Participant Guide

Infectious Disease Awareness

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SKU 4150

Infectious Disease Awareness

Participant Guide

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Introduction

Welcome to **Infectious Disease Awareness**. This Participant Guide has been designed with you in mind. From detailed, step-by-step instructions, to important safety and health information, this manual covers the things you need to know to help you do your job safely and efficiently. The guide complements the training you are about to receive through your Laborers' Training Center. We hope you use this material as a reference both during and after your training.

Remember, education and training programs are a benefit offered to you as a member of the Laborers' International Union of North America. Ongoing education will increase your skills and knowledge, making you the most important asset to your employer's success and your union's strength.

Tips for Using This Manual

Listed below are the icons for use in this guide with a brief description of each.

Chapters

Cover specific, major topics of the training.

Objectives

List the important concepts that you should learn from each chapter or section.

CFR

Identifies information related to regulations.

Identifies information to bear in mind.

Identifies important safety and health information.

Identifies the location of important information.

Identifies a definition.

Same thing, different name.

Infectious Disease Awareness

Objectives

After completing this course, participants should be able to:

1. Define *infectious disease*.
2. List at least five occupations that are at risk from infectious disease exposure.
3. Describe the primary routes of transmission for infectious diseases.
4. Describe three infectious diseases, their symptoms, and how they are transmitted.
5. Describe the NIAID Category A, B, and C priority pathogens/agents.
6. Explain what to do if you are exposed to blood or other body fluids.
7. Define *biosafety*.
8. Explain the importance of using Standard Precautions and Expanded Precautions when working around infectious diseases.
9. Explain and give an example of airborne, droplet, and contact precautions.
10. Define *Hierarchy of Controls* and give an example of each of the following controls: engineering, administrative, and PPE.
11. Identify types of PPE for working safely around infectious diseases.
12. Explain the importance of proper donning and doffing of PPE.
13. Explain the role of decontamination after working in areas contaminated by infectious pathogens.
14. Explain the role of disinfection when working around infectious diseases.
15. Identify two government standards related to working around infectious diseases.
16. Define *psychosocial hazard*.
17. List at least five symptoms of stress.
18. Give at least two actions employers can take to address issues of concern for personnel working around infectious diseases.
19. Give at least two actions workers can take to manage stress from working in environments that pose a risk of infectious disease.

Introduction

The work of those responsible for cleaning and maintaining buildings and work areas probably seems straightforward and routine to most people. However, their work can involve hazardous situations that most people don't know or understand. These workers may use cleaning agents that can be dangerous to them or to the public, or they may actually clean up potentially hazardous substances (e.g. blood, other body fluids). Worker and public safety depends on the workers' understanding of the hazards involved and the workers' ability to correctly address those hazards.

To some degree, every job carries risk, including the risk of contracting diseases. Simply working around other people, animals (birds, bats, etc.), and contaminated environments, can increase health risks. Recent news on the Zika virus, as well as less recent but more frightening accounts of Ebola spreading beyond Africa can make workers concerned about the risk of contracting infectious diseases while doing their jobs.

Infectious Disease Awareness

At-risk Occupations and Industries

Many industries and occupations have potential exposure to infectious diseases:

- building maintenance and janitorial services;
- healthcare;
- humanitarian aid;
- first responders, emergency personnel, security ;
- laboratory ;
- environmental services (disinfection and/janitorial actions in healthcare settings);
- hazardous/infectious waste clean-up and disposal;
- funeral and mortuary;
- travel (airline, rail, ship, bus);
- border, customs, and quarantine workers;
- animal husbandry and veterinary;
- food processing (including meat packing);

Healthcare workers face a greater risk of exposure to infectious diseases than the others listed, but even construction craft laborers may encounter disease hazards on the job. For example, maintenance, housekeeping, or renovation workers in a healthcare facility may risk exposure to disease-carrying viruses and bacteria. Workers on jobsites where many different people come and go, such as airports, universities, and government buildings also have greater chances of exposure. Finally, anyone who responds to disasters also risks contact with bacteria and viruses from the dead and injured, contaminant releases, and unsanitary conditions.

Healthcare workers have the greatest risk of exposure to infectious diseases

Infectious Disease Awareness

There are a huge number of contagious diseases, and new ones appear with alarming frequency. Even old diseases such as tuberculosis (TB) and cholera are occurring more frequently, and are increasing worker health hazards.

The high potential for exposure is the bad news. The good news is that there are ways workers can protect themselves and reduce the risk of contracting an infectious disease. This course introduces infectious diseases, identifies potential work hazards, and provides ways that workers and employers can create a safer, healthier work environment. It is for all workers who may come into contact with any disease, both known and unknown.

WHAT ARE INFECTIOUS DISEASES?

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biological agent: *Bacteria, viruses, fungi, or other microorganisms that can negatively affect human health. Effects can range from mild allergic reactions to serious medical conditions, even death.*

pathogen: *Bacteria, virus, or other microorganism that can cause disease.*

Infectious diseases are illnesses, infections, or other health disorders that are caused by organisms that enter the body and multiply. These small organisms (microorganisms) include bacteria, viruses, fungi, and parasites. They are also called pathogens or biological agents.

Microorganisms are found everywhere in nature. They are found in water, soil, plants, and animals. Many reproduce rapidly and require little to survive. Most are harmless, and are sometimes even helpful. Under some circumstances they cause diseases. Some also evolve and adapt to new environments, making them potentially hazardous to human health, even if they didn't start out that way.

HOW ARE INFECTIOUS DISEASES SPREAD?

Biological agents
Pathogens

Pathogens can easily spread, causing outbreaks of an illness. A person may be exposed by contact with another person, from insect or animal bites, from consuming contaminated food or water, or simply by contacting the pathogen in the environment. Learning how infectious diseases are transmitted is important for determining proper infection prevention and control measures, and must be considered in risk assessment.

The different ways diseases spread are called *routes of transmission*. Some pathogens have multiple routes of transmission. The primary means include:

- **Direct contact:** (A susceptible person physically contacts an infected person and transfers the organism; for example, by kissing, by sexual contact, or by touching open wounds/sores, etc.) Ebola is a very serious, deadly disease transmitted by

direct contact. Direct contact diseases are most hazardous to family members and healthcare workers.

- **Indirect contact:** Transmission occurs when an individual touches a contaminated surface and then becomes infected by touching his or her mouth, eyes, or nose. Influenza is typically transmitted through indirect contact.

- **Airborne:** Transmission occurs through droplets or aerosols. With aerosols, the organism gets into the air and is breathed in by another person (breathing in a contaminant or organism is called inhalation). When they are inhaled by a susceptible individual, they enter the respiratory tract and can cause infection. Since air currents can disperse these particles or droplet nuclei over long distances, airborne transmission does not require face-to-face contact with an infected individual.

Droplets are one form of airborne transmission of infectious agents.

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aerosols: *A suspension of tiny particles or droplets in the air.*

Droplets containing infectious agents are generated when an infected person coughs, sneezes, or speaks. They usually do not stay in the air very long. Transmission occurs when droplets come into contact with a person's eyes, nose, or mouth. Droplet transmission does not occur through the air over long distances. Droplet transmission occurs more frequently when a person touches the droplet after it settles onto a surface. Good examples of airborne diseases are tuberculosis and whooping cough.

- **Vector-borne:** Carried by another species; "vector" usually refers to an insect, and transmission occurs via a bite from the vector. For example, Zika and West Nile Virus are transmitted by mosquitos. Construction workers are at greater risk from vector transmitted illness.

- **Non-contact vehicle transmission:** Infection spreads from a contaminated source to the individual. Often, the contaminant is ingested (enters through the mouth). Pathogens may be found on food or in water. Food-borne illnesses include E. Coli and Salmonella. Janitorial workers in public buildings and environmental services personnel in healthcare facilities, as well as disaster relief workers are at a higher risk of encountering these diseases.

- **Bloodborne:** Bloodborne pathogens are encountered via contact with an infected person's blood or other body fluids. Diseases from these pathogens are often transmitted by contaminated needle sticks. HIV and hepatitis B are examples of

bloodborne illnesses. Healthcare workers and emergency responders are at higher risk for these diseases. Also at risk are individuals who empty sharps containers in public facilities.

Sharps container

Any of these means of transmission can happen in the workplace. The risk of becoming ill from an infectious disease depends on the opportunity for exposure, incubation period for the disease, the virulence of the disease, and the overall health or susceptibility of the person who is exposed.

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incubation period: *the time between exposure to an infection and when symptoms appear.*

virulence (VEER-uh-lens): *how harmful an organism is.*

immunocompromised: *inability to develop a normal immune response because of disease, malnutrition, or immunosuppressive therapy.*

The *incubation period* is the time between exposure to an infection and when symptoms appear. It varies depending on the type of infection. For example, chickenpox has an incubation period of one to three weeks, while the flu takes only one to three days. The infectious period (when a person can transmit the disease to others) is not always the same as the incubation period. With chickenpox, the person may be infectious before symptoms show. Ebola, although highly virulent, is not known to be infectious until after symptoms appear.

Virulence describes how effective a pathogen is at making a person sick. It also refers to the severity of the disease after it is contracted. Ebola is an example of a highly virulent disease.

Some people are more likely to contract diseases than are others. Those who have compromised immune systems (a weakened ability to fight off diseases) are at greater risk. They are known to be *immunocompromised*. In other words, if a person is already sick with something, he or she is more likely to become sick with something else. Very young and very old people are also more likely to become sick.

Sometimes people can become immune to a disease, either by having already had the illness or by getting a vaccination against the illness. Immunity means a person will not get, or they have a very low probability of getting a disease, even if exposed to it. To protect against some diseases, workers who are at high risk (workers in healthcare settings or those in unsanitary environments) should make sure that they are vaccinated against likely diseases if the vaccinations are available.

RECENT OR FREQUENT OUTBREAKS

Infectious disease outbreaks have occurred many times throughout history. Some of the most significant are described below.

Influenza

Various flu outbreaks have had worldwide impacts. The 1918 Spanish Flu pandemic spread quickly and was helped by the movement of troops engaged in World War I. After the end of WWI in 1919, one fifth of the world's population was infected. The mortality rate was as high as one in five. This influenza is a particularly good example of a highly virulent disease and was unusual because it was particularly devastating to individuals aged 20 to 40. These individuals are normally more resistant to influenza.

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pandemic: *widespread, across the whole country or the world*

Many different strains of the influenza virus continue to cause outbreaks every year. Some are more serious than others. Serious outcomes of flu infection can result in hospitalization or death. The best way to prevent the flu is by getting vaccinated each year, although flu strains change each year, and vaccines have varying levels of success in preventing the flu. Risk of catching the flu can be reduced by following Standard Precautions such as hand washing, covering the mouth and nose when sneezing and coughing, disinfecting soiled/contaminated surfaces, and limiting exposure to affected individuals.

People who have the flu often feel some or all of these signs and symptoms:

- fever or feeling feverish/chills,
- cough,
- sore throat,
- runny or stuffy nose,
- muscle or body aches,
- headaches,
- fatigue (very tired), or
- some people may have vomiting and diarrhea.

HIV/AIDS

The first documented case of HIV/AIDS (human immunodeficiency virus/acquired immunodeficiency syndrome) was in 1959 in the Congo. By 2011, over 60 million people were affected and 25 million people had died. In Sub-Saharan Africa, one in five adults were infected.

HIV is an example of a bloodborne pathogen that is extremely virulent. It is transmitted through contact with the blood, semen, genital fluids, or breast milk of a person infected with HIV. Generally, it is transmitted through sexual behavior or via contaminated needles or syringe use. Since the virus must come into contact with a mucous membrane, damaged tissue, or be directly injected into the bloodstream, the virus is not easily transmitted. Healthcare workers who handle needles, scalpels, or other sharps may be at risk of contracting HIV.

HIV destroys white blood cells that are part of a person's immune system, making the body less able to fight infections. There is no cure for HIV/AIDS but it can be controlled with antiretroviral therapy and if treated right away, the therapy can greatly prolong the lives of infected individuals.

Symptoms of HIV vary depending on the stage of the infection. Some symptoms may include: fever, chills, muscle aches, fatigue, swollen lymph nodes, and mouth ulcers – generally flu-like symptoms. However, in the early stages of the disease the person may not feel sick at all. The only way to know for sure is to have a blood test.

E. coli

Escherichia coli are bacteria found in the environment, in foods, and in the intestines of people and animals. E. coli has been transmitted to the general population through contaminated food, often from inadequately washed fruit and vegetables and undercooked meat.

E. coli are a large and diverse group of bacteria. Some kinds of *E. coli* can cause diarrhea, while others cause urinary tract infections, respiratory illness and pneumonia, and other illnesses. The symptoms of *E. coli* infections vary for each person but often include severe stomach cramps, diarrhea (often bloody), and vomiting. Most people get better within 5–7 days. Some infections are very mild, but others are severe or even life-threatening. It is important to stay hydrated when suffering from *E. coli* infections. Workers in the food industry and disaster

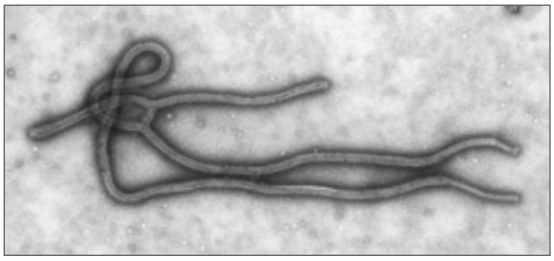
workers who may be exposed to unsanitary conditions are particularly at risk for transmission of *E. coli*.

SARS

Severe Acute Respiratory Syndrome (SARS) was notable in the way it is believed to have spread. It started in China in 2002, and spread to 37 countries worldwide by person-to-person contact during airplane travel. Experts believe that this virus was spread by droplets expelled from an infected person's cough or sneeze and then breathed in by others. It also spread indirectly from contact with infected surfaces. SARS demonstrated how quickly viruses spread in a world that is so interconnected by international travel. This virus spreads rapidly from person to person. Symptoms include fever, dry cough, shortness of breath, headache, muscle aches, sore throat, fatigue, and diarrhea.

Ebola

The Ebola virus disease (EVD) is a severe and often fatal disease. The 2014 Ebola outbreak was the largest Ebola outbreak in history and the first in West Africa. It most commonly spreads by direct contact with blood, secretions, organs or other body fluids of infected individuals. The fatality rate is around 50%.



The Ebola virus

EVD is usually marked by fever, muscle pain, headache, and sore throat. The illness progression includes nausea, vomiting, diarrhea, and impaired organ function. In some cases, rash, internal and/or external bleeding, and death may occur.

Family members and healthcare workers have the highest risk of contracting the virus, but other workers who clean linens and other materials used by the patient and individuals who decontaminate their hospital and living quarters are also at risk.

Because Ebola is so infectious after the incubation period ends, individuals who work in public buildings, especially travel related areas such as airports, train stations, vehicles, etc. should also take precautions when working during a known outbreak.

Zika

Zika virus disease is caused by the Zika virus, which is spread to people primarily through the bite of an infected mosquito. It can also be sexually transmitted. Zika most frequently occurs in tropical and subtropical regions. In 2016, Zika outbreaks occurred in South and Central America, the Caribbean and in areas of Miami-Dade County, Florida. Symptoms of Zika include mild fever, rash, joint/muscle pain, and headache. The virus is also spread from a pregnant mother to her fetus and may cause severe fetal brain defects. During the colder winter months the virus is not as common in North America.

To date, over 5,000 cases have been reported in the United States, most by travelers returning from affected areas outside the U.S. It remains to be seen if it will spread further within the United States, but it is likely since mosquitos are difficult to control. Outdoor workers, such as construction craft laborers, are at higher risk of contracting Zika. Precautions include wearing long sleeve shirts and pants, using insect repellant, and eliminating standing water from the work area.

CATEGORIZATION OF PATHOGENS AND BIOLOGICAL AGENTS

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CDC: *U.S. Centers for Disease Control*

NIAID: *National Institute of Allergy and Infectious Diseases*

NIH: *National Institutes of Health*

A pathogen priority list is maintained and revised regularly by the National Institute of Allergy and Infectious Diseases (NIAID). NIAID is part of the National Institutes of Health (NIH), which falls under the U.S. Department of Health and Human Services. It is an organization that supports research to understand, treat, and ultimately prevent infectious diseases.

NIAID's pathogen priority list includes diseases that emerge naturally as well as those that may be deliberately introduced as an act of bioterrorism. The list is categorized to help identify the dangers associated with various pathogens. These categories may be used for regulatory purposes, for example, with the Department of Transportation (DOT) special permitting for packaging and transportation of Category A infected waste. Additionally, the category may determine how waste generated in the treatment and care of an infected patient is managed.

The NIAID pathogen priority list includes three risk levels:

- **Category A Priority Pathogens:** Organisms/biological agents that pose the highest risk to national security and public health.
- **Category B Priority Pathogens:** The second-highest priority organisms/ biological agents.
- **Category C Priority Pathogens:** The third-highest priority, including emerging pathogens that could be engineered for mass dissemination in the future.

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disseminate: *spread widely*

Category A Priority Pathogens

Category A infectious agents are capable of causing permanent disability, or life-threatening or fatal disease. They pose the highest risk to national security and public health because they:

- Can be easily disseminated or transmitted from person to person.
- Result in high mortality rates and have the potential for major public health impact.
- Might cause public panic and social disruption.
- Require special action for public health preparedness.
- Cannot be transported without special permissions unless the virus is inactivated.

Waste contaminated with Category A pathogens require more stringent packaging requirements under DOT regulations. Certain biological agents have specific regulations for their handling, storage, and transportation. They cannot be treated like standard medical waste. For example, Ebola waste cannot be transported without special permissions unless the virus is inactivated. Inactivation is done via incineration or sterilization.

Examples of Category A pathogens include:

- anthrax;
- botulism;
- smallpox;
- viral hemorrhagic fevers;
    - hantaviruses, and
    - Ebola

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hemorrhagic (hem-or-A-jic): *characterized by profuse bleeding*

Category B Priority Pathogens

Category B pathogens, the second-highest priority organisms/biological agents:

- are moderately easy to disseminate;
- result in moderate morbidity (illness) rates and low mortality rates; and
- require CDC's diagnostic capacity and enhanced disease surveillance.

Class B pathogens include biological agents such as:

- Staphylococcus;
- typhus fever;
- food and waterborne pathogens:
  - bacteria (*E. coli*, salmonella);
  - viruses (hepatitis A);
- mosquito-borne encephalitis viruses, including:
  - West Nile virus;
  - California encephalitis; and
  - Eastern equine encephalitis virus.

Category C Priority Pathogens

Category C pathogens are the third-highest priority, and include emerging pathogens that could be engineered for mass dissemination in the future because of:

- availability,
- ease of production and dissemination, and
- potential for high morbidity and mortality rates and major health impact.

Some of the Category C pathogens include:

- tuberculosis (TB),

- seasonal influenza virus,
- yellow fever, and
- SARS.

Emerging Infectious Diseases

NIAID also lists several emerging infectious diseases. This list includes diseases that have recently emerged or have existed previously but are rapidly increasing in incidence or geographic range.

Some emerging infectious diseases include:

- Rubeola (measles, added in 2014),
- Poliovirus (added in 2015), and
- Zika virus (added in 2016).

OCCUPATIONAL EXPOSURE AND RISK FOR INFECTIOUS DISEASES

Exposure to infectious diseases will differ based on:

- job sites and tasks;
- the pathogen, its virulence, and its means of transmission (the pathogen may be unknown, thereby increasing potential risk); and
- potential pathways of exposure.

If workers are exposed, or suspect exposure to an infectious agent, they should seek medical assistance immediately, depending on the type of pathogen, and the type of exposure.

Recognizing and Responding to Hazards

Healthcare providers are the most likely to identify and report a suspected outbreak of an infectious disease. Reports generally go to the city or state department of health. Single incidence of a disease is usually only reported if it is the first or early occurrence of a disease that is not previously recognized or has recently re-emerged.

The most common type of exposure is from blood or bodily fluids. At work, if an employee is exposed, he or she should:

- Flush the area with running water.
- Wash the area with plenty of warm water and soap.
- Report the incident to the appropriate staff member (supervisor, human resources, health and safety specialist, staff medical personnel).
- Record the incident.
- Seek medical advice.

If exposed to blood or bodily fluid, wash the area immediately

Identifying infectious Disease Risks in the Workplace

Medical laboratories already have established protocols for biosafety – the discipline addressing the safe handling and containment of infectious microorganisms and hazardous biological materials.

When a potential risk is identified, employers should work with public health experts and employees to establish and implement safety precautions and procedures. The risk may relate to jobs and tasks in a consistently elevated risk environment such as those found in healthcare facilities, or for job tasks where risk is elevated as a result of an infectious disease outbreak (e.g. janitorial services in an airport).

Regardless of the setting, two processes should happen. First, the employer should conduct a risk assessment. Then they should develop an exposure control plan. This plan helps ensure procedures are in place to protect all employees who have potential contact with infectious agents.

The Risk Assessment

A risk assessment is a process that:

- identifies hazards that have the potential to cause harm,
- evaluates the level of risk associated with the hazards, and
- determines effective ways to eliminate or control the hazard(s).

Health and other professionals will conduct the risk assessment, but the involvement of front line workers is very important. Administrators, supervisors, maintenance personnel, and those working closest to the hazard will have the direct experience with the tasks and operations that have the potential for exposure. They can help develop effective interventions that workers can and will use to improve infection prevention and control.

Key Steps in Developing the Risk Assessment

The risk assessment usually includes the following steps:

Step 1: Identify hazards.

- Employers have a duty to assess the health and safety risks faced by their workers.

Step 2: Decide who may be harmed, and how.

- Identify who is at risk, including employees, contract staff, and members of the public.
- Review work routines in all the different job locations and situations.
- Identify vulnerable workers such as young workers, disabled and pregnant or breastfeeding women.

Step 3: Assess the risks and take action.

- Employers must consider how likely it is that each hazard could cause harm. Even after all precautions have been taken, some risk usually remains. For each remaining hazard determine whether the risk remains high, medium, or low.

Step 4: Record the findings.

- Employers record the main findings of the risk assessment, including details of any hazards and action taken to reduce or eliminate risk.

Step 5: Review the risk assessment.

- Employers should periodically review the assessment to ensure that safe practices are being followed and to consider new conditions, equipment, technology, or hazards.

WORKER PROTECTION AND INFECTION CONTROL

Selection of Control Measures

Once the risk assessment is completed, the next step is to select appropriate control measures to prevent exposure to infectious pathogens. This control selection process considers:

- likelihood of exposure;
- consequences of exposure;
- whether exposures occurre ;
- how exposures occurred;
- if exposure resulted from specific job duties;
- routes of disease transmission;
- whether *Standard Precautions* or *Expanded Precautions* apply; and
- how the *Hierarchy of Controls* applies

Likelihood of exposure will be defined in the risk assessment. It is important to know how a worker may be exposed while conducting work tasks and during breaks. If some exposures have already occurred, knowing how that happened will help identify the type of control needed to reduce or eliminate the possibility of that type of exposure happening again.

The consequences of exposure relate directly to the type of infectious disease and its characteristics. More virulent diseases require higher levels of protection. Consequences also relate to how easily the disease is transmitted. If it is easily transmitted then isolation and reducing or eliminating the spread of the disease is critical.

Paths of exposure may include ventilation systems, medical equipment, and food/water, etc. The disease's route of transmission (e.g. direct or indirect, contact, airborne, vector-borne) can help identify potential paths of exposure.

To help protect workers in infectious disease settings, biological safety experts developed Standard Precautions. For extremely high risk environments, a more stringent set of precautions, called Expanded Precautions, was developed. The implementation of these

precautions will depend on the degree of risk and if the risk is well defined. In unknown situations, higher level precautions are required.

Standard Precautions

Standard Precautions reduce the risk of disease transmission. While Standard Precautions were designed 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.

The main practices include:

- **Hand Hygiene:** Wash hands with soap and water if they are soiled or if exposure is proved or suspected. If hand washing is not possible, rub hands with an alcohol-based preparation.
- **Respiratory Hygiene/Cough Etiquette:** Cover nose and mouth when coughing/sneezing. Dispose of used tissues and masks and perform hand hygiene after contact with respiratory secretions.
- **Gloving:** Wear gloves when touching body fluids/waste, 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.
- **Mouth, nose, eye (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.
- **Gowns/Protective clothing:** Wear protective clothing that keeps out contaminants. Remove soiled gowns/protective coverings as soon as possible and perform hand hygiene.

Hand Hygiene with ABR

Cough Etiquette

- **Appropriate handling of laundry:** Handle, transport, and process used linens in a manner that prevents contamination of self and transfer of pathogens to others and the environment.
- **Environmental cleaning:** Use required procedures for cleaning/disinfecting surfaces.

Expanded Precautions

Expanded Precautions are used when Standard Precautions don't provide enough protection from, or control of, an infectious disease. They are used when dealing with highly transmissible or epidemiologically important pathogens.

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epidemiology: *the branch of medicine that deals with the incidence, distribution, and possible control of diseases and other factors relating to health.*

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

1. Easily transmitted and the occurrence of clusters of two or more infected individuals in one (healthcare) setting.
2. Antimicrobial resistance.
3. Associated with serious clinical disease, increased morbidity and mortality .
4. A newly discovered or reemerging pathogen.

Expanded Precautions relate to the main routes of transmission:

- Airborne Precautions
- Droplet Precautions
- Contact Precautions

These precautions may be combined for diseases that have multiple routes of transmission. They are used in addition to Standard Precautions.

- **Airborne Precautions:** Airborne Precautions reduce the risk of airborne transmission of infectious agents. Microorganisms carried in this manner can be dispersed widely by air currents. They may be inhaled by or deposited on a susceptible host within the same room or over a longer distance from the source patient. Therefore, special precautions such as personal respiratory protection and special air handling and ventilation are needed to minimize the spread of the disease.

- **Droplet Precautions:** Droplet Precautions reduce the risk of droplet transmission of infectious agents. Droplet transmission involves contact with contaminated large-particle droplets through the susceptible person's eyes, nose or mouth.

  Transmission via large-particle droplets requires close contact between source and recipient persons. Precautions usually include use of surgical masks or face shields when in close proximity to the infected person.

- **Contact Precautions:** Contact Precautions reduce the risk of disease transmission by direct or indirect contact. Direct-contact transmission involves skin-to-skin contact and physical transfer of organisms from an infected person to another person. Indirect-contact transmission involves contact with a contaminated object, usually located in the infected person's living or healthcare environment. Masks, gowns, and gloves are typically used to reduce contact transmission risks. Use of disinfectants and decontamination procedures minimize the risk of spreading the infection.

Hierarchy of Control Measures for Infectious Diseases

To help determine what actions, processes and precautions to include in the control plan, workplace health and safety professionals may consider a system called the Hierarchy of Hazard Control or "Hierarchy of Controls." It identifies options based upon effectiveness, from the most effective (elimination of the hazard) to the least effective (use of personal protective equipment - PPE). The health and safety professional's goal is to identify the most effective yet practical means to control risk and to put these decisions and options into the control plan for implementation.

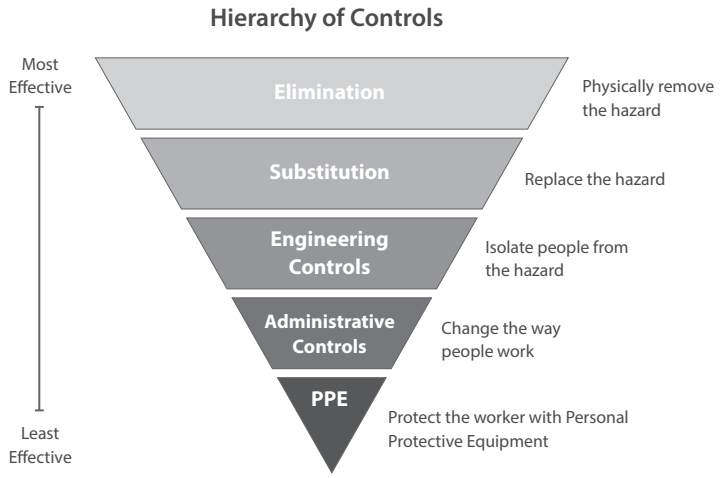

Figure 1: Hierarchy of Controls.

Figure 1 shows the Hierarchy of Controls listed in decreasing order of preference.

- **Elimination and Substitution:** Elimination and substitution (physically removing or replacing the hazard) are the most effective controls. They are also the most difficult to implement or simply may be impractical. For an existing process, major changes in equipment and procedures may be required to eliminate or substitute for a hazard. These options more often relate to chemical hazards (e.g. replacing lead-based paint with titanium white, using ultraviolet light in place of chemical cleaning products) and not to control infectious disease.

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biocontainment: *the physical containment of highly pathogenic organisms (also called containment).*

- **Engineering Controls:** Engineering controls seek to isolate people from the hazard or remove it before it comes in contact with the worker. Isolation is an example of an engineering control. Isolation is the separation of an infected person from others. It is frequently used for infectious aerosols or airborne diseases like tuberculosis. To prevent the spread of disease from the isolation area, engineering controls such as barriers to access and special ventilation may be used. Persons who must come into contact with the infected individual or area will use required PPE.

  Containment or biocontainment is the physical containment of highly pathogenic organisms. Infectious waste usually requires special containment before disposal or transport. Infectious waste must be contained separately from other waste and handled and transported by specially trained and authorized workers.

Sharps containers are a commonly used engineering control against needlesticks.

  A common example of containment is the use of sharps (e.g. hypodermic needles) containers in healthcare facilities. Today many public areas (like bathrooms in airports or restaurants, for example) provide sharps containers for their patrons. However, when they are not available, sharps may end up being discarded in the trash. Workers must be aware of their surroundings when handling any waste/trash.

Signage is an important part of administrative controls.

- **Administrative Controls:** These are changes in the way work is done. Some examples include changing procedures or implementing new ones, employee training, and installing signs and warning labels. Administrative controls do not remove

hazards. Instead, they limit exposure or reduce exposure through behavior changes and hazard awareness. For example, signs warn individuals that they are entering an area that uses radiation or that contains biological hazards. Administrative controls are often used in combination with PPE. Perhaps the most effective administrative control is limiting or eliminating the amount of time that a worker spends in an environment that presents a risk of infection.

- **PPE:** Personal protective equipment (PPE) includes gloves, protective clothing, hardhats, safety glasses, safety footwear, and respirators. PPE is frequently used where hazards are not particularly well controlled. PPE programs may be relatively inexpensive to establish, but over the long term, can be very costly to sustain. These methods for protecting workers have also proven to be less effective than other measures, requiring significant effort by the affected workers.

  Work practices, or administrative controls, and personal protective equipment are less desirable controls than engineering controls. However, with highly infectious diseases, they are the primary type of control measures available.

  See *Table 1* for additional examples of utilizing the Hierarchy of Controls with infectious diseases.

Table 1: Examples of Hierarchy of Controls with Infectious Diseases

Hierarchy of Controls	Examples of controls
Elimination or substitution	• Not applicable to infectious disease hazards.
Engineering	• tongs or other tools; • safer medical device; • sharps containers; • ventilation; • Leak/puncture proof container; • closed systems (containment, barriers); • HEPA filtration ; • ultraviolet lights; and • disinfector, sterilizer, autoclave.

Hierarchy of Controls	Examples of controls
Administrative (work practice controls)	• policies and procedures; • buddy system; • redesign of work process, flow; • avoid areas where hazards are present; • training and education; • hand washing; • job task rotation; • adequate staffing; • hazard communication, labeling, signage; and • hire experts to control/clean up biohazards.
PPE	• gloves; • face shields; • goggles; • respirators; • hoods; • protective gowns; and • other protective suits or shields.

PPE FOR INFECTIOUS DISEASES

Considerations for selecting PPE for workers at risk of infectious disease exposure include:

1. **Type of anticipated exposure:** For example, workers may be exposed through splashes or sprays, and blood, body fluids, or other contaminated liquids (sewage, contaminated water, etc.) that might penetrate regular clothing or get into mucous membranes.
2. **Durability and appropriateness of the PPE for the task:** This will affect, for example, whether an apron, gown, or full protective suit is selected for PPE. It is also important to know if the protective clothing needs to be fluid resistant, fluid proof, or neither. For cleaning/disinfecting tasks, the type of cleaning products used will impact PPE selection.

3. **Fit:** PPE must fit the individual user. The employer must provide PPE in the appropriate size for the wearers. This is particularly important for respiratory protection. Poorly-fitted respirators will allow contaminants to enter.

Workers and their representatives (e.g., union steward or other representative) have a right to obtain a copy of the PPE assessment. It is best when labor and management work together to conduct the PPE hazard assessments. To learn more about the selection of PPE for workers who have potential occupational exposure to highly infectious diseases at a particular worksite, the assessment should be reviewed.

Worker wearing PPE

Gloves

Most patient care activities require the use of a single pair of nonsterile gloves made of latex, nitrile, or vinyl. However, because of allergy concerns, some facilities have eliminated or limited latex products, including gloves, and now use gloves made of nitrile or other material.

For jobs and tasks that do not involve patient care, the type of glove will depend on the risk of exposure, type of transmission route, cleaning and disinfecting chemicals being used, and potential exposure to sharp objects. Some gloves do not provide a snug fit on the hand, especially around the wrist, and therefore should not be used if extensive contact is likely, or the gloves should be taped to protective clothing to eliminate gaps.

Protective Clothing

Depending on the pathogen(s) present, cleanup workers or emergency personnel may need to wear one or two layers of full-covering protective clothing: the inner suit may be a hooded fiber suit (such as Tyvek®), while the outer suit may be a full-body garment constructed of durable viral penetration-resistant material.

Key factors in selecting appropriate clothing are chemical resistance, water resistance, and suit design. Suit design refers to how a garment is put together. The material seams may be sewn or sealed (welded) by cementing or welding tape over the stitched seam. Welded seams provide greater protection for the wearer.

Face Shields

PPE is available to protect all or parts of the face from contact with potentially infectious material. Face shields may be worn over certain respirators to protect the face from splashed or sprayed substances.

Goggles provide barrier protection for the eyes. Personal prescription lenses do not provide optimal eye protection and should not be used as a substitute for goggles. Goggles should fit snuggly over and around the eyes or personal prescription lenses. Goggles with antifog features will help maintain clarity of vision.

Respiratory Protection

Surgical masks are not respirators!

Respirators are used to protect workers from hazardous or infectious aerosols, such as TB. Respirators that filter the air before it is inhaled provide significantly more protection against airborne contaminants than masks.

APR respirators

The most commonly-used respirators in healthcare settings are particulate respirators. These are air-purifying respirators that rely on filters to remove contaminants from the air as the

wearer breathes in. Air-purifying respirators use cartridges to filter specific contaminants and may cover the nose and mouth (half-face) or the eyes, nose, and mouth (full-face). When the wearer breathes in, the suction that occurs is momentary negative pressure in the respirator facepiece. If there is a leak or improper seal due to a poor fit, then contaminants can enter.

Note: Respirator cartridges vary and protect against different contaminants. Not all cartridges used to protect workers against infectious particles effectively protect them from exposure to certain chemicals used in waste packaging procedures, or for cleaning and decontaminating equipment and surfaces. The respiratory protection plan will identify the type of cartridge needed if an air-purifying respirator will be used on the job.

Powered air-purifying respirators (PAPR) use a small, lightweight battery-operated blower to draw air through the purifying cartridge and blow it into the facepiece. The blower delivers air at a constant rate and keeps a positive pressure inside the facepiece. This reduces the likelihood of contaminants leaking into the respirator when the user inhales.

If even greater protection is needed (for example in extremely hazardous or unknown environments) the worker may need to use a respirator that provides clean air from a tank, the self-contained breathing apparatus or SCBA.

Respirator Selection

Your employer is responsible for selecting the appropriate respirators for you and your co-workers. First, information on the contaminants (chemical or biological) is needed. The required type of respirator will be based on the safe exposure levels. It is very important that an actual or educated estimate of the exposure levels is known before selecting a respirator. If the information isn't available, OSHA requires that the job's exposure levels be considered immediately dangerous to life and health (IDLH). IDLH concentrations are life-threatening and call for you to wear the most protective types of respiratory protection.

In addition to exposure levels, respirator selection is influenced by:

- job tasks to be performed,
- duration and frequency of tasks to be performed,
- work location,

- physical demands of the work, and
- respirator comfort.

Before using a respirator, workers must be medically evaluated to determine that it is safe for them to wear a respirator. They must also be fit-tested for the appropriate respirator size and type and trained on how to use the respirator. No worker should be issued or use a respirator if these steps without the evaluation, training, and fit-test.

Donning and Doffing PPE

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mucous membrane: *membrane that lines body cavities and canals that lead to the outside (e.g. eyes, mouth, inside the nose). The membrane's function is to stop pathogens and dirt from entering the body and to prevent bodily tissues from becoming dehydrated.*

Workers must don (put on) and use PPE properly to achieve the intended protection and minimize the risk of infection. Workers should doff (remove) PPE in a way that avoids self-contamination. For example, avoid skin and mucous membrane contact with potentially infectious materials. Do not remove respirators in work areas where air contaminants (e.g., airborne-transmissible agents) may be present.

Workers must don PPE in the proper sequence

The order of PPE donning and doffing may vary depending on the infectious agent(s), the type of PPE a worker uses, the nature of the work tasks, and which devices or garments are contaminated.

Donning and doffing procedures must be in writing, including:

- Using a checklist to ensure all procedures are followed.
- PPE must be put on and taken off in proper order to avoid contamination.
- A trained observer/trained observer's assistant must be present to assist and document the procedure.

In a decontamination unit, workers may need to pass through several separate areas as they doff their PPE.

When using designated areas for donning and doffing PPE, the layout must allow for clear separation between clean and potentially contaminated areas. This may range from the use of a multi-stage decontamination unit that is specially constructed for decontamination and disinfection of workers' PPE as they exit the contaminated work area, or the use of an anteroom outside a patient's room in a healthcare facility.

anteroom: *a small, separate barrier room at the entrance to the work area, with doors at each end.*

DECONTAMINATION AND DISINFECTION

Decontamination

Decontamination is the process of removing contaminants (infectious agents) that have accumulated on people who have worked in a contaminated or likely contaminated environment. Proper decontamination:

- protects the worker from getting hazardous or infectious matter on their bodies and clothes,
- minimizes the transfer of hazardous substances into clean areas, and
- prevents uncontrolled movement of contaminated material from the site.

Decontamination procedures are specific to the industry, job task, and worksite. These procedures are outlined in the site safety plan and must be followed.

This course provides awareness-level PPE guidance, and does not include a complete review of all donning, doffing, and decontamination procedures. Your work site will define its required decontamination procedures. Remember that you must receive training if using respirators is a part of the site's safety control plan.

Decontamination occurs in stages or steps with a defined order that must be followed to ensure the maximum protection and minimum spread of disease. Decontamination begins when a worker exits the contaminated area, called the exclusion or "hot" zone. The actual process of cleaning/disinfecting and removing PPE occurs in the contamination reduction zone or contamination reduction corridor (CDC), just outside of the hot zone. As the worker moves through the decontamination process, he or she gets closer to the clean area. A worker should never cross back and forth among the zones because doing so spreads contamination.

Disinfection

Disinfection is a process that eliminates most or all infectious organisms from objects and

surfaces. Usually liquid chemicals are used as disinfectants. These may include certain alcohol-based hand cleaners and bleach solutions.

The particular disinfectant used and how often disinfection occurs depends on the location, type of surface, type of soiling, type of infectious agent, and which task is performed. The employer's written schedule for cleaning and disinfection should identify these specifics on a task-by-task basis.

A sample disinfection protocol includes these steps:

1. Remove all visible debris, especially organic material.
2. Wash the area or item with water and detergent.
3. Thoroughly rinse the cleaned area to remove any detergent residue.
4. Allow the area to dry completely.
5. Apply the appropriate disinfectant.
6. Allow the proper contact time (usually at least 10 minutes).
7. Thoroughly rinse and allow the area or item to dry.

REGULATIONS, GUIDELINES, AND STANDARDS

Federal and state government agencies develop and set standards and guidelines for the industries affected by infectious diseases. Site-specific Exposure Control Programs comply with or exceed these benchmarks. However, few regulations specifically address infectious disease control. Some agencies that set standards, enforce safety laws, and provide guidance regarding workplace safety – and indirectly – infectious diseases, are discussed below. Workers should be aware of the standards that are relevant to their individual job sites to ensure their own safety as well as safety of others.

Occupational Safety and Health Administration (OSHA)

This is the federal agency within the U.S. Department of Labor responsible for enforcing national safety and health standards. The Occupational Safety and Health Act (OSHA) requires that employers provide a safe and healthful workplace free of recognized hazards. Employers'

responsibilities in certain hazardous/contaminated environments include providing training, medical examinations, personal protective equipment, and recordkeeping.

Some OSHA standards relevant to infectious disease control include:

- **Bloodborne Pathogens Standard (29 CFR 1910.1030):** Safeguards workers against health hazards caused by bloodborne pathogens. It places requirements on employers whose workers have occupational exposure to blood or other potentially infectious materials (OPIM). Occupational exposure means reasonable anticipated skin, eye, mucous membrane, or parenteral contact with blood or other OPIM.

  Employers must develop an exposure control plan, implement the plan controls and universal precautions, provide PPE, make certain vaccines available, provide post-exposure evaluation and follow-up, use labels and signs to communicate hazards, provide training, and maintain worker medical and training records.

- **Personal Protective Equipment (PPE) Standard (29 CFR 1910.132):** Requires employers to provide PPE for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers. Employers are also required to ensure PPE is used and maintained in a sanitary and reliable condition. The employer is required to conduct an assessment to determine the need for PPE and to provide training, including how to properly don and doff.

Employees have the right to request OSHA inspections.

- **Respiratory Protection Standard (29 CFR 1910.134):** Requires employers to identify respiratory hazards and to use feasible engineering controls to reduce such hazards. When engineering controls are insufficient, employers must select respirators that are appropriate to the hazards and develop a written respiratory protection program that details selection, types of respirators, fit-testing, medical evaluations, maintenance and care, training/retraining, and evaluation.

- **Hazard Waste Operations and Emergency Response (HAZWOPER) Standard (29 CFR 1910.120):** Regulates hazardous waste operations and emergency response work in the United States. Specifically, it provides worker health and safety training requirements. The standard defines hazardous substance to include any biologic agent and other disease-causing agent that may cause negative health effects. Spills of infectious material are also covered by the standard's requirements.

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parenteral: *taken or administered in a manner other than through the digestive tract, for example through intravenous or intramuscular injection.*

- **General Duty Clause (Sec. 5(a)(1)) of the Occupational Safety & Health Act:** In some cases where a specific OSHA standard doesn't apply, this requires employers to furnish each employee with a place of employment that is free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to employees. OSHA has used the general duty clause to address MRSA, TB, and other infectious disease hazards.
- **Hazard Communication Standard (29 CFR 1910.1200):** Requires employer compliance when workers use certain chemicals for cleaning, decontamination, and disinfection. This includes making sure that chemicals have labels and safety data sheets (SDS), and training workers to handle the chemicals appropriately. There are no SDS for infectious diseases. However, workers performing tasks in infectious diseases contaminated worksites may use or be exposed to cleaning supplies and solvents. The chemicals in these substances can pose health hazards that will be identified in their SDS.

Other federal agencies conduct research to identify new threats and offer guidance on controlling disease spread.

- **Centers for Disease Control and Prevention (CDC):** A federal agency of the U.S. government that provides facilities and services to investigate, identify, prevent, and control disease. The CDC is a global leader in public health. The CDC develops infectious disease guidelines, but it has no enforcement authority.
- **National Institute for Occupational Safety and Health (NIOSH):** The federal agency responsible for conducting research and making recommendations for the prevention of work-related disease and injury. The Institute is part of the CDC.

State Plans

In addition to OSHA, most states have their own worker health and safety laws and agencies. Some states enact and enforce stricter requirements than federal regulations. State agencies and local jurisdictions could also have regulations that require management of samples, specimens, and wastes generated in the management of patients or managing infectious diseases.

Infectious Disease Awareness

Cal-OSHA Aerosol Transmissible Diseases (ATD) Standard

California has the only standard on aerosol transmissible diseases. The OSHA state plan for California established the Aerosol Transmissible Diseases (ATD) standard in 2009. The standard requires covered employers to develop a comprehensive exposure control plan for ATDs. While not covering all infectious pathogens, this standard serves as a model for the nation. Compliance with the ATD standard is mandatory in California. Users in other states may benefit from reviewing its detailed requirements and approaches to hazard identification and control and related training materials on the Cal-OSHA website.

Interim Planning Guidance for Handling Category A Solid Waste

The *Planning Guidance for the Handling of Waste Contaminated with a Category A Infectious Substance – Category A Waste Guide* is a consolidated overview of regulations, and provides information and guidance to healthcare providers, healthcare waste workers, communities, and leaders on the proper management and handling of these waste materials. An infectious substance is Category A if it is in a form capable of causing permanent disability or life-threatening or fatal disease in otherwise healthy humans or animals upon exposure to the substance. The United Nations (UN) provides a list of Category A substances and guidelines for their transportation. The Ebola virus is one such pathogen, given its ability to cause severe, often fatal, illness in humans.

Medical Screening and Surveillance for Infectious Diseases

There are two OSHA standards that provide guidelines for medical screening and surveillance for at-risk workers. One is the Bloodborne Pathogens Standards (29 CFR 1910.1030), and the other is the HAZWOPER Standard (29 CFR 1910.120).

The Bloodborne Pathogens Standard does not require a pre-placement medical exam but requires that the employer offer the hepatitis B vaccine. If a worker suspects an exposure to hepatitis B, additional post-exposure testing is required, and the worker must follow U.S. Public Health Service post-exposure protocols.

The HAZWOPER Standard does require a pre-placement medical exam as well as emergency/exposure examinations or tests when a worker performs job tasks on a hazardous materials response or cleanup. Work and medical history is also considered with an emphasis on symptoms related to handling hazardous substances and health hazards, fitness for duty, and the ability to wear PPE such as respirators.

In addition to the HAZWOPER Standard, the Respiratory Protection Standard (29 CFR 1910.134) requires workers to fill out a respirator medical evaluation questionnaire or complete a medical exam that answers the same questions as those in the questionnaire.

PSYCHOSOCIAL HAZARDS

Psychosocial hazards affect the workers' emotional or psychological well-being. These hazards may relate to the way work is conducted and managed, the nature of the work (e.g. physical hazards, conflict, isolation, etc.), or social context (e.g. stereotypes, stigma, etc.). These hazards are often linked to workplace stress, absenteeism, difficulties at home, and even workplace violence.

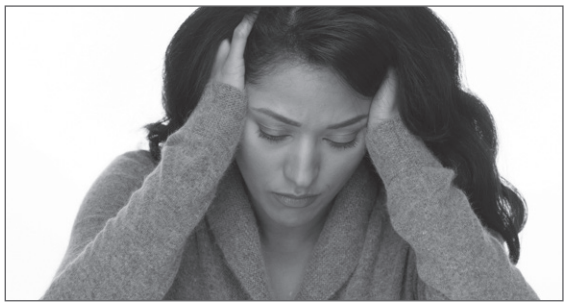
Stress

Working around infectious diseases can cause worker stress. They may worry about becoming infected with a disease and they may worry about taking the infectious agents home to their families. Workers may observe illnesses or fatalities that can cause them lasting psychological impacts. Workers may endure long or unusual hours under hazardous and uncomfortable conditions. This physical stress may compound the psychological stress. Emergency response and support workers providing assistance at disaster sites are particularly vulnerable.

Symptoms of stress are many and varied, but some include:

- nausea,
- diarrhea,
- high blood pressure,
- headaches,
- sleep problems,

- difficulty concentrating,
- difficulty making decisions,
- flashbacks,
- anxiety,
- guilt,
- fear,
- grief,
- sadness,
- apathy,
- isolation,
- withdrawal,
- anger, and
- irritability.



Stress has many signs and symptoms.

The signs and symptoms of a stress reaction may last a few days, a few weeks, a few months, or occasionally longer depending on the severity of the traumatic event. With understanding and the support of employers and family, the stress reactions usually pass more quickly. Occasionally workers may experience a traumatic event so painful that professional assistance from a counselor is necessary.

Controls for Psychosocial Hazards

Psychosocial hazards are diverse and may impact both the worker and family members. Employer controls can range from management training, to developing and implementing effective policies and procedures, to providing support groups and/or individual counseling.

Some things employers can do include:

- involve workers in risk assessment;
- communicate work hazards, tasks and precautions;
- provide more worker control over work tasks and environment;

- value safety and health in the workplace;
- consider the interaction between working and living conditions; and
- listen to and address worker's fears.

Workers can also take actions to manage the stress they feel, both during and after an incident, or when work tasks pose ongoing risks.

Exercise can help with stress.

- Develop a "buddy" system with a co-worker. Watch out for each other. Co-workers may be intently focused on a particular task and may not notice a hazard nearby or behind.
- Take care of yourself physically by exercising regularly and eating small quantities of food frequently.
- Take frequent rest breaks. The work you will be doing may take place in an extremely dangerous environment. Mental fatigue over long shifts can put you at increased risk for injury.
- Drink plenty of fluids such as water and juices.
- Try to eat a variety of foods and increase your intake of complex carbohydrates (breads, whole grain muffins, granola bars, etc.).
- Whenever possible, take breaks away from the work area. Eat and drink in the cleanest area available.
- Recognize and accept what you cannot change – the chain of command, organizational structure, waiting, equipment failures, etc.
- Give yourself permission to feel bad – you are in a difficult situation.

Infectious Disease Awareness

Summary

Environmental service workers may be asked to perform cleanup operations on an infected site or transport infected waste. Other workers may need to perform maintenance operations in a workplace setting where infected equipment or materials are present. The diversity of workplaces where this might take place makes working around infectious diseases especially challenging.

A number of government agencies are working to provide guidelines and best practices for different industries so that people can work safely around infectious diseases.

A risk assessment process identifies potential hazards, evaluates the level of risk associated with those hazards, and determines effective ways to eliminate or control the hazards. Understanding how different pathogens are spread, and the likelihood of exposure while performing particular tasks will direct the selection of control measures, including the use of Standard Precautions and Expanded Precautions.

PPE for working around infectious diseases varies, depending on the worksite and the type of risk present. Protocols are constantly evolving to reduce risk of exposure, including the types of PPE required, and how workers must don (put on) and doff (take off), as well as detailed procedures for decontamination and disinfection.

Psychosocial hazards are often associated with working around the presence of highly infectious diseases, and it is important for both workers and employers to be aware of the signs and symptoms of stress, and various controls that for those situations.

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