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Rethinking tuberculosis: Microbiological and immunological crossroads in the post-pandemic era.

Reflexionando acerca de la tuberculosis: encrucijadas microbiológicas e inmunológicas en la era postpandemia

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Dear Editor:

Tuberculosis (TB) remains one of the most formidable infectious diseases. Despite decades of global control efforts, TB still causes substantial morbidity and mortality. The WHO Global Tuberculosis Report 2024 indicates that 10.8 million people developed TB in 2023, with 1.25 million deaths, confirming TB as the leading cause of death from a single infectious agent. The highest burden persists in South-East Asia, Africa, and Western Pacific regions, with India contributing nearly one-quarter of global cases.[1,2]

The COVID-19 pandemic reversed progress, with case detection falling sharply in 2020 and 2021. This disruption exposed weaknesses in surveillance, diagnostic infrastructure, and preventive services, setting global TB control back nearly a decade.[1,2]

Beyond epidemiology, advances in immunology highlight TB as both an infectious and immune-mediated disorder. Dysregulated Th1/Th17 responses and T-cell exhaustion permit bacillary persistence. While immune checkpoint pathways such as PD-1/PD-L1 have attracted interest, evidence shows that indiscriminate checkpoint blockade risks exacerbating immunopathology and precipitating TB reactivation. Hence, checkpoint inhibitors should not be deployed as TB therapy outside trials. Instead, oncology patients requiring ICIs should undergo baseline latent TB screening, prophylactic therapy when indicated, and vigilant monitoring.

More promising are host-directed therapies (HDTs). Phase II trials of PDE-4 inhibition (CC-11050) and mTOR modulation (everolimus) demonstrate safety and improved lung function. Likewise, statins show immunomodulatory synergy and favorable imaging outcomes, positioning them as feasible adjuncts in drug-sensitive and resistant TB.[3,5]

At the microbiological frontier, metagenomic sequencing and CRISPR-based diagnostics are accelerating pathogen detection, while AI-assisted chest radiography offers scalable triage in resource-limited settings. Together, these innovations bring precision medicine closer to TB control.

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CONCLUSION

TB exemplifies the intersection of microbiology, immunology, and clinical practice. We recommend three priorities for the post-pandemic era:

1. Embed immunological biomarkers (e.g., Mtb-specific CD4+ T-cell activation profiles, RISK signatures) into monitoring frameworks.

2. Adopt a safety-first algorithm for patients receiving ICIs, limiting their use to oncology with TB screening and preventive measures.

3. Scale accessible diagnostics and advance HDTs (CC-11050, everolimus, statins) through pragmatic trials.

These steps, anchored in updated epidemiology [1,2] and supported by translational studies [3-5], provide a practical, evidence-based roadmap to reduce the global TB burden.

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Author contributions

All authors have reviewed and approved the submission of article.

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Artificial Intelligence (AI)

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Nota del editor / Aviso de responsabilidad

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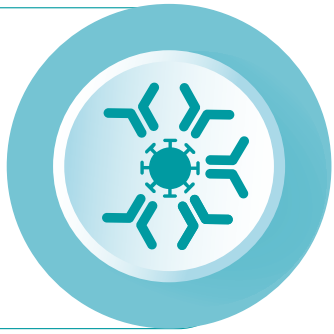

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