OSHA® FactSheet

PPE Selection Matrix for Occupational Exposure to Ebola Virus

Guidance for common exposure scenarios

Employers are responsible for ensuring that workers are protected from exposure to Ebola virus and that workers are not exposed to harmful levels of chemicals used for cleaning and disinfection. While most workers in the U.S. are unlikely to encounter Ebola virus or individuals with Ebola, workers whose jobs involve healthcare, mortuary/death care, airline and other transportation operations, cleaning and environmental services, law enforcement, and certain other tasks may be at higher risk for exposure.

- Based on existing OSHA and Centers for Disease Control and Prevention (CDC) guidance, OSHA's personal protective equipment (PPE) selection matrix is intended to help employers select appropriate PPE for workers who may be exposed to Ebola virus through direct contact with blood or other potentially infectious body fluids from individuals with signs or symptoms of Ebola; objects, materials, and surfaces with Ebola-virus contamination; and exposure to bio-aerosols that may contain Ebola virus particles.
- The matrix covers examples of common exposures, but is not intended to prescribe PPE for every worker or exposure or discuss all PPE options. In all cases, employers must identify hazards to which their workers may be exposed; provide appropriate PPE to protect them; and train them on when and how they must use it, and how to dispose of or decontaminate the equipment.
- Employers must comply with OSHA's standards on Bloodborne Pathogens (29 CFR 1910.1030), PPE (29 CFR 1910.132), Respiratory Protection (29 CFR 1910.134), and other requirements, including those established by state plans, whenever such requirements apply.

Photo courtesy of CDC

- Visit www.osha.gov/ebola for additional information about Ebola, including information about putting on (donning) and removing (doffing) PPE. CDC guidance states that all healthcare workers involved in the care of Ebola patients must receive repeated training on and must demonstrate competency in putting on and removing proper PPE before working with Ebola patients. Workers in other sectors where exposure to the Ebola virus or someone with Ebola may be anticipated should also demonstrate competency in putting on and removing proper PPE.

OSHA PPE Selection Matrix for Occupational Exposure to Ebola Virus

✔	**Use at a minimum**
◆	**Use when high(er)-risk exposure(s) is present**

	Conducting normal work activities	**Casual interaction (outside of a healthcare setting)**		**Physical contact (outside of a healthcare setting)**		**Providing medical and supportive care**						**Conducting clinical laboratory work**	**Conducting research laboratory work**	**Handling dead bodies**	**Cleaning and disinfecting environments**			**Performing maintenance work**		**Handling, transporting, treating, and disposing of waste**	
	In settings where there is no reason to anticipate exposure to Ebola virus[1]	(e.g., face-to-face conversation without physical contact) with individuals with risk factors for Ebola[2], but with no signs or symptoms[3]	(e.g., face-to-face conversation without physical contact) with individuals with signs or symptoms of Ebola	with individuals with risk factors for Ebola, but with no signs or symptoms	with individuals with signs or symptoms of Ebola	to individuals with no signs, symptoms, or risk factors for Ebola	to individuals with risk factors for Ebola, but with no signs or symptoms	during initial evaluation of individuals with suspected Ebola (including those with some signs or symptoms), but without obvious bleeding, vomiting, or diarrhea	during initial evaluation of individuals with suspected Ebola who have bleeding, vomiting, or diarrhea, or when these symptoms are likely to develop; or during hospitalization of individuals with suspected or confirmed Ebola	to individuals with suspected or confirmed Ebola, which involves performing aerosol-generating procedures (AGPs)	while transporting sick individuals with risk factors for Ebola or who are suspected or confirmed to have Ebola	on samples from patients with suspected or confirmed Ebola, including testing which results in bio-aerosol generation[4]	on samples or other material suspected of containing or known to contain Ebola[4]	of individuals suspected of dying or known to have died of Ebola, such as during packaging of remains in an appropriate containment bag or transferring of packaged remains to a crematory	with suspected or confirmed Ebola virus contamination, but without significant, visible contamination from blood or other body fluids	with suspected or confirmed Ebola virus contamination that includes significant, visible contamination from blood or other body fluids	with suspected or confirmed Ebola virus contamination and using disinfectants which may pose a chemical hazard	in areas that have been fully and appropriately decontaminated in a way that eliminates Ebola virus	in areas suspected or known to have Ebola virus contamination, which have not been fully and appropriately decontaminated in a way that eliminates Ebola virus (e.g., in emergencies)	suspected or known to have Ebola virus contamination (considered Category A waste), and that has been appropriately packaged[5] at its point of origin	suspected or known to have Ebola virus contamination (considered Category A waste), and where waste containers must be opened or waste otherwise handled directly
Typical precautions/PPE, if any, for normal work tasks	✔	✔	✔	✔	✔	**Standard precautions**	**Standard precautions**	**Standard precautions**	**Standard precautions**	**Standard precautions**	**Standard precautions**	**According to biosafety level**	**According to biosafety level**	✔	✔	✔	✔	✔	✔	✔	✔
Dedicated clothing (uniform/scrubs, shoes)			✔		✔		◆	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	◆	✔	✔	✔
Gloves, Single (nitrile)		◆	✔	✔	✔		◆														
Gloves, Double (nitrile)					◆			✔	✔	✔	✔	✔	✔	✔	✔						
Gloves, Double (nitrile + heavy duty)															◆	✔ **For chemical protection**	✔ **For chemical protection**		✔ **As appropriate for hazard**	✔ **Puncture-resistant gloves**	✔ **Puncture-resistant gloves**
Face mask (e.g., surgical mask)			✔		✔			✔							✔					◆	
Face and eye protection (e.g., shield/goggles)			✔		✔			✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔
Head/neck cover (e.g., surgical hood)[6]									✔ **Impermeable**	✔ **Impermeable**	✔ **Impermeable**	◆ **Fluid-resistant**	✔ **Impermeable**	✔ **Impermeable**	◆ **Impermeable**	✔ **Impermeable**	✔ **Impermeable**		◆ **Impermeable**		
Fluid-resistant or impermeable gown[9]			◆ **Fluid-resistant**		✔ **Fluid-resistant**			✔ **Fluid-resistant garment should fully cover skin**	✔ **Appropriate garment should fully cover skin**[8]	✔ **Impermeable garment should fully cover skin**	✔ **Impermeable garment should fully cover skin**	✔ **Fluid-resistant**	✔ **Impermeable**		✔ **Fluid-resistant**	✔ **Impermeable garment should fully cover skin**	✔ **Impermeable**		◆ **Fluid-resistant**	✔ **Impermeable**
Fluid-resistant or impermeable coveralls[6]			◆ **Fluid-resistant**		◆ **Fluid-resistant**							◆ **Fluid-resistant**	◆ **Impermeable**	✔ **Impermeable**	◆ **Fluid-resistant**		◆ **Impermeable**		✔ **Impermeable**	◆ **Fluid-resistant**	◆ **Impermeable**
Fluid-resistant or impermeable apron[6]								◆ **Fluid-resistant**	✔ **Impermeable**	✔ **Impermeable**	✔ **Impermeable**			✔ **Impermeable**		✔ **Impermeable**	◆ **Impermeable**				
Shoe/boot covers high enough to cover lower leg[6]			◆ **Fluid-resistant**		✔ **Fluid-resistant**				✔ **Impermeable**	✔ **Impermeable**	✔ **Impermeable**	◆ **Fluid-resistant**	✔ **Impermeable**	✔ **Impermeable**	✔ **Fluid-resistant**	✔ **Impermeable**	✔ **Impermeable**		✔ **Impermeable**	◆ **Fluid-resistant**	◆ **Impermeable**
Disposable N95 respirator[7]					◆			◆	✔	✔	✔	◆	✔	✔	◆						✔
Elastomeric respirator + appropriate cartridge[7]								◆				◆	◆		◆	✔	✔		✔		◆
Powered Air-Purifying Respirator (PAPR)[7]								◆				◆	◆			◆	◆		◆		◆
Full-body, air-supplied positive pressure suit													✔ **If not working in Class III BSC**[4]								
Example of workers who may require this level of PPE	Most types of U.S. workers who do not fit into other categories on this matrix	Airline crews and other transportation workers; customs/ border protection officers, transportation security screeners, other law enforcement personnel; public health workers		Airline crews and other transportation workers; customs/ border protection officers, transportation security screeners, other law enforcement personnel; public health workers		Healthcare workers, including physicians, nurses, and others; aid workers; airline and other transportation workers		Healthcare workers, including physicians, nurses, and others		Air medical transport workers, EMS workers		Clinical laboratory scientists and technicians; other laboratory personnel	Laboratory scientists and technicians	Morticians; coroners; medical examiners; forensic scientists	Environmental services workers in all settings, including hospitals, aircraft and airports, and other areas			Maintenance workers in all settings		Environmental services and waste collection workers in hospitals and other settings; DOT-permitted waste disposal and collection company workers	

Additional resources for workers and employers

OSHA, CDC, and the National Institute for Occupational Safety and Health (NIOSH) provide guidance for workers performing a variety of tasks in healthcare and non-healthcare settings, including:

- OSHA Ebola Web page: www.osha.gov/ebola
- CDC Ebola Web page: www.cdc.gov/ebola
- NIOSH Ebola Web page: www.cdc.gov/niosh/topics/ebola

Note: This document is not intended to cover all OSHA standards that may apply. State plans adopt and enforce their own occupational safety and health standards at www.osha.gov/dcsp/osp.

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[1] Most workers in office environments normally do not require PPE to perform their job tasks safely. In settings where there is no reason to anticipate exposure to Ebola virus, no new or additional PPE is warranted.

[2] Risk factors for Ebola include contact with blood or other body fluids or human remains of a patient known to have or suspected of having Ebola; residence in or travel to an area where Ebola transmission is active; and direct handling of bats or non-human primates from disease-endemic areas: www.cdc.gov/vhf/ebola/exposure/risk-factors-when-evaluating-person-for-exposure.html.

[3] Signs and symptoms of Ebola include fever, severe headache, muscle pain, weakness, diarrhea, vomiting, abdominal (stomach) pain, and unexplained hemorrhage (bleeding or bruising): www.cdc.gov/vhf/ebola/symptoms.

[4] Handling of samples from individuals with suspected or confirmed Ebola, or research samples of Ebola virus, should be done in containment (e.g., in a biosafety cabinet, BSC) to protect workers and to prevent contamination of surfaces outside the BSC. OSHA recommends that clinical laboratory testing work described in this matrix be conducted at, a minimum, Biosafety Level (BSL) 2 with BSL 3 precautions, using at least a Class II BSC; and that research work be conducted at BSL 4 using a Class III BSC. Following a risk assessment and development of a comprehensive strategy for mitigating lab worker exposures, some types of specimens from individuals with suspected or confirmed Ebola may be safely handled and tested in the core clinical laboratory (i.e., at levels lower than BSL-2 with 3 precautions) using an integrated approach. Such an approach may involve decontaminating and packaging samples in containment within an Ebola patient care area; use of specialized equipment that does not require opening/uncapping tubes, centrifugation, or other aerosol-generating procedures; training on and use of appropriate PPE; and proper waste handling and disposal techniques.

[5] Package waste according to OSHA's Bloodborne Pathogens standard (29 CFR 1910.1030) and, if transporting waste off-site for treatment and disposal, DOT's Hazardous Materials Regulations (49 CFR 172).

[6] Consider the amount of vomit and watery excrement a patient is producing when selecting these items. Material thickness, fluid resistance, seam integrity, and the amount of time a worker can comfortably wear a protective garment should be considered when selecting gowns, coveralls and aprons. When the anticipated risk of exposure to blood and body fluids is low, employers should provide workers with fluid-resistant garments. Fluid-resistant gowns should meet American National Standards Institute (ANSI) / Association for the Advancement of Medical Instrumentation (AAMI) PB70 Level 3 requirements. Fluid-resistant coveralls should be made of fabric and constructed with seams that pass: (1) American Association of Textile Chemists and Colorists (AATCC) 42 Impact Penetration Test at 1 g or below and AATCC 127 Hydrostatic Head Test at 50 cm or above, or (2) EN 20811 Hydrostatic Head Test at 50 cm or above, or (3) American Society for Testing and Materials (ASTM) F1670 Synthetic Blood Penetration Resistance Test, or (4) International Organization for Standardization (ISO) 16603 Synthetic Blood Penetration Resistance Test (at 3.5 kilopascal [kPa] or above). When the anticipated risk of exposure to blood and body fluids is high, employers should provide workers with impermeable garments. Impermeable isolation or surgical gowns should meet the ANSI/AAMI PB70 Level 4 requirements. Impermeable coveralls should be made of fabric and constructed with seams that pass ASTM F1671 Bloodborne Pathogen Penetration Resistance Test or ISO 16604 Bloodborne Pathogen Penetration Resistance Test (at 14 kPa or higher). In absence of manufacturer-provided data on seams, select a garment constructed with an appropriate seaming technique (e.g., taped seams).

[7] In instances where workers may be exposed to bio-aerosols (e.g., as a result of spraying liquids or air during cleaning) suspected of or known to contain Ebola virus, medically qualified workers must use, at a minimum, a NIOSH-approved, fit-tested N95 respirator. A full-face elastomeric respirator or PAPR offers a higher level of protection (i.e., greater assigned protection factor, APF) than a half-mask elastomeric respirator or disposable N95. When using elastomeric respirators or PAPRs while using disinfectants that may pose a chemical hazard, a combination particulate/chemical cartridge may be necessary to protect workers from exposure to the chemicals in addition to Ebola virus particles. Note that disposable N95 respirators and certain cartridges for elastomeric respirators may be adversely affected by an increase in moisture and spray from certain work tasks, including during cleaning and decontamination. In such instances, or during other tasks to improve worker comfort, a supplied-air respirator (SAR) may be an alternative.

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