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Genomic Surveillance and Precision Public Health for Emerging Viral Outbreaks

Tulio de Oliveira

Stellenbosch University, South Africa

Genomic surveillance has become an indispensable component of modern infectious disease control, enabling rapid detection, characterization, and monitoring of emerging viral pathogens. This presentation explores the application of whole-genome sequencing, bioinformatics, and molecular epidemiology to strengthen outbreak investigations and guide evidence-based public health interventions. Case studies from SARS-CoV-2 and other viral outbreaks demonstrate how genomic surveillance supports identification of new variants, transmission networks, and vaccine effectiveness.

The presentation highlights advances in real-time sequencing technologies, international data-sharing platforms, and artificial intelligence tools that improve outbreak forecasting and response. Integrating genomic surveillance with clinical, epidemiological, and environmental data enhances decision-making and strengthens pandemic preparedness.

Future directions include expanding sequencing capacity in low-resource settings, improving international collaboration, and developing sustainable genomic surveillance networks capable of responding rapidly to future emerging infectious diseases.

Biography

Tulio de Oliveira is Director of the Centre for Epidemic Response and Innovation (CERI) at Stellenbosch University, South Africa. He is internationally recognized for his expertise in viral genomics, genomic surveillance, and outbreak investigation. His work has played a key role in strengthening global responses to emerging infectious diseases.