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Chapter 1: Introduction to Infectious Diseases

Things to Remember

1. 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 may also be called pathogens or biological agents.
2. The primary routes of transmission for infectious diseases include:
   - **Direct contact:** A susceptible person physically contacts an infected person and transfers the organism.
   - **Indirect contact:** An individual touches a contaminated surface and then becomes infected by touching his or her mouth, eyes, or nose.
   - **Airborne:** Transmission occurs through droplets or aerosols. With aerosols, the organism gets in the air and is breathed in by another person and can cause infection. Airborne transmission does not require face-to-face contact with an infected individual. Droplets containing infectious agents are generated when an infected person coughs, sneezes, or talks. Transmission occurs when droplets come into contact with a person's eyes, nose, or mouth.
   - **Vector-borne:** Carried by another species; "vector" usually refers to an insect, and transmission occurs via a bite from the vector.
   - **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.
   - **Bloodborne:** From contact with an infected person's blood or sometimes other body fluids.
3. Recent or historic outbreaks of an infectious disease include: bubonic plague, 1918 Spanish flu, HIV/AIDS, cholera, E. coli, SARS, Ebola, and Zika (among others).
4. Some examples of infectious diseases, their routes of transmission, and symptoms, include the following:
   - Cholera is transmitted through ingestion; it doesn't usually spread from person to person. Its symptoms include diarrhea, vomiting, and leg cramps. Rapid loss of body fluids can lead to dehydration and shock.
   - E. coli has been transmitted to the general population through contaminated food, often from inadequately washed fruit and vegetables. The symptoms of E. coli infections vary for each person but often include severe stomach cramps, diarrhea (often bloody), and vomiting.
   - Ebola virus disease most commonly spreads by direct contact with blood, secretions, organs or other body fluids of infected individuals. EVD is usually marked by fever, muscle pain, headache, and sore throat. The illness progression includes nausea, vomiting, diarrhea, and impaired organ function.
   - Zika virus disease spreads to people primarily through the bite of an infected mosquito. It can also be sexually transmitted. Symptoms of Zika include mild fever, rash, joint/muscle pain, and headache.
5. NIAID maintains and regularly revises a pathogen priority list, which 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.
   - **Emerging Infectious Diseases:** NIAID also lists several emerging infectious diseases. These have newly appeared or have existed previously but which are rapidly increasing in incidence.

Chapter 1: Introduction to Infectious Diseases

Things to Remember

6. Occupations that are at risk from infectious disease exposure include:
    - building maintenance;
    - healthcare;
    - humanitarian aid;
    - first responders, emergency personnel, security;
    - laboratory;
    - environmental services (cleanup and waste disposal);
    - funeral and mortuary;
    - travel (airline, rail, ship); and
    - border, customs, and quarantine workers.
7. Biosafety is the discipline addressing the safe handling and containment of infectious microorganisms and hazardous biological materials.
8. Key elements in assessing risks for occupational exposure to infectious diseases include:
    - Sources and pathways for potential exposure to infectious pathogens, as well as routes of transmission.
    - Characteristics of the pathogens, including pathogenicity, virulence, and infectious dose.
    - Effectiveness of existing controls, including the use of Standard and Expanded Precautions.

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Chapter 2: Hazard Recognition and Controls

Things to Remember

1. Hazards on an infectious disease worksite can be classified by the following categories:
   - **Biological:** Bacteria, viruses, insects, plants, birds, animals and humans.
   - **Chemical:** Exposure to chemical disinfectants used in cleaning operations.
   - **Physical:** Heat stress, noise, radiation.
   - **Ergonomic:** Repetitive movements, improper setup of workstation.
   - **Psychosocial:** Stress, violence.
   - **Safety:** Slipping/tripping hazards, inappropriate machine guarding, equipment malfunctions or breakdowns.
2. Key elements of an infectious disease exposure control plan (ECP) include the following:
   - management commitment and employee involvement;
   - risk assessment;
   - hazard contro;
   - decontamination, disinfection and sterilization
   - reporting and recordkeeping;
   - training;
   - post-exposure and occupational health procedures; and
   - plan updates/evaluation.
3. Biological worksite hazards include infectious agents, which are organisms that can produce infection or infectious disease. You may also see them referred to as pathogens or biological agents. They include bacteria, fungi, viruses, and parasites. Prevention of occupational exposures to pathogens begins with employers developing a written exposure control plan (ECP), which is required by the OSHA Bloodborne Pathogens Standard. Key elements include universal/standard precautions, engineering and workplace controls, personal protective equipment (PPE) and housekeeping, among others.
4. 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. These include hand hygiene, use of PPE, respiratory hygiene and cough etiquette, and safe handling of potentially contaminated equipment or surfaces.
5. The CDC's expanded precautions include contact, droplet and airborne precautions. These additional precautions are used in conjunction with standard precautions. Contact precautions apply to patients with the presence of stool incontinence, draining wounds or uncontrolled secretions. These include performing hand hygiene before wearing gloves and after removing PPE, and cleaning/disinfecting the exam room. Droplet precautions apply to patients known or suspected to be infected with a pathogen that can be transmitted by droplet route. These include performing hand hygiene after contact with respiratory secretions and contaminated objects/materials, wearing a facemask, and cleaning/disinfecting the exam room. Airborne precautions apply to patients known or suspected to be infected with a pathogen that can be transmitted by airborne route. These include wearing a fit-tested N-95 or higher level disposable respirator, performing hand hygiene before and after contact with respiratory secretions and/or body fluids and contaminated objects/materials, and leaving the exam room vacant for at least one hour.

Chapter 2: Hazard Recognition and Controls

Things to Remember

6. Chemical hazards include disinfectants for highly infectious diseases, which can pose hazards for workers through inhalation, exposure to skin or open cuts, or through the eyes, nose or mouth. Pay 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. It is important to recognize that, in some cases, you are protecting for both the infectious hazard and the chemical hazard. In addition to PPE listed on product labels for disinfectants, other controls may reduce the risks of chemical exposures. These include ensuring adequate ventilation where workers are using disinfectants, using tools rather than doing cleanup directly with gloved hands, and the removal of PPE in a way that avoids self-contamination.
7. 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.
8. 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. 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. 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.
9. 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. Engineering controls include using a device to lift and reposition heavy objects, reducing the weight of a load, repositioning work tables, using diverging conveyors and installing diverters on conveyors, and redesigning tools to enable neutral postures. Administrative controls include requiring two people to lift heavy loads, establishing systems that rotate worker tasks, using staff "floaters" to provide periodic breaks, and properly using and maintaining pneumatic and power tools. PPE for ergonomic hazards includes padding to reduce direct contact with hard, sharp or vibrating surfaces; and good-fitting thermal gloves to help with cold conditions.
10. 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. Psychosocial 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).

Chapter 2: Hazard Recognition and Controls

Things to Remember

11. 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. 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.
- Electrical hazards such as frayed cords, missing ground pins, or 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 this include keeping floors dry or using mats, providing warning signs for wet floor areas, and eliminating uneven floor surfaces.

12. Safe work practices are habits that workers can adopt and use to protect themselves while performing specific duties. Safe work practices for infectious disease worksites include the following:

- Following standard precautions and any expanded precautions, as directed.
- Prohibiting eating, drinking, chewing, smoking, or any practice that increases the probability of hand-to-mouth transfer in any area designated as contaminated.
- Thoroughly washing face and hands upon leaving the work area, and before eating, drinking, or any other activities.
- Not allowing excessive facial hair on personnel required to wear respiratory protection, if the facial hair interferes with a satisfactory fit.
- Avoiding contact with contaminated surfaces, or with surfaces suspected of being contaminated.

13. 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. 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 is it located, what decontamination procedures have been prescribed, and whether or not you have the proper training and equipment to perform your duties.

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Chapter 3: Health Effects

Things to Remember

1. There are various types of occupational health and safety professionals to keep you and your coworkers safe and healthy, including:
   - **Industrial hygienist:** Scientists and engineers committed to protecting the health and safety of people in the workplace and the community.
   - **Safety professional:** Individuals who help organizations prevent injuries and illnesses, evaluate hazards and risks on jobsites, and help implement controls.
   - **Occupational and environmental physician:** Physicians who frequently provide first-level medical care on-site, in addition to medical surveillance when applicable or required by OSHA or other standards.
   - **Occupational health nurse:** Specialty practice that focuses on promotion and restoration of health, prevention of illness and injury, and protection from work-related and environmental hazards.
   - **Infectious disease specialist:** A worker might be referred to an infectious disease specialist if an infection is difficult to diagnose, is accompanied by a high fever, or if the patient does not respond to treatment.
   - **Infection control practitioners:** Work in healthcare settings to create infection control plans, and are responsible for training both medical staff and patients in infection control protocols.
2. Medical screening and medical surveillance are two fundamental strategies for optimizing employee health. Medical screening, a method for detecting disease or body dysfunction, is only one component of a comprehensive medical surveillance program. The fundamental purpose of screening is early diagnosis and treatment of the individual (clinical focus). The fundamental purpose of surveillance, which is the analysis of health information to identify potential problems in the workplace, is to detect and eliminate the underlying causes of hazards or exposures (prevention focus). If workers are exposed, or suspect exposure to an infectious agent, they should seek medical assistance immediately.
3. The health effects of biological hazards depend on the infectious agent, and can range from mild skin irritation to life-threatening viral or bacterial diseases. Two of the most common symptoms associated with biological hazards are intestinal upset and skin irritation or infection.
4. It is crucial for workers to be aware of the type of pathogen(s) known or suspected to be present at a worksite. This includes the routes of transmission, the severity or harmfulness, the signs and symptoms, the incubation period, whether or not a vaccine is available, what types of treatments are available, and the protocol for reporting any suspected exposure.
5. Employers must conduct and provide advance planning for medical care to workers potentially infected with highly infectious agents, which is a fundamental component of an occupational health program for a worksite where Category A priority pathogens are known or suspected to be present. Occupational health plans for an infectious disease worksite may cover such topics as control methods (engineering and administrative), medical evaluations and support, pre-/post-exposure prophylaxis and vaccines, PPE, and reporting.
6. Disinfectants used in cleanup operations, if not used properly or if proper work controls are not followed, can have different health effects. A chemical exposure can be either acute or chronic. An acute exposure is a single short exposure or a few short exposures to a relatively large concentration of a chemical. Physical warning signs of acute exposure include breathing difficulties; dizziness, drowsiness and disorientation; a burning sensation in your eyes or on your skin; weakness and fatigue; and chills and an upset stomach. Chronic exposures are hazardous because some chemicals may accumulate in your body over time.

Chapter 3: Health Effects

Things to Remember

7. Heat stress from exposure to high temperatures can result in heat rash, heat cramps, heat exhaustion, and heat stroke. Heat rash is the mildest form and looks like a red cluster of pimples or small blisters. Heat cramps usually affect workers who sweat a lot, and can also be a symptom of heat stroke. Heat exhaustion is the body's response to an excessive loss of water and salt, and resembles shock. Heat stroke is the most serious form of heat stress, and can be fatal if not recognized and immediately treated at the scene.
8. You can reduce the risk of heat stress by monitoring your pulse, body temperature, and weight loss. Check your heart rate (pulse) during rest breaks. If it is greater than 110 beats per minute, your work time should be reduced and your rest time increased. Check your temperature at the end of the work period. If it is higher than 99.6°F (37.6°C), your work time should be reduced and your rest time increased. If it's higher than 100.6°F (38.1°C), your PPE needs to be removed. Check your weight before and at the end of the work shift. If your weight loss is greater than 1.5 percent of your total weight, you need to drink more fluids before and during work.

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Chapter 4: Standards, Guidelines, and Workers' Rights

Things to Remember

1. Employers must follow all OSHA standards that apply to their scope of work. The following standards and directives are directly applicable to protecting workers against the transmission of infectious agents:
   - Bloodborne Pathogens Standard (29 CFR 1910.1030)
   - Personal Protective Equipment (PPE) Standard (29 CFR 1910.132)
   - Respiratory Protection Standard (29 CFR 1910.134)
   - Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard (29 CFR 1910.120)
   - General Duty Clause (Sec. 5(a)(1)) of the Occupational Safety & Health Act
   - Hazard Communication Standard (29 CFR 1910.1200)
2. Occupational exposure means a reasonably anticipated skin, eye, and mucous membrane contact with blood or other potential infectious material that may result from the performance of an employee's duties. The OSHA Bloodborne Pathogens Standard requires an exposure determination that includes development of a list of job classifications and tasks that have reasonably anticipated exposure. It also requires that all blood and body fluids and other potentially infectious material be treated as potentially infectious.
3. In 2014, OSHA published guidelines for Ebola in the wake of the outbreak that occurred that year. Safe handling, treatment, transport, and disposal of waste that is suspected or known to be contaminated with Ebola virus begins at the point the waste is generated (that is, the point of origin), and continues through final disposal. Guidance includes the following:
   - Take steps to minimize solid and liquid waste.
   - Identify a complete chain for waste handling.
   - Create a waste management plan.
   - Place materials in double, leak-proof bags and store in rigid, leak-proof containers.
   - Follow DOT guidance for packaging.
4. The Centers for Disease Control (CDC) guidance is considered the authoritative source of information on infection control in the U.S., and is a major contributor in controlling infectious disease worldwide. State and local health departments and healthcare facilities use CDC guidelines as a basis for developing infection control programs. Typically, the CDC's website has information on transmission, risk of exposure, prevention, protection of healthcare and laboratory workers, diagnosis, outbreaks, and treatment.
5. *The Interim Planning Guidance for Handling Category A Solid Waste* is a consolidated overview of regulations, which provides information and guidance on the proper management and handling of waste materials. The inter-agency report describes on-site and off-site inactivation of Category A biological agents, as well as engineering and administrative controls, PPE, and worker training recommended for working with Category A waste and inactivated waste.

6. The CAL-OSHA Aerosol Transmissible Diseases (ATD) Standard requires covered employers to develop a comprehensive exposure control plan for ATDs. While only mandatory in California, the standard serves as a model for the nation. The written exposure control plan includes:
   - Establishing engineering and work practice controls to protect employees who operate, use, or maintain vehicles that transport persons who are ATD cases or suspected cases.
   - Providing written decontamination procedures for the cleaning and decontamination of work areas, vehicles, personal protective equipment, and other equipment.

   Employers in California must provide the protections required by Section 5199 of the ATD Standard according to whether the disease or pathogen requires airborne infection isolation or droplet precautions.
7. DOT-SP 16279 is an Ebola-specific special permit, released by the Federal Department of Transportation Pipeline Hazardous Materials Safety Administration (PHMSA), which allows for different sizes of packaging to accommodate larger volumes of contaminated waste.
8. The EPA Resource Conservation and Recovery Act (RCRA) deals with the proper management of waste materials, specifically those wastes that are considered a hazardous waste under these regulations. This may include materials that are listed specifically by the EPA as a hazardous waste, or those that may exhibit characteristics as specified in the regulations. It is important to keep RCRA regulations in mind when dealing with wastes generated at an infectious waste-contaminated site.
9. Under the OSHA Construction Standard, employees have many legal rights on the job site. Employees have the right to:
   - Have an employee representative.
   - Review standards and regulations.
   - Access medical and exposure records.
   - Request safety and hazard information.
   - Request an OSHA inspection.
   - Help the OSHA compliance officer.
   - Contest the abatement period.
   - Contact the National Institute for Occupational Safety and Health (NIOSH).
   - Report imminent danger, and safety and health hazards.
   - Refuse dangerous work.

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Chapter 5: Personal Protective Equipment

Things to Remember

1. The *assigned protection factor (APF)* is the amount a respirator leaks, as assigned by OSHA. An APF is based on the assumption that the respirator is working properly, is worn correctly, and fits the wearer. The lower the APF, the lower your protection. The higher the APF, the higher your protection. APF is calculated by dividing the concentration of airborne contaminants outside the respirator by the concentration inside the respirator. The maximum use concentration (MUC) is the level of contamination that, if exceeded, will cause you to be exposed above the PEL (overexposed). In other words, the MUC is the highest exposure level of a contaminant or a group of contaminants for which a specific respirator can be used safely. At no time should you use a respirator in an environment that exceeds the MUC. The MUC is calculated by multiplying the APF of the respirator that is going to be used by the PEL of the chemical or substance the respirator is going to be used against.
2. The following types of respirators are common in infectious disease work:

Respirator	Features	APF
Half-face APR	Covers half of face from nose to below chin; one or two filters	10
Full-face APR	Covers full face from forehead to below chin	50
Powered Air-purifying Respirator (PAPR)	Battery-operated blower draws air through filter into face-piece; constant flow rate of 4–6 cf/m; slight "positive pressure" inside face-piece	Half-face 50 Full-face 1,000

3. There are two basic types of respirators that you can use to protect yourself against airborne contamination: air-purifying respirators (APRs) and atmosphere-supplying respirators (ASRs). APRs rely on the air in your work environment as your source of breathing air, and clean the air you breathe by filtering or removing contamination from the air before it enters your lungs. ASRs supply you with safe breathing air from a cylinder on your back or a hose connected to a source of safe air. There are two types of ASRs. Supplied air respirators (SARs) provide air delivered by an airline connected to a safe air source. Self-contained breathing apparatus (SCBA) provide air that is supplied by a compressed air cylinder on your back.

4. There are several potential limitations of APRs, including PAPRs, to be aware of:
   - **Oxygen-Deficient Atmospheres:** You cannot wear an APR in any atmosphere that is oxygen-deficient or has the potential to become so.
   - **IDLH Concentrations:** An APR should never be worn in an immediately dangerous to life and health (IDLH) atmosphere.
   - **Filter/Cartridge Life:** The service life of filters, cartridges and canisters is limited by their ability to block or remove contaminants.
   - **Cartridge/Canister Efficiency:** While one cartridge may be very efficient for some chemicals, it allows others to pass through quickly.
   - **Humidity/Temperature:** Breakthrough can occur more quickly under conditions of high humidity and temperatures.
   - **Usage/Change-Out:** The useful life of a cartridge or canister is limited once the cartridge package is opened.
   - **Eye Protection:** Since you have no eye protection when wearing a half-face APR, you must wear safety glasses, goggles, or a face shield if any hazards that may injure your eyes are present.

5. APRs are typically manufactured to use two basic types of purifying elements: Particulate filters and sorbent cartridges and canisters. Particulate filter respirators are used for protection against solid particles, dusts, fumes, and/or mists. They do not protect against gases and vapors. Sorbent cartridges and canisters are used with APRs to protect you from exposure to air that is contaminated with toxic vapors and gases. While particulate filters are effective for nearly all types of particles, sorbent cartridges and canisters are designed to protect against specific types of contaminants. Cartridges are designed to be used individually or in pairs on half and full face-pieces, and their service life is rather short. Canisters contain larger amounts of sorbent material. Therefore, they are bigger, can usually be used for a longer period of time, and are worn in situations where the concentration of gases or vapors is higher.

6. OSHA lists the following requirements for an effective respiratory protection program:
   1. Procedures for selecting respirators for use in the workplace.
   2. Medical evaluations of employees who are required to use respirators.
   3. Fit-testing procedures for tight-fitting respirators.
   4. Procedures for proper use of respirators in routine situations and in reasonably foreseeable emergencies.
   5. Procedures and schedules for cleaning, storing, inspecting, repairing, discarding, and otherwise maintaining respirators.
   6. Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators.
   7. Employee training in the respiratory hazards to which they are potentially exposed during routine and emergency situations.
   8. Employee training in the proper use of respirators, including the following:
      - Donning and doffing (putting on and taking off)
      - Limitations
      - Maintenance
   9. Procedures for regularly evaluating the effectiveness of the program.

Chapter 5: Personal Protective Equipment

Things to Remember

7. A qualitative fit-test (QLFT) or quantitative fit-test (QNFT) must be performed on all negative- or positive-pressure tight-fitting respirators before you wear them. A qualitative fit-test (QLFT) is a pass/fail fit-test used to check respirator fit that relies on your response to a test agent. It involves introducing a harmless odorous or irritating test agent into your breathing zone. If you do not detect the test agent, the respirator fits you properly. A quantitative fit-test (QNFT) is a more sophisticated and accurate type of fit-test done with a machine. It measures the actual amount of leakage into the respirator while you are wearing it, which gives you a "fit factor" for the respirator.
8. A respirator must be adjusted when you put it on to ensure the best possible seal. This is called a user seal check, and you must do it every time you put on your respirator. A *positive-pressure user seal check* includes covering the exhalation valve of the respirator with your palm, and exhaling gently for about 10 seconds. If your respirator seals properly, a slight pressure should build up inside your face-piece. If you feel or hear air leaking out, the respirator is not sealing properly. You must tighten your face-piece straps slightly and repeat the user seal check. A negative-pressure user seal check includes covering the filters or cartridges with the palms of your hands, and inhaling gently and holding your breath for about 10 seconds. If your respirator seals correctly, your face-piece should collapse slightly inward. If the respirator does not seal correctly, the face-piece will not collapse, and you will feel air leaking into the face-piece.
9. During a respirator inspection, the following should be checked:
    - Respirator function;
    - Connections, including tightness; and
    - Condition of all parts, especially rubber parts, for flexibility and deterioration.
10. Your employer is required to create and put in place procedures for the proper use of respirators. A fit-test must be performed before you are assigned a respirator to ensure that the respirator fits properly and affords you the required protection. User seal checks are done every time you put a respirator on to make sure it is adjusted properly and that you have a good face-piece seal. Your respirator should be packed and stored to prevent the face-piece and any other parts from chemicals, contamination, damage, dust, moisture, extreme temperatures, and sunlight.
11. Selection of PPE should always be based on risk assessment. The level of protection needed for a work environment can be grouped into two categories:
    - **High-Risk Protection:** Needed if there is a potential for exposure to blood and bodily fluids.
    - **Low-Risk Protection:** Needed if exposure does not include blood and bodily fluids. If this is the case, there is still a need for PPE and decontamination, but it is not as extensive as for bodily fluid exposures.

    PPE for high-risk environments includes gloves (inner and outer), gowns and protective suits, head covers, foot protection, respirators, and plastic aprons. PPE for low-risk environments includes gloves (inner only), gowns, foot protection, face shield, respirators, and plastic aprons. Training with the PPE being used is crucial in order to maximize the protection it provides. The CDC recommends administrative procedures to document the training of observers and healthcare workers for proficiency and competency in donning and doffing PPE, and in performing all necessary care-related duties while wearing PPE.

Chapter 5: Personal Protective Equipment

Things to Remember

12. There are many steps involved in the proper inspection, donning, and doffing of PPE. These steps may differ from site to site. Donning uses a trained observer and doffing uses a trained observer's assistant. Checklists insure that each stage is done properly.
13. The CDC guidelines for healthcare include disinfecting immediately any visibly contaminated PPE surfaces. Decontamination is critical because workers can become contaminated with infectious material while taking off PPE and respirators. Disposable PPE, such as protective gowns or suits, should be put into leak-proof disposable infectious waste containers. Containers should have leak-proof labeled biohazard bags that conform to DOT Hazardous Materials Regulations (HMR) specifications.
14. The CDC has a standard protocol for safe doffing of inner gloves. The protocol helps to reduce contamination to the worker in the doffing process.

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Chapter 6: Work Area Preparation, Decontamination, and Disinfection

Things to Remember

1. On an infectious disease worksite, isolation and containment may be necessary before any decontamination and disinfection can be done. Isolation is the physical separation of an infected or colonized host from the remainder of the at-risk population. Containment prevents the spread of contaminants outside the work area. The contaminated area should not be disturbed until proper controls have been implemented, in order to avoid spreading infectious pathogens to other areas.
2. Even in large operations, the basic principles for containment and isolation of a smaller area or zone should generally be followed. This includes isolating the entire work area, establishing negative pressure and decontamination areas, and isolating the problem.
3. Preparing the work area for infectious disease decontamination and disinfection includes performing a risk assessment, posting danger signs, securing the work area, setting up the decontamination unit, and shutting down the HVAC (heating, ventilating and air conditioning) systems.
4. A decontamination unit is designed to allow workers to don and doff PPE, as well as pass in and out of the work area without spreading harmful pathogens outside the containment area.
5. A multi-stage decontamination unit will include a clean area for change out of or into street clothes, as well as decontamination areas for donning/doffing PPE, decontaminating or disinfecting reusable equipment and safely discarding of disposable materials. It may also contain a shower room.
6. Some infectious disease cleanup sites may be required to have negative pressure (air) in the work area and/or in the decontamination unit, in order to keep hazardous particles and droplets from entering the areas outside the work area and decontamination areas. A negative-pressure air filter machine, also called a negative air machine or NAM, lowers the air pressure in the work area and prevents contaminated air from leaving the work area until it is filtered.
7. In order to determine the amount of air that needs to be exhausted to meet requirements, you first have to calculate what size (or how many) negative air machines you will need to accomplish the necessary air changes per hour (ACH). Specific site requirements will determine how many ACH are required. The following three formulas help to determine how much air to exhaust in the area you are in:
   - Volume of air in your space in feet:
     Length x width x height = volume in cubic feet
   - CFM required for given ACH:
     ACH x volume ÷ 60 minutes per hour = CFM (cubic feet per minute)
   - ACH produced by given CFM:
     CFM x 60 minutes per hour ÷ volume = ACH
8. In order to set up a negative-pressure enclosure, you must determine the amount of air-to-exhaust for a work area. You must also determine the location of the NAM, where and how to exhaust the outgoing, filtered air. You also must know how to change the filters as needed, and how to remove the system safely at the end of the job.
9. Once in the work area, there are several steps involved in decontaminating and disinfecting an area where infectious agents are known or suspected to be present. These steps may vary depending on the type of facility or the pathogens present. Workers must immediately clean and disinfect any surfaces contaminated with blood, urine, feces, vomit or other body fluids. Chemicals should never be mixed together. If biological agents are found on porous substances such as carpets and wallpaper, etc., disposal may be the only option.

10. Each worksite should have a protocol in place for workers to safely pass through the stages of the decontamination unit and exit the work area. These stages will include the use of a trained observer's assistant, who is responsible for helping the workers safely decontaminate, disinfect, doff, and dispose of (as needed) all of their PPE, to reduce exposure to pathogens inside or outside the decon unit.
11. Steps for disinfection include the following:

    Step 1: Contaminated surfaces should be misted with a bleach solution to reduce the formation of dust aerosols. Bleach solutions should be applied with an airless sprayer and left on contaminated surfaces for 15 minutes before wiping.

    Step 2: Items with porous surfaces containing high levels of contamination should be disposed of when feasible, according to applicable regulations.

    Step 3: Contaminated surfaces that remain after the bleaching process should be disinfected according to the guidelines for the type of infectious agent.

    Step 4: A final sanitation wash using a non-reactive detergent solution is then used. The surface should then be rinsed with water, dried, and HEPA-vacuumed for final cleaning.

    Step 5: Any remaining contaminated debris should be bagged and disposed of as recommended.
12. Decontamination units can be constructed in different ways. One way is the use of 2″ × 4″ lumber for the frame, one layer of 6-mil poly for the walls, floors, and ceilings, and duct tape, staples and screws to build the unit. In some cases, ¼″ to ½″ plywood may be used to reinforce the poly walls. Another method is to use a ZipWall pole barrier system with flap doors or zipper doors, or a modular wall panel system. Sticky mats are also used at every entry and exit to trap dust and dirt from boots and equipment.
13. One scenario for safely donning PPE for work in a highly infectious work area includes the following steps:
    1. Inspect all PPE that will be used.
    2. Remove clothing and personal items.
    3. Put on disposable boxers or cotton underwear (optional).
    4. Don inner suit (Tyvek® for example).
    5. Using duct tape, prepare and put on disposable belt and attach the PAPR battery to the disposable belt (if a PAPR is being used).
    6. Put on inner gloves.
    7. Put on outer suit (chemical suit), do not zip the suit up at this time.
    8. Put on rubber boots. The outer suit should be placed over the rubber boot and should be taped. If being used, put on boot covers at this time.
    9. Connect PAPR battery and put on respirator face-piece and perform the user seal checks.
    10. Put on double hoods over respirator head harness (straps) and zip up (seal) outer coverall. Be sure to tape outer hood to the respirator face-piece brim to gain proper seal.
    11. Put on the face shield.
    12. Put on outer gloves (heavy duty nitrile) and apply tape. Be sure to put sleeve of outer suit over the outer glove.
    13. Put on plastic apron (if used).
    14. Proceed through the decontamination unit to the work area.

14. One scenario for safely doffing PPE, passing through a multi-stage decon unit and leaving the work area includes the following steps:

Enter Stage 1 of the Decon:

- Disinfect the plastic apron, face shield, outer gloves, outer suit, boot covers (if used, and rubber boots if covers are not used) with an EPA-registered disinfectant spray.
- Doff plastic apron, face shield, and boot covers (if used) and dispose in the appropriate receptacle.
- Disinfect the exposed surfaces of the respirator, the outer part of the suit that the apron was covering (if apron was used), the rubber boots (if boot covers were used), and all exposed tape. Then remove exposed tape and outer gloves and place in the appropriate receptacle. (Be sure to take off outer gloves carefully so you do not contaminate the inner gloves.)
- Inspect the inner gloves' outer surfaces for visible contamination, cuts, or tears. If inner glove is visibly soiled, cut, or torn, remove the inner gloves, perform hand hygiene on bare hands and don a clean pair of inner gloves. If no visible contamination, cuts, or tears are identified on the inner gloves, then disinfect the inner gloves.

Enter Stage 2 of the Decon:

- Doff rubber boots and outer suit and place in the appropriate receptacle. When removing the outer suit, slowly and carefully reach for the zipper or fasteners and unzip or unfasten the outer suit completely before rolling down and turning inside out if possible. Avoid contact of the outer surface of the outer suit with the outer surface of the inner suit during removal.
- Disinfect the inner suit.
- Disinfect the inner gloves again. Remove and discard inner gloves making sure not to contaminate bare hands during removal process. Perform hand hygiene with disinfectant and don a new pair of inner gloves.

Enter Stage 3 of the Decon:

- Remove the PAPR battery (if a PAPR is used), including the duct tape belt, and place the battery in a container or area designated for the collection of PAPR components. Place the tape in the appropriate receptacle.
- Carefully remove inner suit and place in the appopriate receptacle.
- Inspect the inner gloves' outer surfaces for visible contamination, cuts, or tears. If inner glove is visibly soiled, cut, or torn, remove the inner gloves, perform hand hygiene on bare hands and don a clean pair of inner gloves. If no visible contamination, cuts, or tears are identified on the inner gloves, then disinfect the inner gloves.
- Remove PAPR, being careful not to touch the inside of the respirator. Then remove inner gloves and non-contaminated undergarments (if any are used) and place in the appropriate receptacle. Place the disinfected PAPR and battery (if applicable) in the Stage 5 area.

Enter Stage 4 of the Decon:

- Shower

Enter Stage 6 of the Decon:

- Redress. Retrieve any disinfected PPE (if applicable) and any decontaminated waste containers (if applicable) from Stage 5 and place in Stage 6. Exit the Decon.

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Chapter 7: Waste Management

Things to Remember

1. The DOT's Hazardous Materials Regulations (HMRs) regulate infectious substances and regulated medical waste (RMW) as a hazardous material. The HMRs apply to any material that DOT determines is capable of posing an unreasonable risk to health, safety, and property when transported. Any infectious substance and regulated medical waste must conform to all applicable requirements when offered for or actually transported by air, highway, rail, or water. But the overall handling of infectious or regulated medical waste begins with the creation of the waste, includes waste transportation, and ends at final disposition.
2. Once a patient is suspected to have, or has been diagnosed with, an infection caused by one of the Category A infectious substances, the facility treating the patient should activate their facility emergency waste management plan. This plan will indicate whether the facility will be using on-site activation (autoclaving or incineration, for example), or if it will need to follow all necessary requirements for transporting the waste off-site for inactivation.
3. Because of the hazards posed by Category A infectious substances, these materials have more stringent packaging requirements than other infectious substances and RMW. The transport of medical equipment, sharps, and used healthcare products contaminated or suspected of being contaminated with a Category A infectious substance must comply with the packaging requirements for infectious substances in the DOT HMR and, if applicable, the OSHA Bloodborne Pathogens Standard. Off-site transportation of this waste, which most often is for incineration, requires additional steps and compliance with specific regulations. Incineration of contaminated waste may be subject to federal, state and/or local laws or regulations. Inactivation or incineration of infectious or regulated medical waste may be subject to state, local and OSHA regulations.
4. Protecting workers during handling, treatment, transport, or disposal of suspected or known Category A contaminated waste begins before the waste is generated, through anticipation, assessment, identification, and planning for occupational exposure risk and appropriate control measures. A comprehensive protection program for waste workers relies on a Hierarchy of Controls; engineering, administrative controls and safer work practices; PPE; and training, medical exams and other elements that OSHA standards require. In all stages of the waste lifecycle, employers and workers should:
    - Limit the number of workers who handle Category A waste to essential staff.
    - Whenever gloves are removed or changed, wash hands with soap and water for at least 20 seconds, or use alcohol-based hand rubs if soap and water are not immediately available.
    - Avoid touching the face or other exposed parts of the body while wearing gloves or before washing/sanitizing bare hands.
    - Change clothing and shower as soon as possible if work clothing becomes soiled.
    - Discard soiled work clothing and PPE with other contaminated waste.
    - Wear dedicated washable footwear while on the job.
    - Consider vaccination to protect workers from diseases for which a vaccine exists.
5. Engineering controls that can be used to avoid hazards while handling hazardous waste include barriers between areas where waste processing equipment operates and where workers may control or observe the equipment; needleless I.V. systems, retractable syringes and other devices designed to prevent needlestick injuries; ventilation equipment; and rigid containers for packaging waste.

Chapter 7: Waste Management

Things to Remember

6. Administrative controls that can be used to avoid hazards while handling hazardous waste include protocols for handling, transporting and disposing of waste. Workers should be trained in how to perform their jobs safely, following appropriate work practices and administrative controls:
   - Package waste in accordance with OSHA's Bloodborne Pathogens Standard, CDC guidelines, and DOT's HMR.
   - Select waste processing techniques that minimize worker exposure to pathogens.
   - Incinerate or autoclave entire, unopened waste containers to eliminate exposure associated with handling and opening containers.
   - Do not use open burning techniques, which could expose workers and other individuals to harmful air contaminants.
   - Handle inactivated, non-infectious waste as though it may continue to pose a hazard from sharps or other puncture injuries.
7. Routine contaminated waste handling, transport, treatment, and disposal operations typically do not fall under OSHA's HAZWOPER standard. However, HAZWOPER requirements may apply to incidents that release, or substantially threaten to release, a hazardous substance, including biological agents, into the environment. Employers, such as those with contracts to transport contaminated waste under a DOT special permit, should be familiar with the provisions of the HAZWOPER standard and be prepared to comply, as needed.
8. For emergency response operations that fall under HAZWOPER, employers must have a written emergency response plan with certain basic and critical elements. They must appropriately train workers who will respond to an emergency before participation in an actual incident, implement medical surveillance for workers potentially exposed to hazardous substances during work, maintain exposure records, and provide appropriate PPE to workers.
9. You should always use mechanical devices whenever possible for lifting, moving and managing waste that is too heavy to manually handle. This may include the use of hand trucks/dollies, forklifts or jacks. You must be properly trained and authorized to operate these mechanical devices. Additional decontamination procedures should also be considered if these devices are used in contaminated areas. As a safety precaution, you should always check for faulty or defective parts before lifting a load that is near the load capacity of the equipment. Tags must clearly state the rated load capacity on all lifting devices and you should never lift more than the equipment can handle.

Chapter 7: Waste Management

Things to Remember

10. Proper lifting techniques for manual handling of waste containers consist of the following steps:

- Firmly place your feet about 10" to 15" apart. Place one foot alongside the object being lifted and the other foot behind the object.
- Use the knee-bend or squatting position. Keep your back straight. Tuck in your chin so that your neck and head continues the straight back line.
- Grab the object using the Palmer grip.
- Tuck your arms and elbows into the side of your body and position your body so that the total weight of the object and your body is centered over your feet.
- Start lifting with a thrust of your rear foot, keeping the object close to your body. Lift with your legs. Do not lift with your back.
- Carry the load close to your body – not with extended arms. To turn or change position, shift your feet. Do not twist your back. Be sure to inspect the container for contamination prior to lifting and carrying the load close to your body.
- To set an object on the ground, follow the same steps in the reverse order.

11. Infected waste may require special types of packaging, depending on whether the waste has been inactivated, or if it is confirmed to contain Category A infectious substances. In addition, overpack drums are required for confirmed cases of Category A waste. Overpacked drums should follow the instructions by the manufacturer or the special permit as applicable and as required.

12. Drums or containers being loaded onto trucks must be firmly secured to prevent them from shifting or breaking during transit. The wheels of trucks being loaded or unloaded should be blocked (chocked) to prevent movement of the truck. The packages should be loaded and secured in accordance with any additional requirements per the special permit (for example it may prohibit stacking of containers or limit the number of containers, etc.).

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Chapter 8: Behavioral Resiliency

Things to Remember

1. A *critical incident* is an event that happens abruptly and has an impact that can overwhelm a person's normally effective ability to deal with physical or emotional stress. Workers in these types of situations may face the danger of death or physical injury, to themselves or to their coworkers, and they may see mass disaster or mass casualties. You may see and experience things that are beyond your body and mind's ability to cope with, without assistance. In addition to physical danger, you are at risk of being impacted behaviorally and emotionally, and the emotional aftershocks can be long-lasting.

2. Critical incident debriefing helps people cope. When worksite critical incidents occur, having a trained specialist visit the worksite and provide needed assistance and support to those who witnessed or may otherwise be affected by the incident is important. This type of support helps workers and others to be better able to recognize and cope with the emotions such traumatic events can produce. A critical incident debriefing plan should be in place for workers on the day of the incident, and the days following the incident.

3. A critical incident can cause you to experience a stress reaction with strong emotional reactions at any time during or after the incident. The four basic principles of trauma-related stress include the following:

   - Trauma is subjective and can have different effects on people.
   - A traumatic response is a normal response to an abnormal event.
   - Traumatic stress is a psychobiological event that impacts the body and the mind.
   - Symptoms of stress from a traumatic event should be addressed and not ignored.

4. The signs and symptoms of a stress reaction may last a few days, a few weeks, or a few months and occasionally longer depending on the severity of the traumatic event or a person's previous experiences. Symptoms of stress reaction can be grouped into the following categories:

   - Physical (nausea, increased blood pressure, headaches);
   - Cognitive (disorientation, distressing dreams, memory problems);
   - Emotional (anxiety, guilt, shock, grief, fear, anger); and
   - Behavioral (unusual anger, isolation, irritability).

   You may experience symptoms after responding to a disaster, and it's unusual to not experience any changes.

5. You will need to take care of yourself to help stay focused on hazards at the site, and to maintain the constant vigilance needed for you and your fellow workers' safety. You may not recognize the need to take care of yourself and to monitor your own emotional and physical health, especially when your assignment stretches into several weeks. In addition to attending any critical incident debriefing meetings that your employer may hold, here are some additional ways that you can manage your stress during a disaster operation:

   - Develop a "buddy" system with a co-worker, and watch out for each other.
   - Take care of yourself physically by exercising regularly and eating small quantities of food frequently.
   - Take frequent rest breaks.
   - Make sure that you 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.).

Chapter 8: Behavioral Resiliency

Things to Remember

6. Whether impacted workers live close to the site of a critical incident with their families, or are away from their families and on the road or "traveling" for work, will likely affect the amount of support required from the employer for a particular victim's family members. When a critical incident results in fatalities and/or serious injuries an employer will need to consider the following steps:
   - Do families of those injured or killed need to be notified? By whom? How?
   - Convey to employees what to say and not to say to families and others.
   - Determine where or to whom calls from family members of injured or deceased workers should be forwarded.
7. Employers in the face of a critical incident should also be prepared to manage contact with the media, both for themselves and their employees. Workers should be assured that their employer has a plan in place to deal with media questions about the incident, and to be informed about that plan. Workers should also be instructed not to talk to the media, not to answer questions, and to whom they should direct reporters if they arrive to cover the incident. In addition, workers should be advised not to take any pictures or video of a critical incident. However, recognizing that some people likely still will, workers should be told not to post any critical incident-related pictures or videos to social media.