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Global Surveillance of Emerging Viral Diseases: Strengthening Pandemic Preparedness

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The rapid emergence and international spread of viral diseases have demonstrated that global health security depends on effective surveillance systems capable of detecting outbreaks before they escalate into pandemics. This presentation explores the integration of molecular epidemiology, genomic sequencing, and digital surveillance tools to improve the early identification and monitoring of emerging viral pathogens. Particular emphasis will be placed on zoonotic viruses, respiratory pathogens, and enteric viruses that continue to pose significant public health challenges worldwide.

Advances in next-generation sequencing and bioinformatics have transformed outbreak investigations by enabling rapid identification of viral variants, transmission chains, and evolutionary patterns. The presentation will discuss the importance of international data sharing, multidisciplinary collaborations, and real-time genomic surveillance in supporting evidence-based public health interventions. Lessons learned from recent outbreaks, including COVID-19 and avian influenza, will highlight the need for coordinated laboratory networks and standardized surveillance protocols.

The session will also address the role of One Health strategies in integrating human, animal, and environmental surveillance systems to detect zoonotic threats at their source. Emerging technologies such as artificial intelligence, wastewater surveillance, and portable sequencing platforms are expected to further strengthen preparedness against future pandemics.

Biography

Marion Koopmans is Head of the Department of Viroscience at Erasmus MC, Netherlands. She is internationally recognized for her research on emerging viral diseases, molecular epidemiology, and outbreak preparedness. Her work has significantly advanced global surveillance strategies and public health responses to infectious disease outbreaks.