

Safe Handling, Treatment, Transport and Disposal of Ebola-Contaminated Waste

Workers involved in handling, treatment, transport and disposal of medical, laboratory and other waste must be protected from exposure to Ebola virus—which causes Ebola virus disease—and from physical and chemical hazards that may be associated with waste management tasks.

Ebola is spread primarily through direct contact with blood or other body fluids of a person who is ill with Ebola and from contact with objects contaminated with Ebola virus. Waste generated from caring for or cleaning up after an Ebola patient may pose a risk to workers if it is not handled safely or treated and disposed of properly.

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 (i.e., the point of origin) and continues through final disposal. Waste may be generated at the point of origin during activities such as:

- Using and discarding sharps, dressings, and other supplies while caring for a patient with suspected or confirmed Ebola;
- Discarding supplies used for clinical laboratory testing of samples from a patient with suspected or confirmed Ebola;
- Cleaning hospital rooms; ambulances, airplanes, and other vehicles; airport and other transportation facilities; residences; or other areas with suspected or confirmed Ebola-virus contamination; and
- Removing and discarding disposable personal protective equipment (PPE) after working in an environment with suspected or confirmed Ebola-virus contamination.

Waste management steps at point of origin

- Take steps to minimize solid and liquid wastes.
- Identify a complete chain for waste handling, collection, treatment, transport and disposal before the waste is generated. Ensure that waste, including incinerator ash or other completely treated materials, has a final place for disposition.



Sharps containers must be closable, puncture-resistant, leakproof, and labeled or color-coded.

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- Create a waste management plan and secure necessary contracts and permits ahead of time in order to help avoid potential exposure hazards, security risks, and storage problems. Pre-identify waste management facilities prior to waste generation; waste management facilities may have their own requirements that may need to be considered.
- Place materials in double, leakproof bags, and store in a rigid, leakproof container to reduce the risk of worker exposure: www.cdc.gov/vhf/ebola/hcp/environmental-infection-control-in-hospitals.html. If waste ultimately will be transported, follow U.S. Department of Transportation (DOT) guidance for packaging from the outset to minimize repackaging or additional handling: phmsa.dot.gov/hazmat/packaging-of-ebola-contaminated-waste.
- Employers should follow manufacturer instructions on product labels and Safety Data Sheets for Environmental Protection Agency (EPA)-registered disinfectants when selecting PPE for their workers.

- Use a puncture-proof container for sharps. See www.cdc.gov/niosh/docs/97-111.
- Mark and label outer packaging according to the Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens standard (29 CFR 1910.1030) and DOT general marking requirements for non-bulk packagings (49 CFR 172.301).
- Ensure that the outsides of waste containers are not contaminated. Use a combination of administrative controls and work practices to avoid contaminating a container when placing waste into it.
- Implement protocols for effectively decontaminating the outside of bags that go into containers, and the containers themselves if they come into contact with potentially infectious waste.
- If porous containers (e.g., corrugated cardboard boxes) become contaminated, they should be placed into another container.
- Disinfect the outsides of waste bags with an EPA-registered disinfectant with label claims for use against non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus) (see page 3: “[Disinfectants for Ebola virus](#)”). Follow manufacturer recommendations for wiping or spraying the bags with an appropriate disinfectant. Follow manufacturer instructions on product labels for concentration, application method, and contact time for the specific disinfectant.
- If practicable, consider autoclaving waste on-site using an appropriate autoclave before it is packaged and sent out of a facility for disposal. Porous materials may require multiple autoclave cycles to ensure sufficient penetration of heat and steam. This approach may be more effective than just using a longer cycle.
- Follow CDC guidelines and DOT Hazardous Materials Regulations (HMR), at www.cdc.gov/vhf/ebola/hcp/medical-waste-management.html and phmsa.dot.gov/hazmat/transporting-infectious-substances.

Use appropriate protective equipment

The Occupational Safety and Health Administration (OSHA) Personal Protective Equipment (PPE) standard (29 CFR 1910.132) requires employers to assess the workplace to determine what hazards are present and then choose the appropriate PPE to protect workers. Employers must select PPE that will protect workers against Ebola virus and other hazards to which they may be exposed. Workers with different job tasks—for instance, those who load waste containers onto trucks compared to those who empty containers onto processing lines—may have very different exposures and require different PPE. Workers must wear PPE to help minimize exposure to the virus via mucous membranes and broken skin, or through inhalation of bio-aerosols. Examples of PPE that may be needed during waste handling, treatment, transport and disposal include:

- Nitrile gloves (consider using double-gloves and/or puncture-resistant gloves for extra protection);
- Goggles or face shields;
- Fluid-resistant or impermeable gowns or coveralls, and aprons;
- Facemasks that cover the nose and mouth;
- Dedicated washable shoes with protective shoe coverings;
- N95 respirators, Powered Air Purifying Respirators (PAPRs), or other respiratory protection devices.

OSHA’s [PPE Selection Matrix](#) is intended to help employers select appropriate PPE for protecting workers who may be exposed to Ebola virus on-the-job: www.osha.gov/Publications/OSHA3761.pdf. The National Institute for Occupational Safety and Health (NIOSH) also provides recommendations for the selection and use of protective clothing and respirators for protection against biological agents: www.cdc.gov/niosh/docs/2009-132.

Training, practice and observation of workers in correct donning and doffing of PPE are important infection control measures. Workers should put on PPE in a way that minimizes the risk of skin and mucous membrane contact with potentially infectious materials; and remove PPE in a way that avoids self-contamination. This includes decontaminating PPE before and between removal steps: www.cdc.gov/vhf/ebola/hcp/procedures-for-ppe.html. The order of PPE removal may vary depending on the type of PPE a worker uses, the nature of the work tasks being performed, and which devices or garments are contaminated, among other factors.

Collecting and transporting waste

- Under the Bloodborne Pathogens standard, [29 CFR 1910.1030](#), and other OSHA requirements, employers already must protect workers who collect and transport waste from exposure to infectious agents, such as the hepatitis B virus and human immunodeficiency virus (HIV), in the waste they handle on a daily basis. Although exposure to these other agents may be more likely, employers are also required to protect workers from exposure to the Ebola virus.
- Following stringent packaging protocols, including decontaminating waste containers, at the point of origin (i.e., where the waste was generated) may reduce the risk of exposure to Ebola virus and other infectious agents for workers involved in collecting packaged waste.
- Place containers of waste as low as possible on dollies, hand trucks, or carts and in trucks or other transport vehicles to prevent toppling and spillage. Secure containers, especially stacked ones, within vehicles using suitable straps or tie-downs.
- Employers must take steps to protect workers from exposure to contaminated waste containers and to protect workers when they must handle waste containers that are visibly soiled or otherwise known or suspected of having Ebola-virus contamination.
- Use proper protections, including additional or more protective PPE, if handling waste containers with visible contamination from blood, body fluids, or other potentially infectious or unknown material. Employers may consider additional or more protective PPE for waste collection and transport workers if they determine another more serious hazard(s) exists.
- Follow DOT HMR, at [phmsa.dot.gov/hazmat/transporting-infectious-substances](https://www.phmsa.dot.gov/hazmat/transporting-infectious-substances).

Processing waste in a treatment/disposal facility

- Under the Bloodborne Pathogens standard, [29 CFR 1910.1030](#), and other OSHA requirements, employers already must protect workers who process waste in a treatment/disposal facility from exposure to infectious agents, such as the hepatitis B virus and HIV, in the waste they handle on a daily basis. Although exposure to these

Disinfectants for Ebola virus

- Use an EPA-registered disinfectant with label claims for use against non-enveloped viruses (e.g., norovirus, rotavirus, adenovirus, poliovirus) to treat contamination/spills and to disinfect non-porous surfaces after bulk spill material has been removed.
- Non-enveloped viruses are typically more difficult to destroy than enveloped viruses, such as Ebola. Stronger disinfectants used to destroy non-enveloped viruses are also capable of inactivating enveloped viruses.
- See EPA List L of selected registered antimicrobial products for use against the Ebola virus: www.epa.gov/oppad001/list-l-ebola-virus.html.
- Always follow the manufacturer's instructions (e.g., concentration, application method and contact time) for the specific disinfectant.
- **Never mix chemicals (e.g., disinfectants/cleaners) together.** Certain combinations of chemicals can be deadly or can reduce the effectiveness of the disinfectant.

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- Workers who are exposed to waste before it is completely treated and decontaminated, including when opening containers to load waste onto processing lines or into autoclaves or incinerators, may be at higher risk for exposure to Ebola virus and other infectious agents than workers with job tasks such as handling waste products that have already been treated (e.g., incinerator ash or waste that already was appropriately autoclaved at its point of origin). Waste that has been properly treated and decontaminated is no longer infectious.
- Place containers of waste as low as possible on dollies, hand trucks, or carts and when stacking to prevent toppling and spillage. Secure stacked containers using suitable shelves, straps or other equipment.

- Employers must consider increasing levels of PPE for waste processing and treatment/disposal workers if they determine that a more serious hazard exists.
- Follow applicable EPA, state, and local regulations for hospital/medical/infectious waste incinerators: www.epa.gov/ttnatw01/129/hmiwi/rihmiwi.html.
- Workers tasked with processing reusable collection and storage containers, conducting housekeeping within processing facilities, or cleaning transport vehicles may refer to OSHA's "Cleaning and Decontamination of Ebola on Surfaces" Fact Sheet for additional guidance: www.osha.gov/Publications/OSHA_FS-3756.pdf.

Do not shred contaminated waste

- Do not use waste management processes that involve shredding incoming waste materials that have suspected or confirmed Ebola-virus contamination.
- Shredding, particularly with equipment that is not closed and ventilated out of the work area, may result in generation of bio-aerosols (aerosolized droplets containing infectious particles that can be inhaled).
- Shredders may become clogged or jammed by atypical, porous waste materials (e.g., linens, carpet, curtains, or other textiles) that must be discarded when decontamination is not possible.
- If at all possible, do not enter a clogged shredding machine to resolve a jam. If a worker must do so, always ensure that the machine is powered off and follow proper lockout/tagout procedures for controlling hazardous energy: www.osha.gov/SLTC/controlhazardousenergy.
- Ensure that the worker has proper PPE to protect against all health and safety hazards that are possible from the waste and the machinery, including bloodborne pathogens and other infectious diseases, and mechanical, electrical, and other physical hazards of the equipment.

Final disposal of treated waste

- Waste that has been properly treated and disinfected using thermal/heat treatment (e.g., microwaves), autoclaving, incineration, or a combination of these or other generally accepted methods is not considered to be infectious.

Safer waste processing techniques

- Select waste processing techniques that minimize potential worker exposure to Ebola virus or other pathogens.
 - Incinerating entire, unopened waste containers in incinerators eliminates exposures associated with handling and opening containers. Incinerator facilities should be operated in compliance with applicable federal, state, and local regulations.
 - If using autoclave or rotoclave equipment, develop, validate and regularly test protocols using biological and non-biological indicators to ensure that the autoclave temperature and pressure are maintained for long enough time periods to kill all organisms throughout the waste content and that heat/steam can penetrate packaging and any porous materials.
 - Weekly (or more frequent) testing with biological or non-biological indicators ensures that autoclave equipment is functioning properly.
 - Do not use open burning techniques, which could expose workers and other individuals to harmful air contaminants.
 - Do not shred contaminated waste (see related section at left).
- Depending on state regulations, such waste can safely be disposed of following the protocols normally used by a facility under the jurisdiction of the state where it is located.
 - As with any solid waste, other applicable disposal requirements should be considered (e.g., if non-infectious materials, such as toxic metals, are present in regulated amounts).

Use appropriate respiratory protection

- In instances where workers may be exposed to bio-aerosols (e.g., as a result of using high-pressure air or water for cleaning) suspected or known to contain Ebola virus, additional respiratory protection is needed. In these cases, medically qualified workers must use, at a minimum, a NIOSH-approved, fit-tested N95 respirator. See www.cdc.gov/niosh/npptl/topics/respirators/disp_part/n95list1.html.

- Wearing a respirator for extended periods of time can be uncomfortable. Workers who need respirators for long time periods may find powered air-purifying respirators more tolerable.
- Respirators used for protecting workers against Ebola virus may not be effective for also protecting them from exposure to certain chemicals used for treating and decontaminating waste, or for cleaning and decontaminating equipment. To learn more about the requirements for selecting an appropriate respirator to protect against chemical exposure (elastomeric respirator with appropriate chemical or combination cartridges or a supplied-air respirator), consult OSHA's Respiratory Protection standard, [29 CFR 1910.134](#), and the manufacturer's Safety Data Sheet (SDS) for the specific chemical(s) that workers are using. See OSHA's Respiratory Protection web page: www.osha.gov/SLTC/respiratoryprotection.

Infection control for all waste workers

- Limit the number of workers who handle waste to essential staff. For example, instruct and train healthcare workers generating waste during care of an Ebola patient to properly package the waste instead of requiring an environmental services or waste collection worker to also handle the waste.
- Whenever gloves are removed or changed, wash hands with soap and water, or use alcohol-based hand rubs if soap and water are unavailable. Always wash with soap and water if hands are visibly soiled.
- 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 with other Ebola-contaminated waste.
- Consider wearing dedicated, washable footwear while on the job.
- Notify a supervisor immediately if exposed to potentially infectious material or waste on the job, including on work clothing or exposed skin or through mucous membranes (e.g., eyes, nose, mouth).

Follow applicable OSHA standards

- Employers must ensure that they comply with OSHA's Bloodborne Pathogens standard, [29 CFR 1910.1030](#), to protect workers who may be exposed to blood or other potentially infectious materials.
- OSHA's Personal Protective Equipment (PPE) standard, [29 CFR 1910.132](#), provides additional information about how to select and use appropriate PPE, training and other requirements.

Worker training is essential

Employers must train workers about sources of exposure to Ebola and appropriate precautions.

Where workers may be exposed to blood or other potentially infectious materials, such as in the waste handling, treatment, transport and disposal industry, employers must provide the training required by OSHA's Bloodborne Pathogens standard, [29 CFR 1910.1030](#). This includes information about how to recognize tasks that may involve exposure and the methods to reduce exposure, including engineering controls, work practices and PPE.

Employers must train workers required to use PPE on what equipment is necessary, how to put it on and take it off safely and effectively, when and how they must use it, and how to dispose of the equipment.

- Employers must comply with OSHA's Hazard Communication standard, [29 CFR 1910.1200](#), when their workers use certain chemicals for cleaning and decontamination.
- OSHA's Lockout/Tagout standard, [29 CFR 1910.147](#), contains requirements on controlling hazardous energy when working with machinery.
- In some cases where a specific OSHA standard doesn't apply, the General Duty Clause (Sec. 5(a)(1)) of the *Occupational Safety and Health Act* requires employers to furnish to each employee 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.

- Employers may also be required to follow state regulations that cover potentially infectious medical waste, sometimes referred to as regulated medical waste: www.epa.gov/osw/nonhaz/industrial/medical/programs.htm.

Assistance for Employers

OSHA's On-site Consultation Program offers free and confidential advice to small and medium-sized businesses in all states across the country, with priority given to high-hazard worksites. On-site Consultation services are separate from enforcement and do not result in penalties or citations. Consultants from state agencies or universities work with employers to identify workplace hazards, provide advice on compliance with OSHA standards, and assist in establishing safety and health management systems. To locate the OSHA On-site Consultation Program nearest you, call 1-800-321-6742 (OSHA) or visit www.osha.gov/consultation.

Additional resources

- About Ebola
 - www.osha.gov/SLTC/ebola
 - www.cdc.gov/niosh/topics/ebola
- About bloodborne pathogens and needlesticks
 - www.osha.gov/SLTC/bloodbornepathogens
 - www.cdc.gov/niosh/topics/bbp
- About management of Ebola-associated waste
 - www.cdc.gov/vhf/ebola/healthcare-us/cleaning/waste-management.html
 - www.cdc.gov/vhf/ebola/healthcare-us/cleaning/handling-waste.html
- For selection and use of PPE, including respirators
 - www.osha.gov/SLTC/personalprotectiveequipment
 - www.cdc.gov/niosh/ppe
 - www.osha.gov/SLTC/respiratoryprotection
 - www.cdc.gov/niosh/topics/respirators
- About toxic and hazardous substances, including chemical hazards
 - www.osha.gov/SLTC/hazardoustoxicsubstances
 - www.cdc.gov/niosh/npg
- About Hazard Communication
 - www.osha.gov/dsg/hazcom
- About controlling hazardous energy (Lockout/Tagout)
 - www.osha.gov/SLTC/controlhazardousenergy

Disclaimer: This document is not a standard or regulation, and it creates no new legal obligations. It contains recommendations as well as descriptions of mandatory safety and health standards. The recommendations are advisory in nature, informational in content, and are intended to assist employers in providing a safe and healthful workplace. The *Occupational Safety and Health Act* requires employers to comply with safety and health standards and regulations promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, the Act's General Duty Clause, Section 5(a)(1), requires employers to provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. State Plans adopt and enforce their own occupational safety and health standards at www.osha.gov/dcsp/osp.

This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627. For other requests or questions, contact OSHA at 1-800-321-OSHA (6742). To receive NIOSH documents or more information about occupational safety and health topics, contact NIOSH at 1-800-CDC-INFO (1-800-232-4636), TTY: 1-888-232-6348, web: www.cdc.gov/info, or visit the NIOSH website at www.cdc.gov/niosh.

