work on infectious disease worksites.
11. Describe safety hazards and controls related to work on infectious disease worksites.
12. List at least five safe work practices for infectious disease worksites.
13. Describe the importance of site safety awareness.

Chapter 2: Hazard Recognition and Controls

Introduction

The skill for spotting hazards on the job develops through work experience, training, and sharing stories and experiences with coworkers. Recognizing and responding to hazards is very important to the health and safety of every worker. Although many aspects of infectious disease work are similar to other types of environmental services or maintenance work, when infectious diseases are present on the jobsite, there are unique aspects to be considered.

The purpose of teaching hazard recognition is to improve a worker's ability to identify hazards found in infectious disease work. Recognizing and understanding hazards is an important step in protecting yourself from injury, illness, or even death.

Chapter 2: Hazard Recognition and Controls

Hazard Recognition and Control

TYPES OF HAZARDS

A common way to classify hazards is by category:

- **Biological:** Bacteria, viruses, insects, plants, birds, animals, and humans, etc.
- **Chemical:** Exposure to chemical disinfectants used in cleaning operations, etc.
- **Physical:** Heat stress, noise, radiation, etc.
- **Ergonomic:** Repetitive movements, improper set up of workstation, etc.
- **Psychosocial:** Stress, violence, etc.
- **Safety:** Slipping/tripping hazards, inappropriate machine guarding, equipment malfunctions or breakdowns, etc.

BIOLOGICAL HAZARDS

Infectious Agents

Infectious agents are organisms that are capable of producing infection or infectious disease. You may also see them referred to as pathogens or biological agents. They include bacteria, fungi, viruses, and parasites. Healthcare workers have a high risk of contact with infectious agents due to the various types of activities involved with their jobs and the possibilities of contamination. Non-healthcare workers may also have a higher risk of contact if assigned duties in cleanup operations or maintenance work on a site known or suspected to contain infectious agents, or in the handling, transporting, treating, or disposal of infectious waste.

Infectious waste is normally generated within healthcare for example from hospitals and medical laboratories. Until the late 1980's, when this waste became a public health concern, such waste was usually discarded with few precautions. Today, regulations require that infectious waste or regulated medical waste (RMW) be properly managed and disposed. While the regulations may vary from state to state, at a minimum Federal Department of Transportation (DOT) regulations mandate that RMW be packaged in a way that it does not pose a public health threat when being transported for disposal. This includes the use of a

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RMW: Regulated medical waste

DOT: Federal Department of Transportation

Chapter 2: Hazard Recognition and Controls

potential combination of a bag (typically red with a biohazard symbol on it) and an outer container that is durable. Items such as sharps are required to be disposed of in containers that are puncture resistant, often called sharps containers.

RMW containers can vary in size, shape and color, however when being generated and transported there are minimum requirements from OSHA and DOT that require the words “biohazard” and the international biohazard symbol. The words regulated medical waste or (bio)medical waste or clinical waste must appear on the outside of the container as well as United Nations (UN) number UN 3291.

As more people have diseases requiring in-home healthcare, there are more instances where wastes could be found outside of healthcare as well. Many public areas may have sharps containers for their patrons, or there may be more medical waste being placed in the regular garbage in homes. This is the reason it is important to be able to recognize and remain alert when managing trash or other waste materials, even outside of a healthcare setting. Special precautions are required when handling regulated medical waste that are mandated by OSHA as well, under the Bloodborne Pathogens Standard.

Since different infectious diseases have different routes of transmission – and some, like Ebola, can have multiple routes of transmission – there are a number of ways that workers may need to be protected. Depending on the biological agent, pathogens may live on surfaces on a worksite, or be transmitted by a cough or sneeze. Other pathogens may stay suspended in the air and be inhaled, or even transmitted through ventilation systems. Decontamination procedures using chemicals may also result in sprays, splashes, or aerosol transmission from work-related activities.

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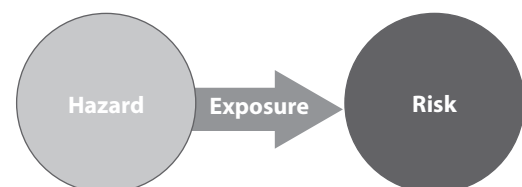
hazards: Any source of potential damage or adverse health effects on a group of workers.

risks: The chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard at work.

Occupational Hazards and Risks for Infectious Diseases

In the case of working around infectious diseases, companies use pathogen safety data to identify and prevent occupational exposure to infectious disease hazards. Hazards may be defined as any source of potential damage or adverse health effects on a group of workers.

Risks may be defined as the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard at work.



Chapter 2: Hazard Recognition and Controls

An Infectious Disease Occupational Exposure Control Plan

Prevention of occupational exposures to pathogens begins with employers developing a written infectious disease occupational exposure control plan to assure proper procedures are in place to protect all employees who have potential exposure to environments that contain infectious agents or atmospheres.

Risk	Likelihood x Severity
Exposure	Contact with a chemical, physical, radiological, and/or biological agent
Assessment	A process of gathering, analyzing, and documenting; evaluation

The table below outlines the key elements of an infectious disease occupational exposure control plan.

Table 1: Key Elements of an Infectious Disease Exposure Control Plan

Management Commitment and Employee Involvement
<ul style="list-style-type: none">• Designated plan administrator, accountability• Committee process includes organizational stakeholders, workers, and union representatives• Written exposure control plan
Risk Assessment
<ul style="list-style-type: none">• Exposure determination• Consideration of proximity to the contaminant source, virulence, pathogenicity, severity of potential health effects, environmental factors, effectiveness of controls, etc.
Hazard Control
<ul style="list-style-type: none">• Hierarchy of controls: use engineering and administrative controls• Selection of PPE and respirators• Product selection committee includes end users• Proper staffing and limit worker exposure to contaminated materials
Decontamination, Disinfection, and Sterilization
<ul style="list-style-type: none">• Routine and targeted decontamination• Handling, containerization, storage, transport, or disposal of contaminated materials• Disinfection and sterilization of contaminated equipment and work areas.

Chapter 2: Hazard Recognition and Controls

Table 1: Key Elements of an Infectious Disease Exposure Control Plan
(continued)

<p>Reporting & Recordkeeping</p> <ul style="list-style-type: none"> • Written procedures for reporting and recording exposures or cases • Reporting to public health authorities as per federal and state law
<p>Training</p> <ul style="list-style-type: none"> • Standard operating procedures in the written plan • Donning and doffing PPE • Frequency tied to demonstrated competency, at least annually • Drills and refreshers
<p>Post Exposure and Occupational Health Procedures</p> <ul style="list-style-type: none"> • Vaccinations, post exposure procedures, baseline medical testing, medical monitoring, medical removal protection (removal from exposure and protection of compensation)
<p>Plan Updates/Evaluation</p> <ul style="list-style-type: none"> • At least annually • New job tasks, new technology • Exposures, emerging infections • Record reviews, surveys, auditing, observations, equipment evaluations

The plan must be industry- and site-specific. Input from workers who perform the job tasks that generate potential exposure is essential. Additionally, a feedback loop should be designed into the plan to allow for continual process improvement. Other organizational stakeholders should include management decision makers, purchasing agents, operational managers, supervisors, human resources, and other functions that will play a role in implementing the plan. Pathogen safety data will be critical in many phases of plan development such as exposure determination, exposure control, decontamination, and post-exposure procedures.

HIERARCHY OF CONTROL MEASURES

The Hierarchy of Controls is used in occupational health as part of the selection process to eliminate or reduce a hazard. *Figure 1* shows the Hierarchy of Controls in decreasing order.

Chapter 2: Hazard Recognition and Controls

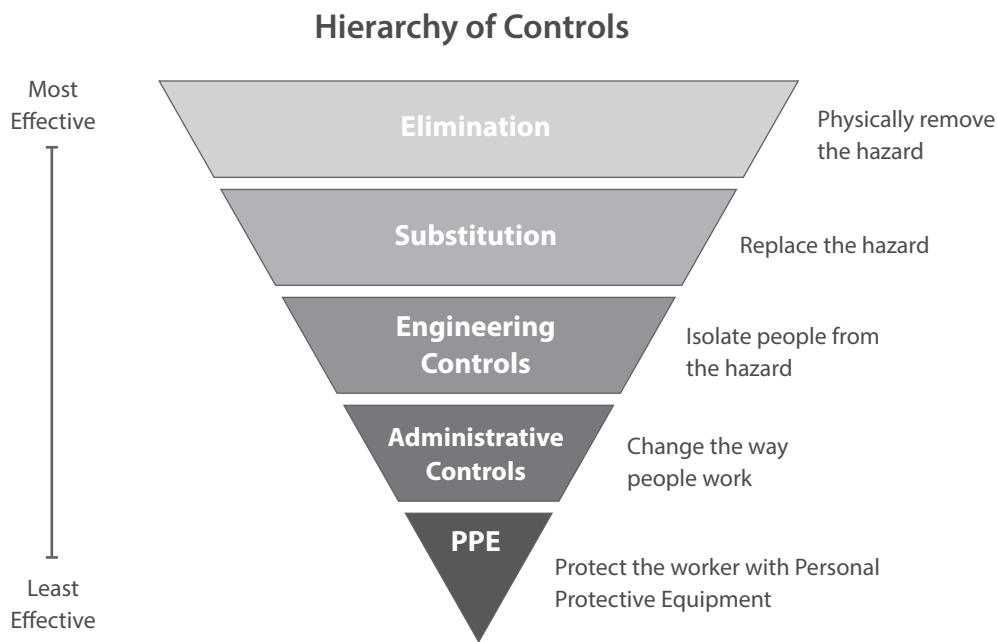


Figure 1: Hierarchy of Controls.

ELIMINATION AND SUBSTITUTION

While most effective at reducing hazards, elimination (physically removing the hazard) and substitution (replacing the hazard) are often the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination and substitution of hazards may be inexpensive and simple to implement.

For an existing process, major changes in equipment and procedures may be required to eliminate or substitute a hazard. Although elimination and substitution are preferred, they are not a consideration for controlling infectious diseases. They generally relate to chemicals and not with an infectious disease.

ENGINEERING CONTROLS FOR INFECTIOUS DISEASES

Engineering controls are a way of reducing or eliminating worker exposure to hazards by using mechanical means (such as ventilation systems), acoustical material, and physical barriers. The work environment should be designed to eliminate or otherwise reduce worker exposure to hazards. Engineering controls in operations on infectious disease worksites serve

Chapter 2: Hazard Recognition and Controls

as physical barriers between workers and pathogens, reducing the likelihood and amount of worker exposure to sources of infectious substances. Equipment that functions without worker actions – for example, continuous operation of a negative-pressure ventilation system in areas where waste is handled – provides the best protection.

Other engineering controls include the following:

- disinfectants;
- isolation rooms;
- special air handling systems, HEPA filtration, ultraviolet lights;
- plastic to contain contamination;
- needleless I.V. systems, retractable syringes, and other devices designed to prevent needlestick injuries. These systems protect healthcare and waste workers;
- rigid containers to package waste, including puncture-proof containers for sharps. Packaging must meet the requirements of OSHA's Bloodborne Pathogens standard and DOT's HMR (or exceptions outlined in a special permit, if applicable);
- equipment that ventilates outside the work area when treating contaminated waste; and
- suitable shelves, straps, or other equipment – especially in transport vehicles, where containers may move or shift – to secure stacked contaminated waste containers.

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HMR: Hazardous materials regulations

Engineering controls selected should be specific to the type of work that will be performed.

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PPE: Personal protective equipment

Engineering controls are favored over administrative controls and personal protective equipment (PPE) for controlling existing worker exposures in the workplace, because they are designed to remove the hazards at the source, before it comes in contact with the worker.

Well-designed engineering controls can be highly effective in protecting workers, and will typically be independent of worker interactions to provide this high level of protection. The initial cost of engineering controls can be higher than the cost of administrative controls or PPE. However over the long term, operating costs are frequently lower, and in some instances, can provide a cost savings in other areas of the process.

Modification, containment, and ventilation are considered engineering controls. Use of isolation rooms with negative air pressure is an example of an engineering control for Ebola.

Chapter 2: Hazard Recognition and Controls

ADMINISTRATIVE CONTROLS FOR INFECTIOUS DISEASES

Administrative controls are a way of reducing worker exposure to an acceptable limit by scheduling reduced work times in hazardous areas and by establishing work rules/practices that will limit worker exposure to known hazards. Selection of administrative controls

should be industry, task, and site-specific. These controls will vary depending on whether they are used in healthcare, mortuary/death care, environmental services, or transportation.

Precautionary measures for preventing exposure to diseases depends on the type of work, the potential for contamination of the work environment, and what is known about other potential exposure hazards. Infection control strategies may have to be modified to include additional selections of PPE, administrative controls, and/or safe work practices.

Administrative controls include the following:

- Practicing Standard Precautions, and in some cases Expanded Precautions (see below), in addition to other controls.
- Hazard communication, labeling, signage, and checklists.
- A training plan that ensures competency.
- Training and education.
- Hand washing.
- Adequate staffing.
- Avoid areas where hazards are present.
- PPE observers and a buddy system for donning, doffing, and decontamination.
- Limit the number of people who are entering infected areas.
- Limit movement between outdoor environment and isolation room.
- Job task rotation.



6-mil poly used as an engineering control.



Signage is an important part of administrative controls

Administrative controls are generally less effective than engineering controls.

Chapter 2: Hazard Recognition and Controls

PPE FOR INFECTIOUS DISEASES

PPE is the last step in the Hierarchy of Controls that provide safety and health in the workplace. Selection of PPE should be based on risk assessment and must comply with OSHA standards that are relevant to the environment, such as:

- OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030)
- OSHA's Hazard Communication Standard (29 CFR 1910.1200)
- OSHA Personal Protective Equipment (PPE) standard (29 CFR 1910.132)
- OSHA Respiratory Protection Standard (29 CFR 1910.134)

The CDC guidelines for PPE for healthcare workers are also relevant for non-healthcare workers working in infectious disease environments. These guidelines emphasize 3 principles:

1. Rigorous and repeated training.
2. No skin exposure.
3. A trained monitor who watches each worker don (put on) and doff (take off) PPE.

No Skin Exposure

"No skin exposure" includes the following precautions:

- double gloves;
- boot covers that are waterproof, go up to mid-calf or leg covers;
- single-use fluid resistant or impermeable gown, mid-calf or coverall without integrated hood;
- single-use, full-face shield that is disposable;
- surgical hoods, complete coverage of head and neck; and
- apron that is waterproof if infected persons are vomiting or have diarrhea.

Chapter 2: Hazard Recognition and Controls

Note: Goggles are no longer recommended, as they may allow for skin exposure, get fogged up, and tempt workers to adjust them with contaminated gloves.

Detailed descriptions of appropriate PPE for work around infectious diseases, including proper donning, doffing, decontamination, and disposal procedures, are provided in *Chapter 5: PPE*.

STANDARD PRECAUTIONS

As was stated in *Chapter 1*, *Standard Precautions* reduce the risk of disease transmission. Standard Precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection. Remember, while Standard Precautions were developed with the healthcare setting in mind, workers in other settings who may be at risk of infectious disease exposure should observe as many of these precautions as possible.

Standard Precautions are a list of guidelines from the CDC, and represent the minimum infection prevention measures that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered. These evidence-based practices are designed to both protect healthcare personnel and prevent the spread of infections among patients. Environmental services workers in settings where infectious diseases are known or suspected to be present should also follow Standard Precautions.

Standard Precautions are comprised of a number of engineering, administrative, and PPE controls, several of which are relevant to environmental services workers:

1. Hand hygiene
2. Personal protective equipment (e.g., gloves, gowns, facemasks), depending on the anticipated exposure
3. Respiratory hygiene and cough etiquette
4. Cleaning and disinfection of devices and environmental surfaces

1. Hand Hygiene

Hand hygiene includes the washing of hands with soap and water if they are soiled or

Chapter 2: Hazard Recognition and Controls

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If hand washing is not possible, rub hands with an alcohol-based hand rub that contains 60–95% alcohol.

exposure is proved or suspected. If hand washing is not possible, rub hands with an alcohol-based hand rub that contains 60–95% alcohol. Hand hygiene stations should be strategically placed to ensure easy access.

A. Handwashing with Soap and Water:

1. Wet hands first with water (avoid using hot water).
2. Apply soap to hands.
3. Rub hands vigorously for at least 15 seconds, covering all surfaces of hands and fingers.
4. Rinse hands with water and dry thoroughly with paper towel.
5. Use paper towel to turn off water faucet.

B. Sample Procedures for Performing Hand Hygiene

Using Alcohol-based Hand Rub (follow manufacturer's directions):

1. Dispense the recommended volume of product.
2. Apply product to the palm of one hand.
3. Rub hands together, covering all surfaces of hands and fingers until they are dry (no rinsing is required).



Worker dispensing alcohol-based hand rub.

C. Indications for Hand Hygiene

Always perform hand hygiene in the following situations:

- before putting on gloves;
- before exiting an area where infectious agents are present;
- after contact with blood, body fluids or excretions, or wound dressings; and
- after glove removal.

Chapter 2: Hazard Recognition and Controls

2. Personal Protective Equipment

PPE use in Standard Precautions involves specialized clothing and/or equipment worn by facility staff for protection against infectious materials. The selection of PPE is based on the nature of the patient interaction and potential for exposure to blood, body fluids or infectious agents. A review of available PPE should be performed periodically (e.g., annually) due to new product developments and improvements. Some of the precautions with PPE include:

- **Gloving:** Wear gloves when touching body fluids, contaminated or potentially contaminated surfaces, and potentially contaminated waste, trash, or other materials. Change gloves between tasks. Remove after use, and perform hand hygiene before touching non-contaminated items, people, or surfaces.
- **Face protection:** Wear required protection (masks, goggles, face shields, respirators, etc.), especially during activities that are likely to generate splashes or sprays of contaminated material.
- **Gowning:** Wear protective clothing that keeps out contaminants. Remove soiled gowns/protective clothing as soon as possible and perform hand hygiene.

See *Chapter 5: PPE* for more detailed coverage of this topic.

3. Respiratory Hygiene and Cough Etiquette

To prevent the transmission of respiratory infections in a healthcare facility, the following infection prevention measures are implemented for all potentially infected persons at the point of entry and continuing throughout their time spent in the facility. This applies to any person with signs and symptoms of respiratory illness, including cough, congestion, rhinorrhea, or increased production of respiratory secretions. Additional precautions (e.g., Expanded Precautions) can be found in below.

All persons with signs and symptoms of a respiratory infection (including facility staff) are instructed to:

- cover the mouth and nose with a tissue when coughing or sneezing;



Cover your nose and mouth with tissue when coughing or sneezing.

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rhinorrhea (rie-no-REE-ah): A medical condition characterized by a runny nose.

Chapter 2: Hazard Recognition and Controls

- dispose of the used tissue (and masks if applicable) in the nearest waste receptacle
- perform hand hygiene after contact with respiratory secretions and contaminated objects/materials

4. Cleaning and Disinfection of Devices and Environmental Surfaces

The procedures outlined in this section pertain to the cleaning and disinfection of noncritical patient-care devices (e.g., blood pressure cuff) and environmental surfaces in patient-care areas (e.g., exam rooms) and certain common-use areas (e.g., bathrooms).

A. Supplies and Cleaning Products

- Follow manufacturer's instructions for cleaning surfaces and noncritical devices; ensure that the cleaning product used is compatible with the surface/device being cleaned.
- Use EPA-registered disinfectant with appropriate germicidal claim for the infective agent of concern (may vary depending on situation) and follow the manufacturer's safety precautions and instructions (e.g., amount, dilution, safe use, storage and disposal) for cleaning/disinfection.
- Review products and supplies periodically (e.g., annually) due to product developments and improvements and to ensure that the materials used are consistent with existing guidelines and meet the needs of the staff.
- Clean reusable mops and cleaning cloths after use and allow them to dry before reuse.



Use an EPA-registered disinfectant that is approved to clean surfaces for specific pathogens.

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germicidal: Something that kills germs.

B. Frequency of Cleaning

Patient-care areas, medication preparation areas (outside pharmacy/compounding areas), and bathrooms are cleaned at least daily, with the following exceptions:

- Promptly clean and decontaminate any location with spills of blood and other potentially infectious materials (refer to step E below).

Chapter 2: Hazard Recognition and Controls

- Disinfect bathrooms after use by a patient with known or suspected infectious diarrhea and before use by another person (refer to step D below).
- Disinfect environmental surfaces and noncritical patient-care devices when visibly soiled.

C. Cleaning Patient-care Areas

General cleaning and disinfection measures that applies to any patient-care area:

- Wear appropriate PPE.
- In general, cleaning should be performed before disinfection unless a one-step detergent disinfectant is used.
- Wet-dust horizontal surfaces by moistening a cloth with a small amount of an EPA-registered disinfectant.
- Avoid dusting methods that disperse dust (e.g., feather-dusting).
- Concentrate on cleaning high-touch surfaces (areas frequently touched by patients and facility staff) and those in close proximity to the patient, as outlined below for specific rooms/areas.
- Follow manufacturer's instructions for cleaning and maintaining noncritical medical device/equipment.
- Clean walls, blinds, and window curtains when they are visibly dusty or soiled.

D. Cleaning Bathrooms

- Wear appropriate PPE.
- Clean the toilet, the area around the toilet, the sink, and faucet handles at least daily, and the walls if visibly soiled.
- If used by a patient with known or suspected infectious diarrhea, clean the bathroom before it is used again, focusing on the toilet and the area around the toilet:
 - Use an EPA-registered disinfectant with specific claim labels for the infective agent.
 - If infective agent is unknown, use a bleach-based disinfectant (e.g., 1:10 dilution prepared fresh).

Chapter 2: Hazard Recognition and Controls

E. Cleaning Spills of Blood and Body Substances

- Wear protective gloves and use appropriate PPE (e.g., use forceps to pick up any sharps and discard in sharps container).
- If the spill contains large amounts of blood or body fluids (e.g., >10 mL), clean the visible matter with disposable absorbent material and discard in appropriate containers for bio-hazardous waste.
- Decontaminate the area using an EPA-registered disinfectant with specific label claims for bloodborne pathogens (e.g., HIV, HBV, HCV) or a freshly diluted bleach-based product (preferably EPA-registered), in accordance with manufacturer's instructions, and allow the surface to dry.
- If a bleach-based product is used:
 - Use a 1:100 dilution to decontaminate nonporous surfaces.
 - If the spill involves large amounts of blood or body fluids, use a 1:10 dilution for first application of germicide before cleaning, then followed by cleaning and subsequent decontamination with 1:100 dilution application.

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HIV: Human Immunodeficiency Virus

HBV: Hepatitis B Virus

HCV: Hepatitis C Virus

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1:10 solution = 1.5 cups of bleach per gallon of water

1:100 solution = 0.25 cups of bleach per gallon of water

F. Handling and Laundering Soiled Linens

- Handle all contaminated linens with minimum agitation to avoid contamination of air, surfaces, and persons.
- Do not sort or rinse soiled linens in patient-care areas.
- Use leak-resistant containment for linens contaminated with blood or body substances; ensure that there is not leakage during transport.
- If laundry chutes are used, ensure that laundry bags are closed before tossing the filled bag into the chute; do not place loose items in the laundry chute.
- In the laundry area, appropriate PPE (e.g., gloves) are worn by laundry personnel while sorting soiled linen, and hand hygiene supplies are available for their use.
- If laundry equipment is available on site, use and maintain the equipment according to manufacturer's instructions.
 - In general, If hot-water laundry cycles are used, wash with detergent in water $\geq 160^{\circ}\text{F}$ ($\geq 71^{\circ}\text{C}$) for ≥ 25 minutes.

Chapter 2: Hazard Recognition and Controls

- If low-temperature (<160°F [$<70^{\circ}\text{C}$]) laundry cycles are used, wash with proper concentrations of laundry chemicals that are suitable for low-temperature washing.
- If commercial laundry facilities are used, ensure that their laundering process is in accordance with current recommendations.



Use leak-resistant containers for linens contaminated with blood or bodily fluids.

G. Waste Disposal

- Puncture-resistant, leak-proof sharps containers are located in every patient-care area.
 - All sharps are disposed of in the designated sharps container; do not bend, recap, or break used syringe needles before discarding them into the container.
 - Filled sharps containers are disposed of in accordance with state regulated medical waste rules.
- Regular trash and regulated medical waste (e.g., biohazardous material and chemical hazardous waste) are disposed of in their designated containers.
- All trash and waste containers are emptied at least daily by designated personnel.
 - Wear appropriate PPE.

Chapter 2: Hazard Recognition and Controls

- Handle, transport, and dispose regulated waste in accordance with state and local regulations.

More detailed information about handling and disposal of medical waste and other infected materials is covered in *Chapter 7: Waste Management*.

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colonization: When an organism successfully enters the body, grows and multiplies.

epidemiology (eh-pih-dee-mee-AH-lo-gee): The branch of medicine that deals with the incidence, distribution, and possible control of diseases and other factors relating to health.

EXPANDED PRECAUTIONS

The CDC's Expanded Precautions (formerly known as Transmission-based Precautions) are intended to supplement Standard Precautions in patients with known or suspected colonization or infection of highly transmissible or epidemiologically important pathogens. These additional precautions are used when the route of transmission is not completely interrupted using Standard Precautions.

Epidemiologically important pathogens are infectious agents that have one or more of the following characteristics:

1. A likelihood for transmission within healthcare facilities based on published reports and the occurrence of temporal or geographic clusters of more than 2 patients.
2. Antimicrobial resistance implications:
 - Resistance to first-line therapies.
 - Unusual or usual agents with unusual patterns of resistance within a facility.
 - Difficult to treat because of innate or acquired resistance to multiple classes of antimicrobial agents.
3. Associated with serious clinical disease, increased morbidity and mortality.
4. A newly discovered or reemerging pathogen.

The three categories of Expanded Precautions include:

1. Contact Precautions
2. Droplet Precautions
3. Airborne Precautions

For diseases that have multiple routes of transmission, a combination of Expanded Precautions may be used. Whether used singly or in combination, they are always used in

Chapter 2: Hazard Recognition and Controls

addition to Standard Precautions. These precautions may be applicable to environmental work in cases where certain infectious are known or suspected to be present.

1. Contact Precautions

Contact Precautions are designed to reduce the risk of transmission of epidemiologically important microorganisms by direct or indirect contact.

Direct-contact transmission involves skin-to-skin contact and physical transfer of microorganisms to a susceptible host from an infected or colonized person, such as occurs when personnel turn patients, bathe patients, or perform other patient-care activities that require physical contact. Direct-contact transmission also can occur between two patients (e.g., by hand contact), with one serving as the source of infectious microorganisms and the other as a susceptible host.

Indirect-contact transmission involves contact of a susceptible host with a contaminated intermediate object, usually inanimate, in the patient's environment. Contact Precautions apply to specified patients known or suspected to be infected or colonized (presence of microorganism in or on patient but without clinical signs and symptoms of infection) with epidemiologically important microorganisms that can be transmitted by direct or indirect contact.

Contact Precautions include:

- Apply to patients with the presence of stool incontinence, draining wounds, uncontrolled secretions, pressure ulcers, rashes, or presence of ostomy tubes and/or bags draining body fluids.
- Perform hand hygiene before wearing gloves.
- PPE use:
 - Wear gloves when touching the patient's immediate environment or belongings.
 - Wear a gown if substantial contact with the patient's environment is anticipated.



Perform hand hygiene after removal of PPE.

Chapter 2: Hazard Recognition and Controls

- Perform hand hygiene after removal of PPE; note: use soap and water when hands are visibly soiled (e.g., blood, body fluids), or after working in the environment of a patient with known or suspected infectious diarrhea (e.g., *Clostridium difficile*, norovirus).
- Clean/disinfect the exam room accordingly.
- Patients with known or suspected infectious diarrhea should use a separate bathroom, if available; the bathroom should be cleaned/disinfected before it can be used again.

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conjunctivae (con-JUNK-tih-vay): The mucous membranes that cover the front of the eye and line the inside of the eyelids.

2. Droplet Precautions

Droplet Precautions are designed to reduce the risk of droplet transmission of infectious agents. Droplet transmission involves contact of the conjunctivae or the mucous membranes of the nose or mouth of a susceptible person with large-particle droplets (larger than 5 µm in size) containing microorganisms generated from a person who has a clinical disease or who is a carrier of the microorganism. Droplets are generated from the source person primarily during coughing, sneezing, or talking.

Transmission via large-particle droplets requires close contact between source and recipient persons, because droplets do not remain suspended in the air and generally travel only short distances – usually 3 feet or less – through the air. Because droplets do not remain suspended in the air, special air handling and ventilation are not required to prevent droplet transmission. Droplet Precautions apply to any patient known or suspected to be infected with epidemiologically important pathogens that can be transmitted by infectious droplets.

Droplet precautions:

- Apply to patients known or suspected to be infected with a pathogen that can be transmitted by droplet route; these include, but are not limited to:
 - Respiratory viruses.
 - *Bordetella pertussis*.
 - For first 24 hours of therapy.
- Perform hand hygiene after contact with respiratory secretions and contaminated objects/materials; note: use soap and water when hands are visibly soiled (e.g., blood, body fluids).
- PPE use:



Bordetella pertussis: Causes pertussis or whooping cough.

Chapter 2: Hazard Recognition and Controls

- Wear a facemask, such as a procedure or surgical mask, for close contact with the patient; the facemask should be donned upon room entry.
- If substantial spraying of respiratory fluids is anticipated from the patient, gloves and gown as well as goggles (or face shield in place of goggles) should be worn.
- Clean and disinfect the exam room accordingly.

3. Airborne Precautions

Airborne Precautions are designed to reduce the risk of airborne transmission of infectious agents. Airborne transmission occurs by dissemination of either airborne droplet nuclei (small-particle residue {5 μm or smaller in size} of evaporated droplets that may remain suspended in the air for long periods of time) or dust particles containing the infectious agent.

Microorganisms carried in this manner can be dispersed widely by air currents and may become inhaled by or deposited on a susceptible host within the same room or over a longer distance from the source patient, depending on environmental factors; therefore, special air handling and ventilation are required to prevent airborne transmission. Airborne Precautions apply to patients known or suspected to be infected with epidemiologically important pathogens that can be transmitted by the airborne route.

Airborne precautions:

- Apply to patients known or suspected to be infected with a pathogen that can be transmitted by airborne route; these include, but are not limited to:
 - tuberculosis;
 - measles;
 - chickenpox (until lesions are crusted over); and
 - herpes zoster/shingles (until lesions are crusted over).
- PPE use:
 - Wear a fit-tested disposable respirator with a N95 rating or higher, if available, when in the presence of the patient; the respirator should be donned prior to room entry and removed after exiting room.

Chapter 2: Hazard Recognition and Controls

- If substantial spraying of respiratory fluids is anticipated, gloves and gown as well as goggles or face shield should be worn.
- Perform hand hygiene before and after contact with respiratory secretions and/or body fluids and contaminated objects/materials; note: use soap and water when hands are visibly soiled (e.g., blood, body fluids).
- Once the infected patient leaves, the exam room should remain vacant for generally one hour before anyone enters; however, adequate wait time may vary depending on the ventilation rate of the room and should be determined accordingly.
- If staff must enter the room during the wait time, they are required to use respiratory protection.



Workers must don PPE before entering an infected area.

CHEMICAL HAZARDS

Disinfectants for Highly Infectious Diseases



Chemicals in disinfectants can pose serious risks for workers if adequate controls are not in place.

The U.S. Environmental Protection Agency (EPA) regulates disinfectants used on environmental surfaces, and there are EPA-approved lists of disinfectants for different infectious diseases, such as MRSA and Ebola.

Certain chemical disinfectants may pose hazards for workers through inhalation, exposure to skin or open cuts, or through the eyes, nose, or mouth. Pay

Chapter 2: Hazard Recognition and Controls

close attention to hazard warnings and directions on product labels. Cleaning products and disinfectants often call for the use of gloves or eye protection. For example, gloves should always be worn to protect your hands when working with bleach solutions.

Do not mix cleaners and disinfectants unless the labels indicate it is safe to do so. Combining certain products (such as chlorine bleach and ammonia cleaners) can result in serious injury or death.

Controls for Chemical Hazards

In addition to PPE listed on product labels for disinfectants, other controls may reduce risks of dangerous levels of chemical exposure. These include the following:

- Ensure adequate ventilation in areas where workers are using disinfectants, including by opening windows and doors, or using mechanical ventilation equipment.
- In some cases, the use of chemical disinfectants may require an employer to train workers on how to protect themselves against chemical hazards and comply with OSHA's Hazard Communication, 29 CFR 1910.1200, and other standards.
- Use tools, such as tongs from a spill kit, as much as possible rather than doing cleanup work directly with gloved hands.
- After cleaning and disinfection work is complete, remove PPE in a way that avoids self-contamination.
- Avoid cleaning techniques, such as using pressurized air or water sprays, which may result in the generation of bioaerosols whenever possible.

PHYSICAL HAZARDS

Heat Stress

A physical hazard is any harmful level of electromagnetic radiation, noise, vibration, temperatures, or light. Of this list, heat can be a serious physical hazard on infectious disease worksites, especially where containment systems will be constructed. This will interrupt the normal airflow in the work area, and the use of personal protective clothing such as Tyvek® will prevent the flow of air over the worker's skin.



Do not mix cleaners and disinfectants unless the labels indicate it is safe to do so.



*29 CFR 1910.1200
OSHA Hazard Communication*



bioaerosols: *Airborne particles that are living (bacteria, viruses, and fungi) or that originate from living organisms.*

Chapter 2: Hazard Recognition and Controls

Heat stress can cause a decrease in mental alertness as well as a heightened level of irritability and decreased patience, which are factors that contribute to increased accident rates.

Generally, productivity decreases significantly with increased heat. The severity of heat stress depends on many factors, including:

- Environmental conditions, such as air temperature, air movement and relative humidity.
- The worker's age and degree of physical fitness and weight.
- Degree of acclimatization (i.e., how well your body is adjusted to hot environments).
- Type of clothing worn.

Under normal conditions the body produces more heat than necessary to maintain its normal temperature of approximately 98.6° F (37.6° C). This excess heat is released through the evaporation of sweat on the surface of the skin when the temperature and humidity of the surrounding air is lower than that of the body. However, when the surrounding air temperature and humidity are higher than the body temperature, the body may not be able to rid itself of excess heat fast enough, which may result in heat stress.

Controls for Physical Hazards

Heat stress can pose serious threats to workers' health. Safety training for workers in decontamination units can help them recognize the signs and symptoms of heat stress, and limiting the amount of time workers spend in a decontamination unit is another example of an administrative work practice control.

ERGONOMIC HAZARDS

Ergonomic hazards occur when the type of work, body positions, and working conditions put strain on your body. They are the hardest to spot since you don't always immediately notice the strain on your body or the harm that these hazards pose. Short-term exposure may result in "sore muscles" the next day or in the days following exposure, but long-term exposure can result in serious long-term illnesses.

Chapter 2: Hazard Recognition and Controls

Ergonomic Hazards include:

- improperly adjusted workstations and chairs;
- frequent lifting;
- poor posture;
- awkward movements, especially if they are repetitive;
- repeating the same movements over and over;
- having to use too much force, especially if you have to do it frequently; and
- vibration.

Controls for Ergonomic Hazards

Engineering Controls:

- Use a device to lift and reposition heavy objects to limit force exertion.
- Reduce the weight of a load to limit force exertion.
- Reposition a work table to eliminate a long/excessive reach and enable working in neutral postures.
- Use diverging conveyors off a main line so that tasks are less repetitive.
- Install diverters on conveyors to direct materials toward the worker to eliminate excessive leaning or reaching.
- Redesign tools to enable neutral postures.



Using a device to lift and move heavy objects can reduce exertion.

Administrative Controls:

- Require that heavy loads are only lifted by two people to limit force exertion.

Chapter 2: Hazard Recognition and Controls

- Establish systems so workers are rotated away from tasks to minimize the duration of continual exertion, repetitive motions, and awkward postures. Design a job rotation system in which employees rotate between jobs that use different muscle groups.
- Staff “floaters” to provide periodic breaks between scheduled breaks.
- Properly use and maintain pneumatic and power tools.

PPE for Ergonomic Hazards:

- Use padding to reduce direct contact with hard, sharp, or vibrating surfaces.
- Wear good fitting thermal gloves to help with cold conditions while maintaining the ability to grasp items easily.

PSYCHOSOCIAL HAZARDS

Psychosocial hazards are stressors that cause stress (short-term effects) and strain (long-term effects). These hazards are associated with workplace issues such as workload, lack of control and/or respect, etc.

Examples of psychosocial hazards include:

- workload demands;
- workplace violence;
- intensity and/or pace;
- respect (or lack of);
- flexibility;
- control or say about things;
- social support/relations; and
- sexual harassment.

Controls for Psychosocial Hazards

Psychosocial hazards are diverse in nature, and controls can range from management training and effective policies and procedures, to support groups or individual counseling, depending on the source of the issue(s). Working around infectious diseases can contribute their own

Chapter 2: Hazard Recognition and Controls

stressors to the work environment, and this topic is covered in more detail in *Chapter 8: Behavioral Resiliency*.

SAFETY HAZARDS

These are the most common and will be present in most workplaces at one time or another. They include unsafe conditions that can cause injury, illness, and death.

Common Safety Hazards include:

- Spills on floors or tripping hazards, such as blocked aisles or cords running across the floor.
- Working from heights, including ladders, scaffolds, roofs, or any raised work area.
- Unguarded machinery and moving machinery parts; guards removed or moving parts that a worker can accidentally touch.
- Electrical hazards like frayed cords, missing ground pins, improper wiring.
- Confined spaces.
- Machinery-related hazards (lockout/tagout, boiler safety, forklifts, etc.).

One of the most prevalent safety hazards for housekeeping workers in healthcare settings is slips, trips, and falls, due to exposure to wet floors.

Controls for Slips, Trips, and Falls

- Maintain floors in a clean and, so far as possible, dry condition, and mats provided where practicable. Walking/Working Surfaces Standard [29 CFR 1910.22(a)(2)].
- Provide warning signs for wet floor areas [29 CFR 1910.145(c)(2)].
- Implement a program to provide safe, immediate cleanup of floor spills.
- Housekeeping procedures such as only cleaning one side of a passageway at a time, and providing good lighting for all halls and stairwells can help reduce accidents.
- Instruct workers to use the handrail on stairs, avoid undue speed, and maintain an unobstructed view of the stairs ahead of them – even if that means requesting help to manage a bulky load.
- Eliminate uneven floor surfaces.

Chapter 2: Hazard Recognition and Controls

Safe Work Practices for Infectious Diseases

Safe work practices are habits you can adopt and use to protect yourself while performing specific duties. You should understand the following information:

- Many safe work practices can be used at different jobsites. You should continue to follow the safe work practices you already know.
- Effective use of safe work practices depends largely on every worker's conscious effort to work safely.
- Following safe work practices while performing any task will greatly reduce the likelihood of injury or illness to yourself or your coworkers.
- Employers should identify safe work practices for any given job so you will understand how to conduct yourself as you perform the work.
- The number of personnel and the amount of equipment in a contaminated area should be minimal. Only the personnel and equipment necessary for effective site operations should be present.
- Work areas for specific activities should be established and communicated.
- Procedures for leaving a contaminated area must be planned and implemented prior to entering the site. Work areas and decontamination procedures must be established on the basis of actual site conditions.
- The "buddy system" may be used to organize work groups so that each worker is assigned to observe the activities of at least one other worker in the group.
- An internal site communication system may be required. Audible or visual signals may be used.
- Site personnel should consider all aspects of site safety before the start of daily activities. A brief safety meeting should be held every day to discuss safety concerns, as well as new and changed activity schedules for the day.

Many of the safe work practices used on infectious disease sites are designed to limit exposure to the hazards found at that site. Some of these safe work practices include the following:

- As mentioned above, always follow Standard Precautions and any Expanded Precautions as directed.
- Eating, drinking, chewing, smoking, or any practice that increases the probability of hand-to-mouth transfer is prohibited in any area designated as contaminated.

Chapter 2: Hazard Recognition and Controls

- Face and hands must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activities.
- After decontamination is completed for outer protective garments, the entire body should be thoroughly washed as soon as possible after your inner protective garment is removed.
- Excessive facial hair on personnel required to wear respiratory protection equipment is not allowed if the facial hair interferes with a satisfactory fit.
- Contact with contaminated surfaces or with surfaces suspected of being contaminated should be avoided.

Site Safety Awareness

General site safety includes a continual awareness of site-related safety concerns. All employees must be aware of site hazards and remain alert to identifying new or additional hazards that may arise as operations progress.

You should ask yourself and your supervisor the following questions, and make certain the answers are understood before starting work:

- What PPE is required for the hazardous substances that may be encountered today on the worksite?
- What potential explosive and/or flammable conditions are present?
- Are there confined spaces present and will they be entered?
- What emergency equipment is available, where it is located, and how is it used?
- What are the standard operating procedures (SOPs) for evacuation and rescue in an emergency?
- How will we be notified if conditions or situations change during the work shift?
- What is the work/rest cycle for each task?
- What are the prescribed decontamination procedures?
- How will the “buddy system” be enforced and how will we be paired up?
- Do I have the proper training and equipment to perform my duties?
- Are there changes in safety procedures for my task?

Chapter 2: Hazard Recognition and Controls

Summary

Recognizing and responding to hazards on the job is very important in protecting yourself from injury, illness, or even death. Hazards on an infectious disease worksite can be classified by the following categories: biological, chemical, physical, ergonomic, psychosocial, and safety.

Biological hazards include infectious agents, which are organisms that can produce infection or infectious disease. Different infectious diseases have different routes of transmission: pathogens can live on surfaces on a worksite, be transmitted by cough or sneeze, and be inhaled or transmitted through ventilation systems.

Prevention of occupational exposures to pathogens begins with employers developing an infectious disease occupational exposure control plan. Key elements include universal/standard precautions, engineering and workplace controls, personal protective equipment (PPE) and housekeeping, among others.

Engineering controls include disinfectants, isolation rooms, special air-handling systems and HEPA filtration, needleless I.V. systems and rigid containers to package waste. Selection of administrative controls should be industry, task and site-specific, and will vary depending on whether they are used in healthcare, mortuary/death care, environmental services or transportation.

Standard precautions are a list of guidelines from the CDC. They include a number of engineering, administrative and PPE controls, several of which are relevant to environmental services workers: hand hygiene, use of PPE, respiratory hygiene and cough etiquette, and safe handling of potentially contaminated equipment or surfaces. The CDC's transmission-based precautions include contact, droplet and airborne precautions. These additional precautions are used in conjunction with standard precautions, when the route of transmission is not completely interrupted using standard precautions.

Selection of PPE should be based on risk assessment, and must comply with OSHA standards that are relevant to the work environment. CDC guidelines for healthcare workers are also relevant for non-healthcare workers, and emphasize rigorous and repeated training, no skin exposure, and a trained monitor who watches every worker don (put on) and doff (take off) PPE.

Chapter 2: Hazard Recognition and Controls

Chemical hazards include disinfectants, which can pose hazards for workers through inhalation, exposure to skin or open cuts, or through the eyes, nose, or mouth. It is important to recognize that, in some cases, you are protecting for both the infectious hazard and the chemical hazard.

A physical hazard is any harmful level of electromagnetic radiation, noise, vibration, temperatures, or light. Of these, heat is often the most common and serious physical hazard on infectious disease worksites, especially where containment systems will be constructed.

Ergonomic hazards occur when the type of work, body positions and working conditions put strain on your body. They are the hardest to spot since you don't always immediately notice the strain on your body, or the harm that these hazards pose. Ergonomic hazards include frequent lifting, poor posture, and awkward and repetitive movements.

Psychosocial hazards are stressors that cause stress (short-term effects) and strain (long-term effects). These hazards are associated with workplace issues such as workload, lack of control and/or respect, etc. Other examples of psychosocial hazards include workplace violence, intensity and/or pace, flexibility, social support and sexual harassment.

Safety hazards are the most common type of hazards, and will be present in most workplaces at one time or another. They include unsafe conditions that can cause injury, illness and death. Safety hazards include spills on floors or tripping hazards, working from heights, and electric and machinery-related hazards.

Safe work practices are habits you can adopt and use to protect yourself while performing specific duties. Safe work practices for infectious disease worksites include following standard and transmission-based precautions, thoroughly washing face and hands, and avoiding contact with contaminated surfaces.

Site safety awareness includes knowing what PPE is required, what potential explosive and/or flammable conditions are present, what emergency equipment is available and where it is located, what decontamination procedures have been prescribed, and whether or not you have the proper training and equipment to perform your duties.