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The unexplored functions of Toll-like receptor signaling: immunometabolism, development and microbiome interactions

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Stellingen

behorend bij het proefschrift getiteld:

“The unexplored functions of Toll-like receptor signaling: Immunometabolism, development and microbiome interactions”

1. Disruption of glucose homeostasis in *tlr2* or *tirap* mutant larvae demonstrates that immune signaling components are also indispensable metabolic regulators, bridging immunology and metabolism (**Chapter 2 and 3**).
2. The opposite effect on neutrophil migration upon wounding in the *tlr2* and *tirap* mutant larvae could be explained by differences in their functions in metabolic regulation, linking immunometabolism to inflammation (**Chapter 2 and 3**).
3. TLR2 affects gut microbial diversity and function in a stage-dependent manner, underscoring its role as a regulator of host-microbiome interactions (**Chapter 4**).
4. TLR2 and the microbiome modulate the localization and dissemination of nontuberculous mycobacteria in the gut, highlighting a multilayered host-pathogen-microbiome regulatory network (**Chapter 5**).
5. Macrophages contribute to the phagocytosis and dissemination of nontuberculous mycobacteria to distal tissues during gut infection (**Chapter 5**).
6. TLR signaling exemplifies how pathogen recognition pathways simultaneously regulate metabolic processes and host-microbiome interactions (**Chen et al., Immun Inflamm Dis, 2024**).
7. Imbalances in the microbiome contributes to the pathogenesis of inflammatory bowel disease, underscoring the importance of host-microbiome interactions in gut disease (**Schirmer et al., Nat Rev Gastroenterol Hepatol, 2019**).
8. Targeting TLR signaling represents a promising therapeutic strategy for nontuberculous mycobacterial infections and inflammatory bowel diseases.
9. Integrating perspectives across molecular biology, metabolism, and microbiome research illustrates that innovation often emerges at the intersection of disciplines.
10. Courage to explore in science is a driving force that transforms challenges into opportunities for discovery.

Li Liu

Leiden, 17th March 2026