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Genomic Surveillance and Antimicrobial Resistance: Transforming Clinical Microbiology for Global Health

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Whole-genome sequencing has revolutionized clinical microbiology by enabling rapid identification of infectious pathogens, outbreak detection, and antimicrobial resistance surveillance. This presentation explores how genomic epidemiology is improving infection prevention, hospital surveillance, and public health responses to bacterial outbreaks. Advances in sequencing technologies, computational biology, and bioinformatics now allow clinicians to track pathogen evolution, identify transmission pathways, and detect resistance genes with unprecedented accuracy. The presentation highlights the growing importance of integrated laboratory networks, international genomic databases, and real-time surveillance systems in monitoring emerging infectious diseases. Novel diagnostic platforms, machine learning algorithms, and rapid antimicrobial susceptibility testing are improving patient management while supporting antimicrobial stewardship initiatives. Future directions include precision microbiology, AI-assisted genomic analysis, and global collaborative research to reduce the spread of multidrug-resistant organisms.

Biography

Sharon J. Peacock is Professor of Clinical Microbiology at the University of Cambridge, United Kingdom. Her research focuses on bacterial genomics, antimicrobial resistance, hospital-acquired infections, and infectious disease surveillance. She is internationally recognized for advancing genomic epidemiology and precision microbiology.