Third Report on the operation of the Ebola Mobile Laboratory of the National Institute for Communicable Diseases in Sierra Leone, Freetown

Prepared by: Janusz T. Paweska
Head Centre for Emerging and Zoonotic Disease, NICD/NHLS

As a part of the World Health Organisation’s Global Outbreak Alert Response Network (WHO-GOARN) response to the Ebola virus disease (EVD) outbreak in West Africa, the Centre for Emerging and Zoonotic Disease (CEZD) of the National Institute for Communicable Diseases (NICD) established an Ebola Mobile Laboratory (EML) in Sierra Leone, Freetown-Lakka, in the second half of August 2014. The operation of the NICD EML in Sierra Leone is financially, technically and logistically supported by the Ministry of Health of the Republic of South Africa, WHO-GOARN, and Sierra Leonean Ministry of Health and Sanitation (MoHS). In addition, the NICD EML is supported by the International Atomic Energy Agency and the Center for Disease Control and Prevention, by provision of laboratory equipment, diagnostic consumables and reagents.

The NICD EML teams comprise of 4-5 members, each rotating in Sierra Leone every 4-6 weeks. Up to 10 December 2014 five teams have been deployed. It is planned that the NICD EML will be operating in Freetown up to June 2015, thus requiring deployment of five additional teams. Before deployment to Sierra Leone the NICD EML members undergo in-house pre-deployment training, followed by 4-5 days on site training by the preceding team.

Since the second week of NICD EML operation in Freetown, South African undertook intensive training the national Sierra Leonean scientists in specimens receiving, data capture, RT-PCR Ebola diagnostic and interpretation of test results, EML operation and logistics, including bio-hazard protection and bio-waste disposal. The local staff is now fully incorporated in the daily functions of the NICD EML. The daily activities include:

- operational checklists of biocontainment devices, preparation of decontamination solutions, and logistic arrangements to ensure uninterrupted Ebola diagnostic service
- reception of specimens and Ebola case investigation data logging
- processing and aliquoting of specimens for laboratory analysis
- RNA extraction and sample testing by RT-PCR
- interpretation, recording, and updating of Ebola report database,
- reporting and consultation of results to the National Disease Prevention Center, the WHO Ebola Coordination Center, local hospitals and Ebola holding and treatment centers
- incineration of laboratory bio-waste,
- training of new NICD EML teams and continuation of training of local staff

EVD Highlights Sierra Leone

- As of 14 December, the cumulative number of confirmed, probable and suspected cases of Ebola Virus Disease (EVD) in Sierra Leone has reached 8,428, with a total of 2,442 deaths. Of 142 health care workers who have contracted EVD in Sierra Leone, 109 have died (76.8%).
- The national epidemiological data shows the first decline in EVD cases.
- Migration within the country remains a challenge in the implementation of quarantine by-laws. This is of particular concern with the holidays approaching, during which time more population movements might occur across the country.
- Under-reporting of cases is of great concern. Recent surveys in Kono have highlighted how unreported cases can quickly create a ‘hot spot’.
In response to a major flare-up of EVD in the Kono district, a two-week lockdown has been imposed in this area.

Rapid Response and Stabilisation Teams will be established to halt new spikes of infection.

The most EVD-affected areas are Western Urban and Western Rural. In preparation for the Western Area Surge, United Nations (UN) for Ebola Emergency Response (UNMEER), in collaboration with EVD outbreak response partners are bringing in more personnel, equipment and ambulances for the Ebola Treatment Centres (ETC’s).

A key element of the Western Area Surge plan is the intensification of social mobilisation and the enhancement of active case finding.

Lack of space in Ebola holding centres in the Western Area continues to leave a number of symptomatic patients to be cared for by relatives, which poses risks for the community.

Cross-infection issues remain critical, both during transport and in holding facilities where suspected cases are often kept together with confirmed cases.
• Currently there are 13 ETCs with approximately 675 available beds, and total bed capacity of 886. They are run by the MoHS, U.K, Médecins Sans Frontières, Save the Children, China, IFRC, Plan International, GOAL, Partners in Health, and other partners. Over 1,500 treatment beds are needed to ensure safety of patients and healthcare workers.

• Each ETC, of a 50 to 100 beds capacity, is managed and staffed by Foreign Medical Teams comprising 25-35 clinical and infectious disease experts, as well as 200-250 national staff.

• Almost 95% of dead bodies reported to the burial teams are buried by the following day, but reports indicate that in some instances traditional burials are being still carried out in the rural districts.

A burial team collecting a dead body, Freetown, Sierra Leone, December 2014.

• There are currently 101 burial teams operational in Sierra Leone, conducting more than 190 EVD-confirmed or suspected burials/day. It is estimated that approximately 95% of reported bodies nationally are buried safely within 24 hours of reporting. Due to the increase cases of EVD in the Western Area, the burial teams are facing difficulty with cemetery spaces.

• Unsafe burials, including the washing of dead bodies, late reporting and lack of isolation continue to be the major factors in the high rates of transmission across the country, especially in Freetown and in rural areas.

• Infection Prevention and Control (IPC) training and distribution of IPC supplies continue throughout the country. About 200,000 Personal Protective Equipment (PPE) sets are needed every month.

Training of local volunteers in the use of Personal Protective Equipment by Emergency staff. Freetown, Sierra Leone, 2014.
• About 5,000 volunteers are required for active case-finding and contact tracing, in addition to existing district surveillance officers. On average a 2-person surveillance team can manage 40 households in urban areas and 20 households in rural areas daily. Each surveillance team needs an ambulance team in support to pick-up suspected cases. As of 08 December, over 3,100 contact tracers had followed up a total of 53,321 case-contacts of whom 33,071 had finished their 21 day follow up and 18,192 contacts were still being followed up. In preparation of the Western Area Surge, MoHS, WHO and CDC trained 180 district surveillance officers, and 300 community monitors. In support of the Western Area Surge, an additional 522 new contact tracers, 69 Ward Councillors Supervisors and 45 additional technical supervisors are being trained.

• EVD diagnosis has to be provided to patients within 24 hours after the collection of samples to ensure timely and adequate patient management and prevent transmission. Nine laboratories are operating with a total capacity of up to 600 samples per day. These are run by US CDC, NICD/NHLS South Africa, Nigeria, Canada, UK, and China. Two Nigerian mobile laboratories supported by European Union and the National Institute for Infectious Disease “Lazzaro Spallanzani” (Italy) were opened on 14 December at MSF Prince of Wales ETC and Emergency Hospital, in Freetown, respectively.

• Additional vehicles and motorcycles are needed for surveillance, burials and transportation of EVD-patients.

• Psycho-social support is required for EVD-affected families, with a special focus on vulnerable groups (women, children, disabled persons, survivors).

• As of 10 December, 10,014 children have been identified as being directly affected by the Ebola Crisis, including 4,497 children having lost one or both parents to EVD.

• As of 10 December, 9,120 metric tons of food and nutritional assistance were distributed to isolation/care centres, quarantined homes, and discharged patients.

Every day local news papers are loaded with reports describing the Ebola outbreak situation in Sierra Leone, including international efforts and strategies to control and stop the outbreak, building and opening of new Ebola treatment centers, food donation to hospitals and affected communities, establishment of new Ebola diagnostic laboratories, humanitarian support to quarantine homes and Ebola victims, safe burial procedures, and social stigmatization. Ebola posters and messages are highly visible at the road sides, shops and public buildings as part of the Ebola awareness health campaign efforts.
South African NICD Ebola Mobile Laboratory Diagnostic Service

The Western Urban Area, where the SA NICD EML operates, remains a hotspot of EVD epidemic in Sierra Leone. As on Dec 18 2014 the NICD EML has tested more than 4977 clinical specimens (blood and buccal swabs) from suspected EVD cases, of which 2100 (42.2%) were positive by RT-PCR. Specimens are mostly submitted from Freetown health care facilities, including Emergency Ebola Treatment Centre, Connaught Hospital, 34 Military Hospital, Macanley Street Clinic, Hasting Ebola Treatment Centre, Princess Christian Hospital, Lumley Governmental Hospital

Of the total of 3048 blood specimens received from 25 Aug to 18 December, 1520 (49.9%) were positive. Of the total of 1929 buccal swabs submitted to the NICD EML during the same period, 580 (30.1%) were positive. Percentage of positive blood samples decreased from 62.3 to 32.4 and of positive swabs from 39 to 15.7 during the period of 25 Aug to 18 December 2014.
Rotation of SA NICD EML Teams, Laboratory & Operational Activities

South African NICD Ebola Mobile Laboratory teams, Freetown, Sierra Leone.

Left: Members of the 1st (Chantel le Roux, Petrus Jansen van Vuren, Günther Meier, Janusz Paweska) & the 2ed (Phumza Lekhuleni Ohaebosim, Nadia Storm, Alan Kemp) team.

Right: Proudly South African members of the 3rd team (Lisa Ming Sun, Desiree du Plessis, Dr Petrus Jansen van Vuren, Orienka Hellferssee, and Busisiwe Mogodi) in the office of the SA NICD Ebola Mobile in Freetown-Lakka, Sierra Leone, November 2014. Underline name indicates on site Laboratory Team Leader.
South African NICD Ebola Mobile Laboratory teams, Freetown, Sierra Leone.

Left: Members of the 3rd (Busisiwe Mogodi, Orienka Hellfersce, Lisa Ming Sun, Desiree du Plessis, Petrus Jansen van Vuren) & the 4th team (Günther Meier, Janusz Pawska) team.

Right: Members of the 4th (Günther Meier, Janusz Pawska) & 5th team (Nishi Prabdial-Sing, Deidre Greyling, Shayne Loubser, Cardia Fourie) in the office of the SA NICD Ebola Mobile in Freetown-Lakka, Sierra Leone, December 2014. Underline name indicates onsite Team Leader.

NICD 2nd team working in Ebola Mobile Laboratory in Freetown, September-November 2014.

From the left: Nadia and Alan processing blood specimens from Ebola suspected cases in a glove box; Phumza and Nadia adding a positive PCR control in a ventilated enclosure; Phumza and Dauda Sowa, a Sierra Leonean scientist, extracting RNA for Ebola PCR from inactivated samples.

NICD 3rd team working in Ebola Mobile Laboratory in Freetown, November-December, 2014, Freetown-Lakka, Sierra Leone.

From the left: Desiree, Orienka and Busisiwe storing PCR extraction reagents and consumables shipped from SA to NICD EML in Freetown; Orienka and Petrus entering the negative biocontainment chamber; Lisa and Desiree working in designated room for PCR extraction; Busisiwe and Kelfala Konneh, a Sierra Leonean scientist, processing specimens in a negative biocontainment chamber.
The 3rd NICD Ebola Mobile Laboratory team going home. Hand wash and temperature check point at the sea coach water taxi station on the bank of Sierra Leone River. 06 December, 2014. Freetown.


On-site training of team 5 (Dr Nishi Prabdial-Sing, Deidre Greyling, Shayne Loubser, and Cardia Fourie) by Prof. Janusz Paweska, Dr Petrus Jansen van Vuren and Günther Meier.
NICD 4th and 5th team, working in Ebola Mobile Laboratory in Freetown, November-December, 2014.

From the left: Cardia and Nishi logging test results, Deidre and Janusz unpacking PCR kits shipped on dry shipper from SA to NICD EML in Freetown; Nishi performing manual extraction of RNA from inactivated blood samples; Deidre adding RNA templates into PCR master mix in a biosafety cabinet.

Sierra Leonean staff working together with South Africans in NICD EML in Freetown. Five local staff are currently working in the NICD EML: Kelfal Konneh, Osman Konteh, Idrissa Kamara, Dauda Sowa, and Olufumi George.
Operational & Technical Improvements

A number of technical improvements have been made to meet high-throughput needs for Ebola diagnostics and insure quality results, including the use of LightCycler Nano instrument (donated by Roche), redesign of PCR master mix room, replacement of rapid containment kit by a biosafety cabinet, (donated by the International Atomic Energy Agency), implementation of the MagMAX™ 96 Express automated nucleic acid extraction system (donated by CDC Atlanta).

Günther Meier, NICD EML field biocontainment specialist performing running repairs to the generator to ensure its operation which is crucial to the uninterrupted functions of the laboratory.

Air transport of NICD EML staff to Freetown

Restrictions and increasing numbers of commercial airlines discontinuing flights to West African countries affected by the Ebola epidemic makes it difficult to rotate the NICD EML teams in
Freetown and shipping of laboratory supplies. The World Food Programme established its United Nations Humanitarian Air Service (UNHAS) to augment capacity of humanitarian efforts under the UN Mission for Ebola Emergency Response (UNMEER). With the assistance of the South African Ministry of Health, represented by Dr Barry Kistnasamy and his team, the NICD EML staff is regularly booked on UNHAS West African Countries flights and transported from Dakar or Accra to Freetown.

NICD EML staff boarding on UNHAS West African Countries flights.

Visitors, Visits and Networking

The NICD EML is often visited by international delegations and partners interested in our work and collaboration on diagnostic platforms aiming at improving Ebola outbreak responses.

From the left: Visit by CDC China delegation representing the CDC China Ebola Mobile Laboratory in Freetown; visit by Dr Tara Sealy (CDC, Atlanta) who trained the NICD EML team in operation of MagMAX™ 96 express system on a way home after her 6 weeks work at CDC Mobile Lab in Bo district;
From the left: visit by Dr Pierre Formenty and Dhamari Naidoo (WHO, Geneva); visit by Dr Antonino Di Caro (National Institute for Infectious Diseases “Lazzaro Spallanzani“) representing an Italian Ebola laboratory at Emergency Ebola Treatment Center in Freetown.

From the left top: Arrival of USA delegation at NICD Ebola Laboratory in Freetown-Lakka. Delegation represented by: John Hoover, Ambassador; Kathleen Fitz Gibbon, Deputy Chief of Mission; Dr Tom Frieden CDC Director; Oliver Morgan, CDC Sierra Leone Country Director; Austin Demby, CDC Sierra Leone Special Advisor; Dr Stuart Nichol, Chief Viral Special Pathogens Branch, CDC; and O’Bra Heidi, CDC Public Health Analyst. 2ed picture: Kathleen Fitz Gibbon, O’Bra Heidi and Prof. Janusz Paweska. 3rd picture: Dr Tom Frieden, Dr Stuart Nichol and Prof. Janusz Paweska in the office of the SA NICD Ebola laboratory. 4th and 5th picture: Prof. Janusz Paweska giving the NICD EML tour to the USA delegation. 6th picture: Visit of SA NICD and China CDC mobile lab staff to CDC Ebola diagnostic laboratory in Bo.

Prof Janusz Paweska and Dr Jansen van Vuren visiting Emergency Ebola Treatment Center in Freetown-Lakka and the Italian Ebola diagnostic laboratory.
Meeting Dr Antonino Di Caro and his team from the National Institute for Infectious Diseases “Lazzaro Spallanzani”) who are running the operation of the Italian Ebola laboratory at Emergency Ebola Treatment Center in Freetown, and Dr Gina Portlela from Emergency.

From the left first two pictures: Pre-deployment training of NICD staff for Ebola diagnostic work in Freetown-Lakka, Sierra Leone. Günther training NICD staff in changing gloves and working in glove box, which is the same containment enclosure used in NICD Ebola Mobile Laboratory in Freetown-Lakka, Sierra Leone. 3rd picture: Staff of the Special Viral Pathogens Laboratoryof the Centre for Emerging and Zoonotic Disease NICD/NHLS packing laboratory supplies and relief goods for shipment to the NICD Ebola Mobile Laboratory in Freetown-Lakka.

The NICD EML Team 5 will spend Christmas and New Year in Freetown. The team is not only well prepared to provide Ebola diagnostics but also to celebrate festive season while on community service in Sierra Leone.

References: