Emerging and vector-borne disease research and training

Dr Leonard E.G. Mboera discusses the importance of studying emerging and vector-borne diseases at The Southern African Centre for Infectious Disease Surveillance, including challenges to address in this vein

Statistics indicate that infectious diseases are the second cause of illness and death in the world and the first in developing countries. They are responsible for about 15 million deaths each year.

In addition to the high endemicity of infectious diseases such HIV/AIDS, tuberculosis (TB) and Malaria, various new pathogens causing infections have been identified, while several diseases supposedly under control, are re-emerging and causing multiple epidemics in Sub-Saharan Africa. Among the emerging and re-emerging diseases, those transmitted by insects, especially, those spread by mosquitoes are increasingly becoming a threat.

The Southern African Centre for Infectious Disease Surveillance (SACIDS) is concerned by the burden of emerging and vector-borne diseases (EVBD) in Sub-Saharan Africa. EVBDs represent a great proportion of the neglected tropical diseases, which disproportionately affect the poorest and most disadvantaged populations. In recent years, the increase in speed and volume of global travel and expansion of vectors and their adaptability has placed many more people at risk of contracting EVBDs. The major focus of SACIDS community of practice (CoP) on emerging and vector-borne diseases is on viral haemorrhagic fevers (VHF) and mosquito-borne viral diseases. These include Ebola virus disease (EVD), Marburg, yellow fever, Rift Valley fever (RVF), dengue, Zika and chikungunya. SACIDS realises the need to establish strategic research and training programmes in EVBDs.

CoP Composition

The CoP-EVBD is co-lead by Dr Leonard Mboera (SACIDS) and Prof Janusz Paweska (National Institute for Communicable Diseases, South Africa). Scientists working with the CoP are Prof Gerald Misinzo (Sokoine University of Agriculture, SUA) and Dr Calvin Sindato (National Institute for Medical Research). Nationally, the CoP works with scientists from Ifakara Health Institute, National Institute for Medical Research and Kilimanjaro Christian Medical University College.

Regionally, the CoP works with the University of Zambia, Uganda Virus Research Institute and National Institute for Biomedical Research, Democratic Republic of Congo. Internationally, we work with Royal Veterinary College of London, United Kingdom, University of Manchester, UK, Institute of Endemic Disease, Sudan, Korea National Institute of Health and Vrije Universiteit Brussel, Belgium.

How we operate

SACIDS operates as a Virtual Centre linking academic and research institutions in Southern Africa, headquartered at the Sokoine University of Agriculture. Research and training is carried out by multi-disciplinary teams through theme-based communities of practices. One such theme is EVBDs. Each SACIDS associated project has a designated team with a Principal Investigator and co-investigators.

What we aim to achieve

The CoP aims at developing the regional capability for detection and response to emerging and vector-borne diseases. The goal is to contribute towards the reduction in morbidity and mortality due to EVBDs. The overall objective is to improve the understanding and prevention/control strategies of EVBD and increase productivity in Sub-Saharan Africa.

The CoP working hypothesis

The CoP working hypothesis is that the variable involved in the development of new infectious disease outbreaks and re-emerging of the old ones are influenced by complex interactions between the host, the pathogen, and the natural and social environment. Thus the continuous interactions between human, animal and environments facilitate the onset, spread and maintenance of infectious emerging and vector-borne diseases in Africa.

Research approach

Although there is evidence that EVBDs are rising in the region, the magnitude of the burden is not known with certainty and the capacity of the health systems to address them is weak. The CoP aims at adding value to the existing surveillance systems for human and animal diseases in developing capability in the disease detection and early warning systems.

The CoP identified strategic approaches include the need to strengthen:

(i) Regional capacities for early detection, identification and response to emerging and vector-borne diseases

(ii) Regional capacities in predictive and computational modelling skills for epidemic-prone diseases;

(iii) Systems for data collection, analysis, interpretation and information dissemination for EVBDs and;

(iv) The utilisation of routine disease surveillance, climate and research data to improve the community, national and regional capacity to timely respond to EVBD epidemics.

Training and research strategies

To achieve its objectives, SACIDS realises the need to establish strategic post-graduate programmes on infectious diseases in humans and animals. This is done through the recently established Africa Centres of Excellence at the Sokoine University of Agriculture (Tanzania) and the University of Zambia (Zambia). Currently, one post-doctoral fellow, three PhD and one MPhil students work with the CoP. The PhD research subjects include the development of disease prediction models for mosquito-borne arboviral diseases in the Democratic Republic of Congo and development of novel diagnostic tools for detection of VHFs, dengue and chikungunya viruses. The CoP Post-doc fellow is working on Priority Zoonoses Outbreaks in Africa under a new initiative supported by the European and Developing Countries Clinical Trial Partnership titled "The Pan-African Network for Rapid Research, Response, Relief and Preparedness for Infectious Disease Epidemics".

Stakeholder's engagement

Early in 2018, the CoP carried out a gap analysis of the capability for emerging and vector-borne diseases in Tanzania. The analysis realised that the country has limited capacity in mosquito-borne viral disease and that, the country is least prepared to deal with VHF outbreaks due to the limited health system capacity.

Recently, CoP scientists have developed prediction models for Rift Valley fever (RVF) and dengue. The CoP has taken initiatives to develop and conduct training courses on novel serological and molecular diagnostic techniques and high-level next-generation sequencing. Our future focus is to enhance the molecular biology skill sets of researchers to empower them with analytical skills, including bioinformatics. During June 2018, SACIDS initiated discussion with Tanzania's government to Establish national arbovirus infection sentinel surveillance sites to capture events of arbovirus infections including dengue and chikungunya at the community level. Preparation to establish the sites is underway.

Beneficiaries of the CoP

While our ultimate beneficiaries are the communities in Sub-Saharan Africa, the immediate beneficiaries are the scientists and institutions in the partner countries. Other beneficiaries include practitioners, programme managers and decision makers who are directly involved in the implementation of SACIDS programmes.

Dr Leonard E.G. Mboera
Leader, Emerging and Vector-Borne Disease Community of Practice
Southern African Centre for Infectious Disease Surveillance
Sokoine University of Agriculture
P.O. Box 3297, Chuo Kikuu, MOROGORO, Tanzania
leonard.mboera@sacids.org
www.sacids.org
Skype account: Leon.mboera2111

PROFILE