

Addressing Biosafety Implementation: A Country Perspective

Biosafety During the 2014 West African Ebola Outbreak, Sierra Leone

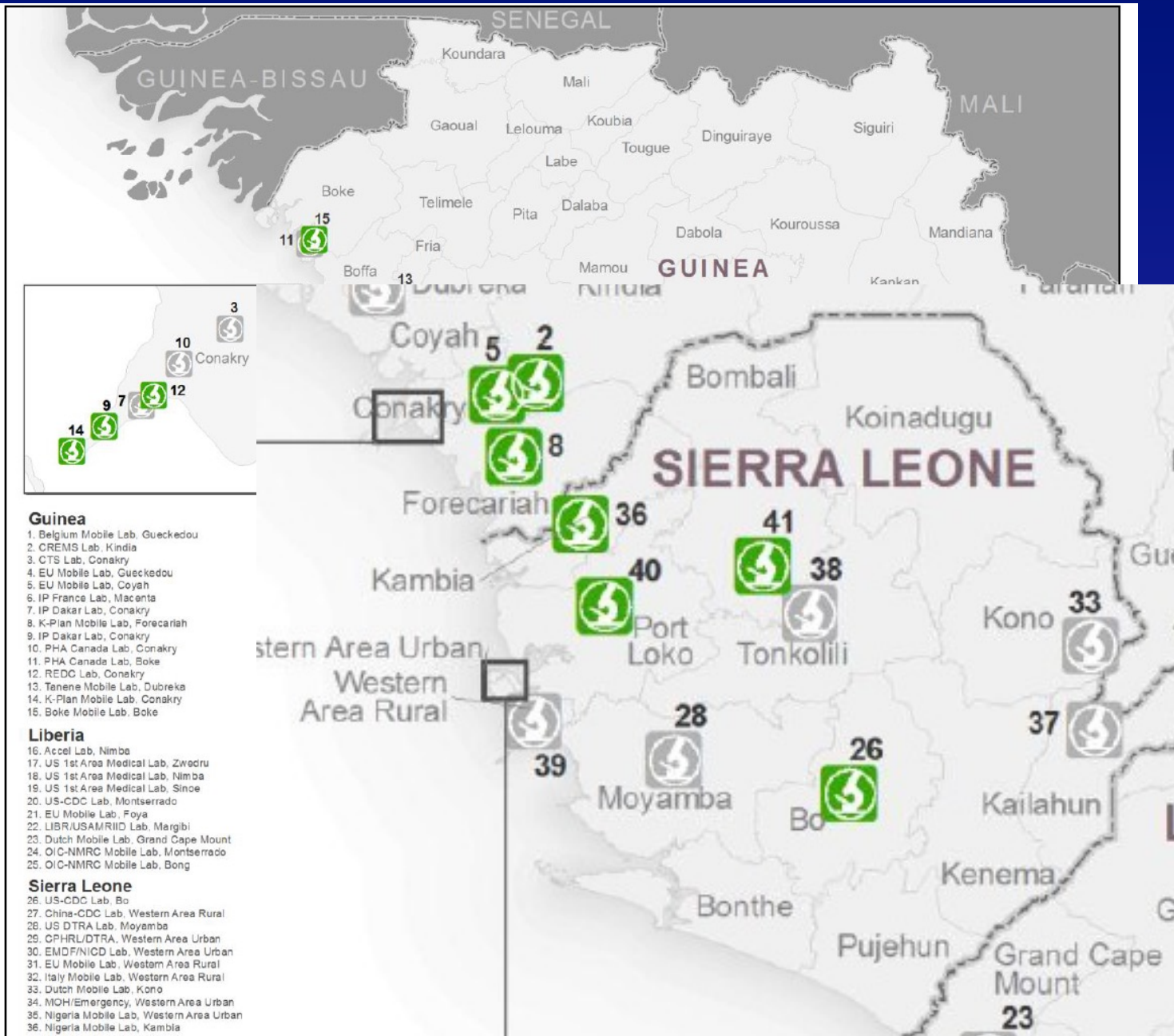
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CDC-Atlanta

Biosafety Global Stakeholders Meeting 2015

September 23-24, 2015 Emory Conference Center, Atlanta, GA,
USA





Guinea

- 1. Belgium Mobile Lab, Gueckedou
- 2. CREMS Lab, Kindia
- 3. CTS Lab, Conakry
- 4. EU Mobile Lab, Gueckedou
- 5. EU Mobile Lab, Coyah
- 6. IP France Lab, Macenta
- 7. IP Dakar Lab, Conakry
- 8. K-Plan Mobile Lab, Forecariah
- 9. IP Dakar Lab, Conakry
- 10. PHA Canada Lab, Conakry
- 11. PHA Canada Lab, Boke
- 12. REDC Lab, Conakry
- 13. Tenene Mobile Lab, Dubreka
- 14. K-Plan Mobile Lab, Conakry
- 15. Boke Mobile Lab, Boke

Liberia

- 16. Accel Lab, Nimba
- 17. US 1st Area Medical Lab, Zwedru
- 18. US 1st Area Medical Lab, Nimba
- 19. US 1st Area Medical Lab, Sinoe
- 20. US-CDC Lab, Montserrado
- 21. EU Mobile Lab, Foya
- 22. LIBR/USAMRIID Lab, Margibi
- 23. Dutch Mobile Lab, Grand Cape Mount
- 24. OIC-NMRC Mobile Lab, Montserrado
- 25. OIC-NMRC Mobile Lab, Bong

Sierra Leone

- 26. US-CDC Lab, Bo
- 27. China-CDC Lab, Western Area Rural
- 28. US DTRA Lab, Moyamba
- 29. CPHRL/DTRA, Western Area Urban
- 30. EMDF/NICD Lab, Western Area Urban
- 31. EU Mobile Lab, Western Area Rural
- 32. Italy Mobile Lab, Western Area Rural
- 33. Dutch Mobile Lab, Kono
- 34. MOH/Emergency, Western Area Urban
- 35. Nigeria Mobile Lab, Western Area Urban
- 36. Nigeria Mobile Lab, Kambia
- 37. PHA Canada, Kailahun
- 38. PHA Canada, Tonkolili
- 39. PH England Mobile Lab, Western Area Rural
- 40. PH England Mobile Lab, Port Loko
- 41. PH England Mobile Lab, Bombali



27



Functional (19)



Closed (22)

National Laboratory System Structure in Sierra Leone

4 National Laboratories as of January 2014:

Central Public Health Reference Laboratory (CPHRL)

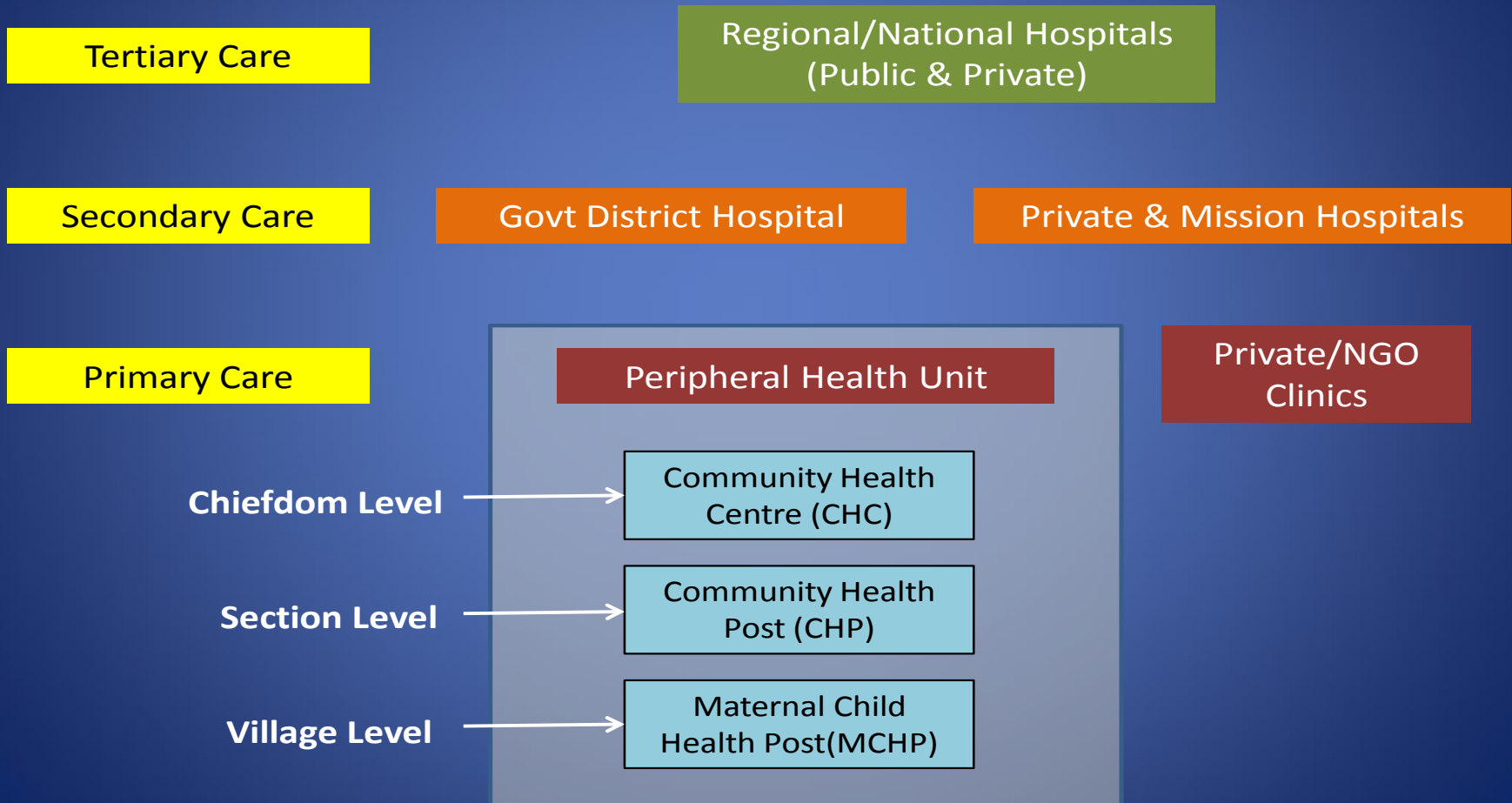
Lakka Tuberculosis Laboratory (Lakka)

Makeni Neglected Tropical Disease Laboratory (Makeni)

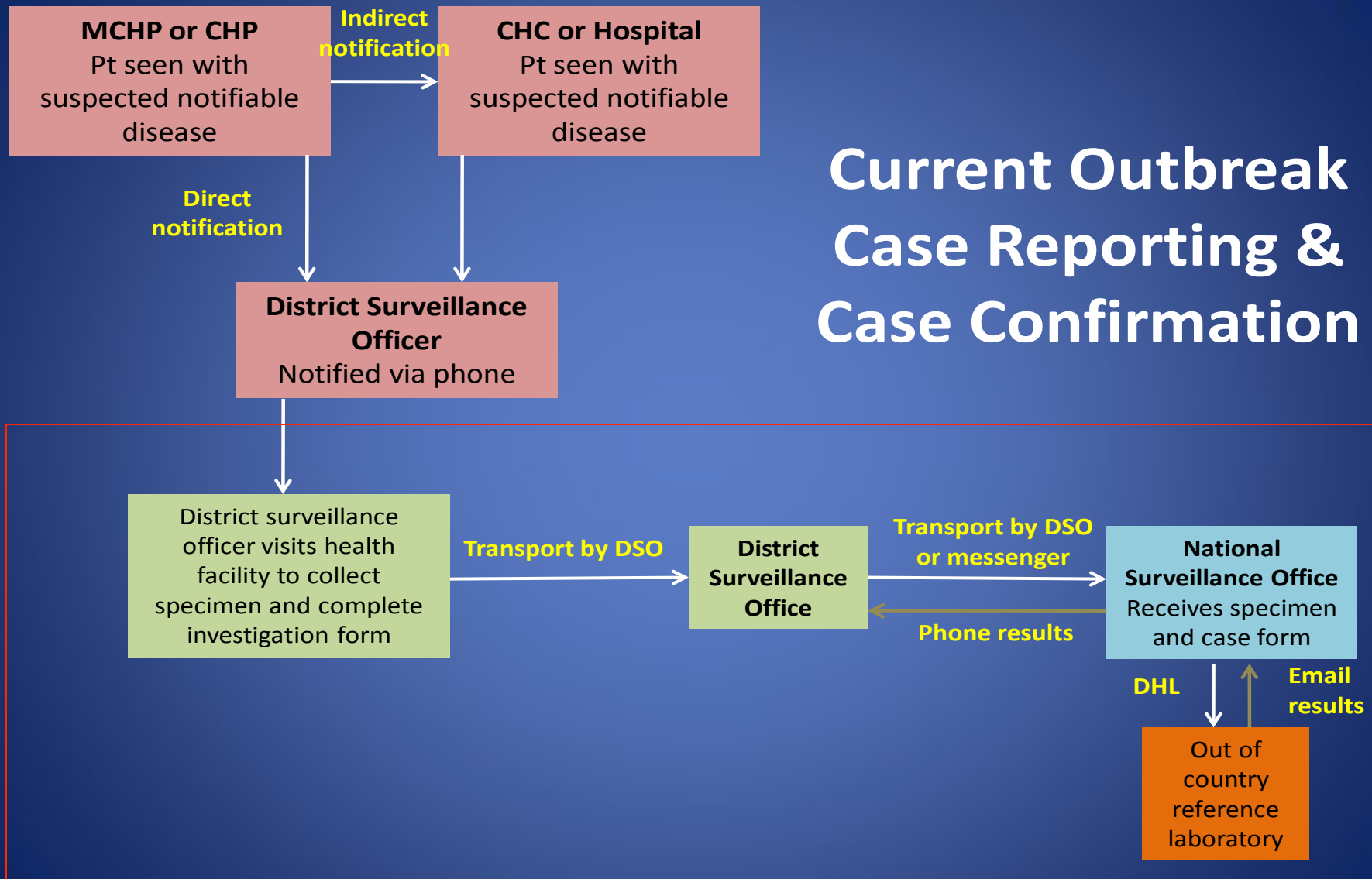
Kenema Lassa Fever Laboratory (Kenema)



Health Services Organization



Current Outbreak Case Reporting & Case Confirmation



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.**

Hayden EC 2014 Ebola's lost ward. Nature 513: 474-477



UGANDA VIRAL HAEMORRHAGIC FEVERS
Surveillance Programme



FOR ALL SUSPECT CASES OF VIRAL HAEMORRHAGIC FEVER:

REPORT THE SUSPECT CASE
TO YOUR DISTRICT SURVEILLANCE OFFICER:

CALL TOLL FREE:
+256 (0) 800 2 84384 (VHFUG)
TO COORDINATE SHIPPING AND TESTING

1. Report any suspect case of viral haemorrhagic fever in a patient with:

- Acute illness
- Fever > 38°C
- No alternative diagnosis (e.g., malaria)
- And at least **four (4)** of the following signs/symptoms:
 - Vomiting/ nausea
 - Diarrhoea
 - Muscle or joint pain
 - Chills / rigors
 - Abdominal pain
 - Skin rash
 - Difficulty swallowing
 - Intense fatigue
 - Headache
 - Unexplained bleeding from any site

2. Put on Proper Personal Protective Equipment (PPE)

Protect yourself by wearing gloves, a head covering, a mask, a gown, and goggles/eye protection.



3. Collect a blood sample for laboratory testing



Sample volume: 4ml
(Minimum sample volume: 2ml)

4. Complete the Suspect VHF Case Report Form



Put form into sealable plastic bag.

5. Safely and correctly triple package the sample



Place each specimen in a sealed plastic bag. Specimen should be labeled with specimen ID, date of collection, specimen type, and patient name.

Place wrapped specimen into plastic container. Seal the lid.

Place Bio-Bottle inside shipping container. Use fabric or other soft material to protect contents.

Put frozen ice packs into the container to maintain specimen at required temperature.

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



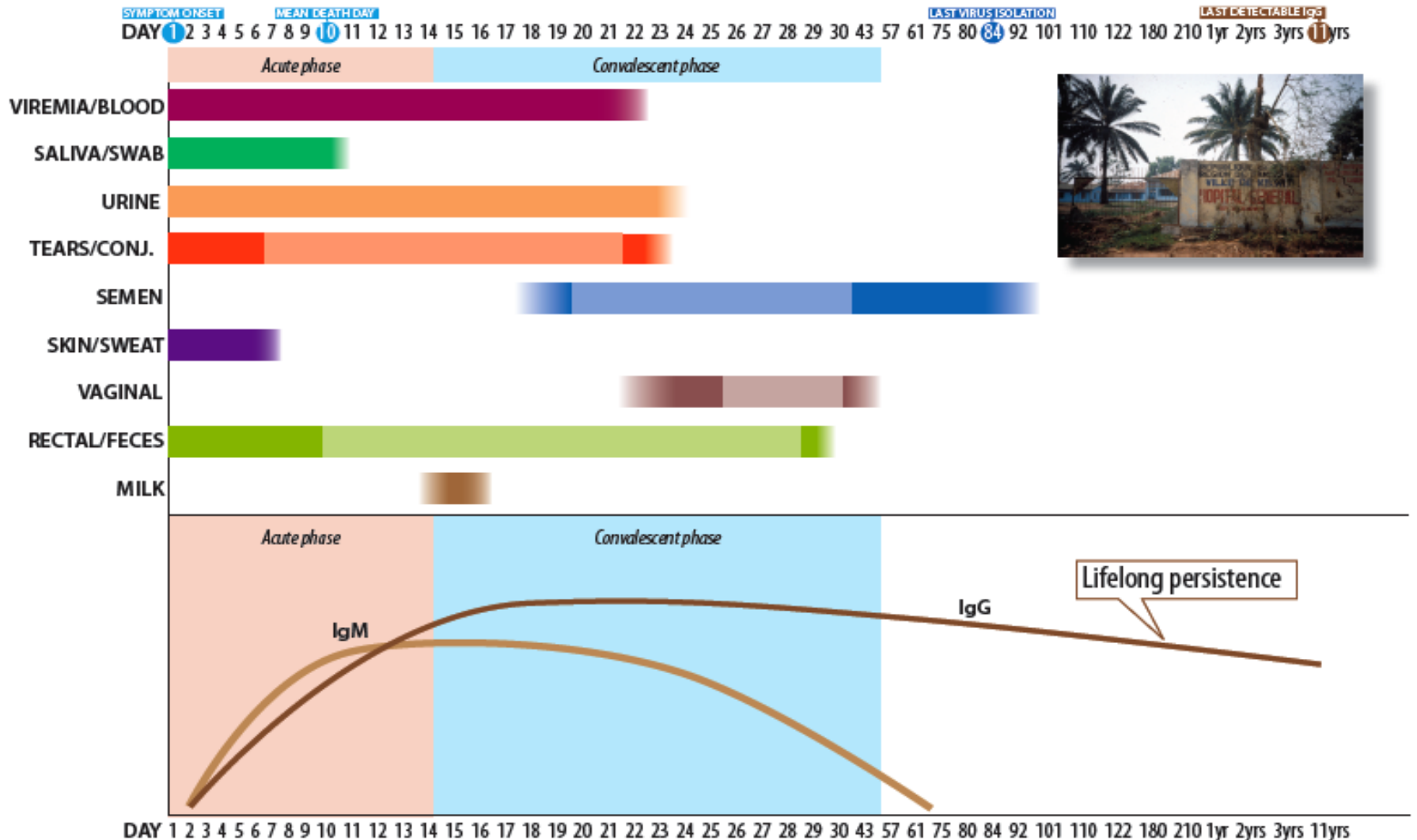
Viral Hemorrhagic Fever Testing Relies on Maintenance of Biosafety

- Processes or systems
- Procedures

Safe, efficient and effective collection, handling, packaging and transportation of specimens

Diagnostic Approaches

Ebola Hemorrhagic Fever



Lateral Flow Rapid Antigen Testing



Training

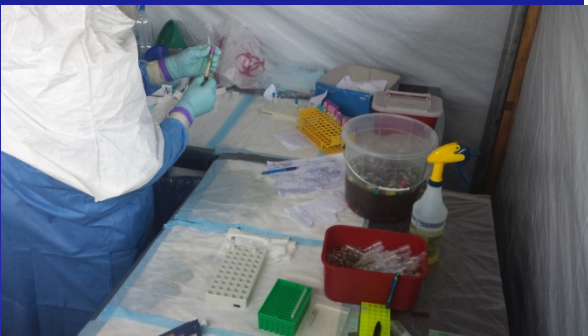


**EBOLA FIELD DIAGNOSTIC LABORATORY
SIERRA LEONE**

OPERATIONS MANUAL

VIRAL SPECIAL PATHOGENS BRANCH

Version 2.0



Page | 1 CDC VSPB Bo



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**

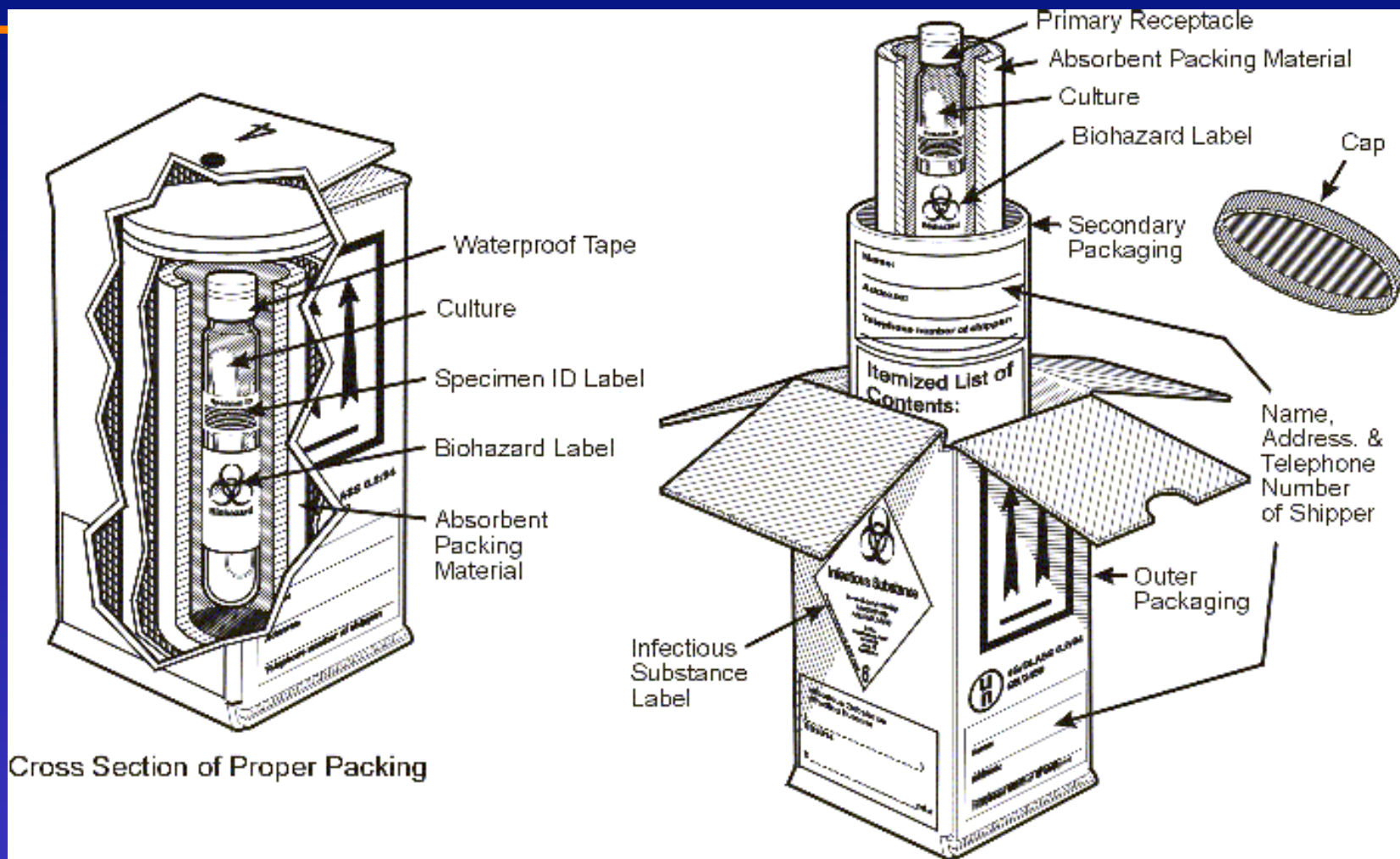
Specimen Collection - 2

- 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**

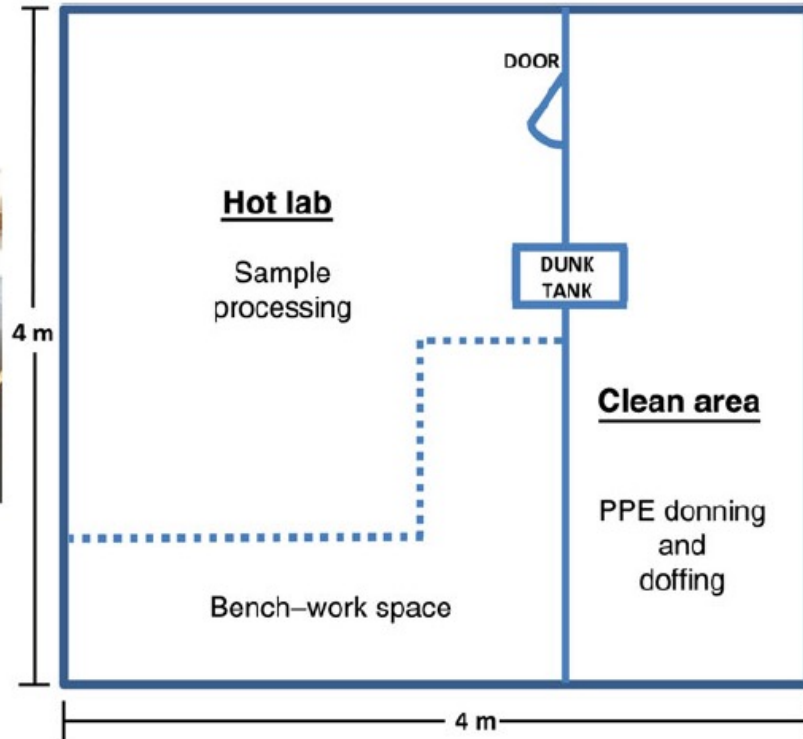
Sample Transport – Triple Packaging



Cross Section of Proper Packing

Packing and Labeling of Infectious Substances

B

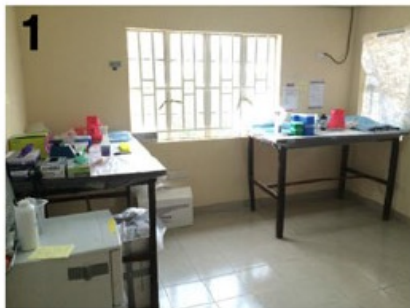
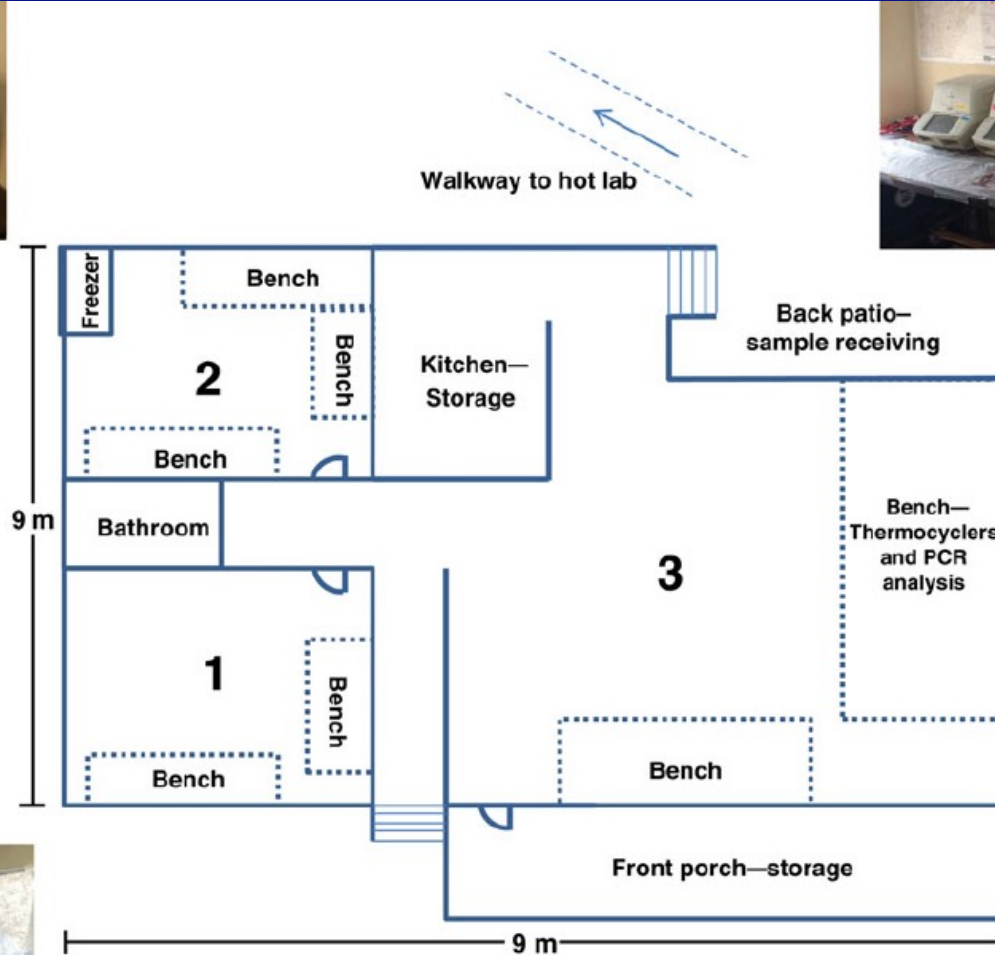




Room 2. The 96-well RNA extractor is in the center, 3 Bead Retrievers are on the right. Foil was placed over the window to deflect the heat of the sun



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

□ **Viral Special Pathogens Branch**

- Stuart Nichol
- Celine Taboy
- Ute Ströher
- Jon Towner
- Brian Bird
- Sharon Andrews
- Bobbie Erickson
- Tara Sealy
- Trevor Shoemaker

□ **CDC**

- Mark Rayfield
- EOC Laboratory Task Force
- Bo Laboratory Teams 1-20
- Oliver Morgan
- Sara Hersey

APPENDIX 1: Basic PPE Photo Guide

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



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

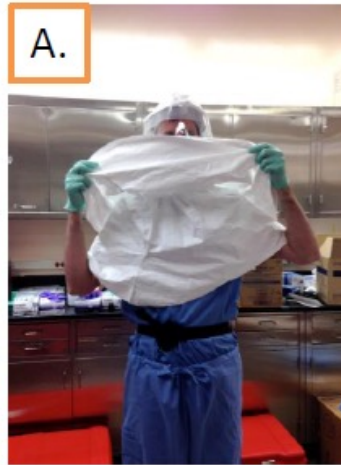


- 7) Put the on the PAPR belt and your hood



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 than 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!



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	100% of laboratories implementing safety guidelines	% of laboratories implementing safety guidelines
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100% of laboratories implementing safety guidelines	Develop national laboratory safety policy and guidelines					
	Establish laboratory waste management protocols					
	Provide adequate PPE and train staff on use					
	Enforce safety guidelines					

Safety policy			50			50	MOHS
Waste management			50			50	MOHS
Procure PPE	70	67	70	70	80	357	MOHS
Enforce safety requirements	24	12	120	64		220	MOHS

Objective 10: To support all laboratories to implement the laboratory safety policy and adhere to safety guidelines by 2015							
Develop national laboratory safety policy and guidelines by end 2012	Conduct workshop to adapt WHO and other international safety policy to Sierra Leone						Laboratory Directorate
Establish a laboratory waste management protocol by end 2012	Develop protocol and train						Laboratory Directorate
Provide adequate PPE and train staff on their use by end 2012	Procure laboratory coats, gloves, and sharps containers						MOHS
Enforce safety requirements for fire, chemical spills and contamination by end 2015.	Procure fire fighting equipment and train staff on use and maintenance						MOHS