

13th August 2014

Personal Protective Equipment (PPE) for Ebola virus disease (EVD) Frequently Asked Questions (FAQs)

3M has received a number of inquiries regarding the appropriate personal protective equipment for potential exposures to Ebola virus disease (EVD). Following are responses to many of the most commonly asked questions. It is important to note this FAQ is not a substitute for the guidance of the United States Centers for Disease Control and Prevention (CDC), World Health Organization (WHO), the European Centres for Disease Prevention and Control (ECDC) and your local health authority. Please consult their websites frequently for the most current information and infection control procedures regarding EVD.

U.S. CDC	http://www.cdc.gov/vhf/ebola/index.html
European CDC	http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fever/information-travellers/Pages/information-travellers.aspx
WHO	http://who.int/mediacentre/factsheets/fs103/en/

For further information related to PPE use, please contact your local 3M Personal Safety Division Technical Services team.

What is Ebola virus disease (EVD)?

Ebola virus disease (also known as Ebola hemorrhagic fever) is a severe, often-fatal disease caused by infection with a species of Ebola virus. EVD is a severe acute viral illness often characterized by the sudden onset of fever, intense weakness, muscle pain, headache and sore throat. This is followed by vomiting, diarrhoea, rash, impaired kidney and liver function, and in some cases, both internal and external bleeding.

Outbreaks of Ebola outbreaks have occurred sporadically in parts of Africa, South America, the Middle East and Eastern Europe. It is a severe, often fatal disease in humans with fatality rates ranging up to 90%.

How is it transmitted?

Ebola is spread through direct contact with blood or body fluids (such as saliva or urine) of an infected person or animal, or through contact with objects that have been contaminated with the blood or other body fluids of an infected person, dead or alive. Transmission is believed to occur via contact with mucous membranes and non-intact skin (i.e., rashes, cuts, etc.). Risk of infection by inhalation of contaminated aerosols by healthcare workers has not been documented, but thought to be low at this time based on case history evidence.

Ebola virus is easily killed by soap, bleach, sunlight, or drying. Machine washing clothes that have been contaminated with fluids will destroy Ebola virus. Ebola virus survives only a short time on surfaces that are in the sun or have dried.¹

What does the WHO recommend for personal protection equipment (PPE) against Ebola virus disease?

The prevention of Ebola virus infection includes measures to avoid contact with blood and body fluids of infected individuals and with objects contaminated with these fluids. Barrier precautions are used to prevent skin or mucous membrane exposure of the eyes, nose, and mouth with blood, other body fluids, secretions (including respiratory droplets), or excretions. For those working to control the Ebola Virus Disease (EVD) outbreak and treat patients, the WHO recommends a basic suite of personal protective equipment for most activities which includes:

- Impermeable gloves
- Impermeable footwear
- Eye and face protection
- Protective clothing
- Fluid resistant mask or respirator

Some tasks require additional body protection. Certain tasks, including administering aerosol generating medical procedures, certain laboratory tasks and autopsies require respiratory protection.

Please see “Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola.” for the full guidance: <http://www.who.int/csr/resources/who-ipc-guidance-ebolafinal-09082014.pdf>

It is important that anyone involved in infection control for ebola virus disease (EVD) thoroughly read and understand that document.

PPE should be selected based primarily on the potential exposures and need for protection against infective fluids and agents. However work conditions, environmental conditions, tasks and accessibility to decontamination facilities should also be considered.

Hand hygiene is strongly emphasized and it is of the highest importance that hand hygiene be performed thoroughly and often including before and after donning and before and after doffing PPE.

Note, currently there is no established guidance that specifies performance criteria for personal protective equipment (clothing, gloves, foot coverings, etc.) specific to EVD. Emphasis should be on the prevention of infective materials from contacting mucous membranes (mouth, nose, and eyes) and non-intact skin.

PPE can help provide a barrier to infectious material however, it is very important that all local infection control protocols and manufacturer’s user instructions be followed when removing (doffing) the equipment to avoid contamination. Additionally, local infection control practices and manufacturer’s user instructions should be followed when cleaning any reusable PPE. The WHO guidance contains recommendations for donning, doffing and cleaning PPE.

A more complete summary of the WHO PPE recommendations as well as the US CDC, ECDC and United Kingdom's PPE recommendations for EVD can be found in Appendix 4.

Eye Protection

Eye protection provides a barrier to infectious materials from entering the eye and is often used in conjunction with other personal protective equipment (PPE) such as gloves, gowns, and masks or respirators. See Appendix 1.

Goggles

Goggles are designed to fit snugly, but not necessarily seal around the wearer's eyes. NIOSH states²: "appropriately fitted, indirectly-vented goggles* with a manufacturer's anti-fog coating provide the most reliable practical eye protection from splashes, sprays, and respiratory droplets. However, to be efficacious, goggles must fit snugly, particularly from the corners of the eye across the brow. While highly effective as eye protection, goggles do not provide splash or spray protection for other parts of the face."

* Directly-vented goggles may allow penetration by splashes or sprays; therefore, indirectly-vented or non-vented goggles are preferred for infection control.

Face Shields

Faceshields are designed to help shield portions of the wearer's face. A best practice would be to wear a face shield in addition to goggles for infection control. While goggles help protect a wearer's eyes from splashes, sprays, and droplets; a face shield can help reduce exposure to the eyes and provide protection to other facial areas. Face shields should have crown and chin protection and wrap around the face to the point of the ear. This will help reduce the possibility of splash, sprays and droplets from going around the edges of the shield and reaching the eyes or other facial areas.

Safety Glasses

Safety glasses provide impact protection but do not provide the same level of splash or droplet protection as goggles and generally should not be used for infection control purposes.

For more information consult 3M Tech Data Bulletin #192 – Eye Protection for Infection Control:
<http://multimedia.3m.com/mws/mediawebserver?mwsId=66666UF6EVsSyXTtNxMa5XFEEVtQEVs6EVs6EVs6E666666-->

Protective Clothing

Currently there is no established guidance that specifies performance criteria for protective clothing (coveralls, gloves, foot coverings, etc.) specific to EVD. Until such guidance is published, selection of personal protection ensembles should be based on a site-specific PPE hazard assessment. Performance criteria included in EN 14126:2006 - Performance Requirements and Test Methods for Protective Clothing Against Infective Agents should be considered. See Appendix 2. In general, protective clothing offering the highest level of protection from infective agents, such as the 3M™ Protective Coverall 4570, is also the least breathable and may introduce hazards related to heat stress and dehydration.

Breathable protective clothing offers less protection but may be desired for tasks in extremely hot conditions where the risk of contacting infective agents is low, where sufficient decontamination facilities are available at the completion of work tasks, and where the risk of harm from heat stress and dehydration is high.

Selection for EVD should be based primarily on the potential exposures and need for protection against infective fluids and agents. However work conditions, environmental conditions, tasks and accessibility to decontamination facilities should be considered.

Respiratory Protection

Fluid resistant masks or respirators are another type of PPE recommended for those in contact with potential EVD cases. This document discusses the use of respiratory protection.

For more information on the differences between surgical masks and respirators please consult 3M Technical Data Bulletin #231 (Europe) - Respirators and Surgical Masks: A Comparison.

A respirator is a device designed to help provide the wearer with respiratory protection against inhalation of a hazardous atmosphere.

To help reduce nose, mouth and respiratory system exposures to particles that are potentially airborne (< 100 microns), particulate removing respirators are often recommended. Particulate respirators are available as:

1. a filtering half facepiece respirator, where the filter is the entire respirator
2. an elastomeric (reusable) half mask with a particulate filter
3. an elastomeric (reusable) full facemask with a particulate filter
4. a powered air purifying respirator (PAPR) that includes a particulate filter.

Particulate respirators are designed to help reduce the wearer's exposure to certain airborne particles. Currently, health authorities have not documented EVD as being transmitted from infected individuals via expired airborne Ebola virus. However, droplets containing the Ebola virus that have become aerosolized (e.g. coughing, sneezing, vomiting, medical procedures, etc.) may have the potential to come into contact with a person's mucous membranes in their nose or mouth or non-intact skin. Therefore, respiratory protection may be helpful in providing a barrier to help prevent infectious materials from contacting a wearer's mucous membranes. They may also help limit inadvertent touching of the nose, mouth and/or eyes (if a full-facepiece or powered-air respirator is used). See Appendix 3.

For more information consult 3M Tech Data Bulletin #174 (Europe) – Respiratory Protection for Airborne Exposures to Biohazards

Summary



Those who will be exposed to individuals with known or suspected cases of EVD should wear PPE that provides a barrier to help prevent infectious material from contacting mucous membranes (mouth, nose, eyes) and non-intact skin (i.e., rashes, cuts, etc.). Always ensure that PPE users are properly trained in the benefits and limitations of the equipment per all applicable guidance and regulations and the manufacturer's user instructions. Please consult your occupational safety and health professional, the appropriate health authority and the PPE manufacturer with questions.

In the event you must travel to an area that is known to have EVD, you should avoid contact with blood and body fluids of infected individuals or objects contaminated with these fluids.




References

- 1) ECDC http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fevers/information-travellers/Pages/information-travellers.aspx
National Institute for Occupational Safety and Health (NIOSH). *Eye Protection for Infection Control*. September 2004. <http://www.cdc.gov/niosh/topics/eye/eye-infectious.html>
- 2) US CDC <http://www.cdc.gov/vhf/ebola/index.html>
- 3) WHO <http://who.int/mediacentre/factsheets/fs103/en/>
- 4) WHO "Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola." <http://www.who.int/csr/resources/who-ipc-guidance-ebolafinal-09082014.pdf>
- 5) US CDC "Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Hemorrhagic Fever in U.S. Hospitals." <http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html>
- 6) The European Centre for Disease Prevention and Control has published "Outbreak of Ebola virus disease in West Africa. Third update, 1 August 2014." <http://www.ecdc.europa.eu/en/publications/Publications/ebola-outbreak-west-africa-1-august-2014.pdf>
- 7) ECDC Factsheet for Health Professionals. http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fevers/factsheet-for-health-professionals/Pages/factsheet_health_professionals.aspx
- 8) The United Kingdom Advisory Committee on Dangerous "VIRAL HAEMORRHAGIC FEVERS RISK ASSESSMENT (Version 2: 09.07.2014)" http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317135155050










Appendix 1 - Specifications for 3M Protective Eyewear, EN Tested, CE approved (marked).

	Goggles		Face Shields	
				
Product	2890SA	Alternative: 2890S	G500-GU with 5F-11	3M™ H8 Headgear with 3M™ Visor WP Series Visors
Description	2890SA Goggle Sealed Acetate AF (anti-fog)	2890S Goggle Sealed PC AS/AF (anti-scratch/anti-fog)	G500-GU Headgear with 5F-11 – Polycarbonate AS/AF visor (anti-scratch/anti-fog)	H8 Headgear, with either of: WP96 – 2mm PC visor WP98 – 2mm Acetate visor
Eye Protection (Splashes, sprays, and respiratory droplets)	Yes		Yes	Yes
Face Protection (Splashes, sprays, and respiratory droplets)	No		Yes	Yes

Appendix 1 - Specifications for 3M Protective Eyewear Meeting ANSI Standards






	Goggles		Face Shields	
				
Product	16644-00000-10 (medium)	16645-00000-10 (large)	40671-00000-10	82501-00000 and 82582-00000
Description	3M™ Lexa™ Splash GoggleGear™ AS/AF (medium) (anti-scratch/anti-fog)	3M™ Lexa™ Splash GoggleGear™ AS/AF (medium) (anti-scratch/anti-fog)	3M™ Maxim™ Splash Goggle Over-the-Glass (OTG) AS/AF (anti-scratch/anti-fog)	3M™ Ratchet Headgear H8A with 3M™ Clear Polycarbonate Faceshield WP96X
Eye Protection (Splashes, sprays, and respiratory droplets)	Yes		Yes	Yes
Face Protection (Splashes, sprays, and respiratory droplets)	No		No	Yes

Appendix 2 - Specifications for 3M Protective Apparel

		3M Model								
		3M™ Protective Coverall 4570	3M™ Protective Coverall 4565	3M™ Protective Coverall 4545	3M™ Protective Coverall 4540+	3M™ Protective Coverall 4535	3M™ Protective Coverall 4510	3M™ Oversleeve 444	3M™ Overboot 440 / 450	3M™ Overhood 446
PPE Directive Approval		CE Category 3	CE Category 3	CE Category 3	CE Category 3	CE Category 3	CE Category 3	N/A	N/A	N/A
Fabric type		Multi-layered laminate	Non-Breathable Laminate	Micro-porous Laminate	SMMMS / Micro-porous Laminate Hybrid	SMMMS / Micro-porous Laminate Hybrid	Micro-porous Laminate	Micro-porous Laminate (same material as 4510)	Micro-porous Laminate (same material as 4535)	Micro-porous Laminate (same material as 4510)
Product Image										
General Data		Test Method								
Protective Clothing - General Requirement	EN ISO 13688:2013	Pass	Pass	Pass	Pass	Pass	Pass	Pass	N/A	N/A
Respiratory protective devices	EN 12941:1998	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Suit Type	ISO 16602:2007	Type 3	Type 4	Type 5/6	Type 5/6	Type 5/6	Type 5/6	Type 5/6	N/A	N/A
Seam construction	N/A	Serged & Taped	Serged & Taped	Serged	Serged	Serged	Serged	Serged	Serged	Serged
Glove	ISO 16602:2007	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Foot protection	ISO 16602:2007	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Material Data per EN 14325										
Abrasion resistance Method 2	EN530:1994	5/6	1/6	1/6	1/6	1/6	1/6	1/6	N/A	N/A
Flex Cracking Resistance, Method B	ISO 7854	1/6	1/6	3/6	4/6	5/6	5/6	5/6	N/A	N/A
Trapezoidal tear resistance	EN ISO 9073-4:1997	2/6	1/6	1/6	1/6	1/6	1/6	1/6	N/A	N/A
Tensile strength	EN ISO 13934-1:1999	1/6	1/6	1/6	1/6	1/6	1/6	1/6	N/A	N/A
Puncture resistance	EN 863:1996	2/6	1/6	1/6	1/6	1/6	1/6	1/6	N/A	N/A
Resistance to Ignition Method 3	EN13274-4	Pass	Pass	Pass	Pass	Pass	Pass	Pass	N/A	N/A
Seam Strength	EN ISO 13935-2:1999	3/6	2/6	2/6	1/6	2/6	2/6	2/6	N/A	N/A
Protection against Infective Agents										
Synthetic blood penetration resistance	ISO 16603:2004	6/6	6/6	3/6	N/A	N/A	N/A	N/A	N/A	N/A
Blood-borne pathogen penetration resistance	ISO 16604:2004	6/6	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Contaminated solid particle penetration resistance	EN ISO 22612:2005	3/3	3/3	3/3	N/A	N/A	N/A	N/A	N/A	N/A
Contaminated liquid aerosol penetration resistance	ISO/DIS 22611:2003	3/3	3/3	3/3	N/A	N/A	N/A	N/A	N/A	N/A
Wet bacteria penetration resistance	EN ISO 22610:2006	6/6	6/6	6/6	N/A	N/A	N/A	N/A	N/A	N/A
Liquid Chemical Permeation										
Chemical permeation resist. - H2SO4 98%	EN 374:2003	6/6	5/6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemical permeation resist. - NaOH 40%	EN 374:2003	6/6	6/6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemical permeation resist. - Methanol	EN 374:2003	2/6	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemical permeation resist. - Ethyl Acetate	EN 374:2003	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemical permeation resist. - Dimethylformamide	EN 374:2003	6/6	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemical permeation resist. - Toluene	EN 374:2003	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemical permeation resist. - Methyl Ethyl Ketone	EN 374:2003	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A





*4570 Not available in the Americas.

Appendix 3 - Specifications for 3M Respiratory Protective Devices

	Half-face		Full Face	PAPR	
	Filtering Facepiece	Elastomeric Facepiece	Elastomeric Facepiece	Loose fitting Facepiece	Loose Fitting Hood/Helmet
					
Eye Protection (Splashes, sprays, and respiratory droplets)	No	No	Yes	Yes	Yes
Face Protection (Splashes, sprays, and respiratory droplets)	No	No	Limited	Limited	Yes
Head Protection (Splashes, sprays, and respiratory droplets)	No	No	No	Yes	Yes
Respiratory Protection* (Airborne aerosols and respiratory droplets)	Yes	Yes	Yes	Yes	Yes







*When equipped with appropriate and approved filter and/or cartridge.

Disposable Respirators, EN Tested, CE approved (marked).

				
Product	3M™ Aura™ Particulate Respirator 9320+ and 3M™ Aura™ Health Care Respirator 1862+	3M™ Aura™ Particulate Respirator 9322+ and 3M™ Aura™ Health Care Respirator 1872V+	3M™ Aura™ Particulate Respirator 9330+ and 3M™ Aura™ Health Care Respirator 1863+	3M™ Aura™ Particulate Respirator 9332+ and 3M™ Aura™ Health Care Respirator 1873V+
Valve	Unvalved	Valved	Unvalved	Valved
Classification	EN 149:2001+A1:2009 FFP2 NR D	EN 149:2001+A1:2009 FFP2 NR D	EN 149:2001+A1:2009 FFP3 NR D	EN 149:2001+A1:2009 FFP3 NR D
	EN 14683:2005 Type IIR	n/a	EN 14683:2005 Type IIR	n/a
Fluid Splash Tested	Yes (1862+ only)	No	Yes (1863+ only)	No
PPE Directive Approval	Yes	Yes	Yes	Yes
MD Directive Approval	Yes (1862+ only)	No	Yes (1863+ only)	No

Note: Other models of 3M Disposable Respirator are available.

Disposable Respirators Approved by the US National Institute for Occupational Safety and Health (NIOSH).









						
Product	3M™ Particulate Respirator 8210	3M™ Particulate Respirator 8511	3M™ Health Care Particulate Respirator and Surgical Mask 1860	3M™ Health Care Particulate Respirator and Surgical Mask 1870	3M™ Aura™ Health Care Respirator 1870+	3M™ VFlex™ Health Care Particulate Respirator and Surgical Mask 1805
Valve	Unvalved	Valved	Unvalved	Unvalved	Unvalved	Unvalved
Size	8210 - one size	8511 - one size	1860 – regular 1860S - small	1870 - one size	1870+ - one size	1805 – regular 1805S - small
Classification	N95	N95	N95	N95	N95	N95
Fluid Resistant	No	No	Yes	Yes	Yes	Yes

Note: Other N95 and higher rated respirators are available, but supply may be constrained if demand increases

Reusable Respirators: EN Tested, CE approved (marked).










	Half Masks		Full Face Masks		Particulate Filters	
						
Product	3M™ Half Mask 6000	3M™ Half Mask 7500	3M™ Full Face Mask 6800	3M™ Full Face Mask 7907S	3M™ 2135 P3 R	3M™ 6035 P3 R
Description	6100 – small (light grey) 6200 – medium (grey) 6300 – large (dark grey)	7501 – small (grey blue) 7502 – medium (light blue) 7503 – large (dark blue)	6700 – small 6800 – medium 6900 – large	7907S – single size	Particulate filter	Encased particulate filter
Classification	EN 140:1998	EN 140:1998	EN 136:1998 Class 1	EN 136:1998 Class 2	EN 143:2000 P3 R	EN 143:2000 P3 R

Reusable Respirators Approved by the US National Institute for Occupational Safety and Health (NIOSH).














	Half Facepiece Respirator			Full Facepiece Respirators			Particulate Filters	
								
Product	3M™ Half Facepiece 6000 Series	3M™ Half Facepiece 6500 Series	3M™ Half Facepiece 7500 Series	3M™ Full Facepiece 6000 Series	3M™ Full Facepiece FF-400 Series	3M™ Full Facepiece 7800 Series	3M™ 2291 P100	3M™ 7093 P100
Description	6100 – small 6200 – medium 6300 – large	6501 – small 6502 – medium 6503 – large	7501 – small 7502 – medium 7503 – large	6700 – small 6800 – medium 6900 – large	FF-401 – small FF-402 – medium FF-403 – large	7800S-S – small 7800S-M – medium 7800S-L – large	Particulate filter	Encased particulate filter

Note: Chemical cartridges are available to help reduce exposures to chemical disinfectants (e.g. chlorine)

Powered Air Respirators: EN Tested, CE approved.

	S-Series		M-Series			Breathing Tube & Cover
	3M™ Versaflo™ Headcovers S-133 or S-333G	3M™ Versaflo™ Hoods S-433 or S-533	3M™ Versaflo™ Faceshield M-106	3M™ Versaflo™ Helmet M-306	3M™ Versaflo™ Helmet M-406	
Powered Air Turbo Unit						
 3M™ Versaflo™ Powered Air Turbo TR-300 with TR-3710E P Filter	EN 12941:1998+A2:2008 TH3 EN 166:2001 2:F:3		EN 12941:1998+A2:2008 TH3 EN 166:2001 1:BT:3	EN 12941:1998+A2:2008 TH3 EN 166:2001 1:BT:3		 3M™ Versaflo™ Breathing Tube BT-20 S (735mm) or BT-20 L (965mm)
 3M™ Jupiter™ Turbo With 450-00-25P2X12 Filter	EN 12941:1998+A2:2008 TH3 EN 166:2001 2:F:3		EN 12941:1998+A2:2008 TH2 EN 166:2001 1:BT:3	EN 12941:1998+A2:2008 TH3 EN 166:2001 1:BT:3		 3M™ Versaflo™ Breathing Tube Dispo Cover BT-922

Powered Air Purifying Respirators (PAPRs) by the US National Institute for Occupational Safety and Health (NIOSH)

	S-Series				M-Series		
							
Models	S-103 S-133	S-403, S-433, S-533	S-605/S-607	S-805/S-807	M-105	M-305	M-405
Assigned Protection Factor	25	1000	1000	1000	25	25	1000
	Breathing Tube						
3M™ Versaflo TR-300 PAPR With TR-3710N HEPA Filter 	3M™ Versaflo™ Breathing Tube BT-20, BT-30, BT-40 						
GVP PAPR with GVP-440 HEPA Filter (Requires V-199 adapter) 	3M™ Versaflo™ Breathing Tube Disposable Cover BT-922 						
Breathe Easy with 450-00-01R12 HEPA Filter 	BE-324 						

Appendix 4:

WHO Guidance:

In August of 2014 WHO published “Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health-Care Settings, with Focus on Ebola.”

<http://www.who.int/csr/resources/who-ipc-guidance-ebolafinal-09082014.pdf>

It is important that anyone involved in infection control for ebola virus disease (EVD) thoroughly read and understand that document. Below is a short summary of personal protective equipment recommendations, however, the WHO document contains extensive information regarding PPE donning and doffing procedures and cleaning methods.

Hand hygiene is strongly emphasized and it is of the highest importance that hand hygiene be performed thoroughly and often including before and after donning and before and after doffing PPE.

At a minimum, the WHO recommends a basic suite of PPE for most activities which includes gloves, a gown, boots or closed toe shoes with overshoes, a mask and eye protection. Some tasks require additional body protection. Certain tasks require respiratory protection.

Everyone entering the patient isolation rooms perform hand hygiene and wear at least gloves, gown, boots / closed toe shoes with overshoes and a mask and eye protection. This recommendation includes visitors. Additionally, this ensemble of PPE is recommended for those handling soiled linen from patients.

If a health care worker is undertaking any strenuous activity, such as carrying a patient, or performing any tasks in which contact with blood and body fluids is anticipated they should also wear two sets of gloves and a waterproof apron over the gown, if the gown is non-impermeable. Disposable overshoes and leg coverings should also be used if boots are not available.

Those examining remains or handling a dead body are instructed to wear an impermeable gown, mask, eye protection, double gloves and closed shoes or boots.

When cleaning the environment or handling infectious waste, workers should wear heavy duty rubber gloves, an impermeable gown and closed shoes (e.g. boots). If the cleaning activities have a risk of splash or contact with blood or bodily fluids, facial protection, such as a mask and goggle or face shield, should be used.

Respiratory protection is recommended for several applications including administering aerosol generating procedures to a patient, performing laboratory operations and during autopsies. If aerosol generating procedures are necessary, the health care worker should wear a respirator, such as an EN-certified FFP2 or NIOSH N95 or equivalent. The WHO cites examples of aerosol generating procedures as those that stimulate coughing or those that could generate aerosols such as bronchoscopy, endotracheal intubation, airway suctioning, positive pressure ventilation via a face mask, or administration of aerosolized or nebulised medication. FFP2 or N95 disposable filtering facepiece respirators are recommended for laboratory personnel handling potentially infected clinical specimens, as well as closed shoes with overshoes or boots, gloves, a disposable impermeable gown and eye protection or face shields. Workers aliquotting, performing centrifugation or undertaking any other procedures that may generate aerosols should use a powered air purifying respirator (PAPR). Persons performing autopsies are instructed to wear a particulate respirator (FFP2 or equivalent or NIOSH N95) or a PAPR as well as eye protection, double gloves, disposable impermeable gowns and closed shoes or boots.

In the WHO guidance document. "Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care", June 2007, the WHO also recommended "particulate respirators at least as protective as a NIOSH-certified N95, EU FFP2 or equivalent" for those performing aerosol generating procedures. They cited examples of acceptable disposable particulate respirators in use in various parts of the world:

- Australia/New Zealand: P2 (94%), P3 (99.95%)
- China: II (95%), I (99%)
- European Union: CE-certified filtering face-piece class 2 (FFP2) (95%), or class 3 (FFP3) (99.7%)
- Japan: 2nd class (95%), 3rd class (99.9%)
- Republic of Korea: 1st class (94%), special (99.95%)
- United States: NIOSH-certified N95 (95%), N99 (99%), N100 (99.7%).

This document can be found at

http://www.who.int/csr/resources/publications/WHO_CDS_EPR_2007_6c.pdf

US CDC:

In August 2014 the US CDC published "Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Hemorrhagic Fever in U.S. Hospitals." This document is targeted to those in health care settings. It is important that anyone involved in infection control for ebola virus disease (EVD) thoroughly read and understand this document. Below is a short summary of personal protective equipment recommendations, however, the CDC document contains extensive information regarding PPE donning and doffing procedures and cleaning methods.

<http://www.cdc.gov/vhf/ebola/hcp/infection-prevention-and-control-recommendations.html>

Similar to the WHO, the US CDC emphasizes hand hygiene and instructs that hand hygiene be performed thoroughly and often including before and after donning and before and after doffing PPE. In general, the US CDC's recommendations are similar to the WHO's. The US CDC recommends that gloves, gown (fluid resistant or impermeable), shoe covers, eye protection (goggles or face shield), and a facemask are worn by health care workers. Double gloves, disposable shoe covers, and leg coverings may be needed for situations in which high levels of blood or bodily fluids could be encountered. Respiratory protection as protective as a NIOSH certified fit-tested N95 filtering facepiece respirator or higher (e.g., powered air purifying respiratory or elastomeric respirator) is recommended for those present during aerosol generating procedures. Healthcare providers performing environmental cleaning and disinfection should wear recommended PPE (described above) and consider use of additional barriers (e.g., shoe and leg coverings) if needed. Face protection (face shield or facemask with goggles) should be worn when performing tasks such as liquid waste disposal that can generate splashes.

European Centre for Disease Prevention and Control:

The European Centre for Disease Prevention and Control has published "Outbreak of Ebola virus disease in West Africa. Third update, 1 August 2014"

<http://www.ecdc.europa.eu/en/publications/Publications/ebola-outbreak-west-africa-1-august-2014.pdf>

Their recommendations are very similar to those of the WHO. It is important that anyone involved in infection control for ebola virus disease (EVD) thoroughly read and understand this document. The ECDC recommends that patient handling be conducted under droplet hygiene precautions; in case of invasive, potentially aerosol-generating procedures airborne transmission, precautions should be employed.

Additionally the ECDC has published a factsheet for health professionals.

http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fevers/factsheet-for-health-professionals/Pages/factsheet_health_professionals.aspx

United Kingdom

The United Kingdom Advisory Committee on Dangerous Pathogens has written a [VHF risk assessment protocol](#) available for health professionals who are advising unwell returning travellers. This document updated in July 2014 "VIRAL HAEMORRHAGIC FEVERS RISK ASSESSMENT (Version 2: 09.07.2014)" also addresses health care worker PPE. This document is contained within the UK National Travellers' Health Network and Centre Health Professional Clinical Update of June 3rd 2014.

http://www.nathnac.org/pro/clinical_updates/ebola_030614.htm

It is important that any health professionals potentially dealing with unwell travellers thoroughly read and understand this document. The document recommends that "Staff at Risk" such as those caring for patients with a high possibility of a viral haemorrhagic fevers and similar human infectious diseases of high consequence (including ebola) should wear gloves, plastic apron, FFP3 respirator and eye protection for potential splash or aerosol generating procedures. "Staff at High Risk" such as those caring for a patient with positive confirmation of a viral haemorrhagic fever should wear fluid repellent disposable gown, double gloves, eye protection and an FFP3 respirator.

The risk assessment can be found at

http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317135155050