Genomic Surveillance Facilitates Ebola Virus Containment and Elucidates Origins, Transmission and Evolution during the 2014 Outbreak.

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The current epidemic of Ebola in Sierra-Leone, Guinea and Liberia, has demonstrated on one hand how lack of preparedness and coordinated response within countries and from international aid agencies and donors, can lead to an unprecedented human and economic loss in the afflicted countries. On the other hand, the rapid detection of the Ebola virus, and containment of the Ebola outbreak by Nigeria is a clear demonstration of the power of genomics diagnostics tools to detect infectious diseases outbreak as soon as they appear and facilitated their containment.

Early in the epidemic, we used genome sequencing to provide insights into virus evolution and transmission and offered important information for outbreak response, including our developing a 15minutes rapid diagnostic test (RDT) for Ebola Virus Disease (EVD).

We observed a rapid accumulation of interhost and intrahost genetic variation, allowing us to characterize patterns of viral transmission over the initial weeks of the epidemic. This West African variant likely diverged from central African lineages around 2004, crossed from Guinea to Sierra Leone, from Sierra-Leone to Liberia and from Liberia to Nigeria between May and July 2014. The virus exhibited a sustained human-to-human transmission, with no evidence of additional zoonotic sources. Because many of the mutations alter protein sequences and other biologically meaningful targets, they were monitored for impact on diagnostics, vaccines, and therapies critical to outbreak response.

As the epidemic winds down and the afflicted West African countries are celebrating because the World Health Organization (WHO) has declared them Ebola free, the questions that keep wandering in my mind are: Is Nigeria and other West African countries prepared for the next outbreak? How best can we prepare for the next outbreak?

We provide insights on how are using new genomics knowledge and technologies to build capacity and leadership toward preparedness and containment of future infectious diseases outbreaks, promote state-of-the-art genome sequencing and field-deployable genetic tools for microbial infections detection in West Africa, and enable a surveillance network for some of the world's greatest global health threats.