SEROPREVALENCE OF VIRAL HAEMORRAGIC FEVERS IN TANZANIA: STRENGTHENING SCIENTIFIC CAPACITY FOR SURVEILLANCE AND RESPONSE

INVESTIGATORS AND COLLABORATING INSTITUTIONS

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Collaborating Partnership
This is a collaborative research project between Tanzania through Southern African Centre for Infectious Disease Surveillance- Africa Centre of Excellence for Infectious Diseases of Humans and Animals (SACIDS-ACE) in Eastern and Southern Africa and Korea National Institute of Health (KNIH). The collaborating Institutions are:

- National Institute for Medical Research (NIMR), Tanzania
- Sokoine University of Agriculture (SUA), Tanzania
- Ifakara Health Institute (IHI), Tanzania
- Muhimbili University of Health and Allied Sciences (MUHAS), Tanzania
- Korea National Institute of Health, South Korea

SUMMARY

Background: Viral haemorrhagic fevers (VHFs) refer to a group of illnesses that are caused by several distinct families of viruses. The term VHF is used to describe a severe multisystem syndrome characterised by an overall vascular system damage. Although no clinical cases of Ebola, Marburg or Yellow fever have been reported in Tanzania, its geographical position puts the country at high risk. With no known cure for all VHFs, the health systems rely on prevention and control strategies to contain new outbreaks. Early detection and diagnosis is a key trigger effective response to infectious disease epidemics.
Broad Objective: Strengthening capacity for surveillance and preparedness against viral haemorrhagic fevers in Tanzania. Specifically, the study aims to: (i) To develop and/or assess a genomics driven near-field based (multiplex) diagnostic system for surveillance of potentially high risk VHFs (Ebolavirus, Marburg, RVF, CCHF, Yellow fever and Arenaviruses) in Tanzania; (ii) To undertake a risk assessment of factors that increase the probability of incursion of VHF pathogens into Tanzania; (iii) To carry out clinical evaluation of diagnostic

tools developed under *Objective 1* in areas identified as high risk by the risk assessment of *Objective 2*; (iv) To build capacity through training of staff in the wide application of molecular and serological technologies, and their derivatives, as tools for primary analysis of diagnostic samples; (v) To assess community knowledge and livelihood practices that influence prevalence and acquisition of VHFs in Tanzania

Methods: The study will involve all five ecological zones in Tanzania. The districts to be involved include Buhigwe, Kalambo, Kyela, Kinondoni, Kilindi, Mvomero, Kondoa, and Ukerewe. Mapping of the ecological zone will be done. All age groups individuals, except those less than 9 months of age will be sampled. Sampling will be done within the complete household which is selected and no household will be replaced if the residents are not found to be at home. Individuals will be asked to provide a blood sample. A total of 5-19 ml of blood will be collected from adults and children >10 years by venipuncture and one to three mls will be collected from children ≥9 months and ≤10 years of age also by venipuncture. Information on socio-demographic characteristics (age, sex, occupation, village, workplace, residence) will be collected for each subject. History including recent history of febrile illnesses, and other risk factors will be ascertained for all participants. Clinical parameters will be documented. The study-related questionnaires will be completed for each consented and assented subject who will then formally enrolled into the study using unique identification code that will restrict direct identification of individuals. All specimens will be processed at the Genome Centre at the Sokoine University of Agriculture laboratory in Morogoro, Tanzania.

Outcomes: The expected outcomes include: (i) Enhanced capacity for risk analysis of the potential for incursion of an emerging/re-emerging disease in Tanzania; (ii) Enhanced research and diagnostic capacity to detect and identify viral haemorrhagic fevers by sharing research resources including specimens; (iii) Enhanced virological capability within the Tanzanian public health systems; (iv) Institutional collaboration between Korea and Tanzania strengthened; and (v) Policy and practice support guidance provided through research evidence.

This is a three-year project estimated to cost USD 195,000.

BACKGROUND

Viral haemorrhagic fevers (VHFs) refer to a group of illnesses that are caused by several distinct families of viruses. The term VHF is used to describe a severe multisystem syndrome characterised by an overall vascular system damage. Viral haemorrhagic fevers include the following diseases: Alkhurma haemorrhagic fever, Argentine haemorrhagic fever, Bolivian haemorrhagic fever, Chapare haemorrhagic fever, Crimean-Congo haemorrhagic fever (CCHF), Ebola virus disease (EVD), Hantavirus Pulmonary Syndrome, Haemorrhagic fever with renal syndrome, Hendra virus disease, Kyasanur Forest Disease, Lassa fever, Lujo haemorrhagic fever, Lymphocytic choriomeningitis, Marburg haemorrhagic fever (MHF), Nipah virus encephalitis, Omsk haemorrhagic fever, Rift Valley fever (RVF), Sabia-associated haemorrhagic fever, Tick-borne Encephalitis and Venezuelan haemorrhagic fever.While some types of haemorrhagic fever viruses can cause relatively mild illnesses, many of these viruses cause severe, life-threatening disease. Most of the haemorrhagic fever viruses are classified as biosafety level four (BSL-4) pathogens.

The VHF diseases which have been reported in Sub-Saharan Africa include EVD, Marburg, Lujo, RVF, Lassa fever and Yellow fever. EVD has several times, occurred in the Democratic Republic of the Congo (DRC) and Uganda (Rosello et al., 2015) and recently in Guinea, Sierra Leone and Liberia (Nyenswah et al. 2014, 2015; Scarpino et al. 2015). Yellow Fever outbreaks have been reported from Uganda, Kenya, DRC and Angola in recent years (http://wwwnc.cdc.gov/travel/notices/watch/yellow-fever-democratic-republic-of-the-congo; http://www.who.int/features/2016/yellow-fever-angola/en/). In Africa, outbreaks of Marburg haemorrhagic fever (MHF) have been reported in Angola, DRC, Kenya, South Africa and Uganda (http://www.who.int/csr/don/). Rodent borne zoonotic viral haemorrhagic fevers, including Lujo Virus have been reported in South Africa and Zambia (Briese et al., 2009). Lassa virus outbreaks have been reported from West African countries (Mylen, 2005) with frequent outbreaks in Nigeria. RVF outbreaks have frequently been reported in East Africa. Between 1930 and 2007, a total of 10 RVF outbreak waves were reported in Tanzania (Sindato et al., 2014). The CCHF, which is primarily transmitted to people from ticks and livestock is endemic in Africa, and has been reported in Egypt, Ethiopia, Mauritania, Senegal, Burkina-Faso, Benin, Nigeria, Central African Republic, DRC, Kenya, Uganda, Madagascar, Zimbabwe, Namibia, South Africa, Madagascar and Tanzania (Swanepoel, 1995; Swanepoel et al., 1987). Of all the VHF known to-date, Ebola has been the most important disease of global security concern. Ebola was first discovered in 1976 in Central Africa, the worst outbreak happened between 2014-2016 when the virus rapidly spread through West African countries of Liberia, Sierra Leone and Guinea, killing more than 11,000 men, women and children. During this period, cases of Ebola were also reported in Mali, Nigeria, Senegal, Spain, Italy, the United Kingdom and the United States.

Although no clinical cases of Ebola, Marburg or Yellow fever have been reported in Tanzania, its geographical position puts the country at high risk. With no known cure for all VHFs, the health systems rely on prevention and control strategies to contain new outbreaks.

RATIONALE

Early detection and diagnosis is a key trigger to effective response to infectious disease epidemics. Most often, delays in early detection and specific diagnosis has resulted into national and international coordinated responses to Ebola and RVF epidemics being marshalled late when the epidemic curves were at or beyond the peak (Coker et al 2011). A recent experience impact of delays in early detection and diagnosis is the Ebola epidemic in West Africa that resulted in over 10,000 human deaths (Epstein, 2016). The international response to the outbreak was marshalled when the disease was already out of control and causing health and humanitarian crises (Nouvellet et al., 2015; Epstein et al., 2015). A similar situation was recently experienced for the yellow fever epidemic in Angola (Grobbelaar et al. 2016). Where a clinical syndrome has been recognised, the absence of specific differential diagnosis has often resulted in inappropriate responses. Yet there are examples in Africa where early recognition and specific diagnosis resulted in prompt and effective response (Briese et al., 2009; Shoemaker et al., 2011; Muyembe-Tamfum et al., 2012).

Diagnostics including point-of-care for VHFs have been or are being trialled in different parts of the world. For implementation of VHFs diagnostic trials and related research it is necessary

to inform on their suitability in Tanzania. Information related to characteristics of pathogens, therefore, needs to be established.

In Tanzania, international health regulations are implemented through integrated disease surveillance and response (IDSR) strategy. IDSR utilizes traditional surveillance methods based on health facility clinical cases, developed mainly for the control of transmission of infections and early detection of known outbreaks. Although Tanzania has in place a surveillance system for VHFs (MoHSW, 2011), the performance and its effectiveness for early detection and timely response is limited. It is critical for a good surveillance system to also incorporate other sources of information such as laboratory, systematic surveys and research data.

A recent capability gap analysis for VHF fever pathogen surveillance in Tanzania, which was undertaken by the Southern African Centre for Infectious Disease Surveillance (SACIDS) Africa Centre of Excellence for Infectious Diseases of Humans and Animals (SACIDS-ACE) involving its national partner institutions, namely the National Institute for Medical Research, Muhimbili University of Health and Allied Sciences, Sokoine University of Agriculture, Catholic University of Health and Allied Sciences and Ifakara Health Institute, revealed a relative weakness in the capacity for systematic surveillance for evidence of viral activity (sub-clinical infection) with VHF associated viruses, when compared with Uganda, the DRC and South Africa.

GOAL AND OBJECTIVES

Project Goal

Establishment of research base centre in Africa through international collaborative research for VHFs jointly spearheaded by the Korean National Institute of Health and Tanzania institutions that form the core of the SACIDS Africa Centre for Infectious Diseases in Eastern and Southern Africa.

Broad Objective

Strengthening capacity for surveillance and preparedness against viral haemorrhagic fevers in Tanzania.

Specific objectives

1) To develop and/or assess a genomics driven near-field based (multiplex) diagnostic system for surveillance of potentially high risk VHFs (Ebolavirus, Marburg, RVF, CCHF, Yellow fever and Arenaviruses) in Tanzania;
2) To undertake a risk assessment of factors that increase the probability of incursion of VHF pathogens into Tanzania;
3) To carry out clinical evaluation of diagnostic tools developed under *Objective 1* in areas identified as high risk by the risk assessment of *Objective 2*;
4) To build capacity through training of staff in the wide application of molecular and serological technologies, and their derivatives, as tools for primary analysis of diagnostic samples;
5) To assess community knowledge and livelihood practices that influence prevalence and acquisition of VHFs in Tanzania

METHODS

Study areas

Tanzania is grouped into five ecological zones (Figure 1). These zones are defined based on the variation on rainfall, vegetation, temperature land use and elevation. For instance, areas with forest rain are expected to have heavy vegetation which might include non-human primates who act as common reservoirs for some of the VHFs. Human-primate interactions are common in such locations and compound to the risk of attaining the infections. Climatic features also differentiate human movements, economic activities, types of vegetation which influence the risk. Hence risk assessment needs to consider the relations between climatic and environmental conditions for optimal estimation of the population vulnerability to VHFs.

A multistage cluster design will be utilized in selecting study sites/districts. The initial stage will involve identifying distinct ecological zones in the country based on rainfall pattern, vegetation and altitude, which will be used to account for differences in humidity, temperature, and land cover use. The country will be divided into five distinct zones based on vegetation and land cover (normalized difference vegetation index, NDVI), rainfall (NDVI and number of wet days per month) and elevation:

- Zone 1: Western parts of the country with tropical forest and some elevated areas and unimodal rainfall pattern, and altitude <2,300m above sea level. The study districts will comprise of Buhigwe (Kigoma) and Kalambo (Rukwa).
- Zone 2: Include part of the Southern-highland districts with areas with high precipitations, and areas with tropical forest and bimodal rainfall pattern, and elevation >2,300 m. Kyela district will be considered in the study.
- Zone 3: North-eastern part of the country, some elevated areas >2,300m, with bimodal rainfall pattern. Kinondoni (Dar es Salaam) and Kilindi (Tanga) districts will be considered in the study.
- Zone 4: Central part of the country, moderate precipitation and unimodal rainfall pattern. The study districts will be Mvomero (Morogoro) and Kondoa (Dodoma).
- Zone 5: Lake Victoria zone, characterised by with bimodal rainfall pattern. Ukerewe Islands will be included

After mapping the distinct ecological zones, a random point generator in ArcGIS (ESRI, Redland, CA) will be used to randomly pick at least one location per zone to sample. Using the latitude and longitude of each randomly selected point, the closest town and village to that point will be identified using GoogleEarth. Multidisciplinary teams will be sent to each location to sample humans. The teams will consist of: physicians, ecologists, epidemiologists, virologists and laboratory personnel.

Sample size estimates

The study sites will include Buhigwe (Kigoma), Kalambo (Rukwa), Kyela (Mbeya), Kinondoni (Dar es Salaam), Kilindi (Tanga), Mvomero (Morogoro), Kondoa (Dodoma) and Ukerewe (Mwanza). Seroprevalence of VHF in the study areas is not known explicitly. Based on the ecological and environmental heterogeneity in the study areas the sample size is calculated independently for each zone. With the desired absolute precision of 5% and confidence level of 95% the estimated sample size per zone will be 384. The sample size is adjusted by the

design effect of 2 to account for the clustering effect in the study design and then a contingency of 30% is added to account for non-responses and refusal resulting to a sample size of 999 per zone. Therefore the sample size for 5 zones will be 4,995. Attempt will be made to recruit equal number of males and females. All age groups individuals, except those less than 9 months of age (potentially considered to have maternal derived immunity against VHF), will be sampled.

Human sampling

All age groups individuals, except those less than 9 months of age, will be sampled. When the team arrives in the study site, an assessment will be done to determine the location and average size of households in the area/village. The number of samples taken in the will be stratified by population. A random number generator will be used to select specific households to sample. Sampling will be done within the complete household which is selected and no household will be replaced if the residents are not found to be at home. Thus a degree of oversampling will be conducted to ensure adequate sampling.

Individuals will be asked to provide a blood sample. Five to ten milliliters (mls) of blood will be collected from adults and children >10 years by venipuncture and one to three mls will be collected from children ≥9 months and ≤10 years of age also by venipuncture. All specimens will be collected by the trained phlebomist on the field team and will be collected using standard sterile technique. Blood will be collected from willing subjects after a written consent is obtained. Two attempts will be done to take the blood samples. In addition, basic demographic information will be collected from each individual bled and recorded in a line list by a member of the field team and will include: age, sex and history of travel from the residence in recent period.

Data collection

Clinical and epidemiological information

Information on socio-demographic characteristics (age, sex, occupation, village, workplace, residence) will be collected for each subject. History including recent history of febrile illnesses, and other risk factors will be ascertained for all participants. Clinical parameters will be documented. The study-related questionnaires will be completed for each consented and assented subject who will then formally enrolled into the study using unique identification code that will restrict direct identification of individuals.

Specimen collection and processing

Traditional clinical specimen for diagnosis of viral haemorrhagic fever is primarily sera. However, to verify the applicability of non-blood samples to the molecular diagnostic kits to used, other types of clinical samples, including saliva, urine and semen will be collected wherever possible. Serum samples from each participant will be labeled, archived, frozen, stored at –80°C, and transferred to research central laboratory, for the case were blood cannot be obtained crevicular fluid from oral cavity will be collected. Crevicular fluid is the component of oral fluid contain plasma IgG and IgM which transude from capillary bids in gingival crevices between teeth and gums. All specimens will be collected by trained phlebomist in accordance with standard operating procedures.The specimens will be labelled using a unique study identification number that also appears on the questionnaire. Samples will be immediately stored in cool boxes, dry shippers or frozen at -196 °C in liquid nitrogen.

Extra care will be observed to make sure that specimens kept at 4°C in cool boxes are transported to the research laboratory within 72 hours, analyzed by the diagnostic laboratory methods, and promptly frozen at -80°C or colder. Frozen specimens shall be transported to the laboratory in liquid nitrogen dry shippers at least once in two weeks for testing. A separate laboratory investigation form containing the same unique identification number will accompany specimens.

Specimen packaging and transportation

Study sites will be provided with cool boxes and dry shipper(s) for transporting samples to the laboratory. Liquid nitrogen container(s) will be provided for local storage of samples, replenishments of liquid nitrogen and for charging dry shippers. Packaging specimens will be according to transportation safety standards. Within Tanzania, specimens will be transported to the laboratory via ground transport. For laboratory procedures which require facilities i.e. BSL4, which is not available in the country, the samples will be shipped to partnering institution in South Korea. For air shipping samples packaging shall meet the World Health Organization and International Air Transport Association (IATA) requirements which involve a triple-layered system to protect specimens from damage and protect carriers from inadvertent exposure to infectious materials.

Laboratory safety

All laboratory specimens will be handled with appropriate safety precautions including those outlined below:

a. Only staff trained in the safe handling of infectious substances (potentially or confirmed) and diagnostic reagents will be employed.
b. Viral Haemorrhagic fever vaccines (those available) will be made available to all staff.
c. Access to the laboratory is restricted.
d. Personal protective effects, including laboratory coats and gloves are worn in the laboratory at all times when handling samples or reagents.
e. Samples entering the laboratory will be first handled in a BSL-3 facility (Iso Arc) before further processing in a BSL-2 with Class 2 biosafety cabinets.
f. Unidentified virus isolates are handled in Class 2 biosafety cabinets with staff wearing lab coats and disposable aprons, double gloves and either a HEPA disposable face mask or a HEPA filter North Full-Face respirator.
g. All contaminated laboratory materials or spills are disinfected in 2% Lysol/Virkon solution and autoclaved prior to leaving the laboratory for incineration.
h. Solid wastes (gloves, disposable masks, aprons) are placed in autoclave bags for autoclaving prior to incineration.
i. Sharps will be placed in plastic sharps-containers appropriately located within the laboratory and will be incinerated regularly.

Specimen storage

Specimens will be transported from the field to research laboratories by trained health workers following the standard procedures. All specimens will be stored within a locked ultra-low freezer at the Sokoine University of Agriculture laboratory in Morogoro, Tanzania. The samples will remain in ultra-low freezer storage for the life of the study initially anticipated to be five years, plus an additional ten years. At that time, the specimens will either be destroyed or will be transferred to a specimen repository under the guidance and

approval of the appropriate regulatory bodies. A copy of the study samples will be shipped to Korea National Health Institute for further testing complying with the Tanzania Material Transfer Agreement (MTA) regulations (http://www.nimr.or.tz). Material transfer forms will be filled and submitted for approval by the Medical Research Coordinating Committes when such samples have been identified.

Development and assessment of genomic-based diagnostic tools for VHFs

For an effective VHFs surveillance system to be timely, it must be performed as near to field sites as possible using robust procedures that can be readily performed in African laboratories. Standard polymerase chain reaction (PCR)-based methods are laborious, costly and time-consuming. We will implement a simple and robust sampling pipeline that exploits molecular diagnostics for VHF pathogens, which will enable timely detection and energize the collection of genomic data to understand the circulation of VHF viruses in Tanzania. Focusing on Ebola virus, Marburg virus, RVF virus, CCHF virus and Arenaviruses we will provide field or near-field diagnostic tools that can be used *in situ* to rapidly confirm disease suspicion, and a pragmatic approach to generate informative sequence data for molecular analyses. Our strategy is to ensure and allow continued surveillance in the field by developing appropriate laboratory methods and tailor-made bioinformatics tools, training of African researchers in their use and expand the collaborative network in Africa.

Reverse transcription loop-mediated isothermal amplification (RT-LAMP) and lateral flow assays

Rapid detection of viruses in the field will be achieved using RT-LAMP assays or lateral flow devices where available. The isothermal (single-temperature amplification) tests have high analytical sensitivity, are tolerant to inhibitors so that simple sample preparation methods can be used, and can be performed using inexpensive and easy-to-use equipment. In these field settings, these assays will be complemented by the use of lateral-flow devices that have been developed under Southern African Centre for Infectious Disease Surveillance (Changula, 2014).

Real time Viral Genomes Sequencing

The project will employ the pocket-sized portable MinION (Oxford Nanopore) sequencing technology that utilize disposable flow cells [http://biorxiv.org/content/early/2015/01/27/011940]. A similar approach has used this technology to characterise Ebola viruses collected during the recent outbreak in West Africa (Quick et al., 2016) and Zika virus in Brazil (Faria et al., 2016). We will use this platform to conduct sequencing of viral genomes direct from clinical samples using methods (multiplex pool primer design, multiplex PCR, sequencing on Minion, bioinformatic analysis and quality control) previously described by Quick et al. (2017). Re-sequencing will be conducted for verification using deoxynucleotide cycle sequencing amplification after RT-PCR. RT-PCR assays will be established to amplify genomic fragments that are appropriate for subsequent sequence analyses.

ELISA

Serologic testing will be done for all samples; initial screening by IgG to each of the viruses will be done followed by IgM testing of all IgG-reactive samples. IgG and IgM testing for Ebola virus, Marburg virus, RVF virus, CCHF virus and Arenaviruses will be done by using cell

culture–derived antigens. Briefly, the ELISA antigens used to coat plates (for IgG) or detect captured IgM produced by infecting Vero E6 cells with respective reference virus strains or by using uninfected cells for control. Each samples will be tested at 4 dilutions (100, 400, 1,600, and 6,400). IgG reactivity/IgM nonreactivity will be considered as evidence of past infection; concurrent IgG/IgM reactivity will be interpreted as infection within the previous 6 months. IgG-seropositive persons without any histories of illness will be considered to have had subclinical or very mild infection

Realtime RT-PCR

One of the rapid and accurate detection methods of virus from clinical sample is Real time RT-PCR. Its high sensitivity and specificity is important to control and manage public health events. Therefore, evaluation on Real time RT-PCR method developed by Korea National Institute of Health (NIH) to detect virus causing viral haemorrhagic fevers will be conducted. It can detect VHFs related viruses such as Ebola, Marburg, Lassa, Crimean-Congo haemorrhagic fever, Rift valley, Yellow fever, and Hantan virus. For this, on-site evaluation test and training by Korea NIH staffs will be carried out. Protocols will be developed in Korea in Year 1 and African researchers trained in their use prior to deployment for near-field VHF screening. This will provide baseline information on VHF prevalence and viral characterisation at a variety of sites that will inform future sampling strategies.

Laboratory Capacities

All laboratory work in Tanzania will be carried out at Sokoine University of Agriculture (SUA). Molecular Biology Research Laboratory at SUA is equipped with Class II biological safety cabinets; a 7500 Applied Biosystems Fast real time PCR systems, a GeneAmp 9700 and 3 Veriti ABI for conventional PCR, Field Laboratory System (Enigma Diagnostics) for fully automated combined nucleic acid extraction and real-time PCR, A 3500 Applied Biosystems Genetic Analyser for automated dideoxy cycle sequencing of PCR products, Conventional and a nanodrop spectrophotometers for determining quality and quantity of DNA, gel documentation systems for visualization of electrophoresed PCR products, Ultralow freezers (-80 ℃), freezers (-20 ℃), refrigerators (+4 ℃) for storage of reagents and cryopreservation of samples, and ELISA washers and readers for serology and an ice maker.

There is a Conventional Virology Laboratory for vaccine development, and diagnostic testing. This is a modern cell culture based biosafety level 2 research laboratory equipped with biological safety cabinets, light and fluorescence microscopes, CO_2 incubators and ultralow freezers. The laboratory has an IsoArk BSL-3 laboratory. The laboratory is finalization the installation of a Next Generation Sequencer by the end of 2017. Moreover, the SACIDS provides links to the South African Centre for Emerging and Zoonotic Diseases of the National Institute for Communicable Diseases (NICD), giving access to the large Biosafety Level 4 laboratory and expertise for safe handling of dangerous pathogens.

ETHICAL ASPECTS

Ethical approval

The proposal will be submitted to the Medical Research Coordination Committee of the National Institute for Medical Research, Tanzania, for ethical approval. Upon approval, the study will be carried out adhering to the approved protocols. The study and its objectives will

be introduced to relevant authorities in the study areas. During data collection, the study objectives and procedures will be explained to each subject and/or guardian in Kiswahili (national language), and they will be made aware that participation in the study is on voluntary basis and their identity would be kept confidential. A written informed consent will be obtained from participants. If the subject or guardian is illiterate, the investigators will read the consent to them and the subject will be requested to provide thumb print. No samples will be taken until informed consent is obtained. A copy of the consent form will be provided to the subject (Appendix 1 and 2).

Participants will be free to respond or refuse to respond to any question, and accept or reject blood sampling, and will be free to stop their participation in the study at any time without any penalty on such a decision. Participant identity will be masked by use of coded identity numbers (IDs), instead of their names. Confidentiality and anonymity of the study participants will be emphasized and maintained throughout the study. A unique code will be used to link the questionnaires and laboratory results, and this unique code will be kept separately with their names. No information concerning the study or the data or blood samples will be released to any unauthorized person. Electronic data will be password protected and stored into password protected computers with limited access to only authorized personnel.

Project physician and laboratory technician(s) trained by the study will be involved in the subject clinical examination and sample collections, respectively. A copy of the study samples will be shipped to Korea National Health Institute for further testing complying with the Tanzania Material Transfer Agreement (MTA) regulations (http://www.nimr.or.tz).

Potential Risks and Benefits

It is not anticipated that the blood collection procedure will contribute any additional physical or psychological risks for the study population as standard operating procedures will be adhered to. Project physician and laboratory scientists/technicians trained by the study will be involved in the subject clinical examination and sample collections, respectively.

Regarding potential benefits of study, there would be no direct benefits to the study participants. However, the results will consolidate important information to the Ministry of Health and the Government of the United Republic of Tanzania as regards to the burden and detection of VHFs in the country. The project will also result improved surveillance of the VHF in the country.

Nucleoside analogue inhibitors of the cell-encoded enzyme S-adenosylhomocysteine hydrolase have been shown to inhibit VHFV replication therefore supportive care and early post exposure interferon beta therapy will be provided to those who will test positive.

Confidentiality

Subject confidentiality is strictly held in trust by the participating investigators, their staff, and the sponsor(s) and their agents. This confidentiality will include testing of biological samples, in addition to household surveys. The study protocol, documentation, data, and all other information generated will be held in strict confidence. The study personnel will not

release any information concerning the study or the data to any unauthorized third party without prior written approval of the lead Institution. Records relating to individual participation in the study will remain private. Individual's names will not be used in any report resulting from this study. All files and laboratory specimens will have only a unique identification number, not the subject or subject' name. All project staff will be trained to work with human subjects. All data and information will be collected and stored securely. Collected samples and associated epidemiological data will be stored in secured place with access only to authorised personnel.

Informed Consent Process

Informed consent process will be initiated prior to the individual's agreeing to participate in the study and continuing throughout the individual's study participation. Extensive discussion of risks and possible benefits of participation in this study will be provided to the subjects and their families. Consent forms describing in detail the study procedures and risks will be given to the subject. The consent forms to be used will be the ones approved by the Medical Research Coordinating Committee and the subject will be asked to read and review the document. Upon reviewing the document, the investigator will explain the research study to the subject and answer any questions that may arise. The subjects will sign the informed consent document prior to being enrolled in the study. The subjects may withdraw consent at any time throughout the course of the study. A copy of the informed consent document will be given to the subjects for their records. The rights and welfare of the subjects will be protected by emphasizing to them that the quality of their medical care will not be adversely affected if they decline to participate in this study.

The community will be engaged through their village government. Community meetings will be held to sensitize and engage the study population. However, individual informed consent will be obtained from each adult individual. In case of children, informed consent will be sought from parents/guardians, and each child will have to give its assent. Subjects, parents, and legal guardians may indicate their consent by signing or marking the form with a thumbprint.

OUTCOMES

The project will result into:

1) Enhanced capacity for risk analysis of the potential for incursion of an emerging/re-emerging disease in Tanzania;
2) Enhanced research and diagnostic capacity to detect and identify viral haemorrhagic fevers by sharing research resources including specimens
3) Enhanced virological capability within the Tanzanian public health systems;
4) Institutional collaboration between Korea and Tanzania strengthened
5) Policy and practice support guidance provided through research evidence

DATA MANAGEMENT AND ANALYSIS

Data processing and quality control

Separate databases will be developed for quantitative and qualitative data. Qualitative data from the serosurvey will be entered in EpiData v.3.1 by qualified data clerks. The

epidemiological data and laboratory results for specific VHFs will be entered into a pre-developed database and then imported into statistical software for coding, cleaning and statistical analysis. A sample of 10% will be re-entered by a different set of clerks for quality control.

Descriptive statistics and univariate association testing

This will be conducted by calculating necessary summary statistical measures including frequency distribution, percentages, tabulation and so forth. Graphical displays such as charts, bars, will be employed to relevant variables. Statistical tests such as chi-square, Fisher's exact, t-test and one-/two- sample proportional tests will be performed to compare the proportion of specific VHF seropositivity outcomes between individuals within and across study zones. Furthermore, chi-squared tests will be used to assess the association between the proportion of seropositivity and the potential risk factor variables: anthropogenic, ecological and climate-related factors. The seropositivity rates and locations of visited households will be mapped using ArcGIS (ESRI East Africa) to study distribution and identify geographical clusters.

Model fitting and selection of the best model

Statistical modelling techniques will be employed to accurately estimate the association between these factors and VHFs risk and to identify potential factors. A mixed effects logistic regression modelling will be used to investigate the association between various potential risk factors and VHF seropositivity outcomes. The models will include household as a random effect variable to account for dependence of data from the same household. The ecological zone will be set as the stratification variable, and will be forced into the model as fixed effect variable. To take account of possible nonlinear effects of continuous-scale risk factors on the logit form of the outcome variable, these variables will be categorised into three contiguous groups, each representing a third of the observations.

Specifically, univariate analysis will be performed to identify predictors to be included in the multivariate model at a cut-off of a p-value of ≤ 0.20. The statistically significant variables from univariable analysis will be included in a mixed effects multivariable logistic regression analysis based on a forward variable selection approach, and will be screened on the potential effect in the model using the likelihood ratio statistic at a cut-off of p-value ≤ 0.05. A factor will be considered to have potential confounding effect if its inclusion in the model results in a change of ≥25% in the coefficient estimates of other risk factors compared to its absence. In case confounding effect is found subgroup analyses will be performed. Variables not statistically significant in the univariable analysis, but with a known association with VHF or suspected to have potential confounder effect, will also be evaluated in the multivariable analysis. In the pre-screening process of the association between variables, only one of the two variables with significant collinearity will be included in the model based on its biological plausibility with regard to specific VHF. Presence of effect modification will be examined by introducing the interaction terms into the model. After identifying potential attributes, a logistic regression analysis will be used to evaluate and quantify the key drivers of the VHF risk. Analysis will consider variation in the risk, predictors and vulnerability between zones. Statistical analysis will be performed using Epi-Info (Atlanta, GA), SAS (Cary, NC) software or any other suitable statistical package. Statistical significance will be tested at 5% level. Goodness of fit of the model will be assessed using standard methods (Hosmer & Lemeshow,

1989). The discriminatory ability of the final model will be assessed using receiver operating characteristic curves (ROC), and will be quantified using the area under the curve (AUC).

VHF Vulnerability

A variable defining vulnerability to VHF infection and risks of transmission for individuals will be created using estimation from the best model. This index will be calculated and given a score based in the magnitude of the effect estimated from the model. Difference between ecological zones, socio-demographic features of individual or they communities live in and other relevant identified factors will be determined to guide development of the surveillance tool. Smooth maps which describe spatial distribution of VHF risk in Tanzania will be produced and discussed.

Development of the surveillance diagnostic system/tools

Results of the best model will again be used as a basis for development of surveillance diagnostic system and tools. Core variables for the system will include significant variables considering the strength of their effect and factors found with interaction or confounding effect for VHFs risk. The strength of the effect of the random parameters (on households) will be used to decide the level of surveillance focus that include also effect within strata (ecological zones). This tool will be used for rapidly assessment in selected communities to identify suspected cases of which will be tested for confirming presence of any VHF pathogens using the RT-LAMP assays explained earlier. This will be tested in different settings to evaluate its performance and be revised accordingly.

DISSEMINATION

Knowledge translation and publication will be part of the dissemination strategies. Meetings and workshops will be conducted to provide fora for knowledge translation and sharing exercise involving mass media, to make sure information generated is shared widely. Results will be shared in national and international scientific conferences to reach a wider scientific community and also published in peer-review journals. Important information for public health will be provided immediately to the Ministries of Health and the World Health Organization. Evidence (policy) briefs will be developed and shared with policy makers.

Detailed formal publication will be a joint activity involving all Tanzanian and Korean collaborators, and will seek approval from the National Institute for Medical Research (Tanzania).

PREVIOUS EXPERIENCES IN SIMILAR RESEARCH WORKS

The research team members have demonstrated expertise in effectively applying interdisciplinary methods in epidemiological surveillance studies in Southern Africa region, and the entire project team has long-running collaborations of this nature. Much of this expertise has been acquired through active participation of the members in various research studies as indicated by their curriculum vitae.

Team members Leonard Mboera, Gerald Misinzo, Calvin Sindato, Francis Mhimbira have been involved in several studies on emerging and re-merging diseases, including Rift Valley fever

and Dengue in Tanzania. Susan Rumisha has immense experiences in handling research "big" data from several research projects. Calvin Sindato and Susan Rumisha have immense experience in statistical modelling of infectious diseases.

BUDGET SUMMARY (in US$)

Category	**Year 1**	**Year2**	**Year3**	**Total**
Personnel	9,500	9,500	9,500	28,500
Supplies (Kits, Tips, Tubes, etc.)	15,000	15,000	15,000	45,000
Travel (attendance at conferences)	6,500	7,000	10,500	24,000
Others (Research and training expenses)	24,250	24,300	23,300	71,850
Equipment	6,500	6,000	3,500	16,000
Indirect Costs (<5% of total costs)	3,250	3,200	3,200	9,650
Total (direct plus indirect)/year	65,000	65,000	65,000	195,000

PROJECT TIMELINE, 2017-2020

Activity	2017 (monthly)			2018 (quarterly)				2019 (quarterly)				2020 (quarterly)		
Submission and approval by Ethics Committee														
Finalization of the survey protocol including site selection, plan of work														
Logistics and administrative arrangements														
Team recruitment and training														
Collection of clinical samples														
Develop and/assess genomics diagnostic surveillance														
Risk assessment of factors that affect VHF pathogens														
Assess community knowledge and practices that influence VHF														
Data management and analysis														
Build capacity in application of molecular and serological technologies														
Preparation of the preliminary report														
Preparation of Publications														
Participate in Local and International conferences														
Workshop for research project evaluation														

REFERENCES

Briese, T., Paweska, J.T., McMullan, L.K., Hutchison, S., et al. (2009) Genetic detection and characterization of Lujo Virus: a new haemorrhagic fever–associated arenavirus from Southern Africa. *PLoSPathog* 2009 5(5)

Changula, K. (2014) *Production and characterisation of monoclonal antibodies to Ebolavirus nucleoprotein and their application in development of a rapid antigen detection test*. PhD Thesis, University of Zambia.

Epstein, L., Wong, K.K., Kallen, A.J. &Uyeki, T.M. (2015) Post-Ebola Signs and Symptoms in U.S. Survivors. *New England Journal of Medicine* 373 (25): 2484-2486.

Faria et al., (2016) Mobile real-time surveillance of Zika virus in Brazil. *Genome Med*. 8(1): 97.

Grobbelaar, A.A., Weyer, J., Moolla, N, van Vuren, P.J. et al. (2016) Resurgence of Yellow Fever in Angola, 2015–2016. *Emerging Infectious Diseases* 22: 1854-1855.

Hosmer, D.W. &Lemeshow, S. (1989) *Applied logistic regression.* Wiley, New York.

MoHSW (2011) *National Integrated Disease Surveillance and Response (IDSR) Guidelines*. 2nd Edition, July 2011. Ministry of Health and Social Welfare, Dar es Salaam, United Republic of Tanzania

Muyembe-Tamfum, J.J., Mulangu, S., Masumu, J., Kayembe, J.M. et al. (2012) Ebola virus outbreaks in Africa: Past and present. *Onderstepoort Journal of Veterinary Research* 79(2), Art. #451

Nyenswah, T., Fahnbulleh, M., Massaquoi, M., Nagbe, T., Bawo, L., Falla, J.D., Kohar, H., Gasasira, A., Nabeth, P., Yett, S. and Gergonne, B., 2014. Ebola epidemic—Liberia, March–October 2014. *Morbidity and Mortality Weekly Report*, *63*(46), pp.1082-1086.

Nyenswah, T., Fallah, M., Sieh, S., Kollie, K., Badio, M., Gray, A., Dilah, P., Shannon, M., Duwor, S., Ihekweazu, C. and Cordier-Lassalle, T., 2015. Controlling the last known cluster of Ebola virus disease-Liberia, January-February 2015. *MMWR. Morbidity and mortality weekly report*, *64*(18), pp.500-504.

Quick et al. (2016) Real-time, portable genome sequencing for Ebola surveillance. *Nature* 7589: 228-32.

Quick, J., Grubaugh, N.D., Pullan, S.T., Claro, I.M. et al. (2017) Multiplex PCR method for MinION and Illumina sequencing of Zika and other virus genomes directly from clinical samples. *Nat Protoc*. 12(6):1261-1276.

Rosello, A., Mossoko, M., Fasche, S., Van Hoek, A.J. et al., (2015) Ebola virus disease in the Democratic Republic of the Congo, 1976-2014. *eLife*4:e09015

Scarpino, S.V., Iamarino, A., Wells, C., Yamin, D., Ndeffo-Mbah, M., Wenzel, N.S., Fox, S.J., Nyenswah, T., Altice, F.L., Galvani, A.P. and Meyers, L.A., 2014. Epidemiological and viral genomic sequence analysis of the 2014 Ebola outbreak reveals clustered transmission. *Clinical Infectious Diseases*, 60(7), pp.1079-1082.

Shoemaker, T., MacNeil, A., Balinandi, S., Campbell, S., Wamala, J.F., McMullan, L.K., et al. (2012) Reemerging Sudan Ebola virus disease in Uganda, 2011.*Emerg Infect Dis*18:1480–3.

Sindato, C., Karimuribo, E.D., Pfeiffer, D.U., Mboera, L.E.G. et al. (2014) Spatial and temporal pattern of Rift Valley Fever Outbreaks in Tanzania; 1930 to 2007. *PLoS One* 9(2): e88897.

Swanepoel, R., Shepherd, A.J., Leman, P.A., Shepherd, S.P. et al (1987) Epidemiologic and clinical features of Crimean-Congo hemorrhagic fever in southern Africa *Am J Trop Med Hyg* 36(1):120-32.

Swanepoel, R. (1995) Nairovirus infections. In: Porterfield J.S. (ed.) *Exotic Viral Infections* (pp. 285-293). London: Chapman and Hall.

APPENDIX I: INFORMED CONSENT

SEROPREVALENCE OF VIRAL HAEMORRAGIC FEVERS IN TANZANIA: STRENGTHENING SCIENTIFIC CAPACITY FOR SURVEILLANCE AND RESPONSE

SOKOINE UNIVERSITY OF AGRICULTURE (SUA)
SACIDS Africa Centre of Excellence for Infectious Diseases of Humans and Animals in Eastern and Southern Africa
College of Veterinary Medicine and Biomedical Sciences
P.O Box 3015, Chuo Kikuu, Morogoro, Tanzania
Tel: +255 23 264 0037; +255 787 011 677

Participant's Consent Statement
The following statement will be read to all individuals asked to participate in the survey.

My name is ……, and I am working for the National Institute for Medical Research (Tanzania)/Sokoine University of Agriculture/Muhimbili University of Health and Allied Sciences in collaboration with the Korean National Health Institute. We are carrying out a study to establish the risk of Viral Haemorrhagic Fevers in Tanzania. It is your free choice to be part of your study. The results of the survey will lead to a better understanding of the risk of VHF in our country.

A trained laboratory technologist will describe to you about the collection of blood and urine for testing of VHF viruses. He/she will seek your permission to collect the specimen from you. She/he will ask for 5mls-10mls of blood which he/she will take from your hand using a syringe and needle. The blood specimen will be taken to a laboratory at Sokoine University of Agriculture in Morogoro and tested for VHF viruses. If it is found to be positive then the specimen will be shipped to a laboratory in Korea for further testing and approval. The results of the test will be kept confidential.

There is the possibility of mild discomfort, bruising and very rarely infection at the site where the blood is taken. But, should you be injured as a direct result of participating in this survey, you will be provided with medical care at a local public health facility at no cost.

You are free to choose to be part of this survey. However, if you accept to take part in this study, there will be no payment to you. The facts about you from this survey will be kept confidential as directed by the Laws of the United Republic of Tanzania. No names will be used on any of the survey reports, publications or presentations. Only we, the researchers, will ever see the surveys with people's names. If you choose not to participate in this study, that is fine too. You will not be treated differently by the health personnel in this area. You may ask the researchers any questions you have at any time.

Do you wish to participate? YES; NO (Please circle)

Signature _____

If you have any questions regarding this research, you may ask the research staff or contact Dr. Leonard Mboera, Leader, Emerging and Vector-borne Diseases, Southern African Centre for Infectious Disease Surveillance, P.O. Box 3297, Morogoro, Tanzania; Telephone: +255 754 314701; E-mail: lmboera@gmail.com

If you have questions about your rights as participant in this research, please contact the chairperson of the National Health Research Ethics Review Committee of the National Institute of Medical Research, at 255 22 2121400.

KIAMBATANISHO 1A: TAMKO LA RIDHAA
UTAFITI KUHUSU MAGONJWA YASABABISHAYO UVUJAJI WA DAMU MWILINI NCHINI TANZANIA: KUJENGA UWEZO WA UFUATILIAJI NA UDHIBITI

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College of Veterinary Medicine and Biomedical Sciences
P.O Box 3015, Chuo Kikuu, Morogoro, Tanzania
Tel: +255 23 264 0037; +255 787 011 677

Taarifaifuatayoitasomwakwakilamshiriki (umrimiaka ≥18) katikautafitihuu.

Mini ni ……, kutoka Taasisi ya Taifa ya Utafiti wa Magonjwaya Binadamu/ Chuo Kikuu cha Sokoine cha Kilimo/ Chuo Kikuu cha Tiba na Sayansi Shirikishi cha Muhimbil. Tunafanya utafiti kuhusu uwepo na kiwango cha maambukizi ya magonjwa ya virusi yanayosababisha uvujaji wadamu katika binadamu. Magonjwa hayo ni pamoja na Homa ya Manjano, Homa ya Bonde la Ufa. Matokeo ya utafiti huu yatatoa takwimu kuhusu viwango vya maambukizi katika jamii za Tanzania na hivyo kuisadia serikali kupanga mipango madhubuti ya kuthibiti magonjwa ya milipuko.

Mtaalamu wa maabara atakuelezea kuhusu zoezi hili na kukuomba ruhusa kuchukua sampuli ya damu kiasi cha mililita 5-10 kutoka mkononi mwako kwa kutumia sindano maalum. Sampuli hiyo ya damu itapelekwa maabaraya Chuo Kikuu cha Sokoine cha Kilimo kwa uchunguzi wa kitaalamu. Kama kutakuwa na viashiria vyakuwepo maambukizi ya virusi, sampuli zitapelekwa kwenye maabara zenye uwezo mkubwa zaidi huko nchini Korea. Matokeo ya uchunguzi wa kimaabara yatahifadhiwa kwa usiri mkubwa.

Kitendo cha utoaji damu kinaweza kuleta usumbufu au kusababisha maumivu kidogo. Kama hilo litatokea, utapewa huduma katika vituo vya afya bila malipo.

Uko huru kushiriki katika utafiti huu. Iwapo utakubali kushiriki, hakutakuwa na malipoy oyote. Taarifa zako zote zitahifadhiwa kwa usiri mkubwa kama sheria za Jamhuri ya Muungano wa Tanzania zinavyoelekeza.
Majinayawashirikiwotekatikautafitihuuhayatawekwawazikatikaripotizotezitakazotokananautafitihuu.
Kama hutapenda kushiriki katika utafiti huu, itakuwa ni sawa tu. Bado utaendelea kupewa huduma zote za afya unazohitaji kutoka kwawa hudumu na vituo vyote vya hudumaza afya kama kawaida. Unaweza kuuliza maswali yoyote na wakati wowote kuhusu utafiti huu.

Je uko radhi kushiriki? NDYO; HAPANA (Zunguishia jibu lilotolewa)

Sahihiyamshiriki _____

Kama kunamaswaliyoyoutekuhusuutafitihuu, unawezakumuulizaMtafitiMkuu Dkt. Leonard Mboera wa wa Kituo cha Ufuatiliaji wa Magonwja Kusini mwa Afrika, S.L.B 3297, Morogoro, Tanzania; Simu: +255 754 314701; Baruapepe: lmboera@gmail.com

Kama unahitaji kuuliza maswali kuhusu haki zako kama mshiriki wa utafiti, basi wasiliana na Mwenyekiti wa Kamati ya Taifa ya Maadili ya Utafiti wa Afya, Taasisi ya Taifa ya Utafiti wa Magonjwa ya Binadamu kwa simu Na. +255 22 2121400.

APPENDIX 2A: CHILD ASSENT FORM

SEROPREVALENCE OF VIRAL HAEMORRAGIC FEVERS IN TANZANIA: STRENGTHENING SCIENTIFIC CAPACITY FOR SURVEILLANCE AND RESPONSE

SOKOINE UNIVERSITY OF AGRICULTURE (SUA)

SACIDS Africa Centre of Excellence for Infectious Diseases of Humans and Animals in Eastern and Southern Africa
College of Veterinary Medicine and Biomedical Sciences
P.O Box 3015, Chuo Kikuu, Morogoro, Tanzania
Tel: +255 23 264 0037; +255 787 011 677

Child assent statement: *The following statement will be read to all children under the age of 18 requested participate in the survey.*

My name is ……, and I am working for the Sokoine University of Agriculture/ National Institute for Medical Research/ Muhimbili University of Health and Allied Sciences in collaboration with the Korean National Health Institute. We are carrying out a study to establish the risk of Viral Haemorrhagic Fevers in Tanzania. It is your free choice to be part of the study. The results of the survey will lead to a better understanding of the risk of VHF in our country.

A trained laboratory technologist will describe to you about the collection of blood and urine for testing of VHF viruses. He/she will seek your permission to collect the specimen from you. She/he will ask for 5-10mls of blood which he/she will take from your hand using a syringe and needle. The blood specimen will be taken to a laboratory at Sokoine University of Agriculture in Morogoro and tested for VHF viruses. If it is found to be positive then the specimen will be shipped to a laboratory in Korea for further testing and approval. The results of the test will be kept confidential. There is the possibility of mild discomfort, bruising and very rarely infection at the site where the blood is taken. But, should you be injured as a direct result of participating in this survey, you will be provided with medical care at a local public health facility at no cost.

You are free to choose to be part of this survey. However, if you accept to take part in this study, there will be no payment to you. The facts about you from this survey will be kept confidential as directed by the Laws of the United Republic of Tanzania. No names will be used on any of the survey reports, publications or presentations. Only we, the researchers, will ever see the surveys with people's names.

If you sign this paper, it means that you have read this and that you want to be in the study. If you don't want to be in the study, don't sign this paper. Being in the study is up to you, and no one will be upset if you don't sign this paper or if you change your mind later.

Your signature (Child): _____ Date _____
Your name: _____ Date _____
Signature of person obtaining consent: _____ Date _____
Name of person obtaining consent: _____ Date _____

If you have any questions regarding this research, you may ask the research staff or contact Dr. Leonard Mboera, Leader, Emerging and Vector-borne Diseases, Southern African Centre for Infectious Disease Surveillance, P.O. Box 3297, Morogoro, Tanzania; Telephone: +255 754 314701; E-mail: lmboera@gmail.com

If you have questions about your rights as participant in this research, please contact the chairperson of the National Health Research Ethics Review Committee of the National Institute of Medical Research, at 255 22 2121400.

KIAMBATANISHO 2B: TAMKO LA KUKUBALI KUSHIRIKI UTAFITI KUHUSU MAGONJWA YASABABISHAYO UVUJAJI WA DAMU MWILINI NCHINI TANZANIA: KUJENGA UWEZO WA UFUATILIAJI NA UDHIBITI

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College of Veterinary Medicine and Biomedical Sciences
P.O Box 3015, Chuo Kikuu, Morogoro, Tanzania
Tel: +255 23 264 0037; +255 787 011 677

Taarifa ifuatayo itasomwa kwa kila mtoto mshiriki (umri miaka <18) katikautafitihuu.

Mini ni ……, kutoka Chuo Kikuu cha Sokoine cha Kilimo/ Taasisi ya Taifa ya Utafiti wa Magonjwaya Binadamu/ Chuo Kikuu cha Tiba na Sayansi Shirikishi cha Muhimbil. Tunafanya utafiti kuhusu uwepo na kiwango cha maambukizi ya magonjwa ya virusi yanayosababisha uvujaji wa damu katika binadamu. Magonjwa hayo ni pamoja na Homa ya Manjano, Ebola na Homa ya Bonde la Ufa. Matokeo ya utafiti huu yatatoa takwimu kuhusu viwango vya maambukizi katika jamii za Tanzania na hivyo kuisadia serikali kupanga mipango madhubuti ya kuthibiti magonjwa ya milipuko.

Mtaalamu wa maabara atakuelezea kuhusu zoezi hili na kukuomba ruhusa kuchukua sampuli ya damu kiasi cha mililita 5-10 kutoka mkononi mwako kwa kutumia sindano maalum. Sampuli hiyo ya damu itapelekwa maabaraya Chuo Kikuu cha Sokoine cha Kilimo kwa uchunguzi wa kitaalamu. Kama kutakuwa na viashiria vyakuwepo maambukizi ya virusi, sampuli zitapelekwa kwenye maabara zenye uwezo mkubwa zaidi huko nchini Korea. Matokeo ya uchunguzi wa kimaabara yatahifadhiwa kwa usiri mkubwa.

Kitendo cha utoaji damu kinaweza kuleta usumbufu au kusababisha maumivu kidogo. Kama hilo litatokea, utapewa huduma katika vituo vya afya bila malipo.

Uko huru kushiriki katika utafiti huu. Iwapo utakubali kushiriki, hakutakuwa na malipo yoyote. Taarifa zako zote zitahifadhiwa kwa usiri mkubwa kama sheria za Jamhuri ya Muungano wa Tanzania zinavyoelekeza. Majina ya washiriki wote katika utafiti huu hayatawekwa wazi katika ripoti zote zitakazotokana na utafiti huu. Kama hutapenda kushiriki katika utafiti huu, itakuwa ni sawa tu. Bado utaendelea kupewa huduma zote za afya unazohitaji kutoka kwa wa hudumu na vituo vyote vya huduma za afya kama kawaida.

Sahihi ya mtoto: _____ Tarehe _____
Jina la mtoto: _____ Tarehe _____
Sahihi ya Mtoa Ridhaa (Mzazi/Mlezi): _____ Tarehe _____
Jina la Mtoa Ridhaa: _____ Tarehe _____

Kama kunamaswaliyoyoutekuhusuutafitihuu, unawezakumuulizaMtafitiMkuu Dkt. Leonard Mboera wa Kituo cha Ufuatiliaji wa Magonwja Kusini mwa Afrika, S.L.B 3297, Morogoro, Tanzania; Simu: +255 754 314701; Baruapepe: lmboera@gmail.com

Kama unahitaji kuuliza maswali kuhusu haki zako kama mshiriki wa utafiti, basi wasiliana na Mwenyekiti wa Kamati ya Taifa ya Maadili ya Utafiti wa Afya, Taasisi ya Taifa ya Utafiti wa Magonjwa ya Binadamu kwa simu Na. +255 22 2121400.

UTAMBULISHO WA KAYA

Jina la Wilaya: _____

Jina la kijiji: _____

Jina la kitongoji: _____

Namba ya kaya: _____

Jina la mtafiti: _____

Tarehe ya mahojiano: _____

Muda wa kuanza mahojiano: _____

I: DEMOGRAFIA

1. Jaza taarifa kwa kila mwana kaya katika kaya hii:

SN	1a. Jina	1b. Jinsi [1] Me [2] Ke	1c. Umri ***(kama ana umri chini ya miezi 12, anza na "0." Ama sivyo Kama umri ni chini ya mwezi mmoja andika "0"; Kama hujui weka "-9"***	1d. Uhusiano na mkuu wa kaya: [1] Mkuu wa kaya [2] Mke au Mume [3] Mtoto wa Kiume/Kike [4] Shemeji/Wifi [5] Mjukuu [6] Mzazi [7] Mkwe [8] Kaka au dada [9] Ndugu wengine [10] Hatuna uhusiano [-9] Sijui	1e. Ndoa [1]Ameoa/ameolewa [2] Mtalaka [3]Wametenganа [4] Mjane/ Mgane [5] Hajaoa/ Hajaolewa [6]Wanaishi pamoja	1f. ***(Kwa Mwanamke wa umri wa miaka 15-49).*** Je ni mjamzito? [1] Ndiyo [2] Hapana [-9] Sijui	1g. (K ana umr ≤2) Je, b ananyon [1] Ndiyo [2] Hapa [-9] Siju
1*		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
2		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
3		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
4		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
5		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
6		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
7		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
8		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
9		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
10		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
11		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2
12		1 2	_____ -9	1 2 3 4 5 6 7 8 9 10 -9	1 2 3 4 5 6	1 2 - 9	1 2

**** Mhojiwa***

2. Kwa kila mjumbe wa nyumba iliyochaguliwa kwa utafiti dodosa yafuatayo: (Jaza Vitambulisho na majina kutoka sehemu ya I)

SN	Jina	2a. Katika kipindi cha miezi mitatu iliyopita, je mwanakaya (jina) alipatwa na homa ***kali***? [1]Ndiyo [2] Hapana (uliza jina linalofuata) [-9] Sijui (uliza jina linalofuata) ***(Kama hakuna aliyeugua katika kaya, nenda 2e)***	2b. Ni matukio mangapi ya homa mwanakaya (jina) alipata kwa miezi mitatu iliyopita? [1]Moja [2]Mbili [3]Tatu [4] Zaidi ya tatu [-9] Sijui	2c. Tukio la mwisho la homa lilidumu kwa siku ngapi kwa (jina)? [1]Moja [2]Mbili [3]Tatu [4] Zaidi ya tatu [-9] Sijui	2d. Kwa tukio la mwisho la homa dalili zipi nyingine (jina) alikuwa nazo? ***(Usisome majibu zungushia yote atakayotaja)*** [1]Hakuna dalili yoyote [2]Maumivu makali ya kichwa [3]Kuchoka viungo/Maumivu [4]Kutapika [5]Kizunguzungu [6]Kukosa nguvu [7]Kuhara [8]Kutokwa na damu sehemu ya mwili (bila kuumia) [9]Kuumwa tumbo [10] Kupata vipele vidogo dogo katika ngozi [95] Nyingine___ [-9] Sijui	2e. Katika kip mitatu iliyopita (jina) alisafiri wilaya hii? [1] Ndiyo [2] Hapana linalofuata) [-9] Sijui (uliza ***(Kama hak*** ***katika kaya, ne***
1*		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
2		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
3		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
4		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
5		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
6		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
7		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
8		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
9		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
10		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
11		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1
12		1 2 -9	1 2 3 4 -9	1 2 3 4 -9	1 2 3 4 5 6 7 8 9 95 -9	1

**** Mhojiwa***

APPENDIX 3: CURRICULUM VITAE

LEONARD E.G. MBOERA

Biodata	
Surname	MBOERA
First and middle names	Leonard Ernest Gustavin
Phone (work)	+255 22 212 1 400
Mobile phone	+255 754 314 701
E-mail	lmboera@nimr.or.tz; lmboera@gmail.com
Country of birth	Tanzania
Place of birth	Moshi, Tanzania
Date of birth	November 21, 1957
Sex	Male
Nationality (birth)	Tanzanian

Professional expertise

Several years of experiences in research in mosquito-borne diseases, ecohealth, outbreak management, infectious disease surveillance and health systems.

University Education

1. 1995-1999, PhD (Chemical Ecology of Mosquitoes), Wageningen Agricultural University, The Netherlands
2. 1989-1991, Diploma of Imperial College (Applied Entomology), Imperial College of Science, Technology & Medicine, London, United Kingdom
3. 1989-1990, MSc (Applied Entomology), University of London, UK
4. 1982-1985, BVM (Veterinary Medicine & Surgery), Sokoine University of Agriculture, Morogoro, Tanzania

Current Institutional Affiliation

SACIDS-African Centre of Excellence in Infectious Diseases of Human and Animals, College of Veterinary Medicine and Biomedical Sciences, Sokoine University of Agriculture, P.O. Box 3297, Chuo Kikuu, Morogoro, Tanzania

Current and Recent Grants (2006-2017)

1. Analysis of Hospital Causes of Mortality in Tanzania. Global Funds/Government of United Republic of Tanzania (Principal Investigator), 2016-2017. US$474,000
2. Novel sustainable approaches to mosquito management through attract and kill techniques. ISCA Technologies. (Principal Investigator), 2016-2018.
3. Enhancing community-based disease outbreak detection and response in East and Southern Africa. Skoll Global Threat (Co-Principal Investigator), 2015-2019. US$400,000
4. Evaluation of long-term and morbidity reduction after twice yearly oral Azithromycin in Kilosa District, Tanzania. Bill & Melinda Gates Foundation (Co-Principal Investigator), 2013-2017. US$ 400,000
5. Integrated Human and Animal Disease Control for Tanzanian Pastoralists Facing Settlement. International Development Research Centre of Canada (Co-Principal Investigators), 2013-2017. CAD 2 million
6. "One stone two birds". Integrating application of biolarvicides and fertilizer in rice fields to control malaria vectors productivity and increase rice yields in Tanzania. Grand Challenges Canada (Co-Principal Investigator); Sept 2014-March 2016. CAD 100,000

7. Epidemiological, clinical and entomological investigation of Dengue infection in Dar es Salaam: understanding the circulation of dengue virus and the vector abundance and transmission indices. Tanzania Commission for Science and Technology; National Institute for Medical Research; Ministry of Health and Social Welfare; National Institute for Infectious Diseases "L. Spallanzani", Rome (Principal Investigator), 2014. TSh 62m
8. Control of the filariasis vector, *Culex quinquefasciatus* using biolarvicide and oviposition attractant-treated breeding sites in Mafia Islands, eastern Tanzania. Grand Challenge Canada (Co-Principal Investigator), 2013-2014. CAD 100,000
9. Integrated Research Partnerships for Malaria Control through an Ecohealth Approach in East Africa. International Development and Research, Canada (Principal Investigator), 2011-2013. CAD 110,000
10. Implementation Science to Optimize Malaria Vector Control and Disease Management. National Institute of Health (Co-Principal Investigator), 2010-2016. USD 491,000
11. Malaria Decision Analysis Support Tool: Evaluating Health, Social and Environmental Policy Tradeoffs, 2010-2011. World Health Organization (Co-investigator), 2009-2013
12. Targeting breeding site preferences of disease spreading mosquitoes: a multidisciplinary effort to develop novel 'green' mosquito control tools''. Tanzania Commission for Science and Technology, (COSTECH), The Swedish International Development Cooperation Agency (Sida) and Netherlands Organisation for Scientific Research, Science for Global development (NWO-WOTRO), Co-Principal Investigator, 2012-2014. EURO 293,250.
13. Integrated Malaria Mosquito Control: Field evaluation for Olyset® window and eave curtains and door screens in malaria holoendemic area Tanzania, 2009-2011 (Principal Investigator). USD 80,000
14. Challenges and opportunities for the involvement of traditional practitioners in scaling up safe male circumcision in the context of HIV prevention in Tanzania, 2009. World Health Organization (Principal Investigator)
15. Mapping Health Innovation Systems in Tanzania, 2007-2009. African Technology Policy Studies, (Principal Investigator)
16. Situation analysis on Health/Medical Research Coordination and Ethics in Zanzibar (World Health Organization/Ministry of Health and Social Welfare, Zanzibar), January-February 2008. World Health Organization (Principal Investigator/Team Leader)
17. Insecticide treated mosquito net utilisation and coverage in Tanzania (Norvatis Aventis/UNDP), 2007-2008 (Principal Investigator)
18. Epidemiology of Avian Influenza in Tanzania (University of Minnesota/ USAID), 2006-2008 (Co-Principal Investigator)

Consultancies

1. Analytical Review of Performance of Health Sector Strategic Plan III, 2009-2015. World Health Organization, Geneva, Switzerland. January - July 2017 (on-going)
2. The burden of reporting data by health workers: A Multi-Country Study. World Health Organization, December 2015-March 2017
3. Regional contingency plan for epidemics due to communicable diseases, conditions and other events of public health concern for the East African Community. EAC/ECSA, April-June 2015.
4. Mid-term Analytical Review of Performance of Health Sector Strategic Plan III, 2009-2015. January - September 2013. World Health Organization/ Tanzania Ministry of Health and Social Welfare
5. Assessment of the Availability of Health Services of the Required Mix at Various Levels of the Health System to Ensure Accessibility and Quality of Health Care including the Change

of Burden of Diseases Resulting from Climate Changes and Environment (Ministry of Finance and Economic Affairs, Tanzania, 2009-2010
6. Alignment and harmonisation in health research in Tanzania. Council on Health Research and Development, 2008-2009
7. Situation analysis on Health/Medical Research Coordination and Ethics in Zanzibar (World Health Organization/Ministry of Health and Social Welfare, Zanzibar), January-February 2008. World Health Organization.

Journal publications (Total articles=131; Average per year=5)
Selected Research Journal Articles

1. Derua, Y.A., Rumisha, S.F., Batengana, B.M., Max, D.A., Stanley, G., Kisinza, W.N. & Mboera, LE.G. (2017) Lymphatic filariasis transmission on Mafia Islands, Tanzania: Evidence from xenomonitoring in mosquito vectors. *PLoS Neglected Tropical Diseases* 11(10): e0005938.
2. Simmons, R., Mboera, L.E., Miranda, M.L., Rand, A., Stresman, G., Turner, E., Kramer, R., Drakeley, C., O'Meara, W.P. (2017) A longitudinal cohort study of malaria exposure and changing serostatus in a malaria endemic area of rural Tanzania. *Malaria Journal* 16: 309. Doi: 10.1186/s12936-017-1945-2
3. Mazigo, H.D., Rumisha, S.F., Chiduo, M.G., Bwana, V.M., Mboera, L.E.G. (2017) Malaria among rice farming communities in Kilangali village, Kilosa District, central Tanzania: prevalence, intensity and associated factors. *Infectious Disease of Poverty* 6:101.
4. Mweya, C., Mboera, L., Kimera, S. (2017) Climate Influence on Emerging Risk Areas for Rift Valley Fever Epidemics in Tanzania. *American Journal of Tropical Medicine & Hygiene* 97 (1): 109-114.
5. Mangesho, P.E., Ole Neselle, M., Karimuribo, E.D., Mlangwa, J.E., Queenan, K., Mboera, L.E.G., Rushton, J., Kock, R., Häsler, B., Kiwara, A. & Rweyemamu, M. (2017) Exploring local knowledge and perceptions on zoonoses among pastoralists in northern and eastern Tanzania. *PLoS Neglected Tropical Diseases* 11(2): e0005345.
6. Schorkopf, D.L.P., Spanoudis, C.G., Mboera, L.E.G., Mafra-Neto, A., Ignell, R. & Dekker, T. (2016) Combining attractants and larvicides in biodgradable matrices for sustainable disease vector mosquito control. *PLoS Neglected Diseases* 10(10); e0005043
7. Sindato, C., Stevens, K.B., Karimuribo, E.D., Mboera, L.E.G., Paweska, J.T. & Pfeiffer, D.U. (2016) Spatial Heterogeneity of Habitat Suitability for Rift Valley Fever Occurrence in Tanzania: An Ecological Niche Modelling Approach. *PLoS Neglected Tropical Diseases* 10(9): e0005002.
8. Mweya, C.N., Kimera, S.I., Stanely, G., Misinzo, G. & Mboera, L.E.G. (2016) Climate change influences potential distribution of *Aedes aegypti* co-occurrence with dengue epidemics risk areas in Tanzania. *PLoS One* 11(9): e0162649.
9. Rahman, R., Lesser, A., Mboera, L., Kramer, R. (2016) Cost of microbial larviciding for malaria control in rural Tanzania. *Tropical Medicine & International Health* 21(11):1468-1475.
10. Vairo, F., Mboera, L.E.G., De Nardo, P., Oriyo, N.M., Meschi, S., Rumisha, S.F., Colavita, F., Mhina, A., Carletti, F., Mwakapeje, E., Capobianchi, M.R., Castilletti, C., Di Caro, A., Nicastri, E., Malecela, M.N. & Ippolito, G. (2016) Clinical, virologic, and epidemiologic characteristics of Dengue Outbreak, Dar es Salaam, Tanzania, 2014. *Emerging Infectious Diseases* 22 (5), 895-899.
11. Mboera, L.E.G., Mweya, C.N., Rumisha, S.F., Tungu, P.K., Stanley, G., Makange, M.R., Misinzo, G., De Nardo, P., Vairo, F. & Oriyo, N.M. (2016) The risk of Dengue virus transmission in Dar es Salaam, Tanzania during an epidemic period of 2014. *PLoS Neglected Tropical Diseases* 10(1): e004313.

12. Kweka, E.J., Tenu, F., Magogo, F., Mboera, L.E.G. (2015) *Anopheles gambiae sensu stricto* aquatic stages development comparison between insectary and semifield structure. *Advances in Zoology* Article ID 720365.
13. Mangesho, P.E., Karimuribo, E., Mlangwa, J., Mboera, L.E., Rushton, J., Kock, R., Kiwara, A. & Rweyemamu, M. (2015) Anthropology and Ecohealth Research in Control of Diseases for Pastorals in Tanzania. *Online Journal of Public Health Informatics* 7(1): e146.
14. Mayala, B.K., Fahey, C., Wei, D., Zinga, M.M., Bwana, V.M., Mlacha, T., Rumisha, S.F., Stanley, G., Mboera, L.E.G (2015) Knowledge, perception, practices about malaria, climate change, livelihoods and food security among rural communities of central Tanzania. *Infectious Journal of Poverty* 4:21. doi: 10.1186/s40249-015-0052-2.
15. Mboera, L.E.G., Bwana, V.M., Rumisha, S.F., Malima, R.C., Mlozi, M.R.S., Mayala, B.K., Stanley, G., Mlacha, T. (2015) Malaria, anaemia and nutritional status among schoolchildren in relation to ecosystems, livelihoods and health systems in Kilosa District in central Tanzania. *BMC Public Health* 15:553
16. Mboera, L.E.G., Bwana, V.M., Rumisha, S.F., Stanley, G., Tungu, P.K., Malima, R.C. (2015) Spatial abundance and human biting rate of *Anopheles arabiensis* and *An. funestus* in savannah and rice agro-ecosystems of central Tanzania. *Geospatial Health* 10:322
17. Mhina, A.D., Kasanga, C.J., Sindato, C., Karimuribo, E.D. & Mboera, L.E.G. (2015) Rift Valley fever potential mosquito vectors and their infection status in Ngorongoro District in northern Tanzania. *Tanzania Journal of Health Research* 16 (4):
18. Mweya, C.N., Kimera, S.I., Mellau, S.B.L., Mboera, L.E.G. (2015) Inter-epidemic abundance and distribution of potential mosquito vectors for Rift Valley Fever virus in Ngorongoro District, Tanzania. *Global Health and Action* 8: 25929.
19. Shayo, E.H., Rumisha, S.F., Mlozi, M.R.S., Bwana, V.M., Mayala, B.K., Malima, R.C., Mlacha, T. & Mboera, L.E.G. (2015) Social determinants of malaria and health care seeking patterns among rice farming and pastoral communities in Kilosa District of Central Tanzania. *Acta Tropica* 141 (1), 41-49
20. Sindato, C., Pfeiffer, D.U., Karimuribo, E.D., Mboera, L.E.G., Rweyemamu, M.M., Paweska, J.T. (2015) A spatial analysis of Rift Valley fever virus seropositivity in domestic ruminants in Tanzania. *PLoS One* 10(7): e0131873.
21. Rumisha, S.F., Zinga, M.M., Fahey, C.A., Wei, D., Bwana, V.M., Mlozi, M.R.S., Shayo, E.H., Malima, R.C., Mayala, B.K., Stanley, G., Mlacha, T. & Mboera, L.E.G. (2014) Accessibility, availability and utilisation of malaria interventions among women of reproductive age in Kilosa District in central Tanzania. *BMC Health Services Research* 14: 452. Doi: 10.1186/1472-6963-14-452.
22. Mweya, C.N., Holds, N., Mboera, L.E.G., Kimera, S.I. (2014) Simulation modelling of population dynamics of mosquito vectors of Rift Valley Fever virus in a disease epidemic setting. *PLoS One* 9(9): e108430.
23. Mutero, C.M., Kramer, R.A., Paul, C., Lesser, A., Miranda, M.L., Mboera, L.E.G., Kiptui, R., Kabatereine, N. & Ameneshewa, B. (2014) Factors influencing malaria control policy-making in Kenya, Uganda and Tanzania. *Malaria Journal* 13:305
24. Kramer, R.A., Mboera, L.E.G., Miranda, M.L., Senkoro, K., Lesser, A., Shayo, E.H., Paul, C.J. (2014) A randomized longitudinal factorial design to assess malaria vector control and disease management interventions in rural Tanzania
International Journal of Environment and Public Health 11, 5117-5132.
25. Sindato, C., Karimuribo, E.D., Pfeiffer, D.U., Mboera, L.E.G., Kivaria, F., Dautu, G., Bernard, B., Paweska, J.T. (2014) Spatial and temporal pattern of Rift Valley fever outbreaks in Tanzania; 1930 to 2007. *PLoS ONE* 9 (2): e8889.

26. Mweya, C.N., Kimera, S.I., Kija, J.B., Mboera, L.E.G. (2013) Predicting distribution of *Aedes aegypti* and *Culex pipiens* complex, potential vectors of Rift Valley fever virus in relation to disease epidemics in East Africa. *Infection Ecology and Epidemiology* 3: 21748.

GERALD MISINZO

Personal History

1.1.1 Name: Gerald Misinzo
1.1.2 Sex: Male
1.1.3 Date of birth: January 02nd, 1975
1.1.4 Place of birth: Sengerema
1.1.5 Marital status: Married
1.1.6 Nationality: Tanzanian

Academic Qualifications

1.2.1 Ph.D. in Veterinary Medicine, 2007, Ghent University, Ghent, Belgium.
1.2.2 MSc. Molecular Biology, 2003, Catholic University of Leuven, Leuven, Belgium.
1.2.3 Bachelor of Veterinary Medicine, 2000, Sokoine University of Agriculture, Morogoro, Tanzania

Employment Record at the University

1.3.1 July 2014 to date, Associate Professor
1.3.2 July 2009 to June 2014, Senior Lecturer.
1.3.3 July 2005 to June 2009, Lecturer.
1.3.4 July 2002 to June 2005, Assistant Lecturer.
1.3.5 September 2000 to June 2002, Tutorial Assistant.

Professional activities

Member of the British Journal of Virology Editorial Board, Smith and Franklin Academic Publishing Corporation. February 2014 to date.
Visiting lecturer, Nelson Mandela African Institute of Science and Technology, Arusha, Tanzania. January 2012 to 2014.
Visiting lecturer, Catholic University College of South-West Flanders, Roeselare, Belgium. March 2009 to date.
Principal investigator, influenza surveillance in Tanzania at PharmAccess Foundation, Dar es Salaam, Tanzania. February 2009 to date.
Assistant editor, Tanzania Veterinary Journal (TVJ). January 2009 to December, 2011.

Teaching

Bachelor of Science in Biotechnology and Laboratory Sciences and Bachelor of Veterinary Medicine.
Master of Science in Molecular Biology and Biotechnology, Master of Science in Applied Microbiology and Master of Science in One Health Molecular Biology.

Supervision of Research

Doctoral students (PhD)

1. Co-supervisor of Emeli Torsson, 2014 to date. Epidemiology of peste des petits ruminants virus in Tanzania. Co-supervising with Dr. Jonas Wensman and Professor Mikael Berg.
2. Primary supervisor of Tebogo Kgotlele, 2014 to date. Molecular characterization and epidemiology of peste des petits ruminants virus in selected areas of Central, Eastern and

Southern Africa. Co-supervising with Dr. Jonas Wensman of Swedish University of Agricultural Sciences, Uppsala, Sweden.

3. Primary supervisor of Fortunate Shija, 2013 to date, Identifying the threats of zoonotic disease emergence in humans from arboviruses of forest wildlife. Co-supervising with Dr. Catherine Walton of University of Manchester, Manchester, UK.
4. Primary supervisor of Gasper Honorati Chiwanga, 2015 to date, Development and evaluation of rapid and reliable assays for testing viability of Newcastledisease virus in vaccines supplied in Tanzania. Co-supervising with Professor Peter Msoffe (University of Dodoma).
5. Primary supervisor of Phanuel Nyimba, 2015 to date, Moleccular epidemiology of Rift Valley fever virus in domestic ruminants and mosquitoes during interepizootic periods in Southern Zambia. Co-supervising with Dr. Edgar Simulundu Sikabala (University of Zambia, Lusaka, Zambia).
6. Primary supervisor of Emma Peter Screening, characterisation and complete genome sequencing of sylvatic and outbreak African swine fever virus isolates in selected zones of Tanzania. Co-supervising with Dr. Gabriel Shirima (Nelson Mandela African Institution of Science and Technology; NM-AIST), Prof. Lughano Kusiluka (NM-AIST)and Prof. Sarah Cleaveland (University of Glasgow, UK)
7. Co-supervisor of Reuben MIiwomor Kom Tettey, 2014 to date, Epidemiology of hepatitis E virus infection among pregnant women at Efia Nkwanta regional hospital, Ghana. Co-supervising with Professors Sharadhuli I Kimera (SUA), Mecky Matee (Muhimbili University of Health and Allied Sciences) and Phyllis Addo (Noguchi Memorial Institute Of Medical Research, University of Ghana, Legon).

Postgraduate students (MSc. and MPhil.)

1. Believe Ahedor, 2014-2016, Detection and characterization of mosquito-borne arboviruses circulating in mosquitoes in Morogoro, Tanzania. Co-supervising with Dr. Catherine Walton of University of Manchester, Manchester, UK.
2. Clara Yona, 2015-2017, Epidemiology and control options for African swine fever in southern Tanzania. Co-supervsing with Professor Hans Nauwynck (University of Gent, Belgium).
3. Primary Supervisor of Happyness Jeremiah, 2015-2017, Current epidemiology of Bancroftian filariasis and clinical disease presentation in endemic communities during elimination process in Tanzania. Co-supervising with Dr. Williams Makunde (National Institute for Medical Research, Tanga).
4. Kulus Patrick, 2013-2015, Molecular characterization and surveillance of African swine fever virus in selected wildlife-livestock interface areas of Tanzania, MSc. OHMB,
5. Pendo Vincent Mauya, 2013-2015, Molecular characterisation of African swine fever virus in selected areas of northern and southern Tanzania during 2014 outbreaks, MSc. OHMB,
6. Jonas Thoromo, 2013-2015, Diagnosis and genotyping of 2014 and 2015 outbreak African swine fever viruses in Zambia, MSc. OHMB,
7. Bwihangane Birindwa Ahadi, 2013-2015, Sero-surveillance and molecular diagnosis of peste des petitis ruminants virus in South Kivu, Democratic Republic of Congo, MSc. OHMB,
8. Mariana Shayo, 2013-2015, Diversity of Culicinae and viral infection in Aedes mosquitoes of Kilombero and Ulanga districts, Tanzania, MSc. OHMB,
9. Kinimi Edson, 2013-2015, Mosquito diversity and febrile illnesses in Karagwe and Kyerwa districts, northwestern Tanzania, MSc. OHMB,
10. Adam Mahamoud Namtimba, 2013-2015, Seroprevalence and genetic characterisation of peste des petits ruminants virus in selected areas of Tanzania, MSc. OHMB,

11. Gurdeep Jaswant, 2013-2015, Detection and genetic characterization of 2013 and 2014 outbreak dengue viruses in patients of Dar es Salaam, Tanzania, MSc. OHMB,
12. Patience Maindo, 2013-2015, Genotypes of hepatitis B virus among voluntary blood donors in Kinshasa, Democratic Republic of Congo, MSc. OHMB,
13. Ruth Maganga, 2013-2015, Detection of arenaviruses from rodents and shrews in selected wildlife-human-livestock interfaces in Tanzania, MSc. OHMB,
14. Charles Mayenga, 2013-2015, Molecular diagnosis and characterization of orf virus in symptomatic goats of Coast and Dar es Salaam regions, Tanzania
15. David Emil Kwavi, 2013-2015, Molecular diagnosis and discrimination of circulating African swine fever virus during 2013 outbreak in Northern Tanzania, MSc. OHMB,
16. Fidelis Charles, 2013-2015, Analysis of mutation rate of 17 Y-chromosome short tandem repeats loci using Tanzanian father-son paired samples, MSc. OHMB,
17. Godlisten Materu, 2013-2015, Molecular characterization of Wuchereria bancrofti in mosquitoes of Pangani District, North Eastern Tanzania, MSc. OHMB,
18. Issa Nassoro, 2013-2015, Serological and molecular detection of rift valley fever virus in livestock and wildlife of Katavi-Rukwa ecosystem, Tanzania, MSc. OHMB,
19. Kennedy Makola Mbanzulu, 2013-2015, Mosquito diversity and virus infectivity in Kinshasa, Democratic Republic of Congo, MSc. OHMB,
20. Shabani Kililwa Muller, 2013-2015, Seroprevalence of Leptospira infection from agro pastoralist communities in Katavi ecosystem, Tanzania, MSc. OHMB,
21. Abdalah Makaranga, 2013-2015, Survey for natural eukaryotic translation initiation factor variants in cassava for identification of sources of cassava brown streak potyviruses resistance, MBB,
22. Jean Pierre Kambala Mukendi, 2013-2015, Detection and molecular characterization of *Dirofilaria immitis* and *Dirofilaria repens* in dogs of Morogoro municipality, Morogoro, Tanzania, MBB and
23. Mariam Richard Makange, 2013-2015, Diagnosis, identification and antifungal susceptibility of cutaneous fungi isolated from Kihansi spray toads and giraffes, MPhil.
24. Emmanuel Sadikiel Macha, 2012-2014, Molecular characterization of peste des petits ruminants virus in northern Tanzania.
25. Godfrey Kayombo, 2012-2014, Seroprevalence of brucellosis in smallholder dairy cattle in Babati district.
26. Ishmaeli Bika, 2012-2014, Molecular characterization of Brucella species in dairy cattle from Morogoro, Tanzania.
27. Tebogo Kgotlele, 2011-2013, Seroprevalence and molecular characterization of peste des petits ruminants virus in Tanzania.
28. Christopher Dickson Sikombe, 2011-2013, Molecular characterization and assessment of epidemiological risk factors of African swine fever virus in Iringa region, Tanzania.
29. Fortunate Shija, 2011-2013, Assessment of milk handling practices and bacterial contaminations along the dairy value chain in Lushoto and Handeni districts, Tanzania.
30. Edward Samwel Mayila, 2011-2013, Molecular diagnosis of respiratory viruses in patients attending Lugalo and Mzinga Tanzania Peoples Defence Forces military hospitals
31. Epaphras Alex Muse, 2010-2012, Molecular characterization of peste des petits ruminants virus and epidemiology of peste des petits ruminants in Southern Tanzania.

Administration

Leader, African Center of Excellence for Infectious Diseases of Humans and Animals in Southern and Eastern Africa (SACIDS-ACE), May 2016 to December 2022.

Head of Department, The Department of Veterinary Microbiology and Parasitology, August 2014 to date.

MSc. One Health Molecular Biology (OHMB) course coordinator, November 2011 to June 2014.

Journal Articles

1. Mbanzulu KM, Wumba R, Mukendi JK, Zanga JK, Shija F, Bobanga TL, Aloni MN, Misinzo G. Mosquito-borne viruses circulating in Kinshasa, Democratic Republic of the Congo. Int J Infect Dis. 2017 Apr;57:32-37. doi: 10.1016/j.ijid.2017.01.016.
2. Simulundu E, Chambaro HM, Sinkala Y, Kajihara M, Ogawa H, Mori A, Ndebe J, Dautu G, Mataa L, Lubaba CH, Simuntala C, Fandamu P, Simuunza M, Pandey GS, Samui KL, Misinzo G, Takada A, Mweene AS. Co-circulation of multiple genotypes of African swine fever viruses among domestic pigs in Zambia (2013-2015). Transbound Emerg Dis. 2017 Mar 15. doi: 10.1111/tbed.12635.
3. Torsson E, Kgotlele T, Berg M, Mtui-Malamsha N, Swai ES, Wensman JJ, Misinzo G. History and current status of peste des petits ruminants virus in Tanzania. Infect Ecol Epidemiol. 2016 Oct 20;6:32701. doi: 10.3402/iee.v6.32701. Review.
4. Mweya CN, Kimera SI, Stanley G, Misinzo G, Mboera LE. Climate Change Influences Potential Distribution of Infected Aedes aegypti Co-Occurrence with Dengue Epidemics Risk Areas in Tanzania. PLoS One. 2016 Sep 28;11(9):e0162649. doi: 10.1371/journal.pone.0162649.
5. Bennett KL, Shija F, Linton YM, Misinzo G, Kaddumukasa M, Djouaka R, Anyaele O, Harris A, Irish S, Hlaing T, Prakash A, Lutwama J, Walton C. Historical environmental change in Africa drives divergence and admixture of Aedes aegypti mosquitoes: a precursor to successful worldwide colonisation? Mol Ecol. 2016 Jul 20. doi: 10.1111/mec.13762.
6. Muller SK, Assenga JA, Matemba LE, Misinzo G, Kazwala RR. Human leptospirosis in Tanzania: sequencing and phylogenetic analysis confirm that pathogenic Leptospira species circulate among agro-pastoralists living in Katavi-Rukwa ecosystem. BMC Infect Dis. 2016 Jun 10;16(1):273. doi: 10.1186/s12879-016-1588-x.
7. Thoromo J, Simulundu E, Chambaro HM, Mataa L, Lubaba CH, Pandey GS, Takada A, Misinzo G, Mweene AS. 2016. Diagnosis and genotyping of African swine fever viruses from 2015 outbreaks in Zambia. Onderstepoort J Vet Res; Vol 83, No 1, 5 pages. doi: 10.4102/ojvr.v83i1.1095
8. Mukendi JP, Kimbita E, Mbanzulu KM, Maindo PP, Misinzo G. 2016. Morphological and molecular detection of canine dirofilarial species of veterinary and medical importance in Morogoro municipality, Tanzania. Vet Parasitol. 220:1-3. doi: 10.1016/j.vetpar.2016.02.005.
9. Mboera LE, Mweya CN, Rumisha SF, Tungu PK, Stanley G, Makange MR, Misinzo G, De Nardo P, Vairo F, Oriyo NM. 2016. The Risk of Dengue Virus Transmission in Dar es Salaam, Tanzania during an Epidemic Period of 2014. PLoS Negl Trop Dis. 10(1):e0004313. doi: 10.1371/journal.pntd.0004313.
10. Bennett KL, Linton YM, Shija F, Kaddumukasa M, Djouaka R, Misinzo G, Lutwama J, Huang YM, Mitchell LB, Richards M, Tossou E, Walton C. 2016. Molecular Differentiation of the African Yellow Fever Vector Aedes bromeliae (Diptera: Culicidae) from Its Sympatric Non-vector Sister Species, Aedes lilii. PLoS Negl Trop Dis. 9(12):e0004250. doi: 10.1371/journal.pntd.0004250.
11. Wensman JJ, Lindahl J, Wachtmeister N, Torsson E, Gwakisa P, Kasanga C, Misinzo G. 2015. A study of Rift Valley fever virus in Morogoro and Arusha regions of Tanzania - serology and farmers' perceptions. Infect Ecol Epidemiol. 5:30025. doi: 10.3402/iee.v5.30025.
12. Misinzo G, Kgotlele T, Muse E, Van Doorsselaere J, Berg M, Munir M. Peste des petits ruminants virus lineage II and IV from goats in southern Tanzania during and outbreak in 2011. Br J Virol. 2015;2:1-4.

13. Misinzo G, Gwandu FB, Biseko EZ, Kulaya NB, Mdimi L, Kwavi DE, Sikombe CD, Makange M and Madege M. 2014. *Neisseria denitrificans* restriction endonuclease digestion distinguishes African swine fever viruses of eastern from southern African origin circulating in Tanzania. *Res. Opin. Anim. Vet. Sci.* 4(4): 212-217.
14. Kgotlele T, Kasanga CJ, Kusiluka LJM and Misinzo G. 2014. Preliminary investigation on presence of peste des petits ruminants in Dakawa, Mvomero District, Morogoro Region, Tanzania. *Onderstepoort J. Vet. Res. 81(2), Art. #732, 3 pages. doi: 10.4102/ojvr.v81i2.732*
15. Kgotlele T, Macha ES, Kasanga CJ, Kusiluka LJM, Karimuribo ED, Van Doorsselaere J, Berg M, Wensman JJ, Munir M and Misinzo G. 2014. Partial genetic characterization of peste des petits ruminants virus from goats in Northern and Eastern Tanzania. *Transbound. Emerg. Dis.* 61(Suppl.1): 56-62 *doi: 10.1111/tbed.12229*
16. Sallu R, Kasanga C, Mkama M, Yongolo M, Njau P, Rweyemamu M, Misinzo G, Knowles N, King D and Wambura P. 2014. Phylogenetic analysis of foot-and-mouth-disease virus type a circulating in Tanzania during 2008-2013 *Res. Opin. Anim. Vet. Sci.* 4(8): 420-426.
17. Makange M, Kulaya N, Biseko E, Kalenga P, Mutagwaba S and Misinzo G. 2014. Detection of *Batrachochytrium dendrobatidis* in Kihansi spray toad at Kihansi captive breeding facility. *Dis. Aquat. Organ.* 111(2):159-64. *doi: 10.3354/dao02775 [Epub ahead of print].*
18. Misinzo G, Kwavi DE, Sikombe CD, Makange M, Peter E and Madege MJ. 2014. Molecular characterisation of African swine fever virus from domestic pigs in northern Tanzania during an outbreak in 2013. *Trop. Anim. Health. Prod.* 46(7):1199-207. *doi: 10.1007/s11250-014-0628-z [Epub ahead of print].*
19. Rweyemamu M, Kambarage D, Karimuribo E, Wambura P, Matee M, Kayembe JM, Mweene A, Neves L, Masumu J, Kasanga C, Hang'ombe B, Kayunze K, Misinzo G, Simuunza M, Paweska JT. 2013. Development of a One Health National Capacity in Africa : The Southern African Centre for Infectious Disease Surveillance (SACIDS) One Health Virtual Centre Model. *Curr. Top. Microbiol. Immunol*. 366:73-91 *doi: 10.1007/82_2012_244*
20. Misinzo G, Kasanga CJ, Mpelumbe–Ngeleja C, Masambu J, Kitambi A and Van Doorsselaere J. 2012. African Swine Fever Virus, Tanzania, 2010–2012. *Emerg. Infect. Dis.* 18(12): 2081-2083
21. Misinzo G, Jumapili F, Ludosha M, Mafie E, Silialis J, Mushi R, Viaene W and Van Doorsselaere J. 2012. Genotyping of African swine fever virus from a 2009 outbreak in Tanzania. *Res. Opin. Anim. Vet. Sci.* 2(5): 334-338
22. Misinzo G, Mathew C, Matondo R, Jumapili F, Ludosha M, Masola S, Munisi W, Viaene W and Van Doorsselaere J. 2012. Pathogenic *Escherichia fergusonii* and *Staphylococcus gallinarum* co-infection in a free-ranging domestic chicken. *Res. Opin. Anim. Vet. Sci.* 2(5): 324-328
23. Muse EA, Matondo RB, Karimuribo ED, Misinzo G, Albano MO and Gitao GC. 2012. Clinico-pathological findings of the 2011 outbreak of Peste des Petits Ruminants (PPR) in Tandahimba district, southern Tanzania. *Res. Opin. Anim. Vet. Sci.*, 2(4): 256-262.
24. Muse AE, Karimuribo ED, Gitao GC, Misinzo G, Mellau LSB, Msoffe PLM, Swai ES and Mbyuzi AO. 2012. Epidemiological investigation into the introduction and factors for spread of Peste des Petits Ruminants, Southern Tanzania. *Onderstepoort J. Vet. Res*. 79(2): Art.#457, 6.
25. Nauwynck HJ, Sanchez R, Meerts P, Lefebvre D, Saha D, Huang L and Misinzo G. 2011. Cell tropism and entry of porcine circovirus 2. *Virus Res.*, 164 (1–2): 43-45. *doi: 10.1016/j.virusres.2011.11.003*
26. Sanchez JL, Johns MC, Burke RL, Vest KG, Fukuda MM, Yoon IK, Misinzo G et al. 2011. Capacity-building efforts by the AFHSC-GEIS program. *BMC Public Health*. 11 (2): S4.

27. Misinzo G, Magambo J, Masambu J, Yongolo MG, Van Doorsselaere J and Nauwynck HJ. 2011. Genetic characterization of African swine fever virus from a 2008 outbreak in Tanzania. *Transbound. Emerg. Dis.* 58: 86-92. *doi: 10.1111/j.1865-1682.2010.01177.x*
28. Van Breedam W, Delputte PL, Van Gorp H, Misinzo G, Vanderheijden N, Duan X and Nauwynck HJ. 2010. Porcine reproductive and respiratory syndrome virus entry into the porcine macrophage. *J. Gen. Virol*. 91: 1659-1667. *doi: 10.1099/vir.0.020503-0*
29. Misinzo G, Delputte PL, Lefebvre DJ, Nauwynck HJ. 2009. Porcine circovirus 2 infection of epithelial cells is clathrin-, caveolae- and dynamin-independent, actin and Rho-GTPase-mediated, and enhanced by cholesterol depletion. *Virus Res*. 139(1): 1-9. *doi: 10.1016/j.virusres.2008.09.005*
30. Misinzo G, Delputte PL, Nauwynck HJ. 2008. Involvement of proteases in porcine reproductive and respiratory syndrome virus uncoating upon internalization in primary macrophages. *Vet. Res*. 39(6): 55. *doi: 10.1051/vetres:2008031*
31. Misinzo G, Delputte PL, Nauwynck HJ. 2008. Inhibition of endosome-lysosome system acidification enhances porcine circovirus 2 infection of porcine epithelial cells. *J Virol*. 82(3):1128-35. *doi: 10.1128/JVI.01229-07*
32. Misinzo G, Delputte PL, Lefebvre DJ, Nauwynck HJ. 2008. Increased yield of porcine circovirus 2 by a combined treatment of PK-15 cells with interferon-gamma and inhibitors of endosomal-lysosomal system acidification. *Arch Virol*. 153(2): 337-42. *doi: 10.1007/s00705-007-1092-0*
33. Lefebvre DJ, Costers S, Van Doorsselaere J, Misinzo G, Delputte PL, Nauwynck HJ. 2008. Antigenic differences among porcine circovirus type 2 strains, as demonstrated by the use of monoclonal antibodies. *J Gen Virol*. 89(1): 177-87. *doi: 10.1099/vir.0.83280-0*
34. Lefebvre DJ, Meerts P, Costers S, Misinzo G, Barbé F, Van Reeth K and Nauwynck HJ. 2008. Increased porcine circovirus type 2 replication in porcine leukocytes *in vitro* and *in vivo* by concanavalin A stimulation. *Vet Microbiol*. 132(1-2): 74-86. *doi: 10.1016/j.vetmic.2008.05.004*
35. Misinzo G, Delputte PL, Meerts P, Drexler C, Nauwynck HJ. 2006. Efficacy of an inactivated PRRSV vaccine: induction of virus-neutralizing antibodies and partial virological protection upon challenge. *Adv Exp Med Biol*. 581: 449-54. *doi: 10.1007/978-0-387-33012-9_81*
36. Misinzo G, Delputte PL, Meerts P, Lefebvre DJ, Nauwynck HJ. 2006. Porcine circovirus 2 uses heparan sulfate and chondroitin sulfate B glycosaminoglycans as receptors for its attachment to host cells. *J Virol*. 80(7):3487-94. *doi: 10.1128/JVI.80.7.3487-3494.2006*
37. Meerts P, Misinzo G, Lefebvre D, Nielsen J, Bøtner A, Kristensen CS, Nauwynck HJ. 2006. Correlation between the presence of neutralizing antibodies against porcine circovirus 2 (PCV2) and protection against replication of the virus and development of PCV2-associated disease. *BMC Vet Res*. 2: 6. *doi:10.1186/1746-6148-2-6*
38. Meerts P, Misinzo G, Nauwynck HJ. 2005. Enhancement of porcine circovirus 2 replication in porcine cell lines by IFN-gamma before and after treatment and by IFN-alpha after treatment. *J Interferon Cytokine Res*. 25(11): 684-93. *doi:10.1089/jir.2005.25.684*
39. Misinzo G, Meerts P, Bublot M, Mast J, Weingartl HM, Nauwynck HJ. 2005. Binding and entry characteristics of porcine circovirus 2 in cells of the porcine monocytic line 3D4/31. *J Gen Virol*. 86(7): 2057-68. *doi: 10.1099/vir.0.80652-0*
40. Meerts P, Misinzo G, McNeilly F, Nauwynck HJ. 2005. Replication kinetics of different porcine circovirus 2 strains in PK-15 cells, fetal cardiomyocytes and macrophages. *Arch Virol*. 150(3): 427-41.

Projects, consultancies and patents

1. Misinzo G and Rweyemamu M. 2016-2021. Southern African Center for Infectious Disease Surveillance (SACIDS) - African Center of Excellence for Infectious Diseases of Humans and Animals in Southern and East Africa. Eastern and Southern Africa Higher Education Centers of Excellence Project (ACE II) funded bu the IUCEA and World Bank Group. Conditional Award of 6,000,000 USD.
2. Misinzo G and Nauwynck HJ. 2015-2018. Improving livelihood through control of viral diseases affecting short cycle stocks. Flemish Inter-University Council - Belgian VLIR-UOS TEAM Projects. 290,676 Euro.
3. Vivek Kapur, Paul Gwakisa, and Joram Buza With Bhushan Jayarao, Isabella Cattadori, Peter Hudson, Istvan Albert, Anna Estes, Walter R. McVey, Jr, Morris Agaba, Francis Shahada, Lughano Kusiluka, Martin Kimanya, Athanasia Matemu, Appolinaire Djikeng, Fausta Mosha, Steven Francesconi, Ketan Patel, Gerald Misinzo, Robinson Mdegela, Robert Fyumagwa, Fortunata Msoffe, Ernest Eblate, and Dennis Rentsch. Global health, emerging infectious diseases, and food safety implications of bushmeat consumption. Funding Agency: DTRA (Defense Threat Reduction Agency); GRANT11475724. Project Start and End Date: 01/14 --12/16 Total Funds Requested: US $ 2,841,769
4. Wensman J, Abubakar M, Berg M, Glass L, Munir M, Misinzo G and Ståhl K. Factors determining susceptibility of peste des petits ruminants virus infections in domestic and wild small ruminants: Understanding the role of wildlife in virus epidemiology and host-pathogen interactions. Swedish Research Council. 524,000 USD.
5. Misinzo G and Walton C. 2012-2015. Identifying the threats of zoonotic disease emergence in humans from arboviruses of forest wildlife. The Leverhulme-Royal Society Africa Award Africa Awards Phase II - R1. 178,900 UK£.
6. Misinzo G and Van Doorsselaere J. 2011-2012. Epidemiological investigation of peste des petit ruminants disease of small ruminants in South Tanzania. 15,000 Euro.
7. Misinzo G and Malago JJ. 2009-2011. A survey of infectious amphibian diseases affecting free-ranging amphibians inhabiting Kihansi gorge and University of Dar es Salaam compound. Lower Kihansi environmental management project (LKEMP) and National Environmental Management Council (NEMC), World Bank CR 3546-1 - TA. Consultancy number NEMC-LKEMP/PROC/C/05/09. 27,118 USD.
8. Misinzo G and Khatibu FHA. 2008-2011. Development of a biological control for chytridiomycosis caused by *Batrachochytrium dendrobatidis* in Kihansi spray toad *Nectophrynoides asperginis* population. Lower Kihansi environmental management project (LKEMP) and National Environmental Management Council (NEMC), World Bank CR 3546-1 - TA. Consultancy number NEMC-LKEMP/C/2/2008. 81,078 USD.
9. Misinzo G and Van Doorsselaere J. 2010. A Survey of Infectious Amphibian Diseases Affecting Free-ranging Amphibians Inhabiting the Kihansi Gorge. Association of Educative and Scientific Authors (VEWA), Belgium. 15,000 Euro.
10. Misinzo G, Kohi YM, Mboera L, Schnabel D, Yongolo MG, Kulanga C and Kadigi MD. 2009-2014. Influenza surveillance in Tanzania using Tanzania People Defence Force (TPDF) military hospitals. United States of America Department of Defence Global Emerging Infections Surveillance and Response System (DoD-GEIS) and PharmAccess Foundation. 800,000 USD.
11. Nauwynck HJ, Misinzo G and Arnouts S. 2007. Culturing circular ssDNA viruses for the production of vaccines. United States Patent office (USPTO). Patent application file number 11/680,420 filed on February 28, 2007. Patent number 20070184544, class 435235100 USPTO.

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Professional Experiences

- Sep 15 2017 - present Director, Div. Emerging Infectious Diseases & Vector Research,
- NIH, CDC, South Korea
- May 8 2017 - Sep 14 2017 Deputy Scientific Director, Div. Emerging Infectious Diseases & Vector Research, NIH, CDC, South Korea
- Sep 2005 - May 7 2017 Deputy Scientific Director, Div. Influenza Virus, NIH, CDC, South Korea
- Oct 10 2012 - Oct 2013 Visiting Researcher, Icahn School of Medicine at Mount Sinai
- NY, USA

Publication (since 2014)

1. Mammalian pathogenesis of oseltamivir-resistant pandemic (H1N1)2009 influenza virus isolated in South Korea. Donghyok, Kyeongcheol Shin, Su-Jin Kim, Joo-Yeon Lee, Chun Kang. Virus Res 2014. 185:41-46.
2. Immunological characterization of monoclonal antibodies used in rapid influenza diagnostic test for detection of the 2009 pandemic influenza A (H1N1)pdm09 infection. Hwajung Yi, Mi-Seon Lee, Joo-Yeon Lee, Hae Kyung Lee, and Chun Kang. J Microbiol 2015. 53(2):166-175.
3. Pathogenesis of novel reassortant avian influenza A (H5N8) isolates in the ferret. Heui Man Kim, Chi-Kyeong Kim, Nam-Joo Lee, Hyuk Chu, Chun Kang, Kisoon Kim, Joo-Yeon Lee. Virol 2015. 481:136-141.
4. Single PA mutation as a high yield determinant of avain influenza vaccines. Ilseob Lee, Jin Il Kim, Sehee Park, Joon-Yong Bae, Kirim Yoo, Soo-Hyeon Yun, Joo-Yeon Lee, Kisoon Kim, Chun Kang, Man-Seong Park. Scientific Reports (NATURE) 2017. 1-10.

Research / Project Involvements for viral haemorrhagic fevers (2017):

Principal Investigator, 'Establishment of research base center in Africa through international collaborative research for viral hemorrhagic fevers' (Korea CDC)

Co-investigator, 'Optimization of highly sensitive molecular diagnosis for detection of viral hemorrhagic fever viruses including Crimean-Congo hemorrhagic fever virus' (Korea CDC)

Manager, 'Development of antigen/antibody test kit for viral hemorrhagic fever viruses' (Korea CDC)

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Education

	University	***Degree***	***Year Attended***
i.	Universität Basel, Switzerland	PhD. Bayesian Statistics	2007 – 2011
ii.	Universiteit Hasselt, Belgium	MSc. Biostatistics	2006 – 2007
iii.	Universiteit Hasselt, Belgium	MSc. Applied Statistics	2005 – 2006
iv.	University Of Dar Es Salaam	BSc. Math. and Stat.	1997 – 2000

Professional/ Employment

1) Statistician, 2001 –2004: Disease Surveillance Program, National Institute for Medical Research, Tanzania
2) Research Scientist (Medical Statistics), July 2004 – June 2012: National Institute for Medical Research, Dar es Salaam, Tanzania
3) Principal Research Scientist (Biostatistics), July 2012 – To date: National Institute for Medical Research, Dar es Salaam, Tanzania

Membership in Medical Association and Other responsibilities

- Tanzania Public Health Association
- Editorial Board Member/ Associate Editor (Statistics), Tanzania Journal of Health Research

Other Professional Training

KAVI-Institute of Clinical Research, University of Nairobi on:

- Certificate in Good Clinical Practice (GCP)
- Certificate in Good Clinical Laboratory Practice (GCLP)

Publications

Dissertation / Theses

1. Rumisha, S.F. (2011) Modelling the seasonal and spatial variation of malaria transmission in relation to mortality in Africa. PhD Thesis, Swiss Tropical and Public Health Institute & University of Basel, Basel, Switzerland, 195pp.
2. Rumisha, S.F. (2007) Dealing with Missing Data in Cross Sectional Data on Transport. Thesis for Master of Science in Biostatistics, Universiteit Hasselt, Belgium, 87pp
3. Rumisha, S.F. (2006) Disease Mapping: A Spatial-Temporal Analysis of Coronary Artery Bypass Graft at the District level in Belgium. Thesis for Master of Science in Applied Statistics, Universiteit Hasselt, Belgium, 41pp
4. Rumisha, S.F. (2000) Identification and Prioritization of Reasons for Low Use of Operations Research. BSc. Dissertation, University of Dar es Salaam, Tanzania, 38pp.

Peer Review Journal Publications

1. Darcy, N., Perera, S., Stanley, G., Rumisha, S., Assenga, K., Polycarp, F., Sijaona, A., Msechu, E., Mzeru, M., Kumalija, C., Kambenga, M., Mayala, B., Elias, M., Biondich, P., Kalungwa, Z., Mwamafupa, J., Kipilyango, N., & Teesdale, S. (2017). Case Study: The Tanzania Health Facility Registry. In K. Moahi, K. Bwalya, & P. Sebina (Eds.), Health Information Systems and the Advancement of Medical Practice in Developing Countries (pp. 208-236). Hershey, PA: IGI Global. doi:10.4018/978-1-5225-2262-1.ch013
2. Vairo, F., Mboera, L.E., De Nardo, P., Oriyo, N.M., Meschi, S., Rumisha, S.F., Colavita, F., Mhina, A., Carletti, F., Mwakapeje, E. and Capobianchi, M.R. (2016). Clinical, Virologic, and Epidemiologic Characteristics of Dengue Outbreak, Dar es Salaam, Tanzania, 2014. *Emerging Infectious Diseases* 22(5), p.895.
3. Mboera, L.E., Mweya, C.N., Rumisha, S.F., Tungu, P.K., Makange, M.R., Misinzo, G., De Nardo, P., Vairo, F. and Oriyo, N.M. (2016). The Risk of Dengue Virus Transmission in Dar es Salaam, Tanzania during an Epidemic Period of 2014. PLoS Negl Trop Dis, 10(1), p.e0004313.
4. Mboera, L.E.G., Bwana, V.M., Rumisha, S.F., Stanley, G., Tungu, P.K. & Malima, R.C. (2015). Spatial abundance and human biting rate of *Anopheles arabiensis* and *Anopheles funestus* in savannah and rice agro-ecosystems of Central Tanzania, *Geospatial Health*; 10:322
5. Mboera, L.E.G., Bwana, V.M., Rumisha, S.F., Malima, R.C., Mlozi, M.R.S., Mayala, B.K., Stanley & Mlacha, T. (2015). Malaria, anaemia and nutritional status among schoolchildren in relation to ecosystems, livelihoods and health systems in Kilosa District in central Tanzania. *BMC Public Health* 15:553. DOI: 10.1186/s12889-015-1932-x
6. Shayo, E.H., Rumisha, S.F., Mlozi, M.R.S., Bwana, V.M., Bwana, V.M., Mlacha, T., Mboera, L.E.G (2015). Social determinants of malaria and health care seeking patterns among rice farming and pastoral communities in Kilosa District in central Tanzania. doi: http://dx.doi.org/10.1016/j.actatropica.2015.01.003
7. Malebo, H.M., Wiketye V., Katani, S.J., Kitufe, N.A., Nyigo, V.A., Imeda, C.P., Ogondiek, J.W., Sunguruma, R., Mhame, P., Massaga, J.J., Mammuya, B., Senkoro, K.P., Rumisha, S.F., Malecela, M.N. & Kitua, A.Y. (2015). In vivo antiplasmodial and toxicological effect of Maytenus senegalensis traditionally used in the treatment of malaria in Tanzania, *Malaria Journal* 14 (1), 79.
8. Mayala, B.K., Fahey, C.A., Wei, D., Zinga, M.M., Bwana, V.M., Mlacha, T., Rumisha, S.F., Shayo, E.H. & Mboera, L.E.G (2015). Knowledge, perception and practices about malaria, climate change and food security among communities of central Tanzania. *Infectious Diseases of Poverty*; 4:21.
9. Mlozi, M.R.S., Rumisha, S.F., Mlacha, T., Bwana, V.M., Shayo, E.H., Mayala, B.K., Malima, R.C., Mashoto, K.O., Mboera, L.E.G (2015). Challenges and opportunities for implementing an intersectoral approach in malaria control in Tanzania. Tanzania Journal of Health Research, Volume 17 (1). doi: http://dx.doi.org/10.4314/thrb.v17i1.2
10. Kivuyo, H.S., Mbazi, P.H., Kisika, D.S., Munga, S., Rumisha, S.F., Urassa, F.M. & Kweka, E.J. (2014). Performance of Five Food Regimes on *Anopheles gambiae* Senso Stricto Larval Rearing to Adult Emergence in Insectary. PLoS ONE 9(10): e110671. doi:10.1371/journal.pone.0110671
11. Rumisha, S.F., Zinga M.M., Fahey, C.A., Wei, D., Bwana, V.M., Mlozi, M.R.S., Shayo, E.H., Malima, R.C., Mayala, B.K., Stanley, G., Mlacha, T. & Mboera, L.E.G (2014). Accessibility, availability and utilisation of malaria interventions among women of reproductive age in Kilosa district in central Tanzania. BMC Health Services Research 14:452.

12. Peter E.L., Rumisha S.F., Mashoto K.O. & Malebo H.M. (2014). Ethno-medicinal knowledge and plants traditionally used to treat anemia in Tanzania: A cross sectional survey. *Journal of Ethnopharmacology*, 154(3):767-73. doi: 10.1016/j.jep.2014.05.002. Epub 2014 May 14.
13. Rumisha, S.F., Smith, T., Masanja, H., Abdulla, S. & Vounatsou, P. (2014). Relationship between child survival and malaria transmission: an analysis of the malaria transmission intensity and mortality burden across Africa (MTIMBA) project data in Rufiji demographic surveillance system, Tanzania. *Malaria Journal*, 13:124. doi: 10.1186/1475-2875-13-124.
14. Mboera, L.E.G., Mfinanga, S.G., Karimuribo, E.D., Rumisha, S.F. & Sindato, C. (2014). The changing landscape of public health in sub-Saharan Africa: Control and prevention of communicable diseases needs rethinking. *Onderstepoort Journal of Veterinary Research* 81(2) Art. #734, 6 pages. http://dx.doi.org/10.4102/ojvr. v81i2.734
15. Peter, E, Mashoto, K.O., Rumisha, S.F., Malebo, H.M., Shija, A. & Oriyo, N. (2014). Iron and Ascorbic Acid Content in *Hibiscus sabdariffa* Calyces in Tanzania: Modeling and Optimization of Extraction Conditions. *International Journal of Food Science and Nutrition Engineering*, 4(2): 27-35. DOI: 10.5923/j.food.20140402.01
16. Rumisha, S.F., Smith, T., Abdulla, S., Masanja, H. & Vounatsou, P. (2014). Modeling heterogeneity in malaria transmission using large sparse spatio-temporal entomological data. *Global Health Action*, 7: 22682.
17. Mwanga J.R., Lwambo N.J.S., Rumisha, S.F., Vounatsou P. & Utzinger J. (2013) Dynamics of people's socio-economic status in the face of schistosomiasis control interventions in Ukerewe district, Tanzania. *Acta Tropica*, (DOI: http://dx.doi.org/10.1016/j.actatropica.2013.01.004)
18. Rumisha, S.F., Smith, T., Abdulla, S., Masanja, H. & Vounatsou, P. (2013) Assessing seasonal variations and age patterns in mortality during the first year of life in Tanzania. *Acta Tropica*; 126:28– 36.
19. Mboera, L.E.G., Mazigo, H.D., Rumisha, S.F. & Kramer, R.A. (2013): Towards malaria elimination and its implication for vector control, disease management and livelihoods in Tanzania. *Malar World J*, 4:19.
20. Mboera, L.E.G., Senkoro, K.P., Rumisha, S.F., Mayala, B.K., Shayo, E.H. & Mlozi, M.R. (2011). Plasmodium falciparum and helminth coinfections among schoolchildren in relation to agro-ecosystems in Mvomero District, Tanzania. *Acta Tropica* 120(1-2):95-102.
21. Minja H., Nsanzabana C., Maure C., Hoffmann A., Rumisha S., Ogundahunsi O., Zicker F., Tanner M. & Launois P. (2011). Impact of Health Research Capacity Strengthening in Low- and Middle-Income Countries: The Case of WHO/TDR Programmes. PLoS Negl Trop Dis 5(10): e1351. doi:10.1371/journal.pntd.0001351
22. Mboera, L.E.G., Shayo, E.H., Senkoro, K.P., Rumisha, S.F., Mlozi, M.R. & Mayala, B.K. (2010) Knowledge, perceptions and practices of farming communities on linkage of malaria and agriculture in Mvomero district, Tanzania. *Acta Tropica* 113(2):139–144.
23. Mboera, L.E., Senkoro, K.P., Mayala, B.K., Rumisha, S.F., Rwegoshora, R.T., Mlozi, M.R. & Shayo, E.H. (2010) Spatio-temporal variation in malaria transmission intensity in five agro-ecosystems in Mvomero district, Tanzania. *Geospatial Health* 4(2):167-78.
24. Mwingira, V.S., Mayala, B.K, Senkoro, K.P., Rumisha, S.F., Shayo, E.H, Mlozi, M.R.S & Mboera, L.E.G. (2009) Mosquito larval productivity in rice-fields infested with Azolla in Mvomero District, Tanzania. *Tanzania Journal of Health Research* 11(1):17-22.
25. Mboera, L.E.G., Kamugisha, M.L., Rumisha, S.F., Kisinza, W.N., Senkoro, K.P. & Kitua, A.Y. (2008) Malaria and mosquito net utilisation among schoolchildren in villages with or without healthcare facilities at different altitudes in Iringa District, Tanzania. *African Health Science* 8, 114-119.

26. Jones C.P., Truman BI, Elam-Evans L.D., Jones C.A., Jones C.Y., Jiles R., Rumisha, S.F. & Perry GS. (2008) Using "socially assigned race" to probe white advantages in health status. *Ethnicity & Disease 18(4):496-504.*
27. Mboera, L.E.G., Rumisha, S.F., Senkoro, K.P., Mayala, B.K., Shayo, E.H. & Kisinza, W.N. (2007) Knowledge and health information communication in Tanzania. *East African Journal of Public Health* 4 (1):33-9
28. Rumisha, S.F., Mboera, L.E.G., Senkoro, K.P., Gueye, D. & Mmbuji, P.K. (2007). Monitoring and evaluation of Integrated Disease Surveillance and Response in selected Districts in Tanzania. *Tanzania Health Research Bulletin*, 9, 1-11.
29. Mboera, L.E.G., Kamugisha, M.L., Rumisha, S.F., Msangeni, H.A., Barongo, V., Molteni, F. & Kitua, A.Y. (2006) The relationship between malaria parasitaemia and availability of healthcare facility in Mpwapwa District, central Tanzania. *Tanzania Health Research Bulletin* 8, 22-27.
30. Rumisha, S.F., Senkoro, K.P. Ngadaya, E., Shayo, E.H., Mayala, B.K., Mtandu, R. & Mboera, L.E.G. (2006) Community knowledge and information communication gaps on HIV/AIDS in Iringa Municipality, Tanzania. *Tanzania Health Research Bulletin* 8, 101-108.
31. Mboera, L.E.G., Rumisha, S.F., Mwanemile, E.J., Mziwanda, E. & Mmbuji, P. (2005) Enhancing disease surveillance reporting using public transport in Dodoma District, central Tanzania. *Tanzania Health Research Bulletin* 7, 201-205.
32. Mghamba, J.M., Mboera, L.E.G., Krekamoo, W., Senkoro, K.P., Rumisha, S.F., Shayo, E.H. & Mmbuji, P. (2004) Challenges of implementing Integrated Disease Surveillance and Response strategy using the current Health Management Information System in Tanzania. *Tanzania Health Research Bulletin* 6, 57-63.
33. Mboera, L.E.G. & Rumisha, S.F. (2004) The role of mass media in disease outbreak reporting in the United Republic of Tanzania. *Tanzania Health Research Bulletin* 6, 73-77.
34. Rumisha, S.F. (2004). Child violence and sexual abuse in Tanzania. *Tanzania Health Research Bulletin* 6, (1) 30 – 35.
35. Shayo, E., Mboera, L.E.G., Mmbuji, P., Rumisha, S.F., Senkoro, K.P. & Mwami, A.J. (2003) The role of community and traditional healers in communicable disease surveillance and management in Babati and Dodoma Districts, Tanzania. *Tanzania Health Research Bulletin* 5, (2) 48-55.
36. Rumisha, S.F., Mboera, L.E.G., Kisinza, W.N., Chuwa, G.J., Kitua, A.Y. & Molteni, F. (2003) Community perceptions of malaria and its management in Iringa District, south-western Tanzania. *Tanzania Health Research Bulletin* 5, (2) 41-47.
37. Rumisha, S.F., Mboera, L.E.G. Kamugisha, M.L., Kalumuna, A., Amri, M., Asila, E. & Kitua, A.Y. (2003) Pattern and distribution of communicable diseases in border districts of Bukoba and Tanga, Tanzania. *Tanzania Health Research Bulletin* 5, 19-23
38. Mboera, L.E.G., Rumisha, S.F., Magesa, S.M. & Kitua, A.Y. (2001) Utilisation of Health Management Information System in disease surveillance in Tanzania. *Tanzania Health Research Bulletin* 3, (2), 15-18.
39. Mboera, L.E.G., Rumisha, S.F. & Kitua, A.Y. (2001) Strategic approach for strengthening national and regional disease surveillance system: The East African example. *Tanzania Health Research Bulletin* 3, (2), 6-9.

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General information
Name: Calvin Sindato
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Educational qualifications

	Institution	Year attended	Degree	Area of specialization
(i)	Sokoine University of Agriculture, Morogoro Tanzania	2011-2015	Doctor of Philosophy (PhD) degree	Risk mapping, modelling and prediction of infectious diseases
(ii)	Sokoine University of Agriculture, Morogoro Tanzania	2006-2007	Masters of Preventive Veterinary Medicine (MPVM), GPA: 4.4	Prevention and control of diseases
(iii)	Sokoine University of Agriculture, Morogoro Tanzania	1998-2003	Bachelor of Veterinary Medicine (BVM), Unclassified degree	Veterinary Medicine and Public Health

Publications in scientific peer review journals

1. Nnko HJ, PS, Ngonyoka A, Saigilu M, Ole-Neselle M, Kisoka W, Sindato C, Estes A. (2017) Pastoralists' Vulnerability to Trypanosomiasis in Maasai Steppe. *EcoHealth* DOI: 10.1007/s10393-017.1275-4.
2. Bett B, Kiunga P, Gachohi J, Sindato C, Mbotha D, Robinson T, Lindahl J and Grace D (2016). Effects of climate change on the occurrence and distribution of livestock diseases. Preventive Veterinary Medicine. http://dx.doi.org/10.1016/j.prevetmed.2016.11.019
3. Sindato C, Kim B. Stevens KB, Karimuribo ED, Mboera LEG, Paweska and Pfeiffer DU (2016). Spatial heterogeneity of habitat suitability for Rift Valley fever occurrence in Tanzania: an ecological niche modelling approach. Plos Neglected Tropical Diseases 10(9):e0005002. Doi:10.1371/journal.pntd.0005002.
4. Mhina AD, Kasanga CJ, Sindato C, Karimuribo ED and Mboera LEG (2015). Rift Valley fever potential mosquito vectors and their infection status in Ngorongoro District in northern Tanzania. Tanzania Journal of Health Research 4.3 (17) 4. Doi: http://dx.doi.org/10.4314/thrb.v17i.
5. Muse, E.A., Lejora, I., Wakibara, J., Kilewo, M., Chuma, I.S., Kihwele, E., Samwel, D., Mtui, A., Sindato, C. and Malele, I. (2015). The Contribution of Tanzanian National Parks in Controlling the Vectors of Sleeping Sickness. *Open Journal of Ecology*, 5, 306-314. http://dx.doi.org/10.4236/oje.2015.57025.
6. Sindato C, Pfeiffer DU, Karimuribo ED, Mboera LEG, Rweyemamu MM, Paweska JT (2015) A Spatial Analysis of Rift Valley Fever Virus Seropositivity in Domestic Ruminants in Tanzania. PLoS ONE 10(7): e0131873. doi:10.1371/journal. pone.0131873
7. Swai ES and Sindato C. (2014). Seroprevalence of Rift Valley fever virus infection in camels (dromedaries) in northern Tanzania. Tropical Animal Health and Production. 46 (8): DOI 10.1007/s11250-014-0726-y
8. Mboera, L.E.G., Mfinanga, S.G., Karimuribo, E.D., Rumisha, S.F. and Sindato, C., (2014). The changing landscape of public health in sub-Saharan Africa: Control and prevention of

communicable diseases needs rethinking', Onderstepoort Journal of Veterinary Research 81(2) Art. #734, 6 pages. http:// dx.doi.org/10.4102/ojvr. v81i2.734.
9. Sindato C, Karimuribo ED, Pfeiffer DU, Mboera LEG, Kivaria F, Dautu G, Bernard B and Paweska JT. (2014) Spatial and Temporal Pattern of Rift Valley Fever Outbreaks in Tanzania; 1930 to 2007. PLoS ONE 9(2): e88897. doi:10.1371/journal.pone.0088897
10. Sindato C, Swai ES, Karimuribo ED, Dautu G, Pfeiffer DU, Mboera LEG, Paweska JT (2013). Spatial distribution of non-clinical Rift Valley fever viral activity in domestic and wild ruminants in northern Tanzania. Tanzania Veterinary Journal Volume 28: pp 21-38. DOI: http://dx.doi.org/10.4314%2Ftvj.v28i0.
11. Reid H, Kibona S, Rodney A, McPherson B, Sindato C, Malele I, Kinung'hi S, Jennaway M,Changalucha J, Blake B and Vallely, A (2012). Assessment of the burden of human African trypanosomiasis by rapid participatory appraisal in three high-risk villages in Urambo District, Northwest Tanzania. African Health Sciences 12(2): 104 – 113.
12. Kabula B, Tungu P, Matowo J, Kitau J, Mweya C, Emidi B, Masue D, Sindato C, Malima R, Minja J, Msangi S, Njau R, Mosha F, Magesa S and Kisinza W (2012). Susceptibility status of malaria vectors to insecticides commonly used for malaria control in Tanzania. Tropical Medicine and International Health, Volume 17 no 6 pp 742–750.
13. Dautu G, Sindato C, Mweene A.S, Samui K.L., Roy P, Noad J. Paweska P,Majiwa P.A.O and Musoke A.J. (2012). Rift Valley fever: Real or perceived threat for Zambia? Onderstepoort Journal of Veterinary Research 79(2), Art. #466, 6 pages. http://dx.doi. org/10.4102/ojvr.v79i2.466.
14. Sindato C, Karimuribo E, and Mboera L.E.G (2011). The Epidemiology and Socioeconomic Impact of Rift Valley fever epidemics in Tanzania: a review. Tanzania Journal of Health Research, Volume 13 (Supplementary 1).
15. Sindato C, Kabula B, Mbilu T.J.N.K, Manga C, Tungu P, Kazimoto J.P, Kibona S.N, Kisinza W.N and Magesa S.M (2011). Resting behaviour of Anopheles gambiae s.l. and its implication on malaria transmission in Uyui District, western Tanzania. Tanzania Journal of Health Research Volume 13 No 4.
16. Sindato C, Kibona S.N, Nkya G.M, Mbilu T.J.N.K, Manga C, Kaboya J.S. & Rawille F. (2008) Challenges in the diagnosis and management of sleeping sickness in Tanzania: a case report. Tanzania Journal of Health Research 10 (3), 171-18.1.
17. Sindato C, Kimbita E.N. & Kibona S.N. (2008) Factors influencing individual and community participation in the control of tsetse flies and human African trypanosomiasis in Urambo District, Tanzania. Tanzania Journal of Health Research 10 (1), 20-27.
18. Sindato, C., Malele, I.I., Mwalimu, C., Nyingilili, H.S., Kaboya, S., Kombe, E., Msumary, C. & Manoza, A. (2007) Seasonal epidemiological variation in human African trypanosomiasis in Babati District, Tanzania. Tanzania Health Research Bulletin 9 (2), 136-139.
19. Nkya, G.M., Sindato, C., Mcharo, J. & Kibona, S.N. (2006) Community knowledge on HIV/AIDS and its relationship with sexual practices in Tabora and Igunga districts, western Tanzania. Tanzania Health Research Bulletin 8 (3), 173-176.
20. Karimuribo E.D, Lughano J. K, Mdegela R.H, Kapaga A.M, Sindato C, and Kambarage D.M. (2005). Studies on Mastitis, Milk Quality and Health Risks Associated with consumption of milk from pastoral Herds in Dodoma and Morogoro Regions, Tanzania. Journal of Veterinary Sciences. 6(3), 213–221.

Policy briefs prepared and shared with Policy Markers

1. Sindato C, Karimuribo E.D and Mboera L.E.G (2016). Policy Brief: Strategic control of Rift Valley fever in Tanzania; shared with Policy Markers during a policy brief dialogue held at the National Institute for Medical Research, Dar es Salaam on 15th March 2016.

2. Sindato C, Karimuribo E.D, Mutagahywa E.B, Mwabukusi M, Akyoo G and Ngolongolo R, Rweyemamu M and Mboera L.E.G. (2016).Policy Brief: Community-based one health participatory disease surveillance using digital and mobile technologies; shared with Policy Markers during a policy brief dialogue held at the National Institute for Medical Research, Dar es Salaam on 16th December 2016.
3. Mboera L.E.G, Rumisha S.F, Sindato C, Karimuribo E.D and Simba D. Policy brief: A 3Ms national surveillance platform to detect and respond effectively to public health events in Tanzania; shared with Policy Markers during a policy brief dialogue held at the National Institute for Medical Research, Dar es Salaam on 16th December 2016.
4. Mutagahywa E.B, Sindato C, Karimuribo E.D, Mwabukusi M, Akyoo G, Ngolongolo R, Rweyemamu M and Mboera L.E.G. Policy Brief: Using smart phones coupled with intelligent mobile and web apps for electronic system of disease surveillance in Tanzania; shared with Policy Markers during a policy brief dialogue held at the National Institute for Medical Research, Dar es Salaam on 16th December 2016.
5. Karimuribo E.D, Sindato C, Mutagahywa E.B, Mwabukusi M, Akyoo G, Ngolongolo R, Mboera L.E.G and Rweyemamu M. Policy Brief: Use of ICT and mobile technologies to support specific disease surveillance: using cholera as an exemplar disease; shared with Policy Markers during a policy brief dialogue held at the National Institute for Medical Research, Dar es Salaam on 16th December 2016.
6. Mangu DC, Manyama C, Sudi L, Rumisha FS, Kimera SI, Sindato C & E.G. Mboera LEG. Towards the development of infectious disease early warning systems in Tanzania. shared with Policy Markers during a policy brief dialogue held at the National Institute for Medical Research, Dar es Salaam on 16th December 2016.

Cross-cutting research activities

1. A network analysis approach for guiding risk-based surveillance and intervention strategies for infectious diseases in Tanzania, 2016-2017. Working as Principal Investigator.
2. Enhancing community-based disease outbreak detection and response in East and Southern Africa, 2015 to 2018. Working as the Lead One Health Epidemiologist.
3. Building an Evidence Base of Effective Programs that Increase the Age at Marriage in Sub-Saharan Africa, 2011/2012 and 2014. Worked as Research Supervisor.
4. Depression and Cardiovascular Disease in African Americans: Meta Analysis in Atlanta Georgia, USA 2005. Worked as Co-Investigator.
5. Assessing the awareness, knowledge, perceptions and practices in relation to milk quality and milk borne diseases in Morogoro and Coastal regions in Tanzania, 2004. Worked as Research Assistant
6. A cross-sectional study on the Impact of water development and conservation schemes on environmental degradation and water-borne human and animal diseases in Dodoma and Coastal regions in Tanzania, 2004. Worked as Research Assistant
7. Assessment of Milk Quality and health Risks associated with consumption of milk in pastoral communities in Dodoma and Morogoro Regions in Tanzania, 2003. Worked as Research Assistant.

Mentorship to students:

(i) Ms. Happines J. Nnko. PhD student, Nelson Mandela African Institution of Science and Technology 2013-2017. Impact of climate change on pastoralists' vulnerability to trypanosomiasis and determinants of adaptation strategies in the Maasai Steppe, Tanzania.

(ii) Mr. Anibariki Ngonyoka, PhD student, Nelson Mandela African Institution of Science and Technology 2013-2017. Risk mapping, modelling and prediction of habitat suitability for tse tse flies in the Maasai Steppe, Tanzania.

(iii) Mr. Ntirandekura J Bosco. PhD student, Sokoine University of Agriculture 2016-2019. Risk modelling of brucellosis in Kagera region.

(iv) Ms. Valentina Sanga. MSc student, Sokoine University of Agriculture 2014-2016. Mapping and modelling of syndromic data collected from human and animal populations in Ngorongoro district using digital technology.

(v) Dr. Lunonu Sigalla. MSc student, Makerere University, 2013-2014. Modelling the factors influencing utilization of cattle dipping services in Kiteto, Tanzania.

(vi) Mr. Juma Kazimoto. MSc student, Sokoine University of Agriculture 2013-2015. Charcoal value chain analysis in Uyui district and Tabora Municipality, Tanzania.

(vii) Dr. Albano Mbyuzi. MSc student, Sokoine University of Agriculture 2013-2015. Modelling the risk factors associated with occurrence of Contagious Caprine Pleuropneumonia and Pest Des Petitis Ruminants in Tandahimba and Newala districts, Tanzania.

(viii) Dr. Gabriel Y. Chitupila. MSc student, Sokoine University of Agriculture 2013-2014. Modelling the risk factors associated with occurrence of bovine brucellosis in indigenous cattle population in Kibondo and Kakonko Districts, Western Tanzania

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Education

PhD in Epidemiology	University of Basel (2017), Basel, Switzerland
Master of Epidemiology (MEpi)	University of Melbourne (2010), Melbourne, Australia
Doctor of Medicine (MD)	University of Dar es Salaam (2005), Dar es Salaam, Tanzania

Employment history

Work station: Ifakara Health Institute, Tanzania
Date: March 2017-To date: Senior Research Scientist
Date: 2012-February 2017: Research Scientist
A clinical research for TB clinical trials, diagnostic studies and the epidemiological studies on TB and co-infections.
Work station: Kibong'oto National TB Hospital, Tanzania
2006-2011: Medical Officer
A general medical doctor mainly managing TB and TB and HIV co-infected patients as well as other communicable and non-communicable diseases.

Clinical Research Experience

Principal Investigator and National Coordinating Investigator for 4 IHI, Tanzania

sites in Tanzania for NC-006 STAND Trial (Shortening Treatment by Advancing Novel Drugs): Jan 2015 - to date	
Co-Principal Investigator, Tuberculosis Cohort in Dar es Salaam: November 2013 - to date	IHI, Tanzania
Co-Investigator, NC-002 Phase II Clinical Trial: June 2012–February 2014	IHI, Tanzania
A Phase II Open-Label Partially Randomized Trial to Evaluate the Efficacy, Safety and Tolerability of the combination of moxifloxacin plus PA-824 plus pyrazinamide after 8 weeks of treatment in Adult Patients with Newly Diagnosed Drug-Sensitive or Multi Drug-Resistant, Smear-Positive Pulmonary Tuberculosis.	
Co-Investigator: Evaluation of new TB diagnostic tools (TB-CHILD): June 2012 – September 2013	IHI, Tanzania
Co-Investigator, Tuberculosis Epidemiology and Management in Tanzania (TB-Cohort) June 2012 – September 2013	IHI, Tanzania

Grants awarded

Jan 2015 - to date Principal Investigator for the Phase 3 Open-Label Partially Randomized Trial to Evaluate the Efficacy, Safety and Tolerability of the Combination of Moxifloxacin plus PA-824 plus Pyrazinamide after 4 and 6 months of Treatment in Adult Subjects with Drug-Sensitive Smear-Positive Pulmonary Tuberculosis and after 6 months of Treatment in Adult Subjects with Multi-Drug Resistant, Smear-Positive Pulmonary Tuberculosis.	Funded by Global Alliance for TB drug Development (TB Alliance) and the expected total budget was US $ 1,189,387.50. The STAND trial was stopped due to safety concerns.
November 2014 – February 2016 Principal Investigator for Tuberculosis case finding at the pharmacy using trained pharmacists and an electronically monitored referral system to reduce TB transmission in the community by shortening the diagnosis delay.	Funded by Grand Challenge Canada with a total budget of US $ 112'000

Publications

1. Said K, Hella J, Knopp S, Nassoro T, Shija N, Aziz F, Mhimbira F, Schindler C, Mwingira U, Mandalakas AM, Manji K, Tanner M, Utzinger J, Fenner L. Schistosoma, other helminth infections, and associated risk factors in preschool-aged children in urban Tanzania. PLoS Negl Trop Dis. 2017 Nov 6;11(11):e0006017. doi:10.1371/journal.pntd.0006017.
2. Hiza H, Doulla B, Sasamalo M, Hella J, Kamwela L, Mhimbira F, Reither K, Gagneux S, Jugheli L, Fenner L. Preservation of sputum samples with cetylpyridinium chloride (CPC) for tuberculosis cultures and Xpert MTB/RIF in a low-income country. BMC Infect Dis. 2017 Aug 4;17(1):542. doi: 10.1186/s12879-017-2642-z.
3. GBD 2015 Eastern Mediterranean Region Adolescent Health Collaborators. Adolescent health in the Eastern Mediterranean Region: findings from the global burden of disease 2015 study. Int J Public Health. 2017 Aug 3. doi: 10.1007/s00038-017-1003-4. Int J Public Health. 2017 Aug 3. doi: 10.1007/s00038-017-1023-0.
4. GBD 2015 Eastern Mediterranean Region HIV/AIDS Collaborators, Mokdad AH. Trends in HIV/AIDS morbidity and mortality in Eastern Mediterranean countries, 1990-2015:

findings from the Global Burden of Disease 2015 study.
5. Amelio P, Portevin D, Reither K, Mhimbira F, Mpina M, Tumbo A, Nickel B, Marti H, Knopp S, Ding S, Penn-Nicholson A, Darboe F, Ohmiti K, Scriba TJ, Pantaleo G, Daubenberger C, Perreau M. Mixed Th1 and Th2 Mycobacterium tuberculosis-specific CD4 T cell responses in patients with active pulmonary tuberculosis from Tanzania. PLoS Negl Trop Dis. 2017 Jul 31;11(7):e0005817. doi: 10.1371/journal.pntd.0005817.
6. Hella J, Morrow C, Mhimbira F, Ginsberg S, Chitnis N, Gagneux S, Mutayoba B, Wood R, Fenner L. Tuberculosis transmission in public locations in Tanzania: A novel approach to studying airborne disease transmission. J Infect. 2017 Jul 1. pii: S0163-4453(17)30227-X. doi: 10.1016/j.jinf.2017.06.009.
7. Manyahi J, Msigwa Y, Mhimbira F, Majigo M. High sero-prevalence of hepatitis B virus and human immunodeficiency virus infections among pregnant women attending antenatal clinic at Temeke municipal health facilities, Dar es Salaam, Tanzania: a cross sectional study. BMC Pregnancy Childbirth. 2017;17:109.
8. Said K., Hella J., Mhalu G., Chiryankubi M, Masika E, Maroa, T, Mhimbira F, Kapalata N, Fenner L. Diagnostic delay and associated factors among patients with pulmonary tuberculosis in Dar es Salaam, Tanzania. Infect Dis Poverty. 2017;6:64.
9. Mhimbira F, Hella J, Said K, Kamwela L, Sasamalo M, Maroa T, Chiryamkubi M, Mhalu G, Schindler C, Reither K, Knopp S, Utzinger J, Gagneux S, Fenner L. Prevalence and clinical relevance of helminth co-infections among tuberculosis patients in urban Tanzania. PLoS Negl Trop Dis. 2017 Feb 8;11(2):e0005342. doi: 10.1371/journal.pntd.0005342.
10. GBD 2015 Maternal Mortality Collaborators. Global, regional, and national levels of maternal mortality, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016 Oct 8;388(10053):1775-1812. doi: 10.1016/S0140-6736(16)31470-2.
11. GBD 2015 Child Mortality Collaborators. Global, regional, national, and selected subnational levels of stillbirths, neonatal, infant, and under-5 mortality, 1980-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016 Oct 8;388(10053):1725-1774. doi: 10.1016/S0140-6736(16)31575-6.
12. GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016 Oct 8;388(10053):1659-1724. doi: 10.1016/S0140-6736(16)31679-8.
13. GBD 2015 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016 Oct 8;388(10053):1603-1658. doi: 10.1016/S0140-6736(16)31460-X.
14. GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016 Oct 8;388(10053):1545-1602. doi: 10.1016/S0140-6736(16)31678-6.
15. GBD 2015 Mortality and Causes of Death Collaborators. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016 Oct 8;388(10053):1459-1544. doi: 10.1016/S0140-6736(16)31012-1.
16. GBD 2015 SDG Collaborators. Measuring the health-related Sustainable Development Goals in 188 countries: a baseline analysis from the Global Burden of Disease Study 2015. Lancet. 2016 Oct 8;388(10053):1813-1850. doi: 10.1016/S0140-6736(16)31467-2.
17. Steiner A, Hella J, Grüninger S, Mhalu G, Mhimbira F, Cercamondi CI, Doulla B, Maire N, Fenner L. Managing research and surveillance projects in real-time with a novel open-source eManagement tool designed for under-resourced countries. J Am Med Inform

Assoc. 2016 Sep;23(5):916-23. doi: 10.1093/jamia/ocv185.
18. Mhimbira F, Hella J, Maroa T, Kisandu S, Chiryamkubi M, Said K, Mhalu G, Mkopi A, Mutayoba B, Reither K, Gagneux S, Fenner L. Home-Based and Facility-Based Directly Observed Therapy of Tuberculosis Treatment under Programmatic Conditions in Urban Tanzania. PLoS One. 2016 Aug 11;11(8):e0161171. doi: 10.1371/journal.pone.0161171.
19. GBD 2015 HIV Collaborators. Estimates of global, regional, and national incidence, prevalence, and mortality of HIV, 1980-2015: the Global Burden of Disease Study 2015. Lancet HIV. 2016 Aug;3(8):e361-87. doi: 10.1016/S2352-3018(16)30087-X.
20. Steiner A, Mangu C, van den Hombergh J, van Deutekom H, van Ginneken B, Clowes P, Mhimbira F, Mfinanga S, Rachow A, Reither K, Hoelscher M. Screening for pulmonary tuberculosis in a Tanzanian prison and computer-aided interpretation of chest X-rays. Public Health Action. 2015 Dec 21;5(4):249-54. doi: 10.5588/pha.15.0037.
21. GBD 2013 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015 Dec 5;386(10010):2287-323. doi: 10.1016/S0140-6736(15)00128-2.
22. GBD 2013 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990-2013: quantifying the epidemiological transition. Lancet. 2015 Nov 28;386(10009):2145-91. doi: 10.1016/S0140-6736(15)61340-X.
23. Reither K, Jugheli L, Glass TR, Sasamalo M, Mhimbira FA, Weetjens BJ, Cox C, Edwards TL, Mulder C, Beyene NW, Mahoney A. Evaluation of Giant African Pouched Rats for Detection of Pulmonary Tuberculosis in Patients from a High-Endemic Setting. PLoS One. 2015 Oct 7;10(10):e0135877. doi: 10.1371/journal.pone.0135877.
24. Mhalu G, Hella J, Doulla B, Mhimbira F, Mtutu H, Hiza H, Sasamalo M, Rutaihwa L, Rieder HL, Seimon T, Mutayoba B, Weiss MG, Fenner L. Do Instructional Videos on Sputum Submission Result in Increased Tuberculosis Case Detection? A Randomized Controlled Trial. PLoS One. 2015 Sep 29;10(9):e0138413. doi: 10.1371/journal.pone.0138413.
25. Global Burden of Disease Study 2013 Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015 Aug 22;386(9995):743-800. doi: 10.1016/S0140-6736(15)60692-4.
26. Mhimbira FA, Bholla M, Sasamalo M, Mukurasi W, Hella JJ, Jugheli L, Reither K. Detection of Mycobacterium tuberculosis by EasyNAT diagnostic kit in sputum samples from Tanzania. J Clin Microbiol. 2015 Apr;53(4):1342-4. doi: 10.1128/JCM.03037-14.
27. GBD 2013 Mortality and Causes of Death Collaborators. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015 Jan 10;385(9963):117-71. doi: 10.1016/S0140-6736(14)61682-2.
28. Breuninger M, van Ginneken B, Philipsen RH, Mhimbira F, Hella JJ, Lwilla F, van den Hombergh J, Ross A, Jugheli L, Wagner D, Reither K. Diagnostic accuracy of computer-aided detection of pulmonary tuberculosis in chest radiographs: a validation study from sub-Saharan Africa. PLoS One. 2014 Sep 5;9(9):e106381. doi: 10.1371/journal.pone.0106381.

Leadership Positions

September 2016-To Date: Head of Department - Interventions, Clinical Trials
Responsibilities:
May 2015-To Date: Head of TB research group and Project Leader

Professional Memberships
International Union Against TB and Lung Diseases (The Union)
Member of following Technical Working Group within Ministry of Health Ministry of Health, Community Development, Gender, Elderly and Children, Dar es Salaam, Tanzania.

6. SIMA ERNEST RUGARABAMU

Sex: Female
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Date of Birth: 09.09.1982
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Number of children: 2; Isaiah, Verdie

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Academic training

Level	Name of School
Primary School Certificate	Mwenge Primary School, 1988-1995
Ordinary Level Certificate	Nganza Secondary School, Mwanza, 1996-1999
Advanced Level Certificate	Lutheran J Seminary Morogoro, 2000-2002
DDS	Muhimbili University of Health and Allied Sciences, 2003-2008
MSc (Microbiology /Immunology)	Muhimbili University of Health and Allied Sciences, 2012-2015

Posts held
Assistant Lecturer, Muhimbili University of Health and Allied Sciences (MUHAS), Microbiology and Immunology, 2015 – present
Laboratory Coordinator, ABCD/AMR Trials, 2016- 2019
Assistant Laboratory Director, MUHAS-Microbiology Research Lab, 2016- 2017

Research Assistant	Muhimbili University,	01/06/2008 - 30/10/2008
Intern Doctor	Amana Municipal Hospital,	01/11/2008- 15/11/2009
Programme officer	Tanzania Dental Association	20/11/2009 - 30/01/2010
Medical Officer	Muhimbili National Hospital	07/02/2010 - 31/09/2013
Microbiology Resident	Muhimbili National Hospital	1/10/2013 - 30/07/2015

Awards/honors

1. Programme Admin – Global Antimicrobial Resistance Partnership-Tanzania, 2016-2017
2. Consultant Microbiologist and Medical Director – Lancet Labs Tanzania, Sept 2017
3. Asst. Lab Director Microbiology-Microbiology Research Lab MUHAS, September 2016
4. Research Lab coordinator -ZNTD/ABCD Trials, 2017- 2019
5. Secretariat of Josiah Kabila University opening, 2008-2010
6. Participant, TRA/Professional forum on fight against drug counterfeit corruption 2010

7. AORTIC 2009 International Cancer Conference, 2009
8. Sahara Company Limited, Best science Student Award, 1999
9. 1st International Youth Leadership Africa Conference, Cape Town, 2007
10. WHO research training and calibration, 2008
11. CPD course on HIV/ AIDS, counselling, testing and treatment 2008
12. CPD Training, customer care in oral health service. 2008
13. Global health course Basic medical and Dental science course2008

Membership and appointments

- Member, Medical Association of Tanzania (MAT), 2008 - present.
- GARP representative on AMR National Action Plan review committee-July 2017

Publications

1. Rugarabamu, S.E., Elison M. Simon, Mecky I. Matee Use of clinical clue to diagnose anaerobic oral and maxillofacial infections among patients at Muhimbili National Hospital, Dar-es-Salaam, Tanzania. *African Journal of Microbiology Research* 2017: 11(10), 422-425
2. Rugarabamu SE (2017) Metronidazole Resistance in Anaerobes Isolated from Patient with Oral and Maxillofacial Infections Attending Muhimbili National Hospital, Dar-es-salaam Tanzania. *J Microbiol Exp* 5(2): 00144. doi: 10.15406/jmen.2017.05.00144

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Academic qualifications

2006–2009: B.Sc (General) (Hons) majoring in Zoology & Applied Microbiology with an upper second class at the University of Dar es Salaam, Tanzania.

2013-2016: MPhil (Virology) at the Sokoine University of Agriculture, Tanzania.

Training

March 2005: ELISA Techniques and Applications organized by the University of Copenhagen at NIMR, Tanga Centre.
April 2006: HIV-1 P24 Antigen assay organized by the University of Copenhagen at NIMR, Tanga Centre.
June 2011: Introductory course in Health Geographic Information System Organized by National Institute for Medical Research
January 2012: Good Clinical Practice (GCP) training course for Investigators at NIMR, Tanga Centre.
February – March 2015: European Mobile Laboratory training at the National Institute for Infectious Diseases "L SPALLANZANI", ITALY and Bundeswehr Institute of Microbiology, GERMANY. (Laboratory Diagnosis of Ebola and Marburg Viruses using RT-PCR).

Publications

1. Vairo, F., Mboera, L.E.G., De Nardo, P., Oriyo, N.M., Meschi, S., Rumisha, S.F., Colavita, F., Mhina, A., Carletti, F., Mwakapeje, E., Capobianchi, M.R., Castilletti, C., Di Caro, A., Nicastri, E., Malecela, M.N. & Ippolito, G. (2016) Clinical, virologic, and epidemiologic characteristics of Dengue Outbreak, Dar es Salaam, Tanzania, 2014. *Emerging Infectious Diseases* 22 (5), 895-899. doi: 10.3201/eid2205.151462
2. Mhina, A.D., Kasanga, C.J., Sindato, C., Karimuribo, E.D. & Mboera, L.E.G. (2015) Rift Valley fever potential mosquito vectors and their infection status in Ngorongoro District in northern Tanzania. *Tanzania Journal of Health Research* 16 (4): Doi: http://dx.doi.org/10.4314/thrb.v17i4.3
3. Mboera, L.E.G., Vairo, F., Oriyo, N.M., Rumisha, S.F., Mweya, C.N., Tungu, P.K., Stanley, G., De Nardo, P., Mhina, A., Misinzo, G., Makange, M.R., Camara, N. & Kateule, O. (2015) *Epidemiological, clinical and entomological investigation of Dengue infection in Dar es Salaam, Tanzania*. National Institute for Medical Research, Dar es Salaam, Tanzania. ISBN 978-9987-9143-8-8
4. Chiduo, M.G., Kamugisha, M., Mhina, A., Francis, F., Mchomvu, J., Kayanda, J., Malecela, E., Sadi, J., Kaseka, J., Msangeni, H., Lemnge, M. (2017) Possible causes of fever among patients with blood smear negative for malaria parasites at Bombo Regional Referral Hospital in Tanga, Tanzania, *Tanzania Journal of Health Research, Volume 19 Number 4, December 2017.*