3RD AFRICAN CONFERENCE ON EMERGING INFECTIOUS DISEASES & BIOSECURITY

16th – 18th August

2017

THEME: PANDEMIC PREPAREDNESS -BIOSECURITY AND INFRASTRUCTURE IN THE WAKE OF THE EBOLA OUTBREAK

Rapporteur's Report

by

Nana Akua S. Korankye-Sampah, Rapporteur

GHANA COLLEGE OF PHYSICIANS & SURGEONS
ACCRA, GHANA

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

IARC – International Agency for Research on Cancer

LMICs – Low and Middle Income Countries

WAHO – West African Health Organisation

RCSDC – Regional Centre for Surveillance and Disease Control

CDC –

TOR – Terms of Reference

SOP - Standard of Operations

ELSI – Ethical Legal and Societal Issues

BBMRI-ERIC – Biobanking and BioMolecular resources Research Infrastructure – European Research Infrastructure Consortium

PLUS - Science Communication and Public Learning and Understanding of Science

CRDF - Civilian Research and Development Foundation

LF – Lassa Fever

EPI - Expanded Programme on Immunization

Executive Summary

The 3rd African Conference on Emerging Infectious Disease (EID) and Biosecurity is conceptualized by the Global Emerging Pathogens Treatment Consortium (GET) in partnership with West African and African Gong (AG) has the honour this year to be hosted by the prestigious NOGUCHI Memorial Institute for Medical Research at the University of Ghana, Legon and the Kumasi Centre for Collaborative Research, KCCR, Kumasi Ghana. The Theme this year is **Pandemic Preparedness-Biosecurity and Infrastructure in the wake of the Ebola outbreak**.

It is critically important that Africa hosts its own indigenous strategic meetings to address and define response mechanism to biological threats and increasing incidences of Emerging Infectious Diseases. Through these processes an alignment should occur with the Biological Weapons Convention, UN SCR 1540, Global Partnership Program (GPP), Global Health Security Agenda (GHSA) and the "One Health" paradigms developed by the WHO, OIE and FAO. Essentially how do we prepare for the next pandemic learning on the devastating lessons of the West African Ebola out-break.

At the first African conference during the height of the Ebola outbreak in January 2015 in Dakar, the **DAKAR DECLARATION & Resolutions** were developed. Essentially the Declaration outlined the severe lack of infrastructure and technical capacity for an indigenous response mechanism to effectively contain a biological threat from a highly infectious pathogen. The resolutions set out to define a systematic approach to mitigating such threats in the future.

The 2nd conference was held a year later in Lagos, where the Dakar Declaration was revised and also gave birth to the **Lagos Declaration on Science Communication**. The lingering biosecurity concerns in the aftermath of the Ebola outbreak and a vaccine strategy was the focus of the Lagos meeting.

This year being the third of this conference, there will be 7 streams to address the central theme of Biosecurity on the era of Emerging Infectious Disease (EID), Biosecurity, Biobanking, Public Learning and Understanding of Science (PLUS), Vaccine and Immunological Strategy, Junior Faculty- mentoring the next generation of African Scientists on EID; Culture, Anthropology and Social Economy.

The specific objectives of the conference are:

- Share experience, best practices and challenges in addressing emerging infectious diseases
- Share experiences and challenges in addressing biosecurity concern in the aftermath of the Ebola outbreak
- Opportunity to present latest breaking research and collaboration on Ebola diseases and other emerging infectious diseases in Africa

- Identify regional and international opportunities for collaboration towards the management, prevention and control of emerging infectious disease
- To Advance the discussion on a Vaccine Strategy for the Ebola belt of Africa
- Open a discussion on Science communication and its role in preventing and curtailing opportunities for public health crises emanating from EID
- Discuss challenges associated with Handling and Processing EID Bio specimen in BSL3 and BSL4 Infrastructure in Africa
- Open discussion on Africa cultural practices and community engagement in managing infectious diseases in Africa.

About GET

The Global Emerging Pathogens Treatment Consortium (GET) was established in 2014 as a direct response to the 2014-16 Ebola virus disease outbreak in West Africa and ongoing outbreaks of

Lassa Fever, Meningitis, Multidrug resistance (MDR) enteric fevers and Yellow Fever across the sub region. There was clearly a need to create an African-led multidisciplinary forum of experts capable of working together with international partners to strengthen Africa's preparedness and resilience in tackling such infectious disease outbreaks caused by emerging pathogens, public health emergencies and pandemics.

GET now operates firmly in the African Biosecurity and pandemic preparedness, space and functions as a think tank, providing high level advocacy and operational and necessary expertise to support Countries and communities achieve improved resources to combat outbreaks and other public health emergencies that can threaten stability, peace and security thereby undermining economic growth and well being.

GET is legally registered in Lagos, Nigeria, Accra, Ghana, Sierra Leone and United State of America. Our primary purpose is to develop African-led and Afrocentric strategies within an international context in order to effectively address emerging infectious diseases. Since its inception, GET has been successful in bringing together a diverse body of specialists drawn from within and outside of the African continent with expertise across a range of fields that include health systems strengthening, infectious diseases surveillance and control, pathology diagnosis and laboratory medicine, bioinformatics, bio-banking, biorisk management, Biocontainment, public health, ethics, community engagement and patient advocacy. The Consortium creates an opportunity for the development and delivery of a rapid, informed response strategy by providing advice, guidance and technical assistance to governments, regional and international health authorities, stakeholders and international aid agencies.

GET is administered by the Executive Steering Committee with oversight from the Board of Advisors. Members of the consortium are functional in working groups which provides members the opportunity to discuss matters and implement strategic capacity development projects which fall within the terms of reference of the respective working groups. The chair of the Executive Steering Committee is the Principal Investigator (PI). The consortium has 9 working groups including Biosecurity, Biobanking, ECEPAS (Ethics Community Engagement and Patient Advocacy and Support), CASE (Culture, Anthropological and Socio Economic), Research and Clinical Trials, GPP which is Grants, Publications and Proposals, One Health or the CESI which is the Climate, Environment, Surveillance and Intelligence, Policy and governance and Convalescent blood strategy

GET has 6 Portfolios: Human Resource and Administration, Accounting and Finance, Legal, Communication, IT website, Conference and event planning. The 3rd African Conference is sponsored by Jansen Pharmaceutical Companies of Johnson and Johnson and OTTN

SECTION 1:

WELCOME AND OPENING CEREMONY

1.1 Welcome address from the Principal investigator of GET and chair of the Faculty of the Conference: Prof. Akin Abayomi:

The conference opened in Accra, Ghana at the Ghana College of Physicians and Surgeon's main auditorium with a welcome speech given by Prof Abayomi.

In welcoming participants to the conference, he stated his desire to emphasize some sensitivities: "Biosecurity is at the heart of everything we do as scientists and as such we need to start paying very close attention. The developments in science and technology are moving faster than we can govern and emerging infectious diseases are galloping ahead because of the human environmental encroachment interface. Biosecurity threats undermine whole economies and create untold pain, suffering and disruption. Amongst the multiple health priorities we face in Africa, the bottom line is are we safe and secure on the Continent of Africa? Do we have resilient health and political systems that protect our sovereignty? These threats can arise from within and without the continent and come in multiple disguises. So we must be aware and alert at all times"

He therefore reiterated the importance of such meetings because "we network, disseminate ideas and concept that promote collaborations, stimulate and encourage ourselves to keep forging ahead against the tide of overwhelming disparities, dysfunctional governments , historical colonial misalignments, lack of clarity of thought and external agendas". He further hinted that public learning and understanding of science and cultural sensitivities are crucial to everything that is done, and it is a delight to have several components of this conference addressing these very important topics.

In welcoming all participants to the conference he expressed his thoughtful gratitude to the many friends of Africa present at the meeting, all chairs of the sub faculties, GET administration and the Local Organising Committee for tirelessly working with minimal resources, and to sponsors for their commitment and finally to the host institution Noguchi Memorial Institute for Medical Research and its immediate past Director Prof Kwadwo Koram.

1.2 GET LOC Chairman Prof. Kwadwo Koram

In his opening remarks Prof Koram noted with glee that the fact that this conference is happening for a third time signifies the relevance and resilience of the conference with the striking attribute of it being an indigenous African initiative with the involvement of researchers, policy makers and implementers from both Africa and the global North. He posited that the "loud silence" of African

voices in academia, research, policy making and implementation during the Ebola crises led to the creation of a number of groups, organizations and initiatives, including Global Emerging Pathogens Treatment Consortium (GET) and the West African Taskforce for emerging and Re-emerging infectious diseases (WATER).

Prof. Koram stated that the success of previous conferences held in Dakar in 2014 and Lagos in 2015 has set the stage for a lasting annual tradition of gathering both African and non-African experts in biosecurity and EIDs to come to Africa to present their work and advance knowledge and actions (actions because it is important in stemming momentum threats) on EIDs. He opined that maintaining the momentum gathered from previous meetings is crucial for the following reasons:

- The need to maintain visibility and emergency preparedness of the African scientific community; because Ebola epidemic may be over but the factors associated with its emergence and spread remain largely intact. Since there is every indication that there could either be a resurgence of EVD or the emergence of other infectious diseases with similar, if not the potential for even more disastrous consequences.
- To provide an opportunity to share deeper insights and new lessons coming out of research because, the Ebola epidemic has brought about an upsurge of research and various interventions targeted at EIDs such as bioethics, anthropology, vaccine trials etc.
- This conference has been presented as an academic and policy based meeting that will address response mechanisms to biological threats and increasing incidences of EIDs from a Continental perspective. The world has come to recognize the importance of biosecurity not only from a public health perspective but from a national security perspective because of how biological agents have been adapted for potential use in warfare.

1.3 Opening Remarks from the Ministry of Health, Ghana: Dr Hoskins

The representative of the Minister of Health of the Ghana Health Ministry remarked that the Ministry of health, Ghana is happy to be associated with the conference and excited also with the theme outlined for the conference. He expressed his pleasure to the fact that a session of the conference will be dedicated to discussing vaccines. He expressed his ministry's interest in taking findings from the conference and forming policies and practices out of it. He finally welcomed participants to Accra, Ghana and wished them all a happy conference.

1.4 Review of Previous Meetings: The Dakar and Lagos Conferences: Professor Akin Abayomi *(Principal Investigator of GET and Chair of the Faculty of the Conference)*

1.4.1 The Dakar Conference

In reviewing these meetings Prof stated that it is not a surprise that the climate impact is going to cause conflict and these are the circles of impact as people hassle for resources: land, water etc. Whenever there is conflict we set ourselves up again for an environment for Emerging Infectious Diseases. There was therefore the need to find the forces that create an environment for an increased emergency of Infectious Diseases.

Factors that stops us from rising to the challenge when these EIDs occur:

Human Resources (the big issue): There is a huge shortage of medical and allied manpower on the Continent. Though there is a shortage of doctors and medical personnel, these EIDs are so severe and take out the few human resources we have since they are the frontline to address outbreaks which are usually contagious which makes these personnels vulnerable, losing them ultimately. One such EID that thought us a bitter lesson was Ebola which claimed the lives of huge amounts of doctors, nurses, medical laboratory scientists and other health professionals, because there was no knowledge on how to handle the outbreak. So if we already have a shortage of manpower and lives in an era of dangerous diseases, where does that lead us? Prof. Abayomi asked. We are left with nothing, he sadly noted.

He put out these statistics using Pathologists as a surrogate mark-up to support his assertion of lack of medical manpower on our continent, showing the magnitude of deficiency of healthcare personnels. In the United Kingdom there is one pathologist for 15,000 people, in the United States there is one pathologist for 19,000 people, in Africa generally we are in the region of one pathologist for about two or three million people, and there are some countries in Africa with no pathologist. He noted that as a disgrace and an indictment on Africa.

Modelling tells us that if we want to catch up with the state of affairs in Europe and America, it will take us 700 years to be able to boast of one pathologist to 15,000 people. He challenged Africa to start thinking out of the box to address this issue because with this lack of medical personnel nothing much can be achieved in this phase of these contagious emerging pathogens.

Infrastructure: Not many facilities; though some hugely developed, could still not handle these outbreaks and the know-how is not available to handle these outbreaks resulting in thousands of lives lost. Improvised facilities were put together in Sierra Leone, Liberia and Guinea at the beginning of the outbreak, before more sophisticated temporary facilities erected with people being managed outside on gravels with tents and trampolines for months till with the assistance of most of our international partners these kind of facilities were built across Sierra Leone, Liberia, Guinea etc to house thousands of people who came down with Ebola.

Governance: Aside human manpower and resources, much cannot be done without governance; rules, regulations, policies and laws are needed. When there are no laws to govern biosecurity and biobanking, you are helpless. Everything in society requires regulation. We have a long way to go with outmoded rules and regulations, because science is moving a lot faster than our rules and regulations, outmoded rules and legislations cannot be used to govern modern technology. And where these legislations do not accommodate the concept of biosecurity, we are then left in a lurch.

Prof Abayomi gave a recount of the emergence of Ebola in Guinea in 2014, its spread to Sierra Leone, Nigeria and neighbouring countries, through discussions on the Ebola outbreak brought to birth GET (Global Emerging Pathogens Treatment Consortium) to provide health logistics, infrastructure, support, consultation etc to African to deal with these EIDs. GET is only 4 years but growing rapidly and not in competition with any other. The Consortium does not comprise of only Africans, it has collaborators from all over the world he put forth.

There was the need therefore for their own conference as a Consortium to share ideas, lament and encourage each other. The first ever meeting of the Consortium was held in Dakar in January 2014 organised by GET and WATER (West African Taskforce for emerging and Re-emerging infectious diseases) Consortium with funding from the Bill & Melinda Gates Foundation (BMGF) dubbed the "Ebola Forum".

There came into being the Dakar Declaration which states:

- The Frequency and magnitude of emerging and re-emerging infectious diseases such as Ebola etc are increasing in Africa globally. Africa's preparedness, surveillance and capacity to respond is found wanting in many sectors, poor coordination and lack of collaboration of the global response teams.
- Africa lacks significant preparedness for Biosecurity threats. Ebola exposed the complete inadequacy of our capacity to deal with pandemic threats
- Africa relies heavily on international support to handle most health crises on the continent.

- Africa has not fully adopted and domesticated the international conventions that govern Biosecurity.

Resolutions for the Dakar Declaration include:

- Africa must strengthen her existing Biosecurity and Biosaftey regulatory mechanisms and its Biocontainer facilities, accelerate the evaluation of promising treatments , reach out to the communities
- There is an urgent need for high level advocacy to high level of government and decision makers: Prof. Abayomi asked for support from the First Lady of Ghana Mrs Rebecca Akuffo Addo.

1.4.2 The Lagos Conference

On the 27th of July 2017, the second GET meeting was held in Lagos, sponsored by the Lagos Ministry of health and the government of Canada (GPP) and hosted by the Commissioner of Health Dr. Jide Idris.

The Lagos Declaration:

A call to action on science communication and the Public Learning and Understanding of Science and technology (PLUS). Through science communication issues like the Ebola outbreak can be brought under control.

The Declaration noted with concern that despite progressive developments in the global north and many parts of global south, science communication and PLUS in Africa continues to significantly lag behind. Science is not understood by our people making it difficult to communicate to our people in Science, this is referred to as the Science Gap. This, something must be done about; else we will be always playing trying to catch up. On reflection; there is an urgent need to copy the rights of science and technology.

A Call to Action for the Lagos Declaration

Africa national governments and ministries of education; the call is to advance, progress and implement good practice initiatives to develop enhanced Science Technology Engineering and Maths

(STEM) education at all levels on the African continent as a foundational strength for the Public Learning and Understanding of Science (PLUS) by our citizens.

Prof Abayomi informed the meeting again that Emerging Infectious Diseases is a biosecurity threat, and Ebola disease falls under the category 'A' pathogen which is the most dangerous pathogen on earth, with the following general characteristics:

- Generally have no treatment
- They cause death very easily
- They create public panic
- They cause social disruption and economic collapse
- They require special action and infrastructure, and public health preparedness
- They can quite easily drain your existing health infrastructure and decimate your health personnel
- They can be used as biological warfare: The problem with these pathogens is that, they can get into the hands of what is called Non-State actors or terrorists who might want to use them for unfriendly activities, making these pathogens have an added concern of biosecurity and bioterrorism because they can be directed to human beings, plants, animals as a threat to collapse countries. The desire a non state actor will want with such pathogens is that they have the following features:
    - Such a pathogen could create panic
    - Can be easily obtained
    - Is inexpensive
    - Can be easily recognised
    - Highly effective

And therefore, in dealing with Ebola (which have all the about features and characteristics) national state security needs to be part of the reckoning since Biosecurity is the nexus between health and security

Prof. Abayomi concluded by asking of our readiness as Africa for the next natural disease outbreak, or an accidental discharge of these dangerous pathogens or biological weapon attack by a terrorist organisation. Which he concluded in the negative based on what happened in Sierra Leon, Liberia and Guinea, he sadly doubted and noted this is not just the problem of Africa, anywhere in the world is not ready.

Therefore this meeting or conference in Accra, Ghana to review the progress made since the Ebola outbreak by the GET Consortium with many other collaborating partners at the 3rd African Conference of Africa.

1.5 Message from Special Guest of Honour: H.E. First Lady of the Republic Of Ghana, Rebecca Akufo-Addo

The First lady after welcoming all participants to the conference recounted how the devastating Ebola outbreak which began in Guinea in December 2013, spread to Sierra Leone, Liberia and Nigeria killed many people across the African continent. She also acknowledged how the local response to the crises or outbreak was criticized but also stated it was gratifying to see the world running round in a fight to contain the outbreak. Millions of people were affected and the entire economies of parts of Africa suffered severely, with the most affected countries still recovering from the impact of Ebola and Africa cannot afford to have such a devastating outbreak again, she added.

She expressed her contentment of this conference which affords Africa with the opportunity to engage some of the best brains in the fight against Emerging Infectious Diseases. She noted Ghana was very lucky to not have had a single case of Ebola, but that is negligent she noted as we could have been easily infected as other countries, and expect to learn some valuable lessons from our brothers and sisters who experienced the brunt of this outbreak. She assured of the hopefulness of using these lessons to strengthen our healthcare infrastructure

The first lady reiterated that fact that Africa is challenged with inadequate healthcare facilities, shortage of human capacity in medical and allied sciences. Africa experiences perennial political instabilities which she cited Kenya as a current example. She also stated in addition that Africa grapples with challenges of food security, nutrition, healthcare, economic performance and energy among others. And these dynamics obviously pose a challenge to our capacity to deal with Infectious Diseases like Ebola, yellow fever, meningitis and Lassa fever.

The rest of the world may come to our aid she said, but looking at this gathering of brilliant minds I have no doubt we have the solutions to the challenges of Emerging Infectious Diseases she added optimistically. Mrs Akuffo-Addo added the need to innovate since innovation is one way of making new grounds, breaking barriers with the need to ensure that effective technologies, products and services duly reach the leaders of people who need them. Science, technology and innovation can be enhanced when we integrate various tools, skills, knowledge and financial resources to solve the challenges facing Africa she added. This calls for all stakeholders to work together in concerted and

sustainable effort with regional and international partners like the Noguchi memorial Institute and others as instituted this annual conference on biosecurity on the African continent. These conferences will address the issue of our vulnerability to Emerging Infectious Disease. The biosecurity threat as such events pose to our communities and most especially women and children who are the most impacted by such events.

Distinguished ladies and gentlemen it gives me great pleasure to have this conference opened; she concluded.

1.6 Insights into the West African Ebola Outbreak: An Indigenous Perspective of Sierra Leone by Prof Sahr Gevao

Prof Gevao gave a brief background to Ebola which started in May 2014 in Sierra Leone is the worst outbreak in West Africa with about 28,000 lives affected, spreading towards neighbouring countries Liberia and Guinea by June 2014.Towards September of 2014 the epidemic had engulfed the entire area of the minor river Basin comprising Sierra Leone, Liberia and Guinea mainly inhabited by the Kisi Tribe.

1.6.1 The Causes of Spread of Ebola in West Africa

- Urban Characteristics: comparing the outbreak that happened in other places such as Congo which actually happened in the hinterlands, Ebola happened in the urban areas of West African countries because mobility in these areas is easy. For instance it takes about a day to move through the entire area of Sierra Leone making the spread of the disease quite easy.
- The alter viral characteristics and clinical presentation was a factor in the outbreak. There were initial misdiagnoses of looking for the terminal stage of bleeding but unfortunately most of the patients who reported never presented bleeding. So at the initial stage of the outbreak, most cases were misdiagnosed as cholera, typhoid fever or malaria because symptoms presented were very similar to that of these diseases.
- Cultural practices and resistance was also a challenge, the worst affected area inhabited by the Kisi tribe felt it was a deliberate move by other countries to get rid of them and never wanted to accept it was a new disease outbreak.
- Post Conflict economic circumstances
- Insufficient human capacity was above all the cause of spread of Ebola.
- Prolong turnaround time of coming out with laboratory results.
- The medium of transportation was slow and public since there were few or no ambulances

Several key stakeholders including government, NGOs played key roles in taking care of the epidemic and coordinated by the National Ebola Response Centre, resulting in the following:

- Increase and improved number of laboratories (16) all over the country , that wasn't the case before the outbreak, these lab were deployed by south Africa, Italy, Germany United states of America , The Netherlands, Nigeria and the United Kingdom.
- Activated the laboratory technical working group to manage specimen. Training and retraining to ensure quality results

Ebola brought to Sierra Leone biosecurity and Biosaftey challenges, risks and threats. There was the need to establish a biobank, but there was no funding and no national capacity and very poor or weak biosecurity and Biosaftey infrastructure Prof Gevao commented

1.6.2 Action Points

- To secure the samples and the data,
- to verify their quantities and quality
- To look at the options whether to do this regionally
- And look at action plans and create some biosecurity framework in the country

1.6.3 Where Are We

The government of Sierra Leone in collaboration with GET through the Canadian government with the help of GPP (Global Partnership Programme) have signed an agreement to develop a biobank in Sierra Leone to train staff in biorisk management and biosecurity. Bio bank policy drafted and completed.

SECTION 2

INTRODUCTION: BIOSECURITY - BIOSECURITY AND BIOTHREAT REDUCTION: BIOSAFETEY, BIOSECURITY AND BIOETHICS CONCERNS IN THE AFTERMATH OF THE LARGEST EBOLA OUTBREAK KNOWN TO MAN /

2.1 Global Partnership Program: Natalie Spears

Ms Spears gave a brief background of the GPP as established in the year 2002 with 31 active members and focuses on biological security, chemical security and implementation of biosecurity council resolution 1540. GPP has been working actively in these and other areas and implementing over a billion dollars worth programming in this regard since its initiation

Biological agents knows no boundaries Ms Spears noted and that is one main focuses of our sources - inhibiting Biosaftey and biosecurity in areas to prevent the proliferation of such materials and the Global Health Security Agenda (GHSA) is a multi-sectorial or agency approach between the regulatory bodies, ministries of health, foreign affairs, agriculture, security working together for a common goal

2.2 Why are we here? A key focus to bear in mind: Dr. Pasquale de Blasio

Dr Pasquale in his presentation pointed out that 300,000 specimens were collected during the Ebola outbreak and there is the need for proper care of it. Many of these samples he said, were sent abroad for further research yet the fate of others was not known. Yet still there are quite a number of these samples in Africa in unsecured locations as such there is the need to find out where samples in abroad are and their intended use. For those left in Africa, there is the need to identify, classify and transport them to secured locations by establishing biobanks to store them, this requires a lot of investment. In order to find a cure to diseases, there is the need for a bio bank, without it there is no possibility to study the disease.

Transport he noted is another part of the biobanking process and there is the need to pay extra attention by showing our preparedness in case of another outbreak

Continuous education or training of personnel on safety standards and disaster recovery for the biobank as well as sanitary engineers and climate change are all factors to also look for when building a biobank he concluded.

2.3 Biosecurity Keynote Address by Dr. Bonnie Jenkins

Dr Jenkins spoke about a number of initiatives and systems in place to ensure that dangerous pathogens of any kind are secured and not get into the hands of non-state actors who intend to do more harm with these pathogens, a number procedures or measures that are in place and want to put in place in a lot of countries to ensure pathogens are not vulnerable to our people and these

programmes are done in reference with the GPP of Canada with funding from a number of countries including the USA, have been undertaking series of activities on biosecurity including personnel training, having background checks, security facilities and culture to raise attention to why it is important to secure these pathogens

Biological Weapons Convention has been around since 1975 is a treaty dedicated to help regulate biological weapons

2.4 Biobanking Keynote Address: Prof Akin Abayomi

Prof gave a definition of a biobank as a facility that actively engages in research projects, national initiatives, and industry to plan the receipt of samples and their data for processing of storage. Has capacity to add value to samples and prepares to disseminate the materials as required by two multiple researchers around the world. Biobanking stuff is always on the cutting edge of genetic development, ethics governance and social justice lately and its management requires futuristic vision he hinted

According to Prof Abayomi; Biobanking may be expensive but the demand for it is huge and where there is demand is also a cost recovery on expenses, boiling down to the issue of sustainability. Biobanking transcends bio storage - It has strict governance, are national assets with multiple stakeholders, owned by the community of humanity which is covered in strict rules of social justice because it is the preservation of human biological specimens and operates on principle of 'freely received freely give' just like blood donation.

Human biobanking can bank diseases or human populations and sometimes both, and are evolving to become sophisticated moving into satellites, self therapy, drug texting, disease modelling etc, biobanks are beginning to manipulate the cells in such a way that they become therapeutically valuable to clinicians who manage to create information out of the samples that are being bio banked.

2.4.1 Pillars of Biobanking

Governance and social risk management: care should be taken on what is banked, who is banked, what samples are used for and the kind of information generated with the samples.

Biorisk Management: what is being banked may pose a threat, whether to one's self or to the community, infrastructure are the least of the problems. The pillars and most important are meticulous invention management and total quality management systems.

Good centralised and national biobanks are needed and not those little private ones, because biobanking belongs to humanity therefore the movement away from private biobanks to professional biobanks with modern technology that ends up with a good healthcare

This is the era of fast pace research – genomics, with computational biology - Fast and collaborative. Human genome project was first started in 1990 to unlock the human genome code to understand what man is made of. The human DNA is big data – we are now in the era of big data. The human genome project was possible because of the advent in technology around genome wide associations, accelerating computing, bioinformatics, and laboratory information management systems, collaborative instead of competitive research. We move from understanding our genomes to understanding the biology of our genomes, to the biology of disease, to advancing the science of medicine and delivery that at the bedside.

2.4.2 Why are we Biobanking

Because we now recognise that everybody is different, different because in our genomic code we have variations called snips, creating snip maps and separating people into different snip profiles though they belong to same family, tribe or community. These profiles will respond differently to same treatment type. Different people respond differently to the same therapy leading to Personalised treatment

To understand the genetics of populations to advance the bio economy that drive improved healthcare which cannot be possible without high quality biobanking

The key to effective biobanking is coupling genotypic analytic data with phenotypic clinical data. Samples in biobanks are useless unless we have good clinical data (phenotypic data – the characteristics of a person, where they come from, medical history, findings and results from clinical presentations). Assumptions cannot be made from genomic data unless there is good and robust phenotypic information.

Key to biobanking is quality assurance therefore the need for a sophisticated laboratory information management system because of the complexity biobanking

Governance is key; policies, guidelines, regulations and legislation. Have the external governance such as the WHO, AU, ECOWAS etc; national authorities such as health ministries, security agencies, public health laboratories, ethics committees, international societies, institutions etc.

Other issues to deal with in biobanking includes; storage of samples forever, converging of samples into satellite, movement of samples out of biobank to unknown sites globally for secondary use, data

access, commercialisation, how to return results to the community, beneficiation. There is the need for policies the govern the movement and storage of samples

Public health emergency should be looked at differently from routine public health medicine. How to share samples and data during crises without compromising social justice. Not much is known about Ebola still and very little is understood of the post Ebola syndrome, therefore the need to keep the samples

He concluded by pointing out how few biobanks are in Africa, and there is the need for more to create a balance

2.5 Vaccine Strategy Keynote Address: Strategy for Responding to Emerging threats - Emergency Committee: Prof. Helen Rees

There is an enormous impact when there is an outbreak, human impact, economic / financial impact; Dr Helen Rees stated. WHO has a constitution that is designed to prevent the international spread of diseases and also define what constitute an emergency. The director general of WHO has the authority to establish emergency committees to provide whether an event constitute public health emergency of international concern and propose issuance of temporary recommendations. Dr Rees recounted how emergency committees are put together and who are made up of the committee and their terms of reference which looks at whether there is a public health emergency of international concern; there have been 6 emergency committees so far she noted.

Whenever there is an outbreak the emergency committee looks at the outbreak had a list of questions which will decide if something constitutes a PHEIC or not

- Look at the number of deaths taking place in the population at the
- Look at the potential for high public health impact
- Is the event unusual or unexpected from a public health perspective
- Is external systems needed to detect investigative control of current events and prevent cases
- Is there evidence of a spread , or lead to similar events to other states
- there a risk of international spread
- Has similar events in the past resulted in international restriction
- Is there a significant risk of international trade or travels

For every single outbreak there has been a vaccine strategy. Numerous vaccines are being developed by MMERS, looking into new strategy for polio vaccine. Where there are vaccine shortages, fraction vaccines are employed and for all these outbreaks.

2.5.1 Lessons Learnt

At the time of these outbreaks – Yellow fever, H1-N1, polio etc - there were a lot of vaccines in the pipeline, but all in the non-clinical pipeline, nothing regarded to clinical valuation with some sitting on shelves a number of years not prioritized. Though there were a couple of other studies, unfortunately by the time these studies came out the number of cases have so much gone up.

One thing learnt around Ebola is to break inventory pathways to really address this, do much more with vaccines on key populations, trials on animals to ascertain efficacy in human, do much more of vaccines on key populations like children, breast feeding and pregnant mothers, and people with HIV etc.

Importantly if we want to roll out vaccines there is the need for a whole social science of communication research agenda.

In the event of another outbreak, the continuous of vaccination re-strategy under the expanded access program is permissible and GAVI (Global Anti Vaccine and Immunization) Organization is storing 300,000 thousand of these vaccines. Approach policy being developed, approved by all parties so in the event of an outbreak, there is readiness to roll.

The public private partnership to the Ebola vaccine experience is unprecedented, timeframe was never seen before for vaccines in terms of development from October 2014 through to 2015, results achieved. WHO developed the RND blueprint for action to prevent epidemics, related to these PHEICs

Dr Rees added that in terms of vaccine development for emerging epidemics, there is the need to strengthen regulatory capacities to bring about robust trials, invest in new vaccines, get new public health funding, address vaccine shortages, look at stock piles by strengthening the manufacturing of vaccines in the African communities, strengthen community surveillance, strategies for inaccessible areas which are becoming a problem globally.

She concluded by stating that Emergency Committees are evolving on their understanding of how they can be used to play a role, declaration of PHEIC is very important, Emergency Committees can make

recommendations as part of an integrated strategy in responding to Emerging pathogens and their emerging threats to our continent.

2.6 Biocontainment Safety Infrastructure for Africa (GPP): Ken Ugwu & Gregers Chalker

Biocontainment simple looks at methods to manage infectious agents in the lab and what to do to eliminate the infected people and workers in the facility and these projects are funded by GPP for Sierra Leone and Nigeria. In designing these containers, biorisk management, a combination of biosecurity and safety was considered

During the design stage; 2 main elements to consider are; practises and procedures in the lab that will be done depending on the outcome of risk assessment, then decide on the practises and procedures to be used in the facility such as washing hands, PPEs, entry and exit from facility, the type of safety equipment needed; cabinets , the facility itself

Containment barriers; the primary barriers and secondary barriers (facility itself, design parameters needed to protect people)

Challenges encountered when putting up the infrastructure are:

- Inexperienced engineers in the field of biobank containment, organise training
- Lack of skilled workers
- Problem of spare parts
- Uninterrupted power a major problem
- Maintenance culture, no maintenance until break down, the fix
- Lack of government support

2.7 COUNTRY PROGRESS REPORTS ON BIOSECURITY

2.7.1 Liberia: Dr Stephen Kennedy

- During the first quarter of 2017, biosecurity conference of Liberia took place to discuss mechanisms for establishing a biobank and to strengthen Biosaftey and biosecurity of the Republic of Liberia. Multiple progresses were made after the meeting on how to advance the issue of biosecurity and biosafety in Liberia.
- Towards the end of the second quarter, there was an arrangement between the US government through the US embassy and the ministry of Health representing Liberia for all biological samples collected to be stockpiled and relocated to the USA
- The thematic group on biosecurity and biosafety that was established was automatically dissolved. After this, Liberia was involved in an establishment of an investment plan just like Guinea and Sierra Leone, with 9 pillars. Pillar3 called for the establishment of the national public health institute, to oversee research in the country, including biosecurity and safety; for preparedness, identification , mitigation, management of Emerging and re-emerging infections
- From the second quarter of 2016 till date the capacity of Liberia has been built to be able to properly identify a potential outbreak of epidemics. There has been training on IPC (Infection Prevention and Control Mechanisms), strengthening of chemical trials on various thematic areas as well as community engagement. These have been the strength since the establishment of the national institute from mid 2016 till date.
- There were some gaps that occurred during that time, at the end of the epidemic the emergency operation centre has been dissolved and there were implications for all these.
- All Ebola treatment units (ETU) in the country have been dismantled; they were mobile units, not permanent.
- Despite the lessons of the epidemic, Liberia is still not fully prepared to contain an outbreak should in case any broke out.

2.7.2 Sierra Leone - The Role of Security Corporations and Biosecurity and Biosafety Programs: Samuel Kamara

Mr Kamara stated his observation from the start of the meeting that most presentations were centred on health issues, he noted the security aspect of biosecurity was necessary and he was here to look at biosecurity with a security lens.

According to him; the health sector in Sierra Leone operated in isolation when the Ebola virus broke out in the country, this making it looked like the health sector was unable to respond and being left

to address the matter alone. It then became obvious the health sector could not handle that because they were overwhelmed with Ebola everywhere in the country, thereby making the response to the outbreak inter institutional.

Mr Kamara who is a national security official pointed out that the security agencies are needed in an outbreak to play the critical roles of securing the hospitals, having the aspect of command and control in the movement of people etc. After putting in all measure with help from international partners Ebola was brought under control and finally eradicated but there came the headache of securing the quantum and potency of samples collected, there were over 100,000 samples collected nationwide that led to the establishment of repositories in and around the country, which became another challenge overwhelming the security agencies on how to secure them so they cannot be accessed by people who may want to use them as weapons of warfare. These blood samples ended up in labs in the Diasporas overseas

GET came to the assistance of the government of Sierra Leone and engaged Canada to construct a biobank, incorporating the ministry of health and the office of the national security in the biosecurity committee with other agencies. National security was included because biobanking cannot be talked about without the security of the samples to bank

Threats to Ebola blood samples became heightened which needed to be taken care of due to how dangerous the Ebola pathogen is. Both potent and non potent blood samples needed to be secured. The quantum of repositories was also a threat, inadequate security provisions, handling and movement of samples, integrity of personnel, and bio-terrorism and cyber warfare on handling of classified materials were all threats to the Ebola blood samples, hence the inclusion of national security in biosecurity committee, by issuing clearance for the movement of blood samples with police escorts. The national security has physical presence in all the repositories

Biobank when established will be secures by the principles of protective security, perimeter security; scan environment to assess the threats, install alarm systems, patrols etc. Access control will also be used. Internal security measures will include vetting of personnel to minimize insider threats, install cameras and alarm systems, security tags /Ids, fire prevention alarms, intruder detection, inventory of blood samples and many more.

SOPs have been put in place to secure the blood samples through rapid armed response, static security deployment, Access procedure, quality control etc. Transferring dangerous pathogens requires national and international guidelines

In conclusion, speaker was of the view that to succeed is the need for good leadership(through vetting, monitoring and motivate effectively), effective synergy among staff, vetting personnel prior to employment , training, watchfulness and teamwork

A concern was raised about sample or material transfer and abuse because samples being transferred are for the purposes of research, whether there was any agreement regarding the use of the samples and data, making sure that samples and data are not abused for other purposed other than what it was intended for and that is research. Mr Kamara assured the national security is on top and working in collaboration with other institutions internationally with knowledge of credibility of such organisations in the Diaspora. Giving out samples will be based on international principles and vetting done in accordance to these principles to ensure blood samples are used for their intended purposes. Proper ethical clearance shall be obtained for the use of these samples.

2.7.3 Guinea: Dr Alpha Barry

Dr Barry told the meeting that after the last conference in Lagos, we were told by Dr Abayomi to go back home and do something and he did exactly that, as a specialist in public health he started a lot of research with his team, CDC and many other organisations. One thing that was found out was that the public health was not respected even, not with biosecurity; so came up with the idea of training the people in biosecurity and biorisk through capacity building in biorisk management by training peripheral laboratory technicians, research and communication for health

There was a challenge of the absence of Biorisk policy management, lack of qualified staff on Biosecurity and Biosafety, lack of equipment to handle bio management, high level of risk of infection. Objectives were to just to contribute to strengthening the health systems in Guinea by organising training workshops; one in each region on Biorisk to improve their skills on Biosecurity, Biosafety and Bio threat

Worked together with CRPF Global who supported the projects and sent specialists, and involved the ministry of health of Guinea and other experienced professionals in laboratory studies and management to handle the training. Authorities were involved for sustainability

There was evaluation and assessment after each training for feedback, but this could not be sustained. But there was a survey conducted to know how knowledge acquired was utilized. 80 out of 110 responded to applying their knowledge after the training, others responded to improved skills, few

others didn't get to be followed up on at all. All stakeholders became knowledgeable in the subject of Biorisk and expressed satisfaction at that.

Dr Barry recommend that there be a development and implementation of projects to raise awareness about Bio threats, with scientific workshops, conferences involving stakeholders, politicians to learn more about biosecurity, biosafety and bio threat because of being at risk; also to create an association of biorisk which already started with the 150 people trained, to raise the awareness of the community

2.7.4 Nigeria - Lessons Learnt after Ebola: Dr Jide Idris

According to Dr Jide; weak health system – issues with infrastructure, the need to have proper health systems are part of the lessons that were learned after the Ebola outbreak. They are also working hand in hand with the GPP to establish a biobank

Other lessons include the need to develop a policy statement on biosecurity which is backed by law**,** Lack, insufficient funding from government and health been hardly looked at as a security issue

2.8 FROM VIRAL TO VERBAL - THE ROLE OF JOURNALISM DURING A DISEASE OUTBREAK

2.8.1 A Case Study of the US Press Coverage of the Ebola outbreak in Africa: Tom Rausch

During disease outbreaks, journalists have an integral role to play on what to report and what not to, what is news worthy and of value?

According to the presentation, the US centre for disease control provided public health authorities and partners with recommendations for monitoring people potentially exposed to Ebola and for evaluating their intended travel, including the application of movement restrictions when indicated; 'self-monitoring for most exposures, and controlled movement for higher risk exposures, with the goal of applying the least-restrictive measures necessary'.

A study by Sell et al, 2016 looked at the frequency at which Ebola and its related policies were addressed by the media and the CDC in the United States. Four main policies discussed were found out - Risk-based restrictions, Travel ban, Quarantine and Isolation

Of the above actions recommended by the CDC Risk-based restrictions was only picked up by 5% of the articles written, with quarantine and isolation dominating the press at the time. The study by Sell et al 2016, found out again that; 'If public health policymakers do not introduce science-based policies in a timely manner, then other less desirable policies may dominate the news media dialogue'

With regards to the role journalist, they must make choices or decisions on what they want the public to know - what to cover, How to cover it, what to emphasize, Who to talk to and When to proceed/hold back etc as stated by Lanson and Stephens 1994 thus: 'Every day, journalists must make choices about what readers want or need to know. Editors need [news judgement] to decide which flood of press releases and tips they get every day are worth pursuing, and which stories in each day's paper deserve the most prominence.'

To answer the questions of what, how, who and when is to identify what are news value. 'the criteria employed by journalists to measure and therefore to **judge the 'newsworthiness' of events**' and to 'select, order and prioritise the collection and production of news' (Richardson 2007: 91) or '**properties of events or stories, or as criteria/principles** that are applied by news workers in order to select events or stories as news or to choose the structure and order of reporting' (Bednarek and Caple 2014). News value informs decision making parameters and the case of the Ebola outbreak was an event of extreme negativity hence the wide coverage, Tom concluded.

2.8.2 Ebola - the roles of scientific and non scientific information: Bankole Falade PhD

There were many messages circulating about Ebola on the media, what to do and what not to do pictures and images. Same message was interpreted differently by different people. There were various messages from other international bodies and media, and Communication Extension assumes message is going into a blank cognition and no one is ignorant and what you already know will influence what is new and that was the case of Ebola with completely mixed directions

There were basically two types of information in the media about Ebola; the scientific (The EVD shuts down the immune system, causing high fever, headache muscle pain, weakness, headaches, muscle aches and chills. Loss of appetite, feel diarrhoea and nausea. Similarity with Lassa fever, Dengue fever and Malaria fever) and Non-scientific information which ended up propagating the virus than containing it, religious beliefs (pastors laying hands on patients of Ebola thereby contracting and propagating the disease), rumours and conspiracy theories of corruption (Former Gambia's president, Yahya Jammeh described the treatment of westerners with new drugs and the neglect of Africans as racism. African herbal cure, poverty, stigma (even when one is healed and discharged) etc

Dr Falade pointed out that in controlling disease outbreak, it's not only about science but about other things that are unrelated to science but has significant impact on science. There were so many controversies and disagreements among scientists about outcome of findings, coming up with different results leaving the public confused. When science is not at peace with itself the public think there are other things behind the science (poverty, lack of jobs)

Science is not enough he opined, other things that can be use to make sense of a particular disease must be looked at or considered. Scientist needs to get into the communities and engage with them. It's not enough to sit behind our desks to write all the academic papers for them to be published. The public need to know something he reiterated.

SECTION 3

BIOSECURITY AND BIOBANKING

The day's activities began with Dr Maimuna Mendy speaking on the topic:

3.1 Ethics and Governance Framework for best practices in Genomic research and biobanking in Africa: Dr Maimuna Mendy

Dr Mendy defined Biological materials as samples obtained from an individual or human being either dead or alive to provide biological information including genetic information and Biobank as a collection of these materials (biological) with the associated data. Without the data, the biobank is not complete. Biobanking is for research and Biobanking is collecting samples and data that are not being used for research. Research is part of biobanking to understand disease and its re-occurrence. It also used as database collection and a system to collect clinical, demographic, treatment, quality and ethics information and organise it.

Dr Mendy stated that Biobanking has evolved whether working with patients as diagnoses or treatment, samples have long being collected and stored and this is not new, what is new is the organisation of its facilities, moving from the storage simple and single collections to series of collections to multiple collections within a centralized facility and there is a transition in biobanking which can be seen in the large sample size because in continental studies, numbers are needed in the studies to have a meaningful outcome in genetic studies, linking of biobanks to epidemiology studies

and networks of samples and data. These transitions have become possible because of the advancement in scientific and technological platforms which have made Genome wide association studies with multiple individuals with results available within a day or two. There are now platforms for genetic studies; DNA sequencing that can give information on a large scale, all these making biobank a centre or platform for research. Ethical issues are exhaustive of biological samples, concern of individual, the material, person, the removal or redrawal of consent, research storage etc.

3.1.1 Informed Consent

There is an obligation of the researchers to the study community to provide information on what their samples are going to be used for, that the research will be of less risk or harm, storage and use, how privacy is protected etc. Other obligations for biobanking include the return of result to the participants and how that is done

Treatment - in biobanking there should be the consideration whether a particular study being conducted will require treatment and how that could be managed.

The council on international organisation of medical science (CIOMS –WHO) has guidelines for research and biobanking that involves what type of consent to be used, how to involve children and other vulnerable; the guidelines on the use of samples and data, the kind of information to be given to participants.

Within informed consent, one has to determine (a) the purpose of the research or for contacting the participants, (b) provide clarity on risk to participants the sample and data being collected from (c) type or nature of samples to be collected (d) address issue of return of results (indicate on consent form whether result will be returned and how that is going to be done by having counsellors etc) (e) Privacy protection issue- storage of samples(where), who can access it (f) beneficiaries of the results

Data and sample sharing is very important to biobanking, hence the need for collaboration with other bio banks and institutions by having the right mechanisms in place. Lately many international funding agencies will provide funding for research if researchers state that they will share resources and materials, since materials coming out of such researches are public property Dr Mendy noted. Thus sharing and access policies. Within this same data and sample sharing there is the need for publication of original results, sharing sample and data help address common diseases, have visibility

Dr Mendy put out some challenges around data and sample sharing on ethics and best practice principles include, (a) difference in requirements,(b) the lack of guidelines in some African countries

are impediments to research and some countries has a barrier on sample export. (c)The issue about not sharing in Africa does cause a lot of problems, there is an under representation of African samples of most of the studies that are going on, this is not satisfactory because we know that ethically and humanly you need the African population to understand global health and disease. Also, diseases are highest in Africa - if we are not including our samples in all of the genetic studies that will help into diagnostics and treatment, solutions or diagnostics from European and American research will not be fit for purpose for us as African, we need to have our own specific targeted and personalised medicine approach of including our samples. (d) The misuses of samples, (e) wastage of resources (f) Benefits of research to stakeholders, institutions, transfer of technology, increase in capacity and facility and the community

3.1.2 Governance

According to Dr Mendy, there is the need for a robust governance system that include training expert members in committees that will review research findings, ethics or biobank steering committee to include stakeholders, biobank managers, make protocols public for community access

Consent should be clear and not ambiguous , person providing consent should have a legal capacity and should not be a child, redrawal of consent should be included – African community consent is important, let them understand the project and buy into it before involving individuals. There is the need for ethics approval for every study though the participants have given their consents. Archive and document everything within the inform consent in the biobank

3.1.3 Benefits

- Researchers can not own or sell resources, these belong to the institution.
- Acknowledgement in co-authorship
- Having an identifier for biobank which is internationally recognised

3.1.4 Transparent and Access Policy

Access policy is a document that publicise to people who would like to use our resources, with clear objectives of the study to those access is being provided. Every transfer must be governed or followed with a material of transfer agreement (MTA). This agreement is a contract or legally binding documents that governs the transfer of research materials and data between two organisations, with

rights and obligations of the providers. Items included in MTAs are name of providing institution to the general commission inspection

Guidelines about sample sharing in Arica, sample usage etc was reviewed and put together by organisations like BC Net, BC Africa and GET. This is a governance frame for best practises for research in Africa and recommends inform consent for research, conditions of consent, conditions of secondary use, analysed data and genetic data. It recommended that this framework be promoted, high level endorsement of the framework by the EU, ECOWAS etc. With the framework, issues about data sharing is being encouraged, sharing resources, to be part of a register – the BC Net Catalogue provides the register for visibility and sustainability.

- **Concern Raised by a participant -** The experiences on the field when establishing biobanking is on sample collected during the recent outbreaks or samples from babies for neonatal screening gives useful information from such samples and would like to keep them but there is no time for inform consent as at that time

- Dr Mendy noted that some institutions add consent waiver in their framework as part of the ethics process and there are criteria for waive and why the waiver

3.2 Biobanking Economics and Sustainability : Jim Vaught

Sustainability according to Dr Vaught means maintaining a biobank, networking and funding, the cost of establishing and recovering cost of biobanks, storage, value of specimens and data(could be of economic value), the cost of best practises(can be hard for some biobanks), employee management, efficiency of biobank, efficient informatics systems and economic scientific values of networks

Setting up a biobank and biobanking network involves cost in four main categories including shipping, processing, storage management and retrieval of bio specimen and data.

Biobank certification programmes can be undertaken on standard of operation procedures all geared towards sustainability and educational programmes on basic modules on biobank governance and ethics, facility designed and safety, quality management, storage and distribution etc. Economic Considerations for Setting up a Biorepository includes:

- Costs of establishing & maintaining biorepositories

- Recovering costs – is full cost recovery possible?
- What is the "value" of specimens and data?
- Costs of implementing best practices
- Importance of quality management & evidence-based standard operating procedures
- Economic benefits

3.3 Panel Presentation/Discussion on National Biosecurity: Finding and Sharing, Strategic Solutions to Biosecurity at the local, regional and national level

Panel Chair – Dr. Maimuna Mendy

Panellist	Topic
Prof Sahr Gevao	Biosecurity challenges in Sierra Leone: • There were scattered Ebola samples all over the country after the Ebola outbreak in Ebola Treatment Units, Laboratories etc. • These were a security challenge considering terrorist activities in neighbouring countries such Nigeria • These were deadly samples which were needed to be contained and reduce the biosecurity challenge associated with it. • Some samples were taken outside the country using MTA to South Africa and other countries Actions taken include: • Firstly, the location of these samples were sought after because some laboratory collected some samples and left remaining unattended to • With the help of GET, funding was sought from institution - GPP to collate and gather the samples and store them in temporary repositories • Currently all sample locations and quantities are known, 3 temporary repositories have been constructed with security access put in place in collaboration with office of national security, plus data on these samples are also secured

	➢ For all the above to be achieved personnel were trained- lab staff and staff of the office of national security on data ascension and bioinformatics ➢ Increase in awareness of different organisations associated with security including the police and the army with series of seminars to get them on board and understand the risk associated with these samples ➢ biosecurity aspect of the Ebola samples is well under control and periodic risk assessment is being taken to make sure the biosecurity level is at its lowest ➢ training for certification have been organised by the IFBA for staff and 25 other stakeholders ➢ in summary; awareness have been created among security forces, ministries of the government, engage community on biosecurity issues and improved their knowledge ➢ knowledge acquired is being applied to mitigate the threat associated with Lassa fever samples collected and all other future samples to be collected
Dr. Fausta Mosha – Ministry of Health , Tanzania	Care in Handling Issues of Biosafety and Lab Equipment: ➢ Assess equipment in terms of purchase and use for health personnel and community at large, implications on the environment ➢ Biosafety cabinets were acquired when the programme for HIV treatment was started in 2004. Here were no service contracts, maintenance records taken place. 6 years later in 2010 the number of biosafety cabinets were about 130 which might pose a risk to staff and environment ➢ All these cabinets were assessed through a survey conducted and it was found out that less than 30% of the 130 cabinets were properly used, maintained. The remaining 30% was a source of safety risk to the environment. Because of funding, could not hire from South Africa to service these cabinets ➢ Established then a programme with the support of the CDC, selected some biomedical engineers for basic and advanced training programs, procured set of tools for maintaining, servicing and repair of the cabinets to reduce the risk to personnel and the environment ➢ Equipment had to be sent to the USA to be calibrated and returned back home. There are now about 6 fully accredited labs as at present, these trained engineers are servicing all these labs though they are not fully accredited because they need fulfil other requirements not present in Tanzania but in the USA

	▪ thinking of Biosaftey issues in Tanzania, there is the need to come out with tailored programmes that are sustainable and cost effective to manage in a way that protects everybody
Dr Alpha Mahmoud Barry – Public Health Specialist, Guinea. Member Ebola Control Committee	**Biorisk Management – Biosafety, biosecurity and bioterrorism** ▪ ***Santé plus*** is a non-profit social organization based in Guinea, Senegal and Mali, has been in existence since 2010, to help improve the health and well-being of African populations. Organisation aims to train, research and communicate for better health ▪ Organisation was put in place in Guinea for Ebola control started training people who served as communicators in the community. They were trained in biorisk, biosecurity, Biosaftey. After these trainings it was observed the level of knowledge was still low but the interest was more in the area of biosecurity and biosafety so a project was developed to look into that. **Challenges** ▪ Low level of Bio risk Management system in the country ▪ Low levels of community awareness on the risk of infectious germs. Students at the faculty of medicine were the most vulnerable about biosecurity and biosafety, based on that conferences were organised within the 10 major universities in Guinea on biosecurity, safety and threats ▪ Low level of monitoring and risk assessment within the country

	▪ Challenge with religious leaders accepting Ebola as a sickness and its causes ▪ Sample losses – have no idea where samples are, ones that are available too there is no idea of how they are being kept. There is therefore the need to reorganise the data collection –number of samples Guinea has, how many were lost, whereabouts of the remaining samples **Strategies Adopted** ▪ Develop Policy & Code of Conduct to support international biological weapon policy by conducting a bio risk assessment (determine the level of the risk),Organize a national Biorisk Meeting involving politicians and leaders and develop a Biorisk National policy ▪ Improve the Skills of health professionals on BRM- Trained 380 health professionals on bio risk management and infection prevention and control ▪ Create a Bio security Association in Guinea ▪ Improve the Community awareness on the issue of the risk of infectious germs ▪ Strengthen of cross-border surveillance systems, (land, air and sea borders) ▪ Develop a biorisk monitoring and evaluation system etc **Expected Results** ▪ The of Skills of health professionals and community awareness improved on BRM and the risk of new epidemic can be reduced and controlled ▪ The country's cross-border surveillance systems will be reinforced and the national and international security in the areas of biosafety, biosecurity and bioterrorism will be improved ▪ The biosecurity, biosafety and bio threat risk and incidents follow up all over the country
Abera Kebede – Lab Quality Manager, Ethiopia	**Implementation of Bio-security - NAHDIC's Experience** ▪ NAHDIC'S responsibilities includes but not limited to (a) coordinating and performing surveillance and diagnoses of diseases of economic and public health importance (b) conducts research on animal health problems (c)build capacities of veterinary labs ▪ MOU signed between DTRA/CBEP and NAHDIC for the implementation of biosafety and biosecurity at NAHDIC, MOU aimed at providing a strategic collaboration framework that outlines NAHDIC and DTRA/CBEP 5-year priorities,

Adisu Kebede – Laboratory Biosafety and Biosecurity Team Leader, Ethiopian Public Health Institute	identifies current-year collaborative projects, and details future areas of potential collaboration. - Put together SOPs and manuals on biosafety and biosecurity manuals with the help of experts from B&V and NAHDIC for implementation for quality management per international standards - Training on Biosafety and biosecurity scheduled for personnels  Document Development and review team **<u>Biosafety and Biosecurity Progress in Ethiopia</u>** - The public health institute is expected to build the capacity of laboratory in the country with regard to biosafety and biosecurity and other quality management systems and have been training laboratory professionals since the year 2005. There are national health and safety guidelines in place for biosafety and laboratories in the country as well as biosafety manuals - Ethiopia is a member of GHSA – has developed a list of hazardous pathogens and toxins. Documents on legislation developed to govern biosecurity and safety issues as well as pathogens regulatory mechanisms to get license for all labs that process these pathogens. A system to control all pathogens have been developed which can track the pathogens from date of storage to discharging - Secured mobile biosafety repository and designed a state of the art national reference laboratory that has enhanced biosafety repository yet to be constructed

	▪ Biosafety cabinet certification programme started in the country to train engineers, final exam yet to be taken in October ▪ Plan for next year to have all labs to be BSL-2/3 certified and conduct risk assessment in these facilities ▪ Attention given to expansion of services
Project Manager for GET in Sierra Leone	**<u>Contributions and Questions from other Participants</u>** ▪ After looking at all the biosecurity challenges experienced in Sierra Leone during and after the Ebola outbreak, it was decided to put a project team together (not limited to members with expertise in biosecurity and biosafety but also others with a potential for further capacity development). Project team is headed by Prof Gevao based in Sierra Leone ▪ Project management office is based in Ghana, ensures quality in all activities. The team based in Sierra Leone. Look at activities in terms of capacity building for project team and engage stakeholders in establishment of temporary repositories and the future of biobanking in Sierra Leone ▪ Biosecurity is a combination of health and security matters analyse stakeholders available, develop a communication plan to engage all of them – the office of the national security, ministry of health and sanitation, military, police. The role they can play, their interest and the information required of these stakeholders, bring them on board from beginning of the project ▪ Involved in capacity development of stakeholders through continuous training and involving them in projects ▪ The need for a biobank policy to provide the enabling environment and to ensure the integrity and sovereignty of Sierra Leone regards to the transparency of the samples and data, hoping to establish a biobank governing council. Policy covers important thematic areas: ➢ Governance ➢ Infrastructure development ➢ Capacity development ➢ Scientific development ▪ Whilst policies, legal frameworks, guidelines and SOPs are being developed, there is the need to harmonise them across the different countries, and not that we are implementing our own SOPs which cannot be implemented in other

Dr. Maimuna Mendy	countries - there is the need for uniformity , a template or framework to work with Legislation is a big challenge

3.4 Biobank Network for Low and Middle Income Countries (BCNet) - Dr Maimuna Mendy

3.4.1 Why Biobanks?

Biobanks is an important infrastructure for research. In 2013, the International Agency for Research on Cancer (IARC) established a LMIC Biobank Cohort building Network (BCNet) to promote and support biobanking activities and research infrastructure in Africa or LMICs

Global cancer incidence rates projected to increase by 60% to 21 million by 2030 and about half of all cancer deaths expected in LMICs, and most of these in African countries. In other to develop preventive measures, policies and for government to fight against this disease or cancer; research has to be conducted with samples and data. There is under representation of quality biological resources (samples and data) for scientific research in LMIC.

3.4.2 Challenges for Biobanks in LIMCs include:

- Data and sample sharing regulations are not available in Africa
- protocols and procedures not harmonised making it difficult to conduct sustained research
- Institutional and regional support; most biobanks lack this support, lack of the right personnel (not trained), unavailability of infrastructure
- Sustainability; because of sustainability issues, there is problem with quality. Though samples are being collected, they are not organised in ways that can be used for research
- Quality and relevance
- Inadequate storage capacity for samples and data, freezers etc

3.4.3 Background of BCNet

Dr Mendy gave the background to BCNet as thus; in 2011 a situational analysis was conducted through needs assessment survey to identify the kind of needs for support and where training gaps were identified. The National Cancer Institute and Centre for Global Health agreed to a partnership in a discussion with stakeholders to establish BCNet with members from Africa, Europe and South East Asia. Partners are international organisations that share same values as most of the biobanking international organisations.

Members of the BCNet Advisory Committee are appointed by the Director of IARC, and membership will be for an initial period of two years. Membership is made up of 21 institutions or states (14 from Africa, 3 from Europe, 2 each from South East Asia and South America). Members agree to share resources, expertise and develop common standard protocols, when appropriate, will host other training and participate in technology transfer and conduct collaborative projects in areas of common scientific and research interest.

The network as said by Dr Mendy has been able to participate in some projects such as the EU-H2020 Grants, B3Africa, Adopt-BBMRI, dissémination: website, Newsletter, engaged in training activities for Biobankers, Pathologistes and technicians

In conclusion the survey brought to bare the absence of laws and regulations governing biobanking activities, rare ethical review information concerning participation in biobanking activities, Lack of access policies and no real ethics committee responsible for biobanks issues. What BCNet did was to develop access policy agreements that will be adopted by different regions.

3.5 Presentation eB3kit (B3 Africa): "B3Africa: Bridging Biobanking and Biomedical Research across Europe and Africa - Erik Bongcam-Rudloff (*Dr in Medical Sciences, Professor in Bioinformatics, Head SLU- Global Bioinformatics Centre, Coordinator B3Africa SLU, Uppsala*)

The B3 Africa project is an EU funded project which aims to implement a cooperation platform and technical informatics framework for biobank integration between Africa and Europe. Comprises of seven countries and other partners with expertise in law, informatics, bio-informaticians and medical doctors. It is a two-leg project; one on the ethical issues and the other leg is the informatics part.

Why B3Africa – Bridging Biobanking and Biomedical Research across Europe and Africa – to create a technical and cooperative for biobanking integration between different groups, sharing data between

Africa and Europe; and this platform will dramatically improve and facilitate the development of better predictive, preventive, and personalised health care worldwide.

The rapidly evolving African biobanks are an invaluable resource because the African population has the greatest genomic diversity on the planet and represents an incredible resource of information to advance biomedical research. This collaboration involves standardised ethical and legal framework, biobank data representation to create bio-informatics for sharing data and knowledge. No one can work for themselves today, neither African nor European continents cannot work for themselves.

The common idea therefore is to create a computing platform with all the contents and all the ethical or legal consideration at one place, sample and information management, data analysis or actual analysis. This platform will have potential or new innovations.

3.6 ECOWAS Regional Biobank Project: Dr. Abdourahmane SOW *(Po Epidemics Control / Laboratory services , West African Health Organization)*

The ECOWAS regional biobank project came into being when the states met the challenges of insufficient diagnostic capacities, weak national / regional capacity, lack or absence of collaboration between reference labs which led to the delays in lab diagnostics

ECOWAS authority of Heads of State and Government during their 45th Ordinary Session on the 10th of July 2014 therefore established a solidarity fund which allowed ECOWAS members and WAHO to deploy professionals to the countries which were hit by the Ebola outbreak. One Health Technical and Ministerial Meeting also took place in Dakar from 8 – 11 November 2016 to implement ECOWAS Regional "One Health" Framework

The 47th Conference of ECOWAS Heads of State and Government (Accra, May 19, 2015) confirmed the creation of the ECOWAS RCSDC with headquarters in Nigeria based on African Union decision to put in place Africa CDC and Regional Collaborating Centers and requested WAHO to make the necessary arrangements to expedite its implementation and its operationalization and calls for partners to support this process

The 48th Conference of ECOWAS of Heads of State and Government (Abuja, December 16 to 17, 2015) adopted the regulation establishing the operating procedures of the ECOWAS Regional Centre for Surveillance and Disease Control – which had responsibilities of:

- Global planning, implementation and monitoring of Africa CDC programs on the basis of the strategic plan
- Provide technical support and capacity building to Member States
- Receive and consolidate reports received from Member States
- Introduce Africa CDC monitoring and evaluation standards and systems in Member States

A regional laboratory network was therefore implemented to work on TOR and SOP to validate the establishment of the Regional Biobank in Abidjan – a sustainable and accessible Network of regional biobank that will provide the West African region with sufficient technical capacity for the conservation and management of biological and environmental resources including associated data in accordance with international standards to improve scientific cooperation and research in the ECOWAS region. To strengthen National/Regional capacity for the conservation of biological and environmental resources by improving scientific collaboration between various reference laboratories in order to support biomedical research and put in place the best strategies for Disease Diagnosis, Control and Prevention.

3.7 Presentation by BBMRI-ERIC: Michaela Th Mayrhofer

Michaela Mayrhofer is her presentation noted that this is not a research project but a research infrastructure established to operate and develop a pan-European distributed research infrastructure of Biobanks and BioMolecular resources in order to facilitate the access of resources as well as facilities and to support high quality BioMolecular and medical research. BBMRI-ERIC shall implement its Work Programme as adopted by the Assembly of Members

The focus is on issues relating to Europe; however BBMRI-ERIC is global and linked to other countries, projects, research infrastructures via projects, such as B3Africa. There is increasing concern about the reliability of medical research, with recent article suggesting that 85% of research funding is wasted. BBMRI-ERIC recognizes quality grades of biobanks with self assessments. The central role of BBMRI-ERIC is to keep track and contribute to the biobank relevant international standard developments, act as an information hub by communicating expert knowledge of the Working Group of ISO to the BBMRI-ERIC community and vice versa,

BBMRI –ERIC has improved access to biobanks, data and samples; currently there are 626 biobanks with 1363 collections; estimated more than 100, 000,000 samples. The development of Access policy is to aid accessibility to biobanks, samples and data. BBMRI- ERIC provide ethical Legal support and societal issues related to biobanking through its common services ELSI

BBMRI-ERIC is a research infrastructure with its own legal status owned by its member states; requires member states to set up National Nodes; Focuses on transnational issues that require harmonized solutions with the ultimate responsibility to the use of samples & data appropriately, so that neither the expectations nor the efforts of the data/sample providers and users go to waste.

SECTION 4

EID, VACCINES AND JUNIOR FACULTY

Section four (4) activities or presentations were centred on Emerging Infectious Diseases, Vaccine and Junior sub-faculties.

4.1 Importance of having Sustainable Vaccine development and manufacturing capacity in Africa: Prof. William Ampofo, Ghana

Dr Ampofo in his presentation put out that Africa represents 14% of the world's population but has less than 0.1% of the vaccine production capacity. There is therefore the need to consider whether self sufficiency in vaccine production in Africa is important or not. Global vaccine market in 2013 was 24billion and Africa's was about 2billion making it about 6% of the global vaccine development in 2013. In 2014 UNICEF's vaccine sales to Africa was about $810,000,000(Eight hundred and ten million dollars) and increased almost to $900,000,000 in 2014, 60% of sales of UNICEF comes from Africa. 45 out of 54 country use UNICEF's system of procurement

Africa represent about a quarter of the population throughout the world fast-forward to 2015. There is a growing demand for vaccines and the significant unmet needs calls for a critical look at meeting the growing needs of our national immunization programmes. This involves where to get the vaccines from and how to pay for them There is a widening gap between supply and demand especially for this continent that has low production capacity for vaccines, production of vaccine is at a low percentage and don't know how to sustain it, very vulnerable to epidemics, poor social economic development, weak national security etc

In 2006 WHO and US Department of Health and Human Service came up with a programme to increase the capacity to produce influenza vaccines because of the threat of the flu pandemic and this helped countries like Mexico, Brazil, Indonesia, Thailand to establish influenza vaccine production capacity.

But efforts in Africa did not succeed; Africa still had zero influenza production capacity despite this strong programme that led to an increase in Influenza vaccine throughout the globe.

The Ebola outbreak in 2014 has led to a strong recommendation from the African Union (AU) but up until now it still remains a recommendation. The Pharmaceutical Manufacturing Plan for Arica put in place by the AU commission and UNIDO through a multi stakeholder meeting with the vision of having a viable pharmaceutical industry in Africa, address some of the health needs of the people and contribute to the overall social and economic development.

Vaccine production was considered the future area; there was a medium and long term plan to establish production capacity to rapidly respond to Africa's needs. In 2015 the Global Action Plan was adopted by member states to seek opportunities for national and regional vaccine production, to investigate procurement options. Producing the vaccines is not enough, there is the need to find a way to maintain the utilization of the vaccines produced and help keep companies in vaccine production viable.

In Africa there are factors against vaccine production; the failure of past and recent experiences in manufacturing, high risk, capital intensive, fragmented independent vaccine market, lack of human and technical capacity, the absence of proper long term vision and the political will to invest in public health and technologies. The African vaccine Manufacturer's initiative came into being in 2010 to look at improving vaccine manufacturing in developing countries. 13 countries form the network to promote the establishment of sustainable human vaccine manufacturing capacity in Africa. Strategies include a high level advocacy to mobilize the continent and to facilitate partnerships between African manufacturers with interested stakeholders, resource mobilization, promote adequate scientific and technical capacity. Partners include WHO, US department of health and human service, UNIDO, AU

To produce vaccines you need money, the technical and scientific ability (know how), the market and regulatory framework. It is a long term process. Vaccine development and manufacturing in Africa is very important, it will create employment and skills, improve national security, improve epidemic and pandemic preparedness and will position Africa positively with regards to local vaccine supply and sustainability, it will break the cycle of dependency on foreign supply of vaccines Dr Ampofo concluded.

4.2 Challenges to the Development of Vaccines against Ebola and Filo Viruses: Dr Valerie Oriol Mathieu

Commencing her presentation; Dr Mathieu pointed out that the outbreak of Ebola in West Africa from 2013 to 2016, came with it lots of cases of deaths coupled with weak health infrastructure and no previous experience of Ebola disease. When Ebola broke in DRC, it did not become an epidemic and very low deaths were recorded (8 confirmed cases with 4 deaths) because it happened in a very remote area with low density population which had a low risk of spreading from person to person. DRC had a lot of experience in managing Ebola outbreaks then so there was a faster identification of the outbreak with faster measures put in place. But there are still factors which can contribute to another outbreak of Ebola therefore Africa must not relent in the development of the Ebola vaccines. Many countries in Africa are still at risk because of less healthcare infrastructure, not much experience with Ebola, high population density. Many countries in sub-Saharan Africa are at risk of increased Ebola outbreak because they have similar ecological systems, food bats (most likely reservoir for Ebola)

One positive outcome of this outbreak has triggered a lot of mobilization to prepare for the next one. Some measures or being put in place include:

- **Pillar #1:** Diagnostic and surveillance(lack of diagnostic capacity in most countries, lack of healthcare personnel and capacity to detect the disease)
- **Pillar #2:** Community management (improved with building of treatment units, early treatment important to decrease mortality though purely symptomatic)
- **Pillar #3**: Vaccines: significant progress made with vaccines development, which is already in clinical development. Another positive element in the vaccine landscape is that WHO's Strategic Advisory Group of Experts on Immunization's (SAGE) recommendation which states that one of the vaccines, the rVSV-ZEBOV is capable of protecting people should be used in case of future outbreak. Though not a broad recommendation to use the Ebola vaccine pre-emptively but a recommendation to use it relatively in case of an outbreak. This is a step but in terms of licensure and marketing authorisation there is no vaccine authorised yet. There is a stock pile of vaccines as required by Gavi
- **Pillar #4**: Treatment: pre-clinical and clinical development for Ebola specific treatment for anti-virus preparation. Not yet licensed any treatment but research still on going
- **Pillar #5**: Community engagement – lots of effort made, lots of progress in terms of social mobilisations in terms of contact restriction, safe burial etc.

There is a need to coordinate all these interventions since there are still gaps in the capacity to respond. One of the tools to manage, contain or prevent Ebola is the vaccine, more research is therefore needed to be sure of the vaccines partially developed really confer protection, is there a need for several doses or a booster is still unknown. There is the need to define the vaccination strategy as proposed by SAGE

in the short term of an outbreak, pre-emptive vaccination before an outbreak (of healthcare personnel or frontline workers) – no consensus on that.

Janssen started a few years ago with partners to develop a vaccine for Ebola Zaire Dr Mathieu pointed out, the vaccine comes with 2 injections or 2 different components. About 2000 people have been vaccinated with no adverse effect in clinical trials and these vaccines are ready for use. Forecast to find out whom, when and where these vaccines will be used has already been done.

4.3 Panel Discussion/Presentation: Factors Contributing to Maintaining Routine HealthCare during an Outbreak

Panel Chair: Dr John Amuesi and Dr. Klement Jaidzeka

Routine healthcare delivery is a practice that goes on before, during and after an outbreak. Epidemics occur largely in areas where the healthcare system is weak and vulnerable which allows for outbreaks to happen Dr John Amuesi noted.

Panellists	**Topic**
ORDER HC Team: ✓ Dr. Norbert Schwarz - Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany ✓ Ms. Verena Schuster - Robert Koch Institute, Berlin, Germany ✓ Dr. Ricardo Strauss – Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany	**Organize Response for Disease Epidemics, maintaining Routine Health Care** Project is yet to start, jointly implemented, looking at focusing on the experience of the 3 most effective countries based on this panel discussion. The health system was not entirely collapsed though there were chaos in the beginning, efforts were made to maintain routine healthcare and to get back on track Order HC want to look at the success factors and solutions, the corporate strategies these countries tried to find. Look at geographical differences, institutional characteristics and all other factors that may provide solutions
Prof. Sahr Moses Gevao (Sierra Leone)	**Q: How has decentralization activities in the health system helped or addressed the weaknesses in the system and increased efficiency within the system? How have these activities coupled with post Ebola and national and international activities with interventions put in place to address the weaknesses in the health system. Give an update**

	on how far these have gone to address the weaknesses in the health system to withstand shocks that might come in - The internal healthcare system was devastated as a result of Ebola outbreak but there has been a lot of improvement due to the intervention of international partners and the government of Sierra Leone - Areas of intervention include (a) training – IPC training was put in place for all healthcare officer and deployment of safety officers, reason being that the healthcare system was abandoned by most health personnel for fear of being infected, lots of front line workers became infected and died as a result of the outbreak. (b) Laboratories were in bad shape before the outbreak but later more equipment were deployed coupled with training of personnel. The central public health lab has undergone significant improvement and diseases can be diagnosed in the country - More assistance needed especially in the area of transportation and ambulance services in the hospitals - Other strategies employed during the outbreak include provision of incentives to staff, compensations after loss of a frontline worker and drastic system improvement
Dr. Stephen B. Kennedy (Liberia)	**Q: which part of the healthcare continued functioning despite the outbreak or was back on track during the outbreak and was there differences in geographical regions** **Ans:** - Liberia was not prepared for such an epidemic of that magnitude and scope - The entire health sector had collapsed when the epidemic occurred reasons being that there were (a) no functional routine health services, the entire health system shut down from the ministry level to the peripheral level because the citizens had no trust in the government (b) perception and conspiracy theory that the epidemic was as a result of

	international conspiracy and because of the mistrust people did not turn to the medical care but sought for traditional cultural practices for cure or attention (c) the population began to migrate from the urban area because the outbreak occurred from the referral hospital in the urban area. This resulted in sporadic outbreak in the rural areas which brought confusion, making people migrate again from the rural area back to the urban area • There was some level of healthcare system, the rural area tried to maintain healthcare initially but as the epidemic increased these services collapsed, transportation came to a halt, supply chain system for the supply of drugs and essential medical services were also not available • There was a gap created after all the above which was being filled by traditional and cultural practices, self medication, and proliferation of quack medical personnel. International organizations began to step in to create a community based approach to address the basic primary routine care in those communities
Dr. Alpha Barry (Guinea)	**Q: How is Guinea positioning herself to make use of all the opportunities of training coming from international partners** **Ans:** • Before Ebola, there was the primary healthcare system which was shut down with the outbreak, many healthcare personnel and members of the community were lost to Ebola • The concern is how to revive the primary health system. People all over the country have to be trained to augment the health system. A module have been developed to train personnel with the health system, the minister of health asked Dr. Barry to personally assist him with this module and training with the objective of strengthening the healthcare system

4.4 Lessons Learned from Ebola – DRC: Dr Annick Antierens

From March to April 2017; 52 cases including 31 deaths of undiagnosed illness registered. 48 out of the 52 of these cases including 27 deaths were children under 5 years of age. Signs and symptoms include fever, diarrhea, abdominal colic, vomiting and dyspnoea. The Ministry of Health and the NGO ALIMA did experiment in mid April and found 8 out of 10 of the cases were malaria

On April 22nd 2017 another alert came when a 37 year old male was brought to HGR on a motor bike with these symptoms; haematuria, epistaxis, bloody diarrhoea, and hematemesis but dies 12km before reaching the health facility. The motor driver subsequently dies with similar symptoms and the care taker of that same man develops similar symptoms but survives

Because of their (DRC) knowledge of Ebola, there was a rapid response to this. On May 10th 2017, DPS sent 5 people to investigate and found 9 suspects (of which 3 died), took 5 samples and sent to INRB(Institute of National Laboratory) in Kinshasa, results of the 5 samples came out thus; 1 positive, 3 negative and 1 undetermined with the final outcome as Ebola Zaire and rapid reaction was put in place. The 9 point reaction put in place include the following:

- Reinforcement of multi sector coordination with committees to fight against epidemic
- Reinforcement of surveillance, active case finding and contact follow up
- Reinforcement of biosecurity measures in health structures and community
- Medical management of infected and suspected cases
- reinforcement of diagnostic capacities of reference and research labs
- Psycho-social management of patients and suspected cases and their families
- Mobilization of human, logistic and financial resources
- Reinforcement of communication and social mobilization
- Reinforcement of health system in the health zones of the province of Bas – Uélé

There was a challenge of accessibility of trying to reach various provinces and Ebola treatment centers with equipment and treatment materials. Valuable lessons learned were as follows:

- Epidemiologic investigation as a start revealed transportation and sample treatment
- Community engagement is crucial(train network of community workers, understanding the community)
- More rapid diagnostics – fate of samples & MTA (mobile labs, reduced turnaround time)
- IPC : acceptable, feasible and user friendly, increased accessibility, better ventilation
- Standard data collection
- Malaria preventive

- Vaccination (the efficacy and effectiveness of the rVSV-ZEBOVE vaccine in preventing Ebola Virus though not registered)
- Experimental therapeutic products (ZMAPP Under expanded use, Cold chain – 20°C Long and carefully monitored infusions and the GILEAD)
- Research agenda: infectivity study

In conclusion, Lessons were learned through coordination and by capitalization on the country's experience. Samples collected are in the National Lab, but still insufficiently prepared in areas of (a) Reaction time, (b) Logistics' E-prep (c) transportation and (d) cold chain.

Finally, there is Pre-discussions with Ministry of Health on the (a) Use of new products/vaccination/ diagnostics and (b) SOP and GCP for experimental products

4.5 The Impact of Rotavirus Vaccination in Africa: Prof George Armah *(Regional Rotavirus Reference laboratory - Noguchi Memorial Institute for Medical Research, University of Ghana, Legon)*

in Africa, the Rotavirus is the most common cause of severe diarrhea and each year, rotavirus kills about 200,000 children in countries around the world, and hospitalizes hundreds of thousands more and it is one of the world's leading causes of child death and hospitalization. Rotavirus kills more than 330 African children under five every day and accounts for 42% of all hospital admissions**.** Each day, rotavirus kills more than 260 children under 5 in Africa and more than 170 in Asia and it is the leading cause of deaths or among 10 countries worldwide as at 2013

For the above reasons WHO recommended Rotavirus vaccines should be included in all national immunization programmes and considered a priority, particularly in countries with high rotavirus gastroenteritis-associated fatality rates, such as in south and south-eastern Asia and sub-Saharan Africa**.** As of March 2017, 92 countries have introduced rotavirus vaccines including 85 national introductions, 2 ongoing phased introductions (Pakistan and India), and 5 sub-national introductions.

A study was carried out to measure the impact of rotavirus vaccination on rotavirus and all-cause diarrhea morbidity in African countries that have introduced rotavirus with monthly rotavirus admissions recorded and stool samples tested for rotaviruses for a period spanning at least 24 months before vaccine introduction. Between 2009 and 2012 Rotarix introduced 2/3 doses of vaccines administered on babies from 6 weeks to 14 weeks to see its impact on hospitalization and on general diarrhea disease in South Africa (August 2009), Rwanda(May 2012), Botswana(July 2012), Malawi(October 2012), Zambia(January 2012) and Ghana(April 2012)

4.6 Simultaneous Multi Pathogen Detection Using the Taqman Array Card (TAC) In the light of Bioterrorism: Dr Francis Dennis

Bioterrorism is an intentional and deliberate release of toxic biological agents to cause mass harm and panic in populations. There is a wide variety of biological agents that could be used; category A which are major public health hazards to be worried about include agents that cause anthrax, haemorrhagic fever etc. Category B which are a step below category A

After the terrorist attack on the US in 2001, CDC revised the 6point plan for strategic plan for preparedness and response which included the preparedness planning and readiness assessment, detection surveillance and epidemiology capacity and the laboratory capacity that involves the diagnoses and the characterisation of the biological agents, response and help alert network, communicating health risk, education and training

The challenges to diagnostics includes the fact that there is a broad spectrum of these potential bioterrorism agents; there is bacteria, viruses, parasites, toxins; most labs has no specimen analysis ad slow turnaround time

Detention Methods used includes the following 2 broad categories**;** Conventional (electron microscopy, biochemical acids, and culture for bacteria) and the new detection method, with technological advancement which includes real time PCR, micro arrays, and mass spectrometry. These give high quality information at a reasonably shorter period but a lot of times have to target one or few pathogens

In other to enhance these challenges pointed out earlier and also to handle a wide potential of agents, innovation is need in the rapid detection and diagnostic tool especially those that will allow for multiplicity of strategies so that a whole series of pathogens can be looked at in one reaction especially when one is not sure which pathogen is responsible.

The Taqman Array Card can be used to screen samples with a faster turnaround time of less than 5 hours, quantifiable reactions; cards can be customised to include pathogens of interest and can screen various pathogens from the same sample and addresses issues of multiplicity. This kind of card will be useful as a rapid response diagnostic tool.

4.7 Investigation of outbreak of Diarrhoea Diseases at Queens College, Lagos: Dr Abdul Salam

Dr Salam started by giving the background to the outbreak of the disease in the school as happening in February 2017, the illness was characterized by high-grade fever and acute watery diarrhoea affecting about 40 known cases. The Lagos State Ministry of Health was notified and a response team put in place with their terms of reference as follows

- Confirm whether there was an outbreak of any disease in Queens College.
- Identify and confirm the disease involved in the outbreak.
- Characterize the outbreak in terms of place, person and time.
- Identify other students at the risk of further infection
- Determine the source(s) of the outbreak
- Take appropriate samples and confirm the diagnosis/organisms involved in the outbreak.
- Institute control measures.
- Write a report with recommendations

The response team carried out their work by interviewing of key Staff, inspecting the Sick Bay, School Kitchen, Water Supply, inspection of student's hostels, refuse disposal system, vvisit to the homes of identified cases and hospitals where they were managed blood culture, serology and genetic studies were conducted for cases admitted in private and public hospitals at Lagos State University Teaching Hospital and US-CDC.

Findings of case investigation confirmed of an outbreak, with water sewage contaminated, food handlers also had parasite infestation with the following recommendations given among many others

- Urgent need for treatment of all water points at the Queens College School.
- Kitchen staff should be treated for salmonella infection and amoebiasis
- A periodic food handlers test should be carried out annually for the kitchen staff and every 6 months for at-risk staff especially those found to be infected recently.
- The kitchen and Dining area should be renovated and all taps should be running.
- School resumption should be delayed till appropriate measures are put in place for the safety of the students.

- Public enlightenment and appropriate information given to students and their parents on the ongoing outbreak.

SECTION 5

SCIENCE COMMUNICATION AND PUBLIC LEARNING AND UNDERSTANDING OF SCIENCE (PLUS) AND CULTURAL, ANTHROPOLOGICAL, SOCIAL AND ECONOMIC (CASE) IMPACT OF INFECTIOUS DISEASES

5.1 SUB-FACULTIES PRESENTATIONS

5.1.1 The Role of Governments and Policy-makers in advancing Science Communication and PLUS in Africa (Mozambique): Joao Cossa

Governments are Executive political authorities or policy makers of a country which have the constitutional and legal power to govern and to make decisions. Science Communication comprises the various forms, models and techniques of disseminating the results of scientific research.The role of governments and policy makers are:

- to enable the advancement of scientific communication and Public Learning and Understanding of Science (PLUS) in Africa by proposing the creation of laws, strategies, policies, decrees
- regulating the introduction of science and technology communication and PLUS into school curricula, from primary to higher levels
- promoting the creation of a culture of science and technology in African societies

Mozambique's approach to advancing Science and Technology Communication and PLUS includes:

- Having a Ministry of Higher Education, Science and Technology to see to the Approval of the Informatics Policy and strategize for the Implementation of Informatics Policy, organize National Science and Technology Exhibitions etc
- Organizing Journalism training in science, technology and innovation; Informatics and Mathematical Olympiads; Mozambican Innovator Promotion National Program etc
- Ministry of Science and Technology, Higher and Technical Vocational Education

African countries must harmonize their policies and strategies for communication of Science and Technology and PLUS through regional levels; promote PLUS through the impact of Science, Technology and Innovation on day-to-day communities and ratify international legal instruments which should be binding at the national level

Shortcoming of exclusive use of official languages, compared to the native languages spoken by the vast majority of populations. Science and technology and PLUS is better promoted when communicated in the local languages speaker concluded.

5.1.2 Building Resilience to Emerging Infectious Diseases in African Communities through Knowledge Sharing and Training: Niniola Soleye *(Managing Director, Dr. Ameyo Stella Adadevoh (DRASA) Health Trust)*

The Dr. Ameyo Stella Adadevoh (DRASA) Health Trust was established in 2014 in honour of Dr Ameyo Stella Adadevoh who first diagnosed the first Ebola patient in Nigeria, she kept the patient and raised the alarm in order for him not to infect others, through her efforts and that of her team Ebola Nigeria was able to contain the Ebola virus from developing into and epidemic. DRASA is based in Lagos and focuses on infection control and outbreak preparedness.

Building resilience entails preparedness in ensuring that all aspects of a country's health system are strengthened to improve biosecurity and the spread of diseases and to prepare for potential pandemics. Nigeria is celebrated a lot on how they were able to contain the Ebola virus from spreading despite its population and the challenges Ms Soleye noted.

Report from save the children in 2015 states that the cost of responding to an outbreak is three times the cost of preparing for an outbreak, with regards to emerging infectious diseases, the virus going to cause the next outbreak in any country is unknown and therefore the need to engage African communities to build resilience - our people do not understand science, hence the science gap. One key determinant of stopping and spreading an outbreak is the amount of time between the primary infection and the diagnosis of the index case and subsequent cases, people are affected in the communities so how do we engage them to get them prepared and understand the scientific contents coupled with fake information, misconceptions and traditional and cultural beliefs.

The main focus of DRASA is education and training through launching a simulation training programme in collaboration with government to ensure people practising in the health sector and those still in school are trained on how to identify, diagnose, manage, treat and contain infectious diseases. Basic IPC, most facilities are not practicing Infection Prevention and Control. The communities and schools (secondary school) are engaged on the proper ways to wash their hands, how to keep their environment clean, effective sanitation. Ultimate goal is to incorporate health and hygienic practises into the curriculum, looking into locally manufacture infection control materials, building resilience, facing cultural, religious

beliefs and traditions are challenging. DRASA has started with establishing health and hygiene clubs in schools and lessons include:

- to find ways to incentivize behavior change and knowledge sharing among ambassadors by engaging students in the communities through skits which were effective ways of communicating to the students
- give the community ownership in the way the information is communicated - another effective way to build resilience
- find members of the community who are already playing a role you can leverage to spread knowledge
- utilize traditional media channels to reach the public but also find creative ways to engage communities on a deeper level - Also partner with media(radio) stations to broadcast periodic talks and topics on disease outbreaks, a lot of education and knowledge sharing on social media platforms

5.1.3 Raising Awareness of Biological Nonproliferation and Biosecurity in Mali - Outcomes of a Training and Awareness Workshop: Kadiatou Dao

Mali goal through the CRDF is to promote the non-proliferation of biological agents through the improvement of practices on biosecurity and biosafety in health facilities, training and workshop was organised to (a) make local decision makers and technical partners aware of the need for the implementation of international projects and agreements on biosecurity and biosafety, (b) Identify and train biosecurity and biosafety managers of laboratories in required basic skills and (c) to determine the basic level in biosecurity and biosafety of 12 laboratories of reference centers and hospitals in Bamako.

Phase one of the training workshops involved a discussion panel on the need for projects, treaties and international agreements implementation related to biosecurity and biosafety in Mali in collaboration with the Mali Association of Biosafety and Biosecurity (MABB). Phase two centered on the training of 22 biosecurity and biosafety officers from national laboratories on laboratory biorisk management and dual use of biological agents. Phase three is to determine the basic level in biosecurity and biosafety of 12 laboratories of reference centers and hospitals in Bamako

Outcome of the conference is to strengthen Malian Biosecurity and Biosafety legislation; develop national guidelines for Biosafety and Biosecurity; develop a cross-sectoral national laboratories policy document and appoint national focal points of the Convention on the Non-proliferation of Biological or Toxin Weapons (BWC), and the UN Resolution 1540 (UNSCR 1540)

Training Recommendations to the authorities and directors of central services, centers of reference and hospitals included

- Develop a National Biosecurity and Biosafety Policy and a Laboratory Biosecurity and Biosafety manual and support laboratories in the accreditation process
- Adopt a biomedical waste management plan in compliance with the environment and the population health
- Integrate the position of Biosecurity and Biosafety officer in the organization chart of services, and ensure the continuing training of the officer and Increase the training sessions in Biosecurity and Biosafety
- Create a platform for the exchange between laboratories – networking

5.1.4 Knowledge Accumulation from Disease Outbreak Response: Joshua Hutton *(Doctoral Candidate from the Science Policy Research Unit (SPRU) - University of Sussex)*

According to research presented by Mr Hutton; there were 3 ways the outbreak of Ebola was responded to when it first broke out:

- Surveillance was ignored and the first thing to note about the crisis is that everything that had been set up to ameliorate the insecurity constructed didn't materialise. The outbreak began in Guinea in December 2013 but wasn't even reported until March 2014 and even then WHO didn't fully recognise the problem until August – surveillance had been delayed for three months and then ignored for five months more.
- WHO's late response also meant that the international resources it had been tasked with mobilising were not there until the outbreak was already devastating. This is in addition to the three most affected countries having some of the weakest health systems in the world and not having implemented fully the IHR core capacities which were supposed to be binding.
- Finally, the Biomedical Countermeasures were not existing - western science R&D and pharmaceutical production machine didn't exist. Ebola was first discovered in 1972 and we didn't have a vaccine or treatment until 2013

There was therefore an action review as academics and studies were started to conceptualize and convert knowledge gained into some form of technology, the only problem was that in a disease outbreak, different pathogens required different responses – event heterogeneity and ambiguity. A 6-member Ebola Interim Assessment Panel was constituted; data collection was through documents

(academic and grey literature, lessons learned reports) and interviews (responses from personnel and panel members). Preliminary outcomes centred on these five top lessons – there is the need for:

- Medical Countermeasure Production
- Rapid Research and Development
- Surveillance
- Empowering WHO Operations (WHO doing what it is expected to do)
- Community Involvement (is key in preparing communities to respond to an outbreak)

Lesson learning could be made better and these types of evaluations could benefit from wider stakeholder engagement to increase buy-in for implementation, this isn't just engaging experts but the affected communities, response organizations, and private representatives.

Decisions not just on the recommendations but also on the processes and methods of investigation should be distributed to allow for an exploration of the tacit issues relevant to each stakeholder, rather than a structured and constrained approach that pre-destines certain lessons with more frequent reviews for smaller outbreaks, and consolidation meetings to investigate cross-event issues for more systematic knowledge accumulation

5.1.5 African Ethical Dynamics in Public Health Emergencies: Samuel J Ujewe (*PhD. Institute on Ethics and Policy for Innovation - McMaster University, Hamilton ON, Canada)*

When we talk of drugs and vaccines in infectious diseases, the technical scientific approach typically constitute about 30% of the solution. The 70% of the solution will be other things that we forget to talk about, and the ethic dimension to this issue is inclusive of the other many things that forms the 70% and Prof G.B. Tangwa has been concerned about the virtual absence of an African voice and perspective in the global discourses of medical research ethics, the standard approach therefore in African ethics in public healthcare is to take the standard principles in biomedical ethics, these are the four key principles around which everything revolves around Dr Ujewe recounted:

- **Respect for Autonomy:** Informed consent - Involving the patient in making informed and voluntary decision, intentionally, with understanding, and without any controlling influences
- **Principle of Non-malfeasance:** requires a practitioner to not intentionally cause harm or injury to a patient, either through acts of commission or omission
- **Principle of Beneficence:** Healthcare practitioners have a duty to be of benefit to the patient, taking positive steps to prevent or remove harm in the patient's way

- **Principle of justice:** defined in terms of fairness in the distribution or administration of healthcare services and/or resources.

The Involvement of WHO during the Ebola outbreak was when they had to come in to consider and assess the ethical implications for clinical decision-making of use of unregistered drugs for Ebola, that needed an ethical approval, ethical ways to gather data, ethical criteria for prioritizing the use of unregistered experimental therapies and vaccines and ethical criteria for achieving fair distribution of Ebola drugs in communities and countries

WHO agreed therefore to use the Ethical criteria based on traditional research ethics, professional ethics, public health ethics and global health ethics in the dissemination of the vaccine including transparency about aspects of care and trust, fair distribution in the face of scarcity, ppromotion of cosmopolitan solidarity, informed consent & freedom of choice, confidentiality and respect for persons as well as preservation of dignity & involvement of communities

Distribution was going to be a key aspect in the use of those drugs, a framework on distributive justice in healthcare was pushed to; (a)Distributive justice: fairness between and within countries (b) Reciprocity and social usefulness (c)Families and communities to be involved, to the extent possible

The ethics of responsibility transcends beyond a local village or community to include the global community, the ethical responsibility is built around the fact that we are inherently interconnected an individual's existence is dependent on the existence of other persons sharing a lot of things in common. Values which ensue from the ethics of responsibility principle include compassion, solidarity, reciprocity, cooperation, interdependence and social well-being – these constitute the moral principles that impose duties on individuals with respect to the community and its members. African Ethic emphasises communal responsibility as a basic principle

During the Ebola outbreak in West Africa, there were criticisms of the rest of the world as they stood unwatched for a long while before everybody gathered around to help reason being that initially Ebola didn't seem to present a global danger, it was apparently localised until it became obvious every country in the world was at risk that everybody became seriously involved to support. From another angle it could be either self interest or self defence

Earlier this year in Southern Africa, the San code of research ethic was passed to emphasize the principles of respect, honesty, justice and fairness, care, and process. South Africa, Namibia and Botswana making up the San ethnic group, have a lot of local knowledge used by pharmaceuticals to advance drugs. This is the first attempt to incorporate African ethical values into a research ethics

process and one African approach which have come through to be recognised and accepted as a code ethic.

5.1.6 Social Determinate of Health: Dr. David Houeto (*MD, MSc, PhD – University of Parakou, Benin)*

Knowledge and psychological experience of healthcare workers to the Lassa fever epidemic at Borgu-Alibon Regional Hospital (Benin Republic) in 2016.

Benin experienced EIDs through Lassa. A survey was conducted on health personnels in the Borgu-Alibon Regional Hospital and their activities and their performance and why they were not dealing with social determinate of health, their knowledge in psychological experience to the Lassa Fever epidemic when the Lassa fever epidemic broke out two years ago – how were the health care workers in the Regional Hospital taking care of the patients

The objective of this survey or activity was to (a) describe the knowledge the healthcare workers had about Lassa fever (the symptoms, complications etc) and (b) to know what lessons they have learned from the orientation of health centres activities in dealing with these health issues. Ethical considerations were also factored in the survey, the study was submitted to the local committee and informed consent signed.

Outcome of study or survey showed majority of the interviewees has poor level of knowledge of Lassa fever, 52% had no knowledge about Lassa fever, the staff had the feeling Lassa fever is mainly fear and stress. Factors associated with the level of knowledge of the staff were occupation - medical doctors and physicians were very well aware of the disease and very well qualified in the process, those who had had training about the disease also were knowledgeable about the disease. The poor level of knowledge of the disease by nursing staff of the hospital could not help in taking good care of those affected with Lassa fever, meaning much care was not given to social determinate of health. There is a strong need of training in EIDs for the healthcare system and at the regional hospitals and universities.

Lassa fever disease is a disease associated with poverty, therefore the need to change the social conditions of the population. There is the need to reconsider the social determinate of all these diseases on our continent

5.2 ABSTRACT PRESENTATIONS

5.2.1 Assessment Of Level Of Information, Attitude And Healthy Practices Towards Prevention And Control Of Lassa Fever Among Traders In A Rural Nigerian Community; A Case For Community Engagement: **Azuka Adeke** (*Member, West Africa College of Physicians*)

Lassa fever has continued to cause outbreaks yearly in Nigeria, rural areas are the most at risk due to the vector or rodent that is commonly found in these settings - *Mastomys natalensis* which transmit the disease to humans and have been prevalent in some parts of West Africa. Study conducted show the possible risk factors as poor hygiene and use of buildings for both residential and commercial purposes (storage of food items), poor infrastructural and communication facilities in rural areas may contribute to low awareness

By February of 2016, at least 19 out 36 states of Nigeria had recorded cases of the disease. Outbreak of Lassa fever in Nigeria in 2016 showed that people are not applying preventive measures against the disease and this study was carried out to assess the level of information among rural dwellers who may not be able to access the media and to take steps to effect health policy that could benefit the people.

Methodology used was a descriptive cross-sectional study in a rural market at Nwezenyi, Ebonyi State Nigeria and included traders dealing with food items. Interviewer-structured questionnaires were designed and analysed data represented using frequencies and proportions

Results of study - Gender distribution – 34 (80.95%) of the respondents were females, while the remainder (19.05%) were males. Age distribution – about 74% between 21-40 years, marital status – 76% were married. Level of education – about 1/3 no education, 35% had only primary, about 1/3 had secondary education

With the level of lack of knowledge, poor attitude and practices of control measures against Lassa fever, despite the prevailing burden in Nigeria, every means possible must be done to improve community engagement about this disease especially to the rural communities.

Recommendations include: Government should improve on awareness campaigns to rural communities through locally adapted measures, Inclusion of community members in designing and implementing plans and policies on infectious diseases for sustainability, Training of community and religious leaders about infectious diseases and improved utilization of Community Health Workers

5.2.2 The Construction of Risk in a Disease Outbreak: **Tom Rausch** (*PhD Candidate, Queen Mary University of London)*

According to Mr Rausch, risk perception is dependent on the discourse around the risk message; the way risk is framed will define the risk action of participants of an experiment or study or will define the reaction of the people the study is trying to reach. Risk perception is dependent on the discourse around the risk message. Risk is not just analytical constructive, experiential relies of images and associations, linked by experience, to emotion and affect, but risk understanding depends on personal background and emotions and facts.

From a societal approach modernisation led to evolution from a society rooted in production of wealth to a society controlled by the production of risk and interpretation of these consequences is causal and risks may be magnified, dramatized or minimized; they are open to social definition and construction, not set in stone but constructed in our society and from the cultural or symbolic approach, risk serves to construct cultural boundaries in people to the extent that people stay in the boundaries of their society and uphold of social and cultural ideas about self and other.

Both address pervasive political and cultural nature of risk impacting social life and subjectivity and basically shift away from monologism to dialogism with interaction between human beings at the centre of the construction of versions of risk – moving away with the understanding that risk is only passed on from one source to the next, it's not just a transfer but something that is created in dialogue between different parties and other members of society – scientists, public, media etc

To deal with risk from a social construct is to approach it from the field of linguistics - Theoretical Linguistics deals with language structure and the nature of language itself for instance semantics which is the intrinsic meaning of different words, syntax which is about language structure and the nature of language. Applied linguistics which deals more with real world problems concerned with the relation of knowledge about language to decision making - foreign language education, forensic linguistics and translation and interpretation. Applied Linguistics allows the study of how framing selections are achieved for instance should risk message be introduced in one language, or only in English or be produced for each particular community with diversified language?

The analytical framework deals with 'when health officials and researchers focus on 'information' as the only part of human communication in health, they fail to incorporate how humans have been biologically, cognitively, genetically, and emotionally build and wired to communicate with themselves and to others' (Odugleh-Kolev 2014: 242). Emotions play an important role in miscommunication, analysis of attitude in communication affect, judgement and appreciation

The main focus of the project states (a) risk as a discursive construct where shared understandings are developed and negotiated in ongoing conversation, (b) there is the transfer approach and cultural

approach to risk communication. The transfer approach is where risk messages produced at a point and just pass out to different recipients, this approach should be moved from to cultural approach where risk direction is created in a multi directional faction, allows stimulate debate and there is a transfer between different parties that all contribute to understanding the message of risk and (c) Development of a framework for the analysis of systemic patterns of emotionality in the communication of a health consortium to investigate how we come to an understanding of the nature of risks connected to infectious diseases.

5.2.3 An Analysis of Medical Laboratory Capability in Pre and Post Ebola Sierra Leone: Hafiju Maada Kanja

Before the Ebola outbreak in 2014 both public Health and clinical laboratories services in the Country were largely undeveloped. Due to weak infrastructure, inadequate numbers of skilled personnel and lack of equipment, many laboratories in all the four stages were neither performing to capacity nor meeting the needs of the Basic Package of Essential Health Services (BPEHS). At the district level there were minimal supervision and coordination of the PHU laboratories. There was no intermediate technical supervisory, coordinating and monitoring unit between the districts and the central levels. Analytical Clinical services were often restricted to minimal clinical tests achieved in health facilities

Laboratory facilities used to have limited trained and qualified staff and dilapidated infrastructures in some part of the Country, lack of testing capacity in the country for haemorrhagic fever at central level and in most secondary and tertiary facilities

A: Clinical Laboratory before Ebola outbreak B: Upgraded Central Public health laboratory

The Public Health laboratory was upgraded in 2010 to diagnose some epidemic prone diseases before the outbreak of Ebola such as, Elisa, Cholera, Tuberculosis etc. Medical Laboratory Staff Before 2014 EVD Outbreak on District/Regional levels were only 10 medical laboratory Scientist nationwide and 219 medical laboratory Technicians with Diploma In Med. Lab. Sciences

In responding to the Ebola epidemic in 2014, major gaps were exposed in the availability of adequate specialised Laboratory Scientist, presence of out-dated equipment and infrastructure, lack of biosafety trained personnel and deficient IPC practices and the laboratory system needed support to cope with the demand for rapid and reliable testing, and ensure the safety of laboratory staff and their communities.

To improve the management of Ebola patients and break the chain of transmission, it was necessary to decrease the turnaround time to less than 24 hours. At the height of the EVD epidemic, International Partners and WHO, supported Ministry of Health and Sanitation (MoHS) to improve laboratory performance, therefore in close collaboration with MoHS and WHO, improvement were made in the use of Laboratory data to inform accurate and timely decision making in support of an effective respond to Ebola.

In August and September 2014, many International field Laboratories responded to the appeal made by the United Nations and WHO and offered assistance to the government of Sierra Leone, and deployed their field laboratories (16 labs from 10 countries) and supplies bio hazard materials. The SOPs used were approved by WHO and the Sierra Leone Ministry of Health and Sanitation (MoHS). The diagnostic results were released immediately after the specimen analyses were completed

Field Laboratories

Training on the use of PPE was continuous process which aided most of the laboratory staff and other health care workers to win the pathological fight, over 400 Laboratory workers were trained, including Sierra Leonean Army and Prison staff, led by British Military Personnel who ran the UK-led Ebola Training Academy in Freetown

A: Training on use of PPE

B: Training of Lab Workers

C: Training of Army and Prison Staff

Role of laboratory in the outbreak included diagnosis of suspected cases satisfying case definition, testing of swabs samples from corpses during the epidemic, testing prior to discharge, Genomic sequencing, viral persistence studies and convalescent blood/plasma studies

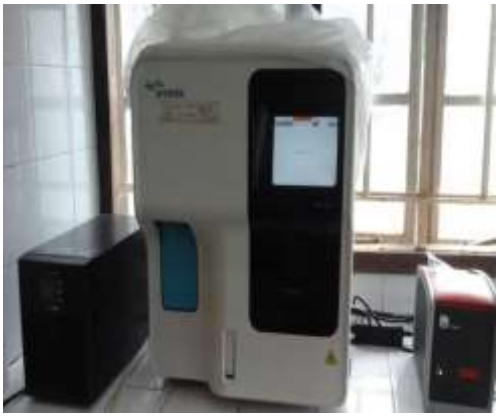
5.2.3(i) The effect of the Intervention of Government on the Lab Services in Sierra Leone

New laboratories were constructed by the government of Sierra Leone and international partners (Public Health England) - at the Bo Government Hospital in the southern part of Sierra Leone and also at the Makeni Government Hospital. Training of Laboratory staff in Biosafety and Biosecurity is a continuous process and supply of Laboratory equipment in these labs has been done.

The Association of Public Health Laboratories (APHL) provides technical assistance to strengthen Sierra Leone's laboratory system in collaboration with the country's Ministry of Health Sanitation (MOHS) and to expand APHL's long-standing commitment to laboratory capacity building in Sierra Leone. APHL supported the development of laboratory management guide, the CPHRL institution toward accreditation via goal assessment, training and mentoring and completed the renovations needed at the CPHRL


Some staff of APHL

Partner's In Health (PIH) is also an International Organization, currently engaged in training of Laboratory staff in good laboratory practices, biorisk, biosafety and biosecurity management and have provided automated and standard laboratory equipment and have also renovated some of the MoHS laboratories.



Automated and standard laboratory equipment provided by PIH

The laboratory plays a critical role in combating the Ebola virus disease. Laboratory results were required for vital decision making such as quarantine of households and communities, treatment and discharge of patients. The work of these laboratories was facilitated by ensuring an efficient pre-analytical phase and post-analytical phase: collection, packaging and transport of samples and the dissemination of the result to various stake holders for action.

Post Ebola and currently, Sierra Leone Laboratory system is well prepared and equipped to respond to any outbreak as it has a good number of trained and qualified laboratory scientist and technicians, and the construction of Biobank in South Africa, to arrive in Sierra Leone in March 2018, which has B2 and B3 labs which is funded by GPP and facilitated by GET Sierra Leone.

5.2.4 Escapades of the 48 year old terrorist of Nigerian Extraction - Lassa virus: Dr Uche Unigwe (*FWAC, MPH MTropMed - Nagasaki*)

This presentation sought to appreciate some of the current challenges in the control of Lassa fever in the Nigerian environment, identify gaps and confounding issues in Lassa fever case control/ management and set the tone to further brainstorm on prospective containment strategies. Approach to the study is descriptive using field experience in the management of Lassa fever over a 10 year period, findings from biomedical collaborative research with the Nagasaki University Institute of Tropical Medicine and a lot of evidence from key stakeholders in the fight against Lassa fever in Nigeria.

Unique strategies employed to contain the virus from rapid spread of 6 states affected 10 years ago to 30 states currently include the suppression of organ function by cytokines and other soluble mediators of inflammation–end organ damage, capillary damage which leads to increased vascular permeability-vascular damage, depression of T-lymphocyte counts which predisposes to profound viraemia-immune impairment among others

5.2.4(i) Challenges to the Control and Management of Lassa Fever

Challenges encountered in the management of the Lassa fever epidemic is classified under five broad categories: Clinical, diagnostic, virology, public health and social issues

- *Clinical challenges* – the fever presents with symptoms and signs not exclusive to any particular body system thus a high index of suspicion is needed to make the diagnosis. Late diagnosis and missed out cases are a common feature with clinical management delay which allows the development of complications and worsens the prognosis
- *Diagnostic challenges* - serological diagnosis, delay in immune response (IgM) due to suppressive effect of the virus, issues of reliability of interpretation of the results (IgG) in Lassa fever endemic areas and sample results coming out negative despite very strong clinical suspicion and response to Ribavirin
- *Challenges in Virology* –development of new mutants of LF virus; resistance to ribavirin. A typical presentation of many cases (mutants), increase in complications among patients presenting from the south-east (S.E) region of Nigeria and the perennial nature and gradual loss of seasonal variation in LF epidemics in the last few, are there mutants not responsive to current primers? Is resistance to Ribavirin therapy developing, increased CFR of the epidemic? Casual observation reveals more complications and possibly worse outcomes by infections of the South East strains. Are these observations clades specific or do we have other vectors beyond *Mastomys natalensis* that may be reservoirs of Lassa fever?
- *Public Health Challenges* - In the past, "point sources" of the infection could be easily identified through contact tracing but recent epidemics are not limited in their spread as several communities are affected simultaneously. Far more community transmissions than nosocomial (hospital-based) transmissions-speculated that for every LF case reported in the tertiary hospital, over five cases may have been missed out in the communities.
- *Social Challenge* - morbid fear among healthcare workers, denial by patients and their relatives in hospitals and communities coupled with discrimination and subtle stigma against those who have become victims of LF, with the complications of permanent disability e.g deafness may interrupt re-acceptance into community – all these issues compounds attempts at the management and control of LF.

Two thing that can be leveraged on are the Loop mediated Isothermal Amplification (LAMP) - a simple, rapid, specific and cost-effective nucleic acid amplification method, characterized by the use of 4

different primers specifically designed to recognize 6 distinct regions on the target gene and the prospects with Favipiravir an antiviral drug that selectively inhibits the RNA-dependent RNA polymerase of influenza virus (a unique MOA. It also blocks the replication of many other RNA viruses). Trials conducted for Ebola with promising results and trials expected for Lassa virus

Prospects on this study shows genomic characteristics of LF strains identified, extensive capacity building for Healthcare Workers, effective public health approaches and review treatment protocols (Ribavirin)

This study suggest that the weapon of FEAR must be addressed, funding for research to develop /study new medicines and characterize clades, develop LAMP PCR primer for rapid diagnostics and update primers for regular PCR, increase skills of health personnel and number of diagnostic centers, extensive social mobilization for communities to reduce stigma, discrimination, denial and improving their health-seeking behavior is necessary.

SECTION 6

SUB FACULTY SECOND SERIES OF KEYNOTE ADDRESSES

6.1 Strategies for Advancing Biosecurity in the African Region: Jemechia Hoyle

There are human resource challenges in Africa so far as biosecurity in Africa is concerned, man power and personnel shortage, African countries lack specific training coupled with inconsistencies in training, lack of training resources, lack in opportunities for continuous education.

Solutions or strategies to advance Biosecurity in Africa in terms of human resources are; focusing on taking initial specimen of the entire region or continent–what capabilities we have and what are missing, identify research gaps, training of health professionals in various specialities to fill those gaps. She also noted of another strategy for advancing biosecurity and preparedness in general is to create a framework that incorporate in university curriculum biosecurity programmes that give basic biosecurity training, then the use of train the trainer approach - train people to train others.

Ms Hoyle also pointed out that dealing with the infrastructure challenges in African can also advance biosecurity by having identifying the regional and international opportunities that help infrastructures by using resources available to strengthen healthcare systems. She mentioned having biosecurity and biobanking policies in place also advance biosecurity.

Governance frameworks properly but in place also can advance biosecurity in Africa as well as treaties and laws can be used to advocate the advancement of biosecurity. Collaborations with other organisations of science and policy makers, traditional rulers, and community leaders etch help advance biosecurity issues.

In concluding her presentation Ms Hoyle proposed the following solutions for globalisation as researchers should collaborate and share their thinking, communicate and address the needs of the population, identify and train volunteers willing to help when things happen, involve the community, have a common biosecurity agenda across the African Region, create training needs in the continent, invest in the next generation through training and finally to continue to invest in the African consortiums to help augment the importance of biosecurity, by having more involvement of community, government etc

6.2 Discussions on the Future of Biobanking: Dr Jim Vaught and Dr Maimuna Mendy

Dr Mendy began this discussion by reiterating the importance of biobanking as an infrastructure for research, though Africa is not yet at the level desired for it to be hence the continuous advocate for our institutions – to provide high quality samples for research. She added that with biobanking, the goals of the West African community can be achieved both in human and animal biobanks. What is important in biobank is organised facilities, good governance, connection to good IT, another importance is about the social issues making sure participants are protected, and confidentiality intact, do not provide access to samples and data not authorised by participants

Jim adding to the discussion stated that there are a lot of issues related to not adopting informed and best practises, because of the importance of biobanking it is really necessary to adhere to best practices. There isn't enough formal training on biobanking and there are some inconsistencies. Speaking about the future of biobanking Jim noted that there should be more catalogues of biobanking collection which can be shared with other bio bankers and said BBMRI is on the fore front of biobank cataloguing.

A participant suggested countries pull resources together and collaborate instead of each country trying to set up a biobank, since countries do not have the money to do so much of this, Dr Mendy noted there are already three bio repositories in Africa funded by the H3 -The H3 Africa Project (Nigeria, South Africa and Uganda) is well located to serve in the different regions. Biobanking has to do with research, therefore any facility collecting samples will have to have some biobanking activities there, but different biobanks can be specialised in different things so that when the environment is conducive enough for

transportation of samples, it can be circulated and stored in one location. This is dependent on purpose of your collection, the biobank and the funding available.

Dr Vaught commenting on biobank networks held that in the US biobank does not corporate really with each other, they operate independently. But however spoke about the advantages of having biobank networks as increases the power of studies through the increased number of samples for research, forces people to think more about incorporating and patronising Standard of Procedures and material transfer agreements (MTA), informed consent documents and so forth. Biobank networks enhance information and data sharing. He also put forth that there are some dangers associated with biobank networking – material transfers, politicians.

Dr Mendy in adding to the obstacles of biobanking networks mentioned technical issues – logistics of transporting samples across Africa is an issue/cannot be active in Africa, these and others are the technical obstacles/barriers for creating centralized biobanks in Africa at the moment. WAHO have started this for West Africa – looking at logistics of transporting samples from different countries in Africa

The advantages however of having these networks of biobanks in different communities serve as security by storing duplicate samples in other networks

A participant, Dr Barry in commenting noted that governments like the idea of biobanks but are scared of the cost implications, therefore suggested a biobank established by a number of countries in a specific area for use of those countries to help in cost sharing – for instance one biobank for ECOWAS countries with segregation for countries

6.3 An Overview of Immunization in Ghana: Dr George Bonsu (*National Programme Manager Expanded Programme on Immunization Ghana*)

Dr Bonsu began his presentation by saying vaccination is one of the most cost-effective public health interventions which is seen as a comprehensive disease control strategy and also a key to the health of children. With the advent of Global Vaccine Action Plan (GVAP), the focus of immunization has moved from mortality to morbidity and economic impact, more of country ownership, reaching every community to reach every child. Immunization through the EPI programme according to Dr Bonsu began in Ghana actively in 1978 with 13 vaccine preventable diseases targeted. This EPI programme is delivered in accordance with WHO's Reaching Every Child Strategy with five key strategies:

- Planning and management of resources through effective micro planning, better management of human and financial resources
- Reaching target populations or groups by improving access to immunisation services to all
- Linking services with communities by partnering with communities to promote and deliver services
- Supportive supervision through regular on-site teaching, feedback and follow-up with health staff
- Monitoring for action by using tools and providing feedback for continuous self-assessment and improvement

EPI has achieved a lot since 1978 - conquered most childhood vaccine preventable diseases, strengthened health systems and contributed to reduction of Under Five Mortality from 111/1000 LB in 2003 to 60/1000 LB in 2014 (GDHS)**.** Ghana partnered with WHO on the pilot implementation of RTS, S/AS01 malaria vaccine in January 2017 together with Kenya and Malawi – introduction of the vaccine start in quarter two of 2018

Dr Bonsu concluded by stating that high political commitment, increased domestic funding for vaccines and supplies, addressing inequities in coverage, and strengthening the health system to achieve effective coverage among others are the pillars that will sustain the gains in immunization.

6.4 Optimizing Research during Public Health Emergency: Prof. Jeffrey Mphalele

Prof Mphalele started his presentation by stating that research during public health emergency requires very much attention and the key issues include whether lessons learned after the Ebola epidemic can be applied to future outbreaks. What is needed for the African region to position itself for research preparedness to become a destination of choice for research when there is epidemic

Public health threats affect economic sustainability of countries, combating such threats require multiple approaches and access to universal health coverage is the universal goal of all the approaches for controlling future epidemics and to ensure effective prevention, early detection and warning and response for public health emergency. During epidemics of any kind, many types of research can be carried out and optimized to ensure preparedness and also have access to emergency financing during an epidemic outbreak

Prof Mphalele made it known that there are certainly barriers for prioritizing research studies during the time of epidemic and the most important thing is; when there is an epidemic frontline workers argue

that the priority is not research but to save lives. Most African countries are under investing in the area of research due to economic drought and researchers should be advocating for more

He concluded by appealing to all African countries to prioritize or invest in research studies during outbreaks and makes it the norm because it is only through research that public health can be improved and advanced, prevent illness and save lives. The only opportunity available for infectious diseases which have potentials for public health emergency is during epidemics to offer the opportunity to field text the efficacy and effectiveness of the health interventions like vaccines and drugs

SECTION 7

CLOSING REMARKS

7.1 Closing Remarks by Prof Akin Abayomi

Prof Akin Abayomi giving his closing remarks thanks all conference participants for their participation and sought to draw the attention of the meeting to an announcement on the internet about a drug – Rampinarez, a broad spectrum anti viral vaccine, has an extra ordinary potent antiviral activities against a broad range of pathogens. Based on many stages this drug can be given intravenously – side effects are reversible. This drug have been received by the food and drug administration of the United States for the treatment of Ebola Virus Disease

Prof Akin noted that during this conference a number of people presented interesting capacity presentations which has made it apparent that there is sporadic capacity development in various parts of Africa when it comes to bio security and biobanking – he informed the conference of a meeting between experts in biobanking and biosecurity to discuss the importance of biosecurity and biobanking to the continent of Africa. Several salient points were discuses – the outcome being a statement put out which will be one of the outputs of this 3Rd African Conference on EIDs. Previous meetings have had declarations (Dakar, Lagos) but this meeting will be a statement. Statement was made or put forth as follows

The level of awareness on the importance of biosecurity amongst policy makers and scientist in Africa is low and most countries are reacting instead of preparing for biosecurity challenges. There is a need for corporation and synergy amongst experts in Africa in developing bio security systems and frameworks to harmonize a pan African approach to biosecurity development on the continent

To address biosecurity issues in Africa we need to build human resources, build infrastructure and develop the appropriate governance structures. There is a need for a compendium of biobanking and biosecurity experts in Africa that will identify the areas of expertise and also the various biobanking and biosecurity projects in countries in Africa. the Global Emerging Pathogens Treatment Consortium(GET) and its sister organisations like WATER facilitate the development of this compendium–GET and partners should be a platform of engaging policy makers like the Africa Union, regional bodies and national bodies in developing biosecurity systems and policies in Africa

Prof Abayomi in ending his remarks quizzed where the 4th African Conference on EIDs and biosecurity should be held–should the conference stay in the region of West Africa or to another region in Africa, which region? Threw a challenge to anybody interested in hosting next year's conference should send bids for consideration of strategic importance of the location.

He made a last appeal in connection to Dr Ada, a survivor of the Lagos Ebola outbreak – she was one of the first people to come into contact with the index case of Lagos outbreak, she and her senior consulted Dr Adadevor contracted the Ebola (Dr Adadevour couldn't survive the virus). Dr Ada is part of the GET Consortium who is currently in the United States to study or advance her career in Public Health and have run out of funding – trust fund set up for her to complete her studies dried up. GET has launched a fund to support her. The appeal is to reach out to GET to support DR Ada complete her studies.

He expressed his heartfelt appreciation to Prof Koram for hosting the conference, the event planning team, security team, sub faculty chairs an all participants and to the first lady of Ghana for gracing the occasion, to the people and country of Ghana.

7.2 Closing Remarks by Prof Koram - LOC

Prof Koram expressed his gratitude to all for their presence and participation for the past three days and thanked all for putting the programme together – programme has been helpful. He noted that there are certain elements that don't get discussed during such conferences and one that comes to mind is to have some technical capacity aligning countries or regionally to be able to maintain the various equipment and things that will be needed to keep the research and biobanks going - he suggested the need to find a slot for such discussion or organise training or workshop for local participants for the routine maintenance of the various things that will be needed to tackle these things – GET should take the lead. He wishes all participants well and safe journey back to their various destinations and added that hopefully next year, we get to meet around the continent.

APPENDIX A: PARTICIPANTS

3rd African Conference on Emerging Infectious Diseases & Biosecurity			
Attendance List			
#	**Name**	**Designation, Country**	**Email**
1	Abdoulaye Nikiema	Society for Laboratory Medicine	Anikiemadlaslm.org
2	AbdulAzeez Anjorin	Lagos State Uni	abdul-azeez.anjorin@lasu.edu.ng
3	Abera Kebede	DTRA, Ethiopia	melatkeb@yahoo.com
4	Abraham Hodgson	GHS	
5	Adisu Kebede	Ethiopian Public Health Institute	Adisukebede78@yahoo.com
6	Adusei Boakye Paul	ASDFA	paulgeek0247@gmail.com
7	Aka Kouadio Ayebe Edwige	Institut Pasteur de Cote d'Ivoire	ayebedwige@yahoo.fr
8	Akin Abayomi	South Africa	abayomi@sun.ac.za
9	Akin Osiboguin	LUTH Nigeria	akinosibogun@yahoo.co.uk
10	Alan Christoffels	South African National Bioinformatics Institute	alan@sanbi.ac.za
11	Alpha Barry	Sante Plus Organization	alphaguinea@gmail.com
12	Amponsah Frederick	MOH, Ghana	
13	Antiekus Amma	MSF	
14	Anum Joseph	MOH HQ Ghana	
15	Azuka Adeke Stephen	Federal Teaching Hospital Abakaliki	Dekez84@gmail.com

16	Barry Alpha Mahmoud	Guinea	DHOVETE@gmail.com
17	Bonnie D Jenkins	Broo Kongs district, USA	Bonniedjenkins@gmail.com
18	Bonginkosi Duma	National Health Laboratory Services - NIOH	bongi.duma@nioh.nhls.ac.za
19	Cedric Aperce	VERTIC UK	Cedric.aperce@vertic.org
20	Claire Standley	Georgetown Uni	claire.standley@georgetown.edu
21	Clement Jaidzeka	GET	cjaidzek@gmail.com
22	Col S O Bel Nono	USAID, predict Ghana	
23	David Harper	Chatham House	david@harperpublichealth.com
24	David Houeto	School of Public Health Uni of Parakou	DHOVETO@gmail.com
25	David Olaleye		davidoolaleye@gmail.com
26	Diakite Mandiou	Uni Gamal Abdel Nasser	mandioud@yahoo.fr
27	Dr. Bamidele Mutin	MOH, Lagos State	drmutiu@yahoo.com
28	Dr. Erinosho A. E	GSMOH	egeniola@gmail.com
29	Dr. Ismail Abdussalam	MOH, Lagos state	dradeshina@yahoo.com
30	Elsie Hayford	Accra College of Medicine, Ghana	eehayford@gmail.com
31	Erik Bongcam Rudloff	University of Agriculture sciences	
32	Eunice Sakyiwaa Obeng	Ghana	ghobeng@yahoo.com
33	Evangeline Obodai	NMIMR, UG	evaelli@gmail.com
34	Fadomouglo Kodjo Yao	Ecowas Benin	
35	Francis Dennis	NOGUCHI, Legon. Ghana	
36	Gbe Nouka Nobe	Ecowas Benin	
37	George Armah	NOGUCHI, Legon. Ghana	
38	Georgina N. Odaibo	Nigerian	foreodaubo@hotmail.com
39	Gregers Chalker	Air Filter Maintenance Services International	gregers@afms.bz
40	Hafiju Maada Kanja	GET Sierra Leone	hiukanja@gmail.com
41	Heba Diab	US Department of State	DiabHI@state.gov

42	Helen Rees	Univ of Witwaterand SA	
43	Hoyle Jamechia	Next Gen health security	Jamechia.hoyle@gmail.com
44	Jeffrey Mphalilele	SAMRC South Africa	Jeffrey.Mphahlele@mrc.ac.za
45	Jide Idris	Commission for health, Lagos	jide.idris1@gmail.com
46	Jim Strong	Public Health Agency of Canada	jim.strong@phac-aspc.gc.ca
47	Jim Vaught	ISBER, USA	jvaught44@gmail.com
48	Joao E Cossa	African Gong Mozambique	
49	John Amuasi	GET, Ghana	
50	Jonathan Ashcroft	Public Health England SL	Jonathan.ashcroft@phe.gov.uk
51	Jonathan Asherant	PHE, UK	
52	Joshua Hutton	Uni of Sussex	J.R.Hutton@sussex.ac.uk
53	Josphesus J Ellie	GET Sierra Leon	josephusellie@yahoo.com
54	Ken Ugwu	Global Affairs	Ken.ugwu@international.gc.ca
55	Kristin Peterson	University of California	kris@uci.edu
56	Leslie Winster	DTRA ,US	
57	Linda Boatemaa	NMIMR,UG	lindaboatemaa@yahoo.com
58	Maggie Lamborn	CRDF Global	mlamborn@crdfglobal.org
59	Maimuna Mendy	Agency for research on cancer biobank	MendyM@iarc.fr
60	Mary Eve Konam	GAC/OAFLA	
61	Mary Lancaster	DTRA, US	MARY.J.LANCASTER5.civ@mail.mil
62	Mbaye Elhadji Mamadou	IRESSEF Dakar Senegal	elthadjimbaye@gmail.com
63	Michael Amyeetey	MOH Ghana	
64	Michala Nayahoyph	BBHNI ENC AT	
65	Nataly Spears	Global Affairs Canada	nataly.spears@international.gc.ca
66	Niniola Soleye	Dr. Ameyo Stella Adadevoh (DRASA) Health Trust	nsoleye@drasatrust.org
67	Norbert Georg Schwarz	Bernhard Nocht Institut for Tropical Medicine	schwarz@bnitm.de

68	Opayele Victor	Nigeria	waleopayele@yahoo.com
69	Osman Kargbo		Osboy.sole@gmail.com
70	Oumou Maiga Ascofare	BNITM	maiga@bnitm.de
71	Ousman Conteh	MOHs Sierra Leone	osconteh@gmail.com
72	Pasquace De Blasio	ISENET, Italy	pasquale.deblasio@isenet.it
73	Primus Che Chi	Kandinski Institute Sweden	Chiprimus@gmail.com
74	Prof. Kwadwo Koram	GET	kkoram@noguchi.ug,edu.gh
75	Ricardo Strauss	Bernhard Nocht Institut for Tropical Medicine	licardo.strauss@bnitm.de
76	Sahr Moses Gevao	GET	sahrgevar@ymail.com
77	Samuel Kamara	Sierra Leone	nelbamo@yahoo.com.uk
78	Samuel Ujewe	Institute of Ethics & Policy for Innovation	sujewe@yahoo.com
79	Schuster Verena	RW, Germany	schusterv@rki.de
80	Stephen Kennedy	Ministry of Health Liberia	SBKENNEDY4@AOL.COM
81	Sunday Omilabu	MOH, Lagos	
82	Susan Mensah	TERUMO BOT, Belgium	
83	Thelma G Roberts	NASSORP, Liberia	
84	Tonitse Orobo	VIGH, USA	drtoritse@yahoo.com
85	Uche Unigwe	Uni of Nigeria Teaching Hospital	unigweus@yahoo.com
86	Irohal Feanyichukwu		iriroha@yahoo.com
87	William Ampofo	Nogouchi Memorial Institute	
88	Wright Kikelomo Ololade	LASUTH Nigeria	loladewright@yahoo.com
89	Emmanuel Freudenthal		emmanuel.freudenthal@gmail.com
90	Rausch Tom		tomjrausch@gmail.com
91	Ayodotun Bobadoye		bobadoyed@gmail.com
92	Sahr Gevao		sahrgevao@gmail.com
93	Edwige Ayebe Aka		ayebedwige@yahoo.fr

94	Azuke Adeke		dekez84@gmail.com
95	Fausta Mosha		fausta_mosha@yahoo.com
96	Hilary Lopes		pehilopes@yahoo.com
97	Jeffrey Mphahlele		Jeffrey.Mphahlele@mrc.ac.za
98	Marcus Eder		marcus.eder@phe.gov.uk
99	Meagan Kay-Fowlow		
100	Sally Deffor		sdeffor@internews.org
101	Womi Eteng Oboma Eteng		womieteng@gmail.com

APPENDIX B: welcome Address from Get Chairman Advisory Board (Prof. Dirian Makinde)

APPENDIX C: Welcome Address by Principal Investigator GET and Chair of the Faculty of the Conference (Prof. Akin Abayomi)

APPENDIX D: welcome address by GET Chairman LOC (Prof. Kwadwo Koram)