



UK Health
Security
Agency

erinha

European Research Infrastructure
on Highly Pathogenic Agents

Biosafety & Biosecurity training/capacity building in Africa: specific needs, challenges and gaps.

ERINHA - Fostering Africa-Europe Cooperation in High-Consequence Pathogens' Research.
Online workshop, 5th November 2021

Prof. Christopher H. Logue
Novel & Dangerous Pathogens Training
UK Health Security Agency

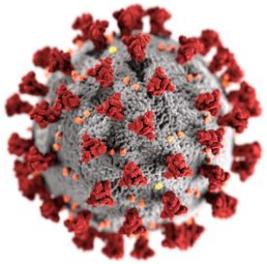
Overview

- Types of Training
- Training “needs”
- Examples of a capacity building training model
- Examples of recent training in Africa
- Lessons learned
- Gaps identified
- Suggestions for future training activities

Types of training

- **Theoretical** - Risk assessment / SOP writing / TTX
- **Technical** - BSCII Maintenance / Assay validation / Equipment troubleshooting
- **Lab-based** - Biosafety / Diagnostic techniques / GMPP
- **Field-based** - Sample collection / Field testing / Waste management / Outbreak response
- **eLearning** - Dangerous Goods Shipping / Introduction to lab workflow / Lab leadership workshops
- **Blended** – a combination of digital/online activities and any of the above

Examples of training needs (requests)



emerging-viruses
risk-assessment
sars-cov-2 genome biosafety
who-blm4 diagnostics pathogens quality
laboratory lfd
bsc-maintenance molecular
sequencing gmp ebola wgs lasa
sample-reception biosecurity sop
clinical-algorithms bsl3 contamination
troubleshooting validation

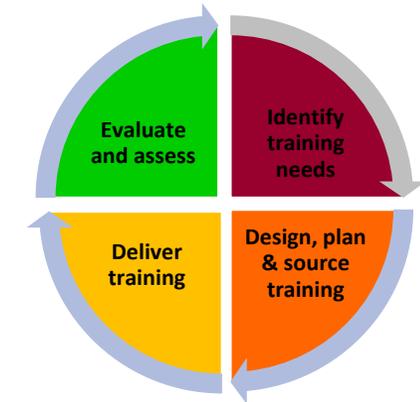


Capacity Building Example - Biosafety & Biosecurity TtT

EU DEVCO Project 53

5 day course: 3 days B&B, 1 day TtT, 1 day Microteaches

- Lab-based & Lecture based
- One Health approach – Human & Animal health institutions



	Trainers	Trainees
• Kazakhstan:	14	→ 834
• Kyrgyzstan:	12	→ 160
• Tajikistan:	14	→ 133
• Mongolia:	12	→ 293
• Afghanistan:	10	→ 178
• Pakistan:	14	→ 192
• Total:	76	→ 1790



Biosafety Training Kits and a selection of consumables with all training material (in English, Russian, Dari, Mongolian) were provided

One training event → numerous training events



Example 2 – ToT Biosafety & Biosecurity Training- EN (WHO) - Kenya

- 05-09 March 2018
- Funding: Canada
- Facilitator: WHO EMRO
- Location: KEMRI, Nairobi, **Kenya**
- Language: English
- Training Provider – PHE– NADP Training
- Participants #: 28
- Participant Countries: 24
- Human health Institutes



Biosafety Training Kits with all training material
(in English) provided

Example 3 – ToT Biosafety & Biosecurity Training- FR (WHO) - Senegal

- 19-23 March 2018
- Funding: Canada
- Facilitator: WHO AFRO / IP Dakar
- Location: Institut Pasteur, Dakar, **Senegal**
- Language: French
- Training Provider – PHE– NADP Training
- Participant #: 24
- Participant Countries: 20
- Human health Institutes



Biosafety Training Kits with all training material
(in French) provided

Example 4 – Risk assessment and laboratory-based training in sample processing using a class III BSC - Ethiopia

- 16-20 September 2019
- Funding: UK
- Facilitator: Ethiopian Public Health Institute (EPHI)
- Location: EPHI, Addis Ababa, **Ethiopia**
- Language: English
- Training Provider – PHE– NADP Training
- Participants #: 8
- Human health Institute

Training included laboratory training on high consequence sample processing in a donated mobile BSL-3 Unit



Example 5 – Biosafety Training (Laboratory) - Zambia

- 2nd - 5th December 2019
- Funding: UK
- Facilitator: Zambia National Public Health Institute
- Location: University of Zambia, School of Veterinary Medicine, Lusaka.
- Provider: PHE– NADP Training
- Participant #: 17
- Participant Countries: Zambia
- One Health approach – Human & Animal health institutions



- Disinfection and waste
- Accidents and spills
- Risk Assessment
- Accident Investigation
- Biosecurity
- Laboratory management
- Routes of infection
- Good microbiological practice (GMP)
- Personal Protective Equipment (PPE)
- Sample reception
- Biological Safety Cabinets Overview
- Safety critical equipment

Example 6 – Training in Lassa Fever Virus Molecular Diagnosis - Nigeria

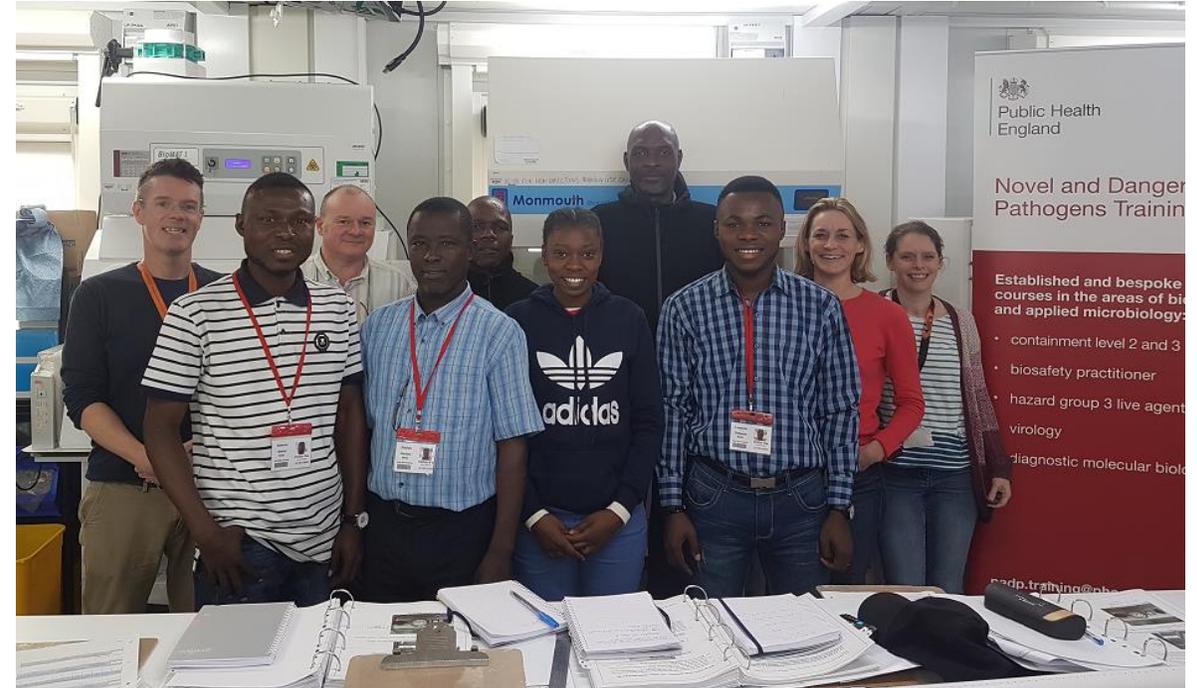
- 13 – 17 January 2020
- Intensive hands-on lab based diagnostic training*
- Funding: Canada
- Facilitator: Lagos Biobank Facility
- Location: Biobank Facility, Mainland Hospital, Yaba, Lagos, Nigeria
- Language: English
- Training Provider – PHE– NADP Training
- Participants #: 12
- Participant Countries: Nigeria
- BSL2 & BSL3
- → Monkeypox sequencing at NCDC



*Basic pipetting training also required

Example 7 - Field Certification of Class II Biosafety Cabinets – Nigeria & Zambia

- 10 – 21 February 2020
- Funding: UK
- Facilitator: PHE IHR / NSF
- Location: NADP Training Lab, PHE, Porton Down
- Language: English
- Training Provider – PHE– NADP Training
- Participants #: 6
- Participant Countries: Nigeria & Zambia
- Professional accreditation on passing theoretical and Practical assessments



Two week course resulting in independent external assessment by NSF Proctor. Passing evaluation resulted in Accreditation by NSF for individuals to Field certify BSCII.

Example 7 - Field Certification of Class II Biosafety Cabinets

- All 6 trainees accredited (80% theoretical pass mark required, 90% practical pass marked)
- COVID-19 had not yet been reported at high levels in either country
- In the 12 months following training, the Nigerian and Zambian teams field tested over 90 and 70 Biosafety cabinets respectively.
- Testing was across numerous regional labs and Institutions.
- Nigerian team presented poster at ECCVID
- NADP Training most successful in numbers of trainees becoming NSF accredited



EVD training – example of home location for deployments to W. Africa – Sierra Leone

- Over 400 UK laboratory staff trained
- Deployed to 3 ETC labs at Kerrytown, Port Loko & Makeni, Sierra Leone.
- Week long intensive practical laboratory course with Scenario training
- Content largely based on experiences of training team members in EVD mobile field labs in Guinea with EM Lab

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Opinion piece

Case study: design and implementation of training for scientists deploying to Ebola diagnostic field laboratories in Sierra Leone: October 2014 to February 2016

Christopher H. Logue, Suzanna M. Lewis, Amber Lansley, Sara Fraser, Clare Shiebler, Sonal Shah, Amanda Sempier, Daniel Bailey, Jason Busuttil, Liz Evans, Miles W. Carroll, Nigel J. Siman, Tim Brooks and Jane A. Shalloo

As part of the UK response to the 2013–2016 Ebola virus disease (EVD) epidemic in West Africa, Public Health England (PHE) were tasked with establishing three field Ebola virus (EBOV) diagnostic laboratories in Sierra Leone by the UK Department for International Development (DFID). These provided diagnostic support to the Ebola Treatment Centre (ETC) facilities located in Kerry Town, Makeni and Port Loko. The Novel and Dangerous Pathogens (NADP) Training group at PHE, Porton Down, designed and implemented a pre-deployment Ebola diagnostic laboratory training programme for UK volunteer scientists being deployed to the PHE EVD laboratories. Here, we describe the training, workflow and capabilities of these field laboratories for use in response to disease epidemics and in epidemiological surveillance. We discuss the training outcomes, the laboratory outputs, lessons learned and the legacy value of the support provided. We hope this information will assist in the recruitment and training of staff for future response and in the design and implementation of rapid deployment diagnostic field laboratories for future outbreaks of high consequence pathogens.

This article is part of the themed issue 'The 2013–2016 West African Ebola epidemic: data, decision-making and disease control'.

1. The 2013–2016 Ebola virus epidemic in West Africa

The first recorded case of Ebola virus disease (EVD) occurred 40 years ago in September 1976 in Yambouka, a small village in then Zaïre (now Democratic Republic of Congo, DRC). Up until December 2013, 24 reported Ebola virus (EBOV) epidemics affecting humans, involving 2388 infected persons and 1590 fatalities had been reported [1]. The West African outbreak of 2013–2016 is the largest recorded, with 11 310 fatalities and 28 616 infected persons as of the final WHO Ebola situation report of 10 June 2016 [2]. EBOV is a member of the family *Filoviridae*; the species responsible for this epidemic and an isolated parallel epidemic in the DRC in August 2014 is EBOV Zaïre [3]. The 2013–2016 EVD epidemic began in The Republic of Guinea in December 2013 and rapidly spread to the neighbouring countries of Sierra Leone and Liberia in early 2014. In March 2014, the World Health Organization (WHO), Médecins Sans Frontières (MSF) and the European Mobile Laboratory (EM Lab) provided patient care and timely diagnosis of patients [4]. It was not until 8 August 2014 that the WHO declared the situation as a Public Health Emergency of International Concern (PHEIC), which remained in place until 29 March 2016. In response to the WHO's call for international support, the UK government committed to a

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Lessons learned (1/2)

- Communication – avoid wasting resources through duplication of efforts
- Training requested – may require flexibility in changing landscape
- Ensure basic principles are implemented first (e.g. pipetting before qRT-PCR)
- Availability of technologies / supply chain (available beyond training?)
- Candidate selection (“certificate collectors” / “training tourists”)

Lessons learned (2/2)

- Clearly define course pre-requisites that include assessed tasks for trainees
- Feasibility of providing training material to candidates (e.g. low cost toolkits)
- Scope for follow up evaluation (i.e post-course tasks/IQA)
- Combining TtT training with technical content allows for a greater impact
- Defined standards to work to (National/WHO/International)

Identified gaps (1/2)

- Maintenance & Validation of equipment
- Equipment without accompanying training (unused top of the range equipment)
- Reagent shelf life / storage (expired before being used, e.g. customs delays)
- Availability of control materials (customs)
- Accessibility of relevant National guidelines (if present, otherwise International stds)
- Systems in place to direct high risk samples to appropriate labs

Identified gaps (2/2)

- Follow up activities (i.e. build on training)
- Opportunities for country to publish and lead training (ownership with Country)
- Need for meaningful accreditation accepted Internationally
- Support updating existing workflows to new guidelines/regulations
- Engagement of National ministries for sustainability
- Collaboration / openness between multiple organisations (esp. donor institutions)

Suggestions for future training activities (1/2)

- Relevant to local settings and situations (adapting > copying)
- Reach more people (blended approach)
- Develop more trained local SMEs (train the trainer)
- Allow time for activities to be conducted independently (supervised scenarios)
- Sustainable model to build on and replicate (small & numerous > large & centralised)

Suggestions for future training activities (2/2)

- Build capacity beyond single projects (transferable skills)
- Develop skills and motivation beyond the length of a project (accreditation, publication)
- Remove reliance on commercial kits / closed systems (in house PCR)
- Engage more openly and frequently with other Partners (NGOs/Providers)
- When possible bring numerous institutions / countries together to develop closer networks

Thank you



UK Health
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Prof Christopher H. Logue

Virology, Biosafety and Biosecurity

Novel and Dangerous Pathogens Training

IHR Strengthening Programme – Laboratory Capacity Building

Novel Variant Assessment Programme Country Lead – Ethiopia

UK Health Security Agency

Porton Down

Salisbury

SP4 0JG, UK.

Office: +44(0)1980 612885

Mobile: +44(0)7827 824407

Email: Christopher.logue@phe.gov.uk

Twitter: @NADPTraining