OPEN ACCESS Freely available online

ISSN: 2471-2663
Clinical & Medical Biochemistry

Perspective

Multitarget Testing in Molecular Microbiology: Revolutionizing Surveillance and Outbreak Investigations

Jennifer Mackay*

Department of Molecular Microbiology, The University of Sydney, Camperdown, Australia

DESCRIPTION

Molecular microbiology has revolutionized the field of diagnostics by enabling rapid and accurate detection of infectious agents. Traditional diagnostic methods often focus on single-target testing, limiting the ability to identify multiple pathogens simultaneously. However, recent advancements in molecular techniques have approached for multitarget testing, allowing for comprehensive and efficient pathogen detection. Multitarget testing in molecular microbiology employs various techniques to simultaneously detect and identify multiple pathogens or genetic markers. These techniques have evolved over time, offering increased efficiency, sensitivity, and specificity. Multiplex Polymerase Chain Reaction (PCR) allows for the simultaneous amplification of multiple Deoxyribonucleic Acid (DNA) or Ribonucleic Acid (RNA) targets in a single reaction. It utilizes specific primer sets for each target, each labeled with a unique fluorescent tag. By using different combinations of primers, multiple targets can be amplified and detected in a single PCR run.

Multiplex PCR is widely employed for the detection of respiratory viruses, sexually transmitted infections, and various pathogens causing bloodstream infections. Next Generation Sequencing (NGS) enables high-throughput sequencing of DNA or RNA samples. This technique can simultaneously sequence millions of DNA fragments, allowing for the detection and identification of multiple pathogens in a single analysis. NGS-based multitarget testing is particularly valuable for identifying novel or emerging pathogens, conducting metagenomic studies, and characterizing complex microbial communities. Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS) is commonly used for microbial identification. By analyzing the unique mass-to-charge ratio of proteins or peptides, this technique rapidly identifies microorganisms. Multitarget testing using MALDI-TOF MS involves the creation of specific biomarker profiles for multiple pathogens, enabling simultaneous identification of different organisms in a single analysis. Microarray-based assays utilize a solid surface with thousands of immobilized probes specific to different target sequences. By hybridizing the sample DNA or RNA to the probes, the presence or absence of specific targets can be determined. Multitarget microarrays allow for the detection of multiple pathogens or genetic markers simultaneously, making them useful for surveillance, genotyping, and epidemiological studies.

Digital PCR techniques divide the sample into thousands of individual partitions, each containing a single DNA molecule. This enables absolute quantification of the target DNA by counting positive partitions. Digital PCR can be multiplexed to detect and quantify multiple targets simultaneously. Droplet Digital PCR (ddPCR) is a variation of digital PCR where the sample is partitioned into droplets, allowing for high-throughput analysis. Multitarget testing in molecular microbiology offers several advantages over traditional single-target testing methods. By simultaneously detecting multiple pathogens or genetic markers, multitarget testing provides a comprehensive and efficient approach to diagnostics. Multitarget testing increases the sensitivity and specificity of pathogen detection. By targeting multiple genetic markers or pathogens in a single assay, it reduces the chances of false-negative or false-positive results. This enhanced accuracy is particularly valuable in cases where coinfections or polymicrobial infections are common, ensuring that all relevant pathogens are identified. Traditional testing methods often require separate tests for each pathogen, consuming valuable time and resources.

Multitarget testing streamlines the diagnostic process by consolidating multiple tests into a single assay. This significantly reduces turnaround time, allowing for prompt diagnosis and appropriate treatment. Moreover, multitarget testing can be more cost-effective than performing individual tests, as it reduces laboratory consumables, reagents, and labor costs. Multitarget testing facilitates efficient monitoring and surveillance of infectious diseases. By simultaneously detecting multiple pathogens, it enables early detection and response to outbreaks. Additionally, it aids in tracking the prevalence and distribution

Correspondence to: Jennifer Mackay, Department of Molecular Microbiology, The University of Sydney, Camperdown, Australia. E-mail: jennmac@gmail.com

Received: 01-May-2023, Manuscript No. CMBO-23-21809; **Editor assigned:** 04-May-2023, PreQC No. CMBO-23-21809 (PQ); **Reviewed:** 18-May-2023, QC No. CMBO-23-21809; **Revised:** 25-May-2023, Manuscript No. CMBO-23-21809 (R); **Published:** 01-June-2023, DOI: 10.35841/2471-2663.23.9.169

Citation: Mackay J (2023) Multitarget Testing in Molecular Microbiology: Revolutionizing Surveillance and Outbreak Investigations. Clin Med Bio Chem.9:169.

of specific pathogens, contributing to epidemiological studies and informed public health interventions. Multitarget testing plays a crucial role in guiding appropriate antimicrobial therapy. By rapidly identifying the causative agents and their resistance profiles, it enables clinicians to make informed decisions regarding antimicrobial treatment. This targeted approach helps optimize antibiotic use, minimizing the risk of inappropriate prescribing, antibiotic resistance, and adverse patient outcomes. Multitarget testing serves as a valuable tool for research and development in the field of molecular microbiology. It allows scientists to explore the relationships between multiple pathogens, their interactions, and the impact of coinfections on disease progression. These insights contribute to a better understanding of pathogen biology, host-pathogen interactions, and the development of new diagnostic and therapeutic strategies.

CONCLUSION

Multitarget testing in molecular microbiology offers numerous benefits. It enhances diagnostic accuracy by reducing false-negative and false-positive results, particularly in cases of coinfections or polymicrobial infections. It improves efficiency by consolidating multiple tests into a single assay, saving time and reducing costs. Multitarget testing also enables efficient surveillance and outbreak investigations, aiding in early detection and response to infectious diseases. Moreover, it facilitates optimal antimicrobial therapy by identifying causative agents and their resistance profiles, leading to improved patient outcomes and antimicrobial stewardship. Multitarget testing supports research and development efforts by providing insights into pathogen biology, host-pathogen interactions, and the development of new diagnostic and therapeutic approaches.