The Role Of the Mobile Laboratory In The Containment Of The 2013-2016 Ebola Virus Disease Outbreak In West Africa: Experience Of The Nigerian-European Consortium.

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Background

Primarily for Diagnostics - **Outbreaks Response** and Intended for:

- **Rapid set up for diagnostics, research and scalable**
- **With African partners for local deployment, ownership, learning, sharing and collaboration with other researchers**
- Nigerian Unit domiciled at ISTH, Irrua was officially commissioned at Benin City in Feb 2014 for the West African sub-region
- To fill the gap because of few labs in West African region capable to reach difficult terrain because fixed labs were not readily available
- Laboratory support was a major pillar in the control of the world’s most deadly Ebola virus disease outbreak that affected West Africa between 2013 -2016.
- For the first time in the sub-region a mobile laboratory unit, led by the Nigerian-European Consortium was deployed to the field through the Global Outbreak Alert and Response Network (GOARN), World Health Organization (WHO) and the African Union (AU) collaboration.
Methods

Pre-analytical steps

- The lab received samples from Emergency ETC and from other referring facilities operating Enugu, Port Harcourt in Western Urban and Rural area of Freetown and Kambia districts and beyond

Analytical steps - Inactivation – Extraction – MM - qPCR

- EVD diagnosis was performed through direct detection of EBOV RNA, based on Real time RT-PCR method

Post-analytical steps

- Results from the EBOV RT-PCR assay were evaluated with attention paid to both targets, i.e. EBOV target and IC target. The cycle threshold (Ct) cut-off of the EBOV target for this method was set at 45
## Comparison of Mobile and Fixed Lab

<table>
<thead>
<tr>
<th></th>
<th>Conventional Lab</th>
<th>Mobile Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space required</td>
<td>A whole building</td>
<td>A single tent or single room</td>
</tr>
<tr>
<td>Mobility</td>
<td>Fixed</td>
<td>Deployable</td>
</tr>
<tr>
<td>Min. № of Equipments</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Min. № of Staff</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Requirement for Power supply</td>
<td>Main Supply, from national grid, Generator</td>
<td>Car battery or generator</td>
</tr>
<tr>
<td>Cost of maintenance</td>
<td>Less expensive</td>
<td>More Expensive ≈ ₦22M / 3 months for 500 Rxns</td>
</tr>
</tbody>
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Scope of Coverage:

A geographical map with all sites of operation of the Nig-EMLab Deployments between 2014-2016

WEST AFRICA

- **Kambia, Sierra Leone**
  - (April 2015 to March 2016)
  - 6332 samples

- **Freetown, Sierra Leone**
  - (December 2014 to February 2015)
  - 1118 samples

- **Enugu, Nigeria**
  - Aug – Sept 2014
  - 7 samples

- **ISTH, Irrua, Sierra Leone**
  - (December 2014 to February 2015)
  - 1118 samples

- **Port Harcourt, Nigeria**
  - (August to October 2014)
  - 28 samples

**Nigeria**
- total Confirmed 19
- by Nig-EMLab 2 (10.5%)

**Sierra Leone**
- total Confirmed 8,706
- by Nig-EMLab 287 (3.3%)
Results

• A total of 7477 specimens were tested in Nigeria and Sierra Leone during the out-break comprising of 1231 whole blood from suspected alive patients and 6246 oral swabs from dead persons in the community.

• Of the 7443 samples tested in Sierra Leone, 287/7443 (3.85%) were positive while 2/34 (5.8%) tested in Nigeria were positive. 7156 negative in Sierra Leone, 32 negative in Nigeria.

• The turn-around time for sample test was 8 hours shorter than 24 hours of fixed laboratories in the field.
Key Achievements during the 2014-2016 EBOV outbreak in West Africa

• 25 staff of ISTH trained/deployed & was stand-by-as Epidemic Task Force
• 7,477 samples received and tested
• 4 field missions - 2 in Nigeria & 2 in Sierra Leone
• 2 & 15 months Nig-EMLab operations in Nigeria & Sierra Leone
• Over 515 days of deployment 2014 – 2016
• **Tested dead buccal swab samples with Cepheid GeneXpert and several rapid test kits for EBOV {OraQuick EBOLA Rapid Antigen, SD Q Line Ebola Zaire Ag, CorgenixReEBOV Antigen Rapid} for WHO/other partners such as US CDC**
• **Contributed to Research**
Challenges:

Deployment Logistics:

• Immigration
• Customs
• Cost of freight

Logistics:

• Trans-boarder transport of laboratory equipment and consumables due to bureaucracies from custom and security agents.
• Power supply
• Security for staff
• Huge fund to remunerate and maintain persons in the field, who were largely international staff.
• Restrictions and an increasing number of commercial airlines that discontinued flights to West African countries made it difficult to rotate the Nigerian-EMLab teams in Sierra Leone, led to Delays in the pre-deployment process and to ship laboratory supplies from Europe.
• The need for frequent equipment replacement due to corrosion from hypochlorite.
Lessons learnt

• Preparation for deployment should be done ahead of time

• Kits and reagents should be reserved for immediate deployment

• Need to have back-up equipment because there were several equipment that had to be replaced

• Burn-out among staff because of change of environment

• ML can be run on car battery but a stand-by generator for power supply essential to run the freezers for storage of reagents and samples
Conclusion

• The deployment of mobile laboratory unit contributed largely to early detection of Ebola cases, post-morten diagnosis, monitoring of patient care, and supported surveillance of suspected cases in remote areas during the EVD outbreak.

• The mobile laboratory initiative should be strengthened for future outbreak response.
The European Mobile Lab - EMLab

Overall aim – Establishment of three lab units

**Feb 2014 local training at ISTH**

The EMLab

- Not mobile -
- but rapidly deployable

**Reception**

**Inactivation**

**Extraction**

**Mastermix**

**Amplification**

**Aliquot bench**

**Viral RNA inactivation in glovebox**

Abbot i-stat for blood gases

Abaxis Picollo for biochemistry

Team 11

Team 1 and 2

Team 8 and 9

Team 11

Chinese ML

EU visitors to Kambia

MSF ETU
Thanks to Partners and funders of Nig-EMLab

Key partners of the EMLab consortium

BNI  BwIM  INMI

World Health Organization

Associated partners

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