

Enhancing preparedness for tackling new epidemic threats



New and re-emerging infectious diseases cause much human suffering worldwide.¹ Many of these diseases are zoonoses² with epidemic potential. All sub-Saharan African regions are highly biodiverse with large rural populations that are highly dependent on livestock agriculture. Movement of pathogens between animals and people increases as the domestic populations expand, creating novel ecotones and ecosystemic perturbation. With increasing food security demands, intensification of livestock and agriculture is required and further evolution and spill over of novel zoonoses to humans is inevitable. The emergence this century of previously unknown zoonotic respiratory tract infectious diseases with epidemic potential,³ such as Avian influenza, Severe Acute Respiratory Syndrome (SARS), and Middle East Respiratory Syndrome (MERS), highlights an urgent need to change the current global status quo.⁴ The 2015 west African Ebola virus epidemic⁵ illustrated that once an infectious disease takes hold locally, the originating region and rest of the world is put at equal risk due to ease of international travel, global food systems, livestock trade, and inadequate capacities to identify and respond to outbreaks.

Several lessons were learnt from the Ebola virus outbreak that could help guide development of more effective and appropriate response capacities. Much of the spread and devastating impact of Ebola virus in west Africa was rooted in the emerging environmental, socioeconomic, and socio-anthropological changes taking place in west Africa. The highly medicalised approach and ineffectiveness of the local and regional surveillance mechanisms delayed appropriate socio-ecological management of the epidemic.^{6,7} Absent were effective active disease surveillance, early diagnosis using rapid diagnostic tests, rapid communication of data for health systems, and engagement and awareness of communities,⁶⁻⁸ to implement intervention measures to control spread. Behavioural factors also contributed to rapid outbreak spread. Improved understanding of eco-epidemiological, socio-cultural, anthropological, and political determinants that drive the emergence and spread of disease is crucial to preventing epidemics. Furthermore, the lack of local capacity and preparedness in affected west African countries to conduct comprehensive, multidisciplinary and well-coordinated

research was also evident during the Ebola virus epidemic. Foreign aid workers and research groups aroused local anxieties among communities⁸ due to ignorance of, or insensitivity to, cultural norms. Research studies to assess and determine optimal management protocols and trial new treatments and vaccines were slow to start,⁹ and were dominated by foreign groups, with scant involvement of African scientists or local policy makers. Newer treatments in development and those with compassionate-use regulations were available but their use and evaluation to inform optimal evidence-based management, were slowed down by the absence of rapid ethical review processes for research in emergency situations.

A more collaborative, inclusive, and strategic ONE HEALTH partnership between the human, environmental, and animal health sectors¹⁰ is now essential to address recurrent and emergent zoonotic threats effectively and to improve national capabilities on disease preparedness, surveillance, and response for preventing another major epidemic in Africa. This partnership will also enable issues around the growing global threat of antimicrobial resistance to be tackled. Although antibiotic resistant bacteria have spread globally due to increased travel and population movement, the scale of the problem of antimicrobial resistance in Africa remains largely undefined. The WHO recommendations on antimicrobial resistance¹¹ points out the lack of surveillance data and highlights the need for coordination between human and animal surveillance systems.

Based on a comprehensive inter-epidemic work programme, a ONE HEALTH partnership for emerging diseases and preparedness needs to develop and strengthen suitable sites and regional networks to enable resolution of administrative, regulatory, disciplinary, ethical, and cultural barriers; harmonise clinical case definitions and management guidelines; pre-approve adaptable protocols; and introduce mechanisms to rapidly exchange high quality data and samples. Such a partnership would ensure the readiness to immediately perform coordinated basic science research, to define the source of outbreak and transmission dynamics, and to conduct large-scale multisite clinical studies. It will enable establishment of regional high quality laboratories incorporating rapid diagnostics for multiple



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pathogens, and proactive surveillance systems providing latest real-time information.¹² Replication of the mobile laboratory model in all African regions will also enable to take forward the important agenda of establishing effective rapid response teams for outbreaks with support of national governments and public health services.

New opportunities to take this ONE HEALTH concept forward comes from several promising developments. The newly established Africa Centers for Disease Control and Prevention (Africa CDC), through five regional centres will perform disease surveillance, investigation, and tracking of infection trends to help African Member States detect and respond to public health emergencies.¹³ Four research and capacity development networks of excellence exist across central, west, east, and southern Africa¹⁴ with extensive experience of work on tuberculosis, HIV, malaria, and viral haemorrhagic fevers. With a critical mass of political support and resources of public health, veterinary, wildlife health, and clinical laboratories will ensure the timeliness and quality of surveillance, research, and response to zoonoses and the fractious issues of antimicrobial resistance in Africa. Benefits will not only accrue to public health but also food security and biodiversity conservation. Existing links with ongoing initiatives on emerging infections such as USAID Emerging Pandemic Threats Program,¹⁵ WHO-Global Outbreak Alert and Response Network (GOARN),¹⁶ Global Research Collaboration for Infectious Disease Preparedness (GLOPID-R), World Organisation for Animal Health, and other stakeholders could ensure implementation of findings into optimal health guidelines, standards, and policy recommendations.

Importantly, the future of public health services in Africa will depend on empowering a whole generation of young African health-care workers, scientists, and technical staff to take leadership of emerging and re-emerging infections through high quality training and mentorship. The time is now for Africa to take bold steps (appendix) to develop its own capabilities and capacities to rapidly identify and respond quickly and effectively to potential outbreaks. The challenge is for African scientists, public health personnel, and national governments to take leadership of developing a new vision through a ONE HEALTH strategy for the emerging and re-emerging infectious diseases and antimicrobial resistance portfolio across the continent.

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For the PANDORA-ID-NET consortium see <http://www.unza-uclms.org/pandora-id-net>

For more on GLOPID-R see <http://www.glopid-r.org>

See Online for appendix

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Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

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Panel: Needs for global preparedness for new and re-emerging infectious disease epidemic threats

Establishment of a "ONE animal-human-environmental HEALTH" consortium

- Exploit existing capabilities across human and animal health groups.
- Enhance capacity to monitor local and regional zoonotic disease trends, predicting outbreaks and risk modelling.
- Improve understanding of sociocultural and political determinants of infectious disease transmission and effective implementation of interventions for vulnerable populations.
- Developing local capacities for conduct of research through multidisciplinary human and animal interface and infections research in the emergency outbreak or epidemic situation and the inter-epidemic period; and develop protocols for clinical management, regional high quality laboratories, and multisite clinical trials.
- Develop capacities for rapid ethical review processes for research in emergency situations.

Development of:

- Effective public health surveillance
- Ethics and research capacities for the rapid investigation of outbreaks at source.

- Mobile laboratories for field use across all four African regions.
- Regional, ready to go (within 48–72 h) outbreak rapid response teams.
- Capacities for providing accelerated evidence for the optimal clinical management of patients and for guiding the public health response to any severe infectious outbreak.
- State-of-the-art data management, analyses, communication, and dissemination systems.

Empowerment through:

- Quality mentorship of younger generation African scientists, clinicians, public health staff, health-care workers, laboratory workers, veterinarians, community workers, policymakers, and others.
- Such mentorship will allow these individuals to take leadership of this important portfolio of emerging infections and antimicrobial resistance.
- More effective political, policymaker, and funder engagement.