GeneXpert for Non-tuberculous Mycobacterial Infections: Expanding the Scope

David Klaus*

Department of Infectious Diseases, University of Miami Leonard M. Miller School of Medicine, Miami, FL, USA

Introduction

GeneXpert technology, renowned for its rapid and accurate detection of Tuberculosis (TB), is increasingly being recognized for its potential to identify Non-Tuberculous Mycobacterial (NTM) infections. While GeneXpert has revolutionized TB diagnosis with its rapid turnaround time and ability to detect drug resistance, its applications are expanding to encompass a broader spectrum of mycobacterial diseases. Non-tuberculous mycobacteria, such as those in the *Mycobacterium avium* complex, *Mycobacterium abscessus*, and other environmental mycobacteria, are emerging pathogens that can cause a range of infections, particularly in immunocompromised individuals. Traditionally, the diagnosis of NTM infections has been challenging due to the slow growth of these bacteria and the limitations of conventional culture methods. GeneXpert, with its advanced molecular diagnostic capabilities, offers a promising solution for overcoming these challenges. The integration of GeneXpert technology for the detection of NTM infections involves adapting its core features—rapid nucleic acid amplification and detection—to identify specific mycobacterial species beyond *Mycobacterium tuberculosis*. This expansion of scope holds significant implications for improving diagnostic accuracy, speeding up treatment initiation, and enhancing patient outcomes for those affected by NTM infections. This introduction will explore the potential of GeneXpert in diagnosing non-tuberculous mycobacterial infections, discussing its advantages, current applications, and the implications of broadening its use. By leveraging the strengths of GeneXpert, healthcare providers can better address the complexities of NTM infections and contribute to more effective management and treatment strategies [1].

Description

GeneXpert technology, originally developed for the rapid detection of Tuberculosis (TB), is now being explored for its application in diagnosing non-tuberculous mycobacterial (NTM) infections. This technology utilizes Polymerase Chain Reaction (PCR) to amplify and detect specific DNA sequences, allowing for quick and accurate identification of pathogens [2].

Application to Non-Tuberculous Mycobacteria includes; Non-tuberculous mycobacteria, which include species such as *Mycobacterium avium* complex, *Mycobacterium abscessus*, and *Mycobacterium kansasii*, are environmental organisms that can cause opportunistic infections, particularly in individuals with weakened immune systems or chronic lung diseases. The traditional methods for diagnosing NTM infections, such as culture and microscopy, can be time-consuming and less sensitive, often leading to delayed diagnosis and treatment [3]. GeneXpert technology addresses these limitations by providing a rapid and sensitive alternative. The system works by detecting specific genetic markers associated with NTM species, thus facilitating early and accurate identification. This rapid detection capability can significantly reduce the time to diagnosis from weeks or months to just hours, enabling prompt initiation of appropriate treatment. There are uses of GeneXpert for NTM detection offers several advantages such as GeneXpert delivers quick results with high sensitivity and specificity, which is critical for managing infections that require timely intervention. The technology simplifies the diagnostic process by automating sample processing and result interpretation, reducing the need for specialized laboratory skills. Rapid identification of NTM infections allows for earlier therapeutic intervention, potentially improving patient outcomes and reducing complications [4].

However, there are challenges associated with expanding GeneXpert's application such as; the system requires adaptation and validation for different NTM species, which involves developing and validating new assays specific to these organisms. The cost of GeneXpert systems and cartridges may be a barrier in low-resource settings, impacting the widespread adoption of this technology for NTM detection. The integration of GeneXpert into the diagnostic workflow for NTM infections represents a significant advancement in the field of mycobacterial diseases. By improving diagnostic speed and accuracy, GeneXpert can enhance treatment outcomes and patient management, particularly for those with chronic or severe infections. As the technology continues to evolve, it holds promise for further enhancing the diagnosis and treatment of a broader range of mycobacterial infections [5].

Conclusion

Expanding GeneXpert technology to include non-tuberculous mycobacterial infections represents a significant advancement in diagnostic microbiology. By offering rapid and accurate detection of these challenging pathogens, GeneXpert enhances early diagnosis and timely treatment, improving patient outcomes. While there are challenges to overcome, such as adaptation and cost, the potential benefits of incorporating GeneXpert for NTM detection make it a valuable tool in managing a broader spectrum of mycobacterial diseases.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Hirabayashi, Ryosuke, Atsushi Nakagawa, Hiroshi Takegawa and Keisuke Tomii. "A case of pleural effusion caused by *Mycobacterium fortuitum* and *Mycobacterium mageritense* coinfection." *BMC Infect Dis* 19 (2019): 1-3.

2. Morimoto, Kozo, Akio Aono, Yoshiro Murase and Tsuyoshi Sekizuka, et al. "Prevention of aerosol isolation of nontuberculous *Mycobacterium* from the patient's bathroom." *ERJ Open Res* 4 (2018).

3. Fukushima, Kiyoharu, Seigo Kitada, Yuki Matsumoto and Sho Komukai, et al. "Serum GPL core antibody levels are associated with disease activity and treatment outcomes in *Mycobacterium avium* complex lung disease following first line antibiotic treatment." *Respir Med* 187 (2021): 106585.

4. Floto, R. Andres, Kenneth N. Olivier, Lisa Saiman and Charles L. Daley, et al. "US Cystic Fibrosis Foundation and European Cystic Fibrosis Society consensus recommendations for the management of non-tuberculous mycobacteria in individuals with cystic fibrosis." *Thorax* 71 (2016): i1-i22.

5. Lobo, Leonard J., Lydia C. Chang, Charles R. Esther Jr and Peter H. Gilligan, et al. "Lung transplant outcomes in cystic fibrosis patients with pre-operative *Mycobacterium abscessus* respiratory infections." *Clin Transplant* 27 (2013): 523-529.

How to cite this article: Klaus, David. "GeneXpert for Non-tuberculous Mycobacterial Infections: Expanding the Scope." *J Pulm Respir Med* 14 (2024): 689.