

Ebola Virus Disease: Waste Management Guidance

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Ebola Virus Disease (EVD): Waste Management Guidance

In addition to the need to break the transmission of EVD between HCWs and their surrounding working environment, EVD waste management control measures must also be applied. EVD infected waste poses a health risk through the retransmission of EVD in outbreak settings. The modes of EVD transmission can be summarized as follows:

- EVD is transmitted by direct (percutaneous, mucocutaneous) contact exposure to body fluids or organs from infected patients.
- It is also transmitted indirectly by exposure through contact with EVD contaminated material such as bedding, linen, patient's clothes and medical equipment used on infected patients in the provision of medical care and reusable PPE, to name some items.
- There is no documented evidence of EVD airborne transmission. However, transmission through mucal droplets from infected patients is also possible (i.e. through coughing and sneezing).
- EVD is not transmitted during the viral incubation period. It can only occur when the specific EVD symptoms appear (including red eyes, vomiting, diarrhoea and bleeding).
- The corpse of deceased EVD patients are *highly* infectious and all direct contact is to be avoided.

Appropriate waste management and handling needs to be highly effective in order to contain the outbreak and break any environmental viral transmission lines.

1. Waste treatment and management

The Ebola virus is considered to be fragile and can be destroyed by applying the following methods:

- **Disinfection:** Through the use of 0.5% or 0.05% chlorine solution in accordance with the materials to be treated.
- **Heat:** Through medical waste incineration, sterilization by autoclave or burning.
- **UV rays:** Through the direct exposure to sunlight.
- **The strict application of universal precautions:** Through good hand hygiene by regularly washing with soap and water.

In accordance with the different resources reviewed: Centres for Disease Control and Prevention (CDC), World Health Organization (WHO) and Médecins Sans Frontières (MSF) EVD infection control (IFC) guidelines, the following is recommended:

1.1 Solid medical waste:

All used disposable PPE, non-sharps and other infectious medical waste needs to be collected in leak-proof hazard waste bags and placed in covered waste bins. Pouring 0.5% chlorine solution on top of the waste bags prior to being securely sealed as pre-treatment disinfection is recommended. The procedure can create back-splash, so care should be taken to protect eyes. Pre-treated contaminated medical waste can be transported for incineration in accordance with IFC unit guidelines.

1.2 Sharps waste disposal:

The recommendations from WHO and the application of universal precautions is to limit all invasive procedures to be performed on EVD suspected/confirmed cases to a minimum, and where possible, to

substitute these with oral alternatives. However, the use of sharp objects cannot be avoided in clinical EVD management settings. All sharps (including syringes, needles, scalpel blades, cannulas and other sharps) are to be disposed of into puncture-resistant/leak-proof sealed disposable containers designed for sharp medical waste collection before incineration.

1.3 Cadaver and corpse burial:

Corpses need to be contained in sealed, leak-proof cadaver bags (or double bags to ensure that there is no leakage as per WHO recommendation). After placing the corpse in the cadaver bag, they are to be sealed and surface sprayed with 0.5% chlorine before being moved to a mortuary or for burial.

1.4 Biological infectious waste:

Biological waste material such as placenta and biopsy samples are to be treated as above, and either buried or burned.

1.5 Infectious excreted:

All biological infectious liquid waste (i.e. faeces, vomit, urine, etc...) is to be disposed of in patient latrines and disinfected by pouring 0.5% chlorine solution.

1.6 Mattresses:

Bed mattresses are to be sprayed with 0.5% chlorine solution before burning. Mattress covers and linen are to be soaked twice in 0.5% chlorine solution for min. 30 minutes prior being washed with the use of a mixture of soap and 0.5 % chlorine.

1.7 Patient's clothes:

Used clothes from patients are to be collected and sealed in a bag for burning.

1.8 Reusable medical equipment and PPE (i.e. boots, goggles, aprons, etc.):

Used reusable medical and PPE items are to be sprayed with 0.5% chlorine solution and then soaked in 0.05% chlorine before washing them and leaving them hung out to dry while exposed to direct sunlight.

1.9 Household waste:

All used household outreach kit material (i.e. gloves, masks, surgical gowns etc...) is to be collected and contained in a waste bag. 0.5% chlorine solution is to be poured over the top before being sealed. The outside of the bag is to be sprayed with 0.5% chlorine solution prior disposal through burning.

2. Incinerator Selection

The use of an appropriate incinerator is essential to ensure the proper, effective and efficient disposal of EVD contaminated waste. UNICEF considered the following assumptions when selecting the appropriate incinerator specifications for EVD waste management:

- The need for a large scale incinerator due to expected high waste volume.
- The installation will be located at a central level.
- The need for reliable power supply availability.
- Suitability for wet waste.
- To be used to incinerate all the above mentioned infectious solid and sharps waste materials.

The following specifications cover incinerators to burn medical waste in a smokeless, odourless and grit-free manner, as required by the Air Pollution Control Authorities (NRAs). The incinerator units must be suitable to operate in the context of limited resources, particularly related to power supply, trained operators and maintenance equipment.

2.1 Capacity

The incinerator should be capable of burning average hospital waste at an approximate rate of 18.75kg / hour, exclusive of biofuel.

2.2 Combustion

The system to be used may have an operator to ensure a steady load-rate to match the hourly consumption capacity of the incinerator. However, the rate of combustion of each batch of waste should be self-regulating. It should not be necessary for the operator to make any manual adjustments to air supply or the burner during normal operation. The system must automatically compensate for the varying waste characteristics.

As the units are to be installed primarily in low-resource settings, units should be energy / fuel consumption efficient. The average consumption rates of fuel and electricity shall be stated in offers.

- 2.2.1 **Temperature:** The incinerator must be able to consistently maintain combustion temperatures of 850°C.
- 2.2.2 **Residual ash:** The resulting ash residue must be less than 5% of the original waste volume.
- 2.2.3 **Flue-gas residence time:** Residence time must be not be less than 1” second in the secondary chamber.

2.3 Smoke and Solid Particle Emissions

The emission of smoke and solid particles is to be limited by ensuring efficient combustion of the flue-gases and effective settling of particulates.

Proposers shall submit data on emission levels as well as a laboratory test report in the proposal.

2.4 Construction

The charging door opening shall be such that hot gases and flames escaping from the door upon opening will not be directed towards either the door handle or the face of the operator. The charging door shall be refractory lined. The door must be mounted on the primary chamber and must be conveniently located to facilitate loading.

The incinerator's design must allow for the easy removal of ash and the cleaning of the combustion chamber after every usage. The system design must provide for the secure removal of residual ash and sharps for the duration of the lifetime of each unit.

The incinerator shall be made of materials that will withstand the high temperature and related performance requirements. The incinerator shall be designed to withstand daily operation at the rated capacity without the requirement for major maintenance for a period of 5 years, when operated as per prescribed standards of operation (SOPs) instruction and when physically located in an adequately protected and secure environment.

2.5 Auxiliary Heating

The burner shall be fitted with an approved flame-failure protection system, and all equipment necessary for safe, full automatic start-up, including "pre-purge" intermittent spark ignition and solenoid valve controlled fuel flow, or better.

The capacity of the burner shall be sufficient to ensure that an 850°C temperature can be attained in the secondary combustion chamber. The Fuel supply line shall have an automatic fire-valve which will close automatically in the event of a fire in the vicinity of the burner. Information about required fuel storage space and containment must be stated in the offer.

The unit shall be fitted with an in-line fuel filter or a filtration system, with the purpose of ensuring proper combustion and efficient use of fuel. The design of filters or filtration systems must facilitate regular cleaning, maintenance and periodic replacement, as appropriate.

2.6 Visual Indicators and Instructions

An indicator of combustion temperatures shall be mounted in a readily visible location. The indicator shall be accurate to +/-10°C.

Incinerators must be well marked with placards regarding dangers, hazards, as well as basic operating instructions. Basic instructions must include process pictures and written instructions in English, French and Spanish.

Additionally, Equipment should also be marked with the full name, model number, serial number, name, address, and contact details of the manufacturer and local dealers where applicable.

2.7 Electrical

Operation of the burner shall be by a single switch to select either "Run" or "Shut Down". When "Run" is selected, the burner shall be automatically switched off at high temperature, and automatically restarted when the temperature falls. "Shut Down" is to immediately extinguish the burner flame followed by delayed, automatic fan-stop after the incinerator has cooled sufficiently to ensure no damage to the burner tip.

2.8 Installation and Training

It must be ensured that the incinerator is installed and operated properly. Depending on the product requirements, installation and training services may therefore be integral part of the delivery to the extent necessary to build up required knowledge/skills of local installers.

References:

World Health Organization, [*Infection Prevention and Control Guidance for Care of Patients in Health-Care Settings, with Focus on Ebola*](#), WHO, Geneva, August 2014.

Médecins Sans Frontières, [*Ebola Outbreak Preparedness and Management*](#), MSF, Brussels, June 2001.

Médecins Sans Frontières, *Household Protection Kit Leaflet*, MSF, 2014.

Centres for Disease Control and Prevention, World Health Organization, [*Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting*](#), WHO, Geneva, December 1998.

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