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EDITORIAL

Preventing future pandemics and epidemics through a North-South collaboration on genomic surveillance in Africa

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The economy and health of the world's population have been recurrently affected by infectious diseases since records began in the early 1900s, including large epidemic events that involved diseases such as the 'Spanish influenza', West Nile fever, Ebola hemorrhagic fever, 'Swine influenza', Zika, HIV/AIDS, SARS-CoV-1, MERS, COVID-19, Monkeypox, to name but a few. In more recent trends, while mosquito-borne viruses have mainly affected the tropics and subtropics in the last

century, infections by Dengue, Zika, and Chikungunya viruses are now threatening countries in the northern hemisphere with endemic circulation that until now have only reported imported infections of these viruses.

Recently, the dramatic development of the COVID-19 pandemic has brought much attention to molecular methods for virus identification and data analysis on epidemiological and evolutionary aspects of

these pathogens. In this context, the metagenomic sequencing approach applies a suite of genomic technologies and bioinformatic tools that can be used to identify potential emerging and re-emerging pathogens directly in clinical samples through nucleotide sequence analysis. In addition to the advantage of employing a single protocol for the identification of a variety of species, metagenomics produces genomic data that can be used to inform not only the diagnosis of pathogens but also their molecular epidemiology. Coupled with portable sequencing technology such as nanopore sequencing, metagenomics can characterize the entire genomic content of pathogens in a relatively short time. This information can reveal relevant epidemiological aspects regarding the dynamics of an epidemic, such as: i) the assessment of viral genetic diversity and evolution, ii) the reconstruction about the origins of epidemics through phylodynamic and phylogeography, iii) the estimation transmission patterns, and iv) providing information in silico for the development and improvement of medical countermeasures (vaccines and new drugs), as well as serological and molecular assays. Real-time genomic sequencing during COVID-19 pandemic and Ebola virus disease outbreaks in the Democratic Republic of Congo has highlighted the need to integrate the staff and data from sequencing to the classical surveillance systems in order to support quick decision-making in infectious diseases emergency situations. Such a system can be achieved through the implementation of sequencing methods such as metagenomics that could provide an improvement in the diagnostic sensitivity and specificity of newly emerging pathogens, in addition to the integration of genetic and epidemiological data, aiming to elucidate patterns of virus dispersion during emergence and epidemics.

Supplementary information The online version of this article ([Tables/Figures](#)) contains supplementary material, which is available to authorized users.

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In the context of the Africa Health Strategy 2016-2030, Africa-CDC has established in 2019 the Africa Pathogen Genomics Initiative (Africa PGI) to reinforce disease surveillance by developing pathogen genomics technology and bioinformatics across the continent. More recently, the EU-EDCTP3 has launched a tender for 22 million euros on the Genomic and Epidemiological surveillance in sub-Saharan countries. The tender has been closed a few days ago, and the potential benefits derivable from the proposals include the following:

1. A highly efficient strategy to detect and control novel pathogens of epidemic or pandemic threat before their circulation at regional or global level.
2. An innovative model for collaboration between African and European academic, health and research institutions
3. Enhanced capacity in Africa for research on pathogen genomics initiatives
4. Improved capacity in Africa for genomic surveillance of infectious diseases
5. Generation of a pro-active model for response to emerging / re-emerging epidemics in Africa
6. Career development and mentorship opportunities for pool of early-career researchers in both Africa and Europe in molecular epidemiology covering pathogen genomics, disease surveillance and genomics data analysis.
7. The development of an efficient policy-advocacy and guidelines for health systems and health services managers for the creation of awareness and effective dissemination of research findings in molecular epidemiology in Africa.
8. An effective community engagement by ensuring ownership of appropriate knowledge through reverse epidemiology and its use in redesigning of intervention tools.

In light of the urgent need to increase genomic surveillance in African countries, the **Journal of Public Health in Africa** is opening the door for an Early Access strategy to disseminate data on early detection, evolution monitoring and epidemic tracking of emerging and re-emerging viral pathogens outbreaks in Africa.

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