A matter of delivery: nanocarriers and the engineering of protective immunity in tuberculosis vaccination

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Stellingen
behorende bij het proefschrift getiteld

A MATTER OF DELIVERY: NANOCARRIERS AND THE ENGINEERING OF PROTECTIVE IMMUNITY IN TUBERCULOSIS VACCINATION

1. The immunostimulatory effects of cationic lipids are shaped not only by their surface charge but also by their molecular structure, which modulates nanoparticle properties and immune cell interactions.

   Adapted from Chapter 2, this thesis.

2. Nanoparticle-based delivery systems modulate antigen processing and immune activation, acting as active immunological components rather than passive carriers.

   Adapted from Chapter 3, this thesis.

3. The abundance of IFNγ-producing or polyfunctional T-cells does not reliably predict protection against *Mycobacterium tuberculosis,* highlighting limitations of conventional immune readouts.

   Adapted from Chapter 4, this thesis.

4. Antigen immunogenicity is not solely intrinsic but can be significantly enhanced through formulation and delivery strategies.

   Adapted from Chapter 5, this thesis.

5. The absence of robust immune correlates of protection remains a major obstacle to rational TB vaccine design.

Adapted from Wang, J., et al. *npj Vaccines* (2024).

6. Protective immunity against TB is multifactorial and unlikely to be attributed to a single cellular or molecular correlate.

Adapted from Brighenti, S., Joosten, S. A. *Journal of internal medicine* (2018).

7. Correlates of TB vaccine efficacy may lie in underexplored areas such as tissue localization, unconventional T-cell responses, and host-intrinsic factors beyond standard cytokine-based profiling.

Adapted from Nemes, E., et al. *Frontiers in immunology* (2020).

8. Integrating human-relevant *in vitro* models early in vaccine development can enhance the predictive value of preclinical screening.

Adapted from Bowley, T. Y., et al. *Frontiers in Immunology* (2025).

9. The COVID-19 pandemic demonstrated that rapid vaccine development is feasible, but equitable distribution, strategic preparedness, and global coordination remain critical barriers to achieving population-wide protection.

Adapted from Agampodi, S., et al. *Expert Review of Vaccines* (2024).

10. Even the most effective vaccine cannot succeed if public trust is eroded by misinformation and vaccine hesitancy.