

The East African Community mobile laboratory network prepares for monkeypox outbreaks

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Abstract

In response to the largest recorded monkeypox virus outbreak outside of endemic Central and Western Africa, the East African Community (EAC), in cooperation with the Bernhard-Nocht-Institute for Tropical Medicine, coordinated an emergency monkeypox diagnostic training for the East African Region. As of June 2022, the Democratic Republic of Congo reported a steady increase of suspected monkeypox cases, increasing the risk of spill-over into the remaining six EAC Partner States. Within the existing EAC Mobile Laboratories project, laboratory experts of the National Public Health Laboratories of the remaining six EAC Partner States (Burundi, Rwanda, Tanzania, Kenya, Uganda, and South Sudan) participated in the workshop and were trained in the reception of suspect samples, DNA extraction and diagnosis using real-time polymerase chain reaction (RT-PCR). The EAC region is now equipped with the tools to prepare and rapidly respond to any emerging monkeypox outbreak.

Introduction

Monkeypox is a zoonotic disease caused by infection with the monkeypox virus, belonging to the *Orthopoxvirus* genus. Prior to May 2022, most reported cases have occurred in endemic countries within the African continent, predominantly in central and western Africa.^{1,2} Outside of Africa, only sporadic cases have previously been reported, all clearly linked to travelers or transmission from infected animals imported from endemic regions.³ The situation with the current monkeypox outbreak is different, with most cases occurring in non-endemic regions across the globe. The WHO situation report dated 22nd June 2022, states a total of 3413 laboratory-confirmed cases globally, with 381 cases in the Americas, 2933 in Europe (the majority of cases, in over 25 European countries), 15 in Eastern Mediterranean and 11 in the Western Pacific.⁴ The sudden nature of parallel monkeypox outbreaks in non-endemic countries without a recent history of travel, suggests there has already been sustained undetected transmission outside of the

endemic west and central African region.⁴ Recent experiences from the SARS-CoV-2 pandemic, highlight the importance of rapid and effective diagnostics for early monkeypox detection to reduce the extent of onward transmission. To this extent, efforts are already underway in Europe to scale up diagnostics, vaccines, and therapeutics, where coordinated responses from the European Center for Disease Prevention and Control and the World Health Organization Regional Office for Europe are being leveraged.⁵ However, with an increasingly globalized society and the ever-more frequent reporting of autochthonous outbreaks in Europe previously only observed in sub-Saharan Africa, there is also an urgent need to rapidly enhance monkeypox diagnostic efforts on the African continent.

Monkeypox status in sub-Saharan Africa and the east African community regions

Between January and June 2022, 1768 suspected monkeypox cases were reported in eight countries within the WHO African Region, with the majority of all suspected cases (83%) in the Democratic Republic of Congo (DRC) (1476 suspected cases, 107 confirmed and 65 deaths), as shown in Figure 1.¹ Of these reported cases, only 183 have been confirmed by laboratory diagnosis, highlighting current limitations in diagnostic capacity within much

of sub-Saharan Africa. In East Africa, seven countries form the Member States of the East African Community (EAC), an inter-governmental body, headquartered in Arusha, Tanzania. These member states include Tanzania, Uganda, Kenya, Burundi, Rwanda, South Sudan, and the DRC (the most recent member to join in April 2022). To date, no suspected monkeypox cases have been reported within any of the EAC Member States, other than the DRC. However, given that five EAC countries have direct land borders with the DRC, porous with extensive trade and population movement, and that Nairobi/Kenya is a major international airport hub, the risk of cross-border transmission of monkeypox across East Africa is high. In response to this increasing threat, the East African Community released a press statement on 16th June 2022, urging the EAC Partner States to provide necessary information for their citizens to protect themselves against monkeypox and prevent the virus from spreading.⁶

Monkeypox preparedness in the east African community region

As part of Vision 2050, the EAC developed a Health Sector Priority Framework (2018-2028), with nine strategic investment priorities targeting health infrastructure, systems and services development, as well as health research and development.⁷ Under



Figure 1. Reported and confirmed monkeypox cases in the Democratic Republic of Congo between February and July 2022.¹



Figure 2. Training on monkeypox virus diagnostic workflow in the Mobile Training Laboratory, at the East African Community Headquarters in Arusha, Tanzania, July 2022. The Training of Trainers program covered sample inactivation, nucleic acid extraction, polymerase chain reaction setup and analysis.

strategic intervention 2, the EAC aims to “strengthen the network of medical reference laboratories and the regional rapid response mechanism to protect the region from health security threats including pandemics, bio-terrorism and common agents”.⁷ To address this priority, the EAC, in conjunction with the Bernhard Nocht Institute for Tropical Medicine and the National Public Health Laboratories (NPHLs) of Tanzania (National Health Laboratory Quality Assurance and Training Centre), Kenya (National Public Health Laboratory), Uganda (Central Public Health Laboratories), Rwanda (National Reference Laboratory), Burundi (Institut National de Santé Publique) and South Sudan (Public Health Laboratory and National Blood Transfusion Services – NHL&NBTS), has established the largest mobile laboratory network in sub-Saharan Africa.⁸ Capable of diagnosing highly infectious pathogens, including viral hemorrhagic fevers of biological safety levels 3 and 4, the mobile laboratory network has been instrumental in improving diagnostic capacity, particularly in remote locations where outbreaks frequently occur, and in combating cross-border epidemics within the EAC region.⁹

To address the growing threat of monkeypox within the region, the EAC organized an emergency monkeypox molecular diagnostic training for the EAC mobile laboratory network (Figure 2). Held in early July 2022 at the EAC Headquarters, in Arusha, Tanzania, the training had a mandate to prepare the mobile laboratories with the required molecular diagnostic capacity to support the rapid confirmation and containment of any emerging suspect case in the region. The training was conducted through the already established Training of Trainers program, therefore building on the existing capacity of the mobile laboratory personnel. Focusing on the Altona Diagnostic RealStar[®] Zoonotic Orthopoxvirus PCR Kit, which detects cowpox virus, monkeypox virus, racoonpox virus, camelpox virus, and vaccinia virus,¹⁰ trainees learned the diagnostic process flow from nucleic acid extraction,¹¹ to real-time PCR and analytical interpretation. Blinded, spiked samples were used to assess the ability of the trainees to accurately confirm cases, with all country teams successful in the identification. Following the training, all Partner States NPHLs have been provided with nucleic acid extraction and Altona diagnostic Orthopoxvirus PCR kits, as part of the preparedness measures. Prior to this training, due to limitations in capacity, including monkeypox diagnostic test availability, samples of suspected cases would need to be sent outside the EAC region for confirmation, which is both time-consuming and expensive.

Upon accurate diagnostic confirmation of any suspect case, the EAC can now judge whether to activate its “Regional Contingency Plan for Epidemics Due to Communicable Diseases, Conditions and other Events of Public Health Concern 2018-2023”, adopted by the Sectoral Council of Ministers of Health. It is the primary instrument for strengthening regional leadership, governance, and coordination of health emergencies with a view of supporting national-level emergency preparedness, response, recovery, and rehabilitation efforts. The scope of the plan includes zoonotic and non-zoonotic infectious diseases (such as monkeypox) and fully adopts the One Health approach. When activated, it envisages the establishment of a crisis management structure to implement emergency preparedness and response in the region. Coordinated by the EAC Secretariat’s Health Department and other key stakeholders such as Partner States ministries concerned with human, animal, and environmental public health emergencies, it is in line with the requirements of the International Health Regulations and the Global Health Security Agenda.

Conclusions

The EAC now prepared the mobile laboratory network to fulfill this diagnostic role, allowing a much more rapid intervention, a prerequisite for effective monkeypox outbreak containment. Furthermore, increasing the preparedness level of the EAC mobile laboratory network for this proactive and rapid response demonstrates the successful integration and utilization of the mobile laboratories into EAC preparedness and response measures. Ultimately, this will ensure long-term sustainability, and enable the EAC region to respond independently to monkeypox and other emerging disease threats, without reliance on external diagnostic capacity.

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