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Mycobacterial Diseases

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Commentary

Identifying Rifampicin-Resistant TB among Patients

Wichor Adam*

Department of Medical Microbiology and Infectious Diseases, Erasmus University, Rotterdam, The Netherlands

DESCRIPTION

Tuberculosis (TB) continues to persist due to delays in diagnosis, inadequate treatment, and the emergence of drug-resistant strains, particularly Rifampicin-Resistant TB (RR-TB). Among tuberculosis presumptive patients those presenting with symptoms suggestive of TB the identification of both *Mycobacterium tuberculosis* (M. tb) and rifampicin resistance is important for effective disease control and patient management. Tuberculosis presumptive patients are individuals who exhibit symptoms suggestive of TB, such as persistent cough, weight loss, fever, night sweats, and fatigue. These patients are typically screened using sputum samples and other diagnostic tests to determine whether they are infected with M. *tb*. Early identification and treatment of M. *tb* in presumptive patients are important to prevent the spread of the disease, particularly in regions where TB is endemic. Diagnosis of TB among presumptive patients can be challenging due to the overlapping symptoms with other respiratory infections. As a result, diagnostic delays may occur, increasing the risk of transmission within communities. This challenge is exacerbated when patients have drug-resistant TB, particularly rifampicin-resistant TB, which requires more complex and prolonged treatment regimens.

Rifampicin-resistant tuberculosis

Rifampicin-Resistant Tuberculosis (RR-TB) is a form of TB in which the bacterium is resistant to rifampicin, one of the most effective first-line drugs used to treat TB. Rifampicin is a foundation of the standard TB treatment regimen, and resistance to this drug significantly complicates the management of the disease. Rifampicin resistance is often associated with Multidrug-Resistant TB (MDR-TB), where the bacterium is also resistant to isoniazid, another key anti-TB drug. RR-TB poses a major public health concern due to its longer and more toxic treatment regimens, as well as poorer treatment outcomes compared to drug-sensitive TB. The emergence of RR-TB is largely driven by inadequate or incomplete treatment, poor patient adherence to medication regimens, and the transmission of resistant strains within communities. It is estimated that around 500,000 new cases of RR-TB are reported globally each year, and early detection among presumptive patients is important to controlling its spread.

Diagnosis of M. *tb* and rifampicin resistance

The evolutionary shift from an environmental bacterium to a highly specialized human pathogen like M. tb likely involved gradual adaptations that allowed the bacteria to survive and thrive within host organisms. Marine sponge bacteria, which live in close association with their host, provide a model for understanding how this transition may have occurred. In marine sponges, bacteria must compete with other microorganisms for resources and protection. These environmental pressures may have led to the development of defense mechanisms such as biofilms, protective coatings, and the ability to manipulate host immune responses traits that are also seen in pathogenic mycobacteria like M. tb. Over time, these traits may have been refined as certain bacteria adapted to life within mammals, eventually leading to the emergence of TB causing strains. Understanding the environmental origins of M. *tb* has important implications for modern TB research. For one, it highlights the adaptability of mycobacteria and their ability to survive in a wide range of environments. This adaptability is part of what makes TB so difficult to eradicate, as M. *tb* can persist in latent form within the human body for decades, only to reactivate under certain conditions. Moreover, studying marine sponge microbes could lead to the discovery of new antimicrobial compounds. Sponges and their symbiotic bacteria have evolved sophisticated chemical defenses to protect themselves from predators and infections. Some of these compounds have shown potential as new antibiotics, which could be important in the fight against drug-resistant TB.

Treatment of rifampicin-resistant TB

Treatment for RR-TB is more complex and lengthy than for drug-sensitive TB. It typically involves a combination of second-

Correspondence to: Wichor Adam, Department of Medical Microbiology and Infectious Diseases, Erasmus University, Rotterdam, The Netherlands, Email: wichada25@gmail.com

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line drugs, including fluoroquinolones and injectable agents, over a period of 9 to 24 months, depending on the severity of the resistance and the patient's overall health. In recent years, newer drugs like bedaquiline and delamanid have been introduced to help improve treatment outcomes in RR-TB patients, especially in cases where second-line drugs are ineffective or cause severe side effects. Treatment adherence is important to prevent further drug resistance from developing. The lengthy and more toxic treatment regimens for RR-TB often lead to poor adherence, which can result in treatment failure and increased transmission of resistant strains. Therefore, it is essential to provide adequate support and monitoring to RR-TB patients throughout the treatment process to ensure adherence and reduce the risk of drug resistance.

CONCLUSION

The emergence of rifampicin-resistant M. tb among tuberculosis presumptive patients represents a significant challenge for global TB control efforts. Early and accurate diagnosis of M. *tb* and rifampicin resistance is essential for effective patient management and preventing the further spread of drug-resistant TB. Tools like GeneXpert M. *tb*/RIF have revolutionized TB diagnostics, enabling healthcare providers to rapidly detect TB and RR-TB among presumptive patients, but barriers to access still exist in many regions. Expanding access to these diagnostic tools and ensuring adherence to complex treatment regimens are important steps in controlling the spread of rifampicin-resistant TB and improving patient outcomes.