CLEANING AND DISINFECTION FOR EBOLA VIRUS DISEASE
Objective

- **Cleaning and disinfection** of equipment and the environment when caring for patients with suspected/known EVD

- **Handouts/Materials:**
  - Department of Health Preparation and Use of Chlorine
  - If practicing:
    - Bucket
    - Bleach to make up cleaning solution
    - Measuring cups (or whatever is used to dilute bleach)
    - Cleaning cloth
    - PPE
Environmental Cleaning Basics

Surfaces in the hospital environment are frequently contaminated with microorganisms from the patient.

Microorganisms, including Ebola virus, live on environmental surfaces from hours to days.
Ebola virus Survival Outside Host

How long does Ebola virus survive on surfaces?

• From hours to days, depending on the environmental conditions.
  – Dried – 24 hr at 25°C; 14 days at 4°C
  – In fluids – up to 46 days at 25°C
Ebola virus Survival Outside Host

• What kills Ebola virus on equipment and the environment?
  – Heat 60°C for 1 hr
  – Hypochlorite (Chlorine solution)
  – Alcohols

• Recommended cleaning solution 0.5% chlorine

• CDC/EPA – have a list of disinfectants approved for EVD - [http://www.epa.gov/oppad001/list-l-ebola-virus.html](http://www.epa.gov/oppad001/list-l-ebola-virus.html)

Environmental contamination in isolation ward

- Sudan Ebolavirus outbreak – Uganda 2000
- 2 positives from 33 environmental specimens
- Ebolavirus was detected on a bloody glove and a bloody IV insertion site
- Not isolated on bedframes, chairs, stethoscopes, clean gloves, food bowl, spit bowl, body bag cleaned with bleach, body louse
- Suggests that environmental contamination and fomites are possible modes of transmission in an ETC
- Item with visible contamination pose a higher risk

Bausch et al. J Inf Dis 2007
Limit Number of Staff

- Limit number of staff entering high-risk areas
  - Consider training staff doing other duties to clean
  - Consider having a special Ebola cleaning team
  - Clean only the area where Ebola patients are cared for and not also other areas
Preparing Cleaning Staff

Cleaning staff should:

• Be educated about transmission of Ebola and importance of environmental cleaning to prevent transmission

• Receive information on: Basics of Infection Control, Basics of Ebola, Hand Hygiene, PPE, Waste, Linen and Environmental Cleaning, Occupational Exposure

• Demonstrate correct Hand Hygiene and PPE technique and competency

• Have adequate PPE and cleaning supplies to protect themselves and clean effectively
Recommendations for PPE

- Double gloves
- Boot covers
- Coverall:
  - Single use fluid resistant or impermeable.
- Respirators, including either N95 respirators or powered air purifying respirator (PAPR)
- Single-use, full-face shield
- Hoods to ensure complete coverage of the head and neck
- Apron that is waterproof and covers the torso to the level of the mid-calf

Staff who will clean should demonstrate correct Hand Hygiene and PPE technique / competency

Reference: CDC 2014
Environmental Cleaning Basics

If you were cleaning a hospital room where what would you clean first?

When cleaning hospital rooms:

• Remove any organic matter from surfaces before disinfecting
• Work from top to bottom
• Work from clean to dirty
Environmental Cleaning Basics

What is the most contaminated area in the hospital room?

• Most contaminated areas:
  – Anything soiled with blood or body fluids
  – The patient bathroom (the toilet is the dirtiest item)
  – The room (the area closest to the patient are the dirtiest)
Environmental Cleaning Process - Ebola

General Cleaning Guidelines apply

**DO NOT**

- Dry sweep with broom
- Dust with dry rag
- Shake out cleaning rags
- Spray (i.e. fog) any clinical areas with disinfectant
  - Dangerous
  - No clinic benefit

Reference: WHO, 2014
Environmental Cleaning Process - Ebola

General Cleaning Guidelines apply

**DO**

- Wear appropriate PPE
- Work from clean to dirty areas
- Clean with moistened cloth and mop
- Clean organic matter prior to disinfection
- Change cleaning solutions frequently
- Refresh equipment frequently
- Clean floor and horizontal work surfaces at least once a day and when soiled with
  - blood or body fluids
- Allow surfaces to air dry (to achieve the disinfectant contact time)
  - **Contact time for bleach = 10 min**

Reference: WHO, 2014
Environmental Cleaning Process - Ebola

• Surfaces or objects contaminated or potentially contaminated with blood, body fluids, excretions or secretions should be cleaned:
  – As soon as possible
  – Using standard hospital disinfectants (e.g. 0.5% chlorine solution)
  – Using full recommended PPE

Reference: WHO, 2014
Making Hypochlorite solution of 0.5% available chlorine

### Preparation and use of chlorine

<table>
<thead>
<tr>
<th>Solution</th>
<th>Use</th>
</tr>
</thead>
</table>
| **1:10 solution**      | • Soiled clothes  
• Toilets  
• Body Fluid Spills  
• Floors/Environment |
| **1:100 solution**     | • Bare hands and skin                                                |

<table>
<thead>
<tr>
<th>Calcium hypochlorite powder or granules 70%</th>
<th>1 tablespoon per 2 liters of water</th>
<th>1 tablespoon per 20 liters of water</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image of container]</td>
<td>[Image of measuring spoon and bucket]</td>
<td>[Image of measuring spoon and bucket]</td>
</tr>
</tbody>
</table>
Making Hypochlorite solution of 0.5% available chlorine

Making chlorine water from 5% bleach
## Conversion Table

<table>
<thead>
<tr>
<th>Bleach Solution</th>
<th>Dilution</th>
<th>Chlorine (%)</th>
<th>Chlorine (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.15 – 6.25%</td>
<td>None</td>
<td>5%</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>1:5</td>
<td>1%</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>1:10</td>
<td>0.5%</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>1:50</td>
<td>0.1%</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>1:100</td>
<td>0.05%</td>
<td>500</td>
</tr>
</tbody>
</table>
Environmental Cleaning Process: Ebola

Equipment

- Use disposable equipment where possible
- If not, rigorously use dedicated equipment
- If not, meticulously decontaminate between patients
- Clean equipment
  - at least daily
  - when soiled
  - upon leaving isolation area
  - after patient discharge

Reference: WHO, 2014
Cleaning Medical Equipment

- Instructions for cleaning medical equipment:
  - Wear PPE
  - Clean with soap and water to remove any organic matter
  - Prepare appropriate disinfectant (e.g. 0.5% available chlorine solution for large items, alcohol for smaller items)
  - Thoroughly wipe all surfaces of the equipment including cords
  - Allow to air dry to achieve the contact time (10 min) to kill organisms
  - All cleaning water = infectious waste

Reference: WHO, 2014
Cleaning Blood or Body Fluid Spill: Ebola

- Wear PPE
- Cover fluids with 0.5% chlorine solution
- AVOID SPLASHTING!!
- Let stand for at least 15 minutes
- Carefully clean with a towel or rag
  - AVOID SPLASHING!!
- Carefully dispose of towel in contaminated waste
- Clean surface again with 0.5% bleach with 10 minute contact time, then soap, and water.
Cleaning PPE

• Do not recycle any single use PPE
  – Performance is not assured after reprocessing

• If necessary clean visors, goggles boots:
  – Wear PPE
  – Clean with soap and water to remove any organic matter
  – Prepare 0.5% available chlorine solution daily
  – Immerse PPE fully in chlorine solution overnight (minimum 30 minutes)
  – Rinse thoroughly with water and dry
  – Initial cleaning materials = infectious waste
  – Disinfection solution = pour down drain

Reference: WHO, 2014

Images: who.int, nline.wsj.com
Resources

WHO 2014 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://apps.who.int/iris/bitstream/10665/130596/1/WHO_HIS_SDS_2014.4_eng.pdf?ua=1&ua=1

Watch the video on disinfecting equipment and the environment in ETC 13.3-MSF-EBOLA_PRACTICAL_DECONTAMINATION_EQUIPMENT.mp4