

Research Application Summary

**The African Centre of Excellence for Emerging and Zoonotic Diseases  
(ACEEZD) at the University of Zambia**

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**Abstract**

The increased reports in sub-Saharan Africa (SSA) of emerging and zoonotic diseases, such as influenza, Ebola virus infections, Rift Valley fever, pneumonic plague, leptospirosis, anthrax, tuberculosis, trypanosomiasis, and neglected tropical diseases (NTDs) is of major public health concern. This is an indication that new measures are needed to urgently contain the risk posed by these diseases. Some of these diseases such as influenza, tuberculosis and plague occurred frequently in the sub-region. Most recent examples include discovery of highly pathogenic Old World arenavirus (Lujo virus) following air transport of a fatally ill patient from Zambia to South Africa. There has also been geographic expansion of *Zaire ebolavirus* associated with severe and widespread outbreaks of ebola virus diseases in West Africa in 2014. Furthermore, numerous outbreaks of arthropod-borne viral infections including large outbreaks of Rift Valley fever in humans and livestock in South and East Africa, and dengue outbreaks in Angola, Kenya, Tanzania and Mozambique have been reported. The occurrence of these diseases has high health and socio-economic impacts, and pose serious bio-safety and bio-security challenges. The University of Zambia (UNZA) with financing from the World Bank is establishing an African Centre of Excellence for Emerging and Zoonotic diseases (ACEEZD) to address some of these challenges, The University and its collaborating institutions have well established laboratories in molecular biology, genomics and a BSL-3 laboratory. The institution also has state of the art equipment to support training and research on infectious diseases. The centre will acquire additional laboratory equipment that can support high quality training and research on NTDs. Already UNZA has an existing Centre for Information and Communication Technology (CICT) that oversees ICT issues in the University. The proposed ACE will strengthen the ICT infrastructure and expand the computer laboratories to accommodate larger student numbers.

**Key words:** Arthropod-borne viral infections, neglected tropical diseases, public health, Zambia, zoonotic diseases

**Résumé**

L'augmentation des rapports sur les maladies émergentes et zoonotiques en Afrique subsaharienne comme la grippe, l'infections du virus Ebola, la fièvre de la vallée du Rift, la peste pneumonique, la leptospirose, l'anthrax, la tuberculose, la tripanosomiase et les maladies tropicales négligées (NTDs) est devenue une menace pour la santé publique.

Cela indique que de nouvelles mesures sont nécessaires pour contenir d'urgence le risque que représentent ces maladies. Certaines de ces maladies, comme la grippe, la tuberculose et la peste, sont fréquentes dans la sous-région. Les exemples les plus récents incluent la découverte d'un virus hautement pathogène du Vieux Monde (virus Lujo) après le transport aérien d'un malade de la Zambie vers l'Afrique du Sud. En 2014, on a également assisté à une expansion géographique de Zaire ebolavirus associé à des épidémies sévères et généralisées de maladies du virus d'ébola en Afrique de l'Ouest. De plus, de nombreuses épidémies d'infections virales transmises par les arthropodes, y compris de grandes foyers de la fièvre du vallée du Rift chez les humains et le bétail en Afrique de l'Est et du Sud et d'épidémies de dengue en Angola, au Kenya, en Tanzanie et au Mozambique ont été rapportées. L'apparition de ces maladies a des répercussions sanitaires et socio-économiques élevées et pose de sérieux problèmes de biosécurité et de biosûreté. L'Université de Zambie (UNZA), avec l'aide de financement de la Banque mondiale, met en place un Centre africain d'excellence pour les maladies émergentes et zoonotiques (ACEEZD) pour relever certains de ces défis. L'Université et ses institutions collaboratrices disposent de laboratoires bien établis en biologie moléculaire, et un laboratoire BSL-3. L'institution dispose également d'équipements de pointe pour appuyer la formation et la recherche sur les maladies infectieuses. Le centre acquerra du matériel de laboratoire supplémentaire qui peut soutenir une formation de haute qualité et des recherches sur les NTDs. UNZA dispose déjà d'un Centre des technologies de l'information et de la communication qui supervise les questions relatives aux TIC à l'Université. Le centre d'excellence proposée renforcera l'infrastructure des TIC et élargira les laboratoires informatiques pour accueillir un plus grand nombre d'étudiants.

Mots clés: Infections virales transmises par les arthropodes, maladies tropicales négligées, santé publique, Zambie, zoonoses

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## Background

Sub-Saharan Africa (SSA) has seen an increase in incidences of emerging and zoonotic diseases such as influenza, Ebola virus infections, Rift Valley fever (Samui *et al.*, 1997), and pneumonic plague, leptospirosis, anthrax, tuberculosis, trypanosomiasis, and neglected tropical diseases (NTDs) (Sikasunge *et al.*, 2008; Hang'ombe *et al.*, 2011; Malama *et al.*, 2014). Most recent examples include discovery of highly pathogenic Old World arenavirus (Lujo virus) following air transport of a fatally ill patient from Zambia to South Africa (Paweska *et al.*, 2009, Ishii *et al.*, 2011). There has also been geographic expansion of Zaire ebolavirus associated with severe and widespread outbreaks of ebola virus diseases in West Africa in 2014 (Changula *et al.*, 2014). Furthermore, numerous outbreaks of arthropod-borne viral infections including large outbreaks of Rift Valley fever in humans and livestock in South and East Africa, dengue outbreaks in Angola, Kenya, Tanzania and Mozambique have been reported. The occurrence of these diseases has high health and socio-economic impacts, and pose serious bio-safety and bio-security challenges This is an indication that new measures are needed to urgently contain the risk posed by these diseases.

For the establishment of pre-emptive measures against zoonoses including NTDs and emerging diseases, a pre-requisite is to identify natural host animals carrying potential pathogens and to elucidate the routes by which the pathogens are transmitted from those animals to other animals, including humans for the purpose of breaking the link. However, there has been no research organization or network specializing in the control of zoonoses. The African Center of Excellence for Emerging and Zoonotic Diseases (ACEEZD) is being established at the University of Zambia through the World Bank Project for Eastern and Southern Higher Education Centers of Excellence initiative, the ACE II. The ACEEZD is funded as a loan/credit to the Government of the Republic of Zambia and is hosted at the School of Veterinary Medicine of the University of Zambia. The ACEEZD aims to:-

- 1). Develop critical mass of skilled human resources that will contribute to the development of innovative interventions for control and elimination of infectious diseases through training to MSc and PhD levels;
- 2) provide expertise in the prevention and control of infectious diseases to both the private and public sectors in the sub-Saharan region who will benefit from employing graduates from the ACEEZD;
- 3) strengthen capacity for high quality innovative research focusing on protection and safeguarding human and animal health from the emergence of dangerous pathogens with high health and socio-economic impacts;
- 4) develop advocacy programs for community and policy makers on infectious diseases.
- 5) strengthen network/linkages with local, regional and international institutions to foster high quality training, research and technological transfer for long term sustainability of ACEEZD;
- 6) produce qualified manpower as future teaching and research faculty; and
- 7) strengthen infrastructure for training, research and development at the ACEEZD.

ACEEZD will endeavour to achieve the regional goal of understanding the natural history of some infectious diseases, through new evidence-based, cost effective, multi-disciplinary, multi-sectoral, and collaborative strategies to be implemented by well-trained and skilled scientists. It will also increase the sub-region's human resource capacity to deal with these problems by training a pool of scientists (MSc and PhD graduates) that will be ready to tackle these challenges. This will be achieved by creating an enabling environment at various regional training institutions to carry out the required training. For the training MSc and Ph.D. regional and national students ACEEZD will acquire state-of-the-art equipment and renovate related existing infrastructure. In addition, ACEEZD will establish applied research programs for regional scientists to pursue high-impact educational training in emerging and zoonotic viral and bacterial infections as well as NTDs.

### **Governance structures**

The University of Zambia, where the ACEEZD is located, has a governance structure which provides leadership and guidance for all educational and research activities. The administration of the project will be the responsibility of the ACEEZD Project Management Team that will meet on weekly basis. The ACEEZD Project Management Team will offer solutions to project challenges and ensure proper implementation of project objectives and goals. The day-to-day operations of the ACEEZD will be overseen by the Center Leader, who shall be assisted by the Deputy Center Leader, and other principal

research members. The Centre Leader will provide leadership, advocacy, coordination, management and administration of all aspects of implementation, training and research, including support and policy framework. He will be responsible for reporting to the World Bank, the UNZA Vice Chancellor and the National Steering Committee. In addition ACEEZD will employ a Project Manager, Procurement Officer and an Accountant to assist in running of the Secretariat. The ACEEZD staff responsible for procurement and finance shall work with their counterparts already working for the University. The University of Zambia has existing robust management systems which ACEEZD is going to utilise. It has human resource, procurement and financial units which are headed by qualified personnel with at least an equivalent of first degree and are registered with relevant professional bodies. Leaders of ACEEZD (Principal research members) will come from the academic members of staff within the school. However, they will be on secondment to ACEEZD.

The ACEEZD Project Management Team shall be advised by a National Steering Committee (NSC) (Fig. 1). The NSC will have representation from the Ministry of Higher Education, the Ministry of Finance, related line ministries in the priority areas of the selected two ACEs in Zambia, the National Higher Educational Authority, National Science and Technology Council (NSTC), the host universities and the private sector. The NSC is expected to have nine members. The Chair of the NSC shall be the Permanent Secretary or his/ her representative of the Ministry of Higher Education. The NSC shall meet at least twice in a year.

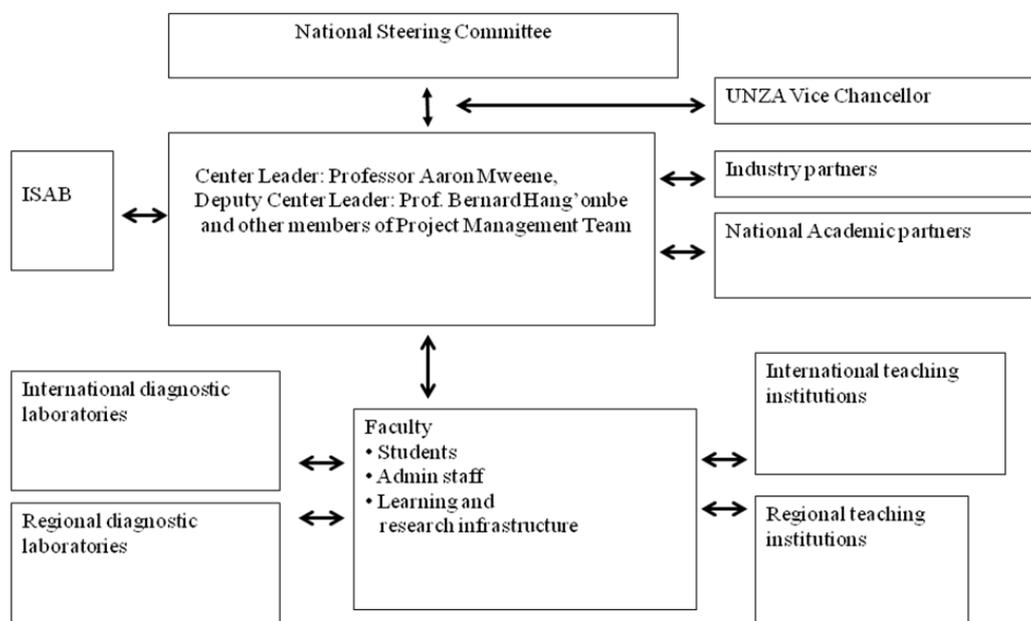


Figure 1. Governance structure of ACEEZD

### **Quality Assurance**

At National level the ACEEZD will adhere to the National Health Research Act No. 2 of 2013, which has led to the establishment of the National Health Research Authority (NHRA) and the National Higher Education Authority (NHEA). The NHRA oversees all health research matters in the country. Furthermore, the activities of ACEEZD will be in compliance of the guidelines of the The Zambia Qualifications Authority ACT, 2011 whose mandate is, inter alia, to: facilitate access to, and mobility and progression within, education, training and career paths; and enhance the quality of education and training. At international level, ACEEZD is in the process of identifying a recognised International accreditation institution. Currently, the School of Veterinary Medicine of the University of Zambia which is the host institution for the ACEEZD has been accredited by the Namibian Veterinary Council for the period 2015 to 2019. The ACEEZD, will therefore, seek accreditation from the Namibian Veterinary Council. There will also be an ACEEZD Self-evaluation and Gap analysis to be verified/certified by an international accreditation body.

The PhD trainings and experiences are diverse and covering many pertinent areas of study and will be linked to top universities in Africa, Europe, Americas, and Asia. This will be achieved through collaboration with international centres of excellence such as the Hokkaido University Research Centre for Zoonosis Control (HUCZC). The Collaboration with the HUCZC has recently resulted in the establishment of the Hokudai Centre for Zoonosis Control in Zambia (HUCZCZ) with an established office at the School of Veterinary Medicine of the University of Zambia.

ACEEZD, in conjunction with the regional counter-parts at Sokoine University of Agriculture (SUA), will appoint a joint international scientific advisory board (ISAB) that will be responsible for standardization and quality assurance of the education and research programmes of ACEEZD. The ISAB will have a membership appointed on a 50-50 representation basis between the two ACEs. The ISAB will be involved in providing guidance for the international accreditation of the education programmes of the ACEEZD. The ISAB will also be responsible for the supervision of compliance to the Mission and Vision of ACEEZD.

### **ACEEZD partners**

The ACEEZD has national, regional and international partners, as shown in Table 1 that will support training and research.

Table 1. ACEEZD's National, Regional and International Strategic Partners

| No.                             | Partner  | Category                 | Expertise   |
|---------------------------------|--|--------------------------|---|
| <b>A. Universities</b>          |  |                          |   |
| 1.                              | University of Zambia<br>School of Medicine   | Public, intra-university | One Health Medicine and Globalisation, Health Economics, Policy Monitoring and Evaluation, Health Promotion, Education and Communication            |
| 2.                              | Copperbelt University  | Public, National         | Emerging diseases and zoonoses, One Health Medicine, Neglected tropical diseases  |
| 3.                              | Sokoine University of Agriculture,<br>Tanzania                                       | Public, Regional         | Integrative Eco-Health, Mobile Digital Solutions and research in selected Viral Diseases of Food Security Importance , One Health Molecular Biology |
| 4.                              | Muhimbili University of Health<br>and Allied Sciences, Tanzania                      | Public, Regional         | Neglected tropical diseases   |
| 5.                              | Hokkaido University, Japan   | Public, International    | Bioinformatics, Bacterial genomics , Eco-health, epidemiology and viral genomics and Risk Assessment and Management                                 |
| <b>B. Research institutions</b> |  |                          |   |
| 6.                              | Central Veterinary Research<br>Institute (CVRI)                                      | Public, National         | Monitoring and Evaluation   |
| 7.                              | Tropical Diseases Research<br>Centre (TDRC)  | Public, National         | Disease surveillance, Neglected Tropical Diseases   |
| 8.                              | Southern African Centre for<br>Infectious Disease Surveillance<br>(SACIDS), Tanzania | Private, International   | Infectious diseases mostly of food security importance  |
| 9.                              | Research Centre for Zoonosis<br>Control (CZC), Japan                                 | Public, International    | Bioinformatics, Bacterial genomics, Eco-health, epidemiology and viral genomics and Risk Assessment and Management                                  |

### **Environmental safeguards**

The Zambia Environmental Management Agency (ZEMA) which operates through an Act (Act No. 12 of 2011) of Parliament oversees all matters related to the environment in Zambia. The implementation of ACEEZD will abide and comply with the national regulations as required by ZEMA. The school has an incinerator for destruction and decontamination of bio-hazardous materials. Identification of the environmental issues pertaining to this project is important in order to bring the project into compliance with applicable national and international environmental legal requirements and policies. The project envisages a teaching and learning environment that harmonizes infrastructure, equipment, animal and human safety and provides the necessary health mechanisms while adhering to the policies and regulations set forth by the ZEMA.

Standard laboratory practice according to WHO (World Health Organisation) (MOPs; Manual of Operation of Equipment according to manufacturer's specifications, MSDS; Material Safety Data Sheets) will be adhered to. All biological and chemical laboratory waste generated by the centre shall be disposed in accordance with national and international disposal guidelines. The school has a Biosafety Lab 3 and other specific labs, incinerators (need upgrade) and other projects with existing protocols and procedures for handling materials and waste. There are well-developed sewage and disposal processes of all chemical and consumable wastes.

The ethical committees under the National Health Research Authority regulate the National Health Research agenda. The Ethical Committees are independent and meet regularly to review the use of animal models for experiments and humans in research in tandem with International Best Practices. Laboratory animals shall be procured from relevant animal houses and maintained according to experimental animal use guidelines. Animal facilities exist though some aspects will need refurbishments.

### **Looking Ahead**

The next five years will be exciting in terms of putting in place the ACEEZD and establishing mechanisms for sustainability of the Centre. A key ingredient will be the quality of the academic programmes we will put in place and the internalization of the training programmes and academic quality assurance and accreditation. The ACEEZD will take advantage of UNZA membership of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM, see [www.ruforum.org](http://www.ruforum.org)) to reach out to the other 65 member universities in 26 African countries, for recruitment of students and beefing staff capacity for delivery of academic programmes. We will also use the RUFORUM platform for disseminating ACEEZD outputs and lesson sharing.

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