Addressing Biosafety Implementation: A Country Perspective

Biosafety During the 2014 West African Ebola Outbreak, Sierra Leone

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National Laboratory System Structure in Sierra Leone

4 National Laboratories as of January 2014:

- Central Public Health Reference Laboratory (CPHRL)
- Lakka Tuberculosis Laboratory (Lakka)
- Makeni Neglected Tropical Disease Laboratory (Makeni)
- Kenema Lassa Fever Laboratory (Kenema)
Health Services Organization

- Tertiary Care
- Secondary Care
- Primary Care

Regional/National Hospitals (Public & Private)
Govt District Hospital
Private & Mission Hospitals

Peripheral Health Unit
- Community Health Centre (CHC)
- Community Health Post (CHP)
- Maternal Child Health Post (MCHP)

Chiefdom Level
Section Level
Village Level

Taken from the Government of Sierra Leone National Disease Surveillance and Response Strategic Plan 2012-2017
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Biosafety in Sierra Leone Prior to EVD

- Lack of laboratory biosafety and biosecurity policies
- Inadequate supply/insufficient use of PPE
- Inadequate training in the use of PPE
- Poor waste management systems including a lack of waste disposal equipment
- Lack of skilled personnel to safely package and transport infectious substances
Kenema, Sierra Leone (May-August 2014)

• Kenema Government Hospital (KGH) in 2005 established a molecular biology facility to diagnose Lassa fever virus.
• Augustine Goba working in the Lassa Fever Laboratory identified the first Ebola case in Sierra Leone (25 May 2014)
• Health care staff were collecting, decontaminating and packaging blood under dangerous conditions
  • Limited training on Ebola virus
  • Personal Protective Equipment lacking
  • Facility issues
  • Waste disposal issues
• Six HCWS died (five from Ebola virus infections); one of two laboratory technician deaths was Ebola-related.

Viral Hemorrhagic Fever Surveillance Programs

Provide training and refresher training to HCWs who may contact suspect cases

Ensure adequate supplies of necessary PPE/sample collection are stocked

Limit testing capacity to well-trained and equipped reference laboratories
Viral Hemorrhagic Fever Testing Relies on Maintenance of Biosafety

- Processes or systems
- Procedures

Safe, efficient and effective collection, handling, packaging and transportation of specimens
Lateral Flow Rapid Antigen Testing
Sample Collection

- Follow the universal good work practice guidelines
- Treat all specimens as potentially hazardous
- Use of barrier protection
- Do not contaminate external surfaces of specimen containers or accompanying paperwork
- Minimal handling of specimens between patient and lab
Specimen Collection - 2

- Ensure proper disinfection of collection site
- Collect specimen into correct containers
- Consider risk-benefit ratio of procedure to patient
Sample Transport

- Promptly deliver collected specimens to the lab to ensure accurate diagnosis of the infectious disease etiology
  - Poor results with hemolyzed specimens
  - Autolysis of bacteria, viruses
  - Limit the possible actions of normal microflora
  - Survival or isolation of fastidious organisms

- Where prompt transport is not possible, refrigerate at 2-8°C
Sample Transport – Triple Packaging

Cross Section of Proper Packing

Packing and Labeling of Infectious Substances
Room 2. The 96-well RNA extractor is in the center. 3 Bead Retrievers are on the right. Foil was placed over the window to deflect the heat of the sun.

Room 3. Office area with thermocyclers.

Access and Security

Door access Cards, password protected, PIN

Camera system, Real time Monitoring
Conclusions: Biosafety in Sierra Leone Post EVD

- Implement national laboratory safety policy and guidelines
- Establish and implement laboratory waste management protocols
- Continue training for safety and waste management in pre-service curricula
- Ensure all existing laboratories have adequate waste disposal systems for potential EID
- Train staff on selection and appropriate use of PPE
- Enhance and improve specimen collection and transport systems
Thank you
Acknowledgements

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The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention.
APPENDIX 1: Basic PPE Photo Guide

How do I go from A to B to C and back again?

A.  
B.  
C.  

These photos depict some of the more complicated steps in safe Donning and Doffing of PPE. This is not the complete SOP. Please follow the full detailed SOP found in the Field-Lab Operations Manual.
PAPR Check

1) Make sure the unit is charged
2) Check the hose/hood for spiders/wasps etc.
3) Connect the Air-hose to Filter unit
4) Check to make sure there is sufficient air-flow
   1) The thimble should float at/above the 2nd lower-line – if it doesn’t check battery charge and filter status

5) Connect the Hood to the Air hose – it snaps in

7) Put the on the PAPR belt and your hood
Proper use of solid front Gowns

1) Separate the 2 layers of the PAPR Hood (A)
2) The inner layer is tucked under the gown at the shoulders (B)
3) The outer layer is draped over the shoulders (C)
4) Secure the back closure
   1) The gown ties should be closed in a manner that allows complete coverage of the PAPR blower
   2) Tie all knots firmly to prevent loosening during your work
Safe Donning of GLOVES
We wear 3 pairs of gloves for Hot Lab work
1) Don first pair of gloves
2) Lightly powder the inner glove
3) Don extended cuffed second glove (purple or green)
4) TAPE cuff of 2nd glove to gown – this covers completely the semi-porous gown sleeve cuff
5) Lightly powder 2nd pair and put on shorter cuff 3rd pair (of a different color then second pair

The 3 pairs makes decon/doffing much simpler and safer. Alternating colors also helps you identify glove tears and breaks

If you don’t tape up the long 2nd pair you could expose the gown cuff and your skin!

GOOD!
BAD!
Final Ensemble should be:
1) Scrubs-socks (taped to pants)
2) PAPR and Long Hood
3) Inner flap of Hood tucked under gown
4) Outer flap of Hood over shoulders
5) Gown closed and secure front and back
6) 3 pairs of gloves
    1) 1st and 2nd pair taped to gown sleeves
7) Crocs with shoe-covers
1) **Doffing** – LOOK in the MANUAL FOR A DETAILED LIST OF STEPS:
2) Begin by decontaminating and removing outer 3rd pair of gloves
3) **With 2nd person complete full-body spray decontamination SOP then**
   1) Remove shoe covers – put in Hot Lab waste
   2) Remove middle 2nd pair of gloves – put in Hot Lab waste
   3) Remove tape and spray inner 1st pair of gloves and tops-sides-bottom of lab shoes
4) Step out of Hot Lab
5) Remove gown by pulling forward and away from you (A)
6) Continue to roll gown away and down through the sleeves (B & C)
7) Make sure to only let the inner surface of gown touch your skin
8) Once gown is rolled down to the gloves/cuffs – pull off
9) Spray decontaminate inner 1st pair of gloves
10) Remove PAPR Hood – take care to not touch Hood to your skin
11) Remove inner 1st pair of gloves
12) Remove lab shoes and scrubs (D)
To support all laboratories to implement the laboratory safety policy and adhere to safety guidelines by end 2014

<table>
<thead>
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<th>100% of laboratories implementing safety guidelines</th>
<th>Develop national laboratory safety policy and guidelines</th>
<th>100% of laboratories implementing safety guidelines</th>
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<tr>
<td></td>
<td>Establish laboratory waste management protocols</td>
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<td></td>
<td>Provide adequate PPE and train staff on use</td>
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<td></td>
<td>Enforce safety guidelines</td>
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<th>Safety policy</th>
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<td>Waste management</td>
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<tr>
<td>Procure PPE</td>
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<tr>
<td>Enforce safety requirements</td>
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Objective 10: To support all laboratories to implement the laboratory safety policy and adhere to safety guidelines by 2015

<table>
<thead>
<tr>
<th>Develop national laboratory safety policy and guidelines by end 2012</th>
<th>Conduct workshop to adapt WHO and other international safety policy to Sierra Leone</th>
<th>Laboratory Directorate</th>
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<td>Establish a laboratory waste management protocol by end 2012</td>
<td>Develop protocol and train</td>
<td>Laboratory Directorate</td>
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<td>Provide adequate PPE and train staff on their use by end 2012</td>
<td>Procure laboratory coats, gloves, and sharps containers</td>
<td>MOHS</td>
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<td>Enforce safety requirements for fire, chemical spills and contamination by end 2015</td>
<td>Procure fire fighting equipment and train staff on use and maintenance</td>
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