Journal of Current and Advance Medical Research
January 2024, Vol. 11, No. 1, pp. 1-2
http://www.banglajol.info/index.php/JCAMR
ISSN (Print) 2313-447X
ISSN (Online) 2413-323X
NLM Catalog ID 101673828
DOI: https://doi.org/10.3329/jcamr.v11i1.81588

EDITORIAL

Immunological Responses to *Salmonella typhi*: A Comprehensive Overview

Tarana Jahan

Assistant Professor, Department of Microbiology, Monno Medical College, Manikganj, Bangladesh

Salmonella enterica serovar Typhi (*S. Typhi*), the causative agent of typhoid fever, poses a significant public health challenge, particularly in regions with limited access to clean water and sanitation. Understanding the host's immunological responses to *S. Typhi* is crucial for developing effective vaccines and therapeutic strategies. This editorial delves into the intricate interplay between innate and adaptive immunity in response to *S. Typhi* infection.

Innate Immune Response

Upon ingestion, *S. Typhi* traverses the gastrointestinal tract, encountering the mucosal epithelium. The innate immune system recognizes *S. Typhi* through pattern recognition receptors (PRRs), notably Toll-like receptors (TLRs). TLR4 detects lipopolysaccharide (LPS), while TLR2 and TLR5 recognize bacterial lipoproteins and flagellin, respectively. Activation of these receptors initiates signaling cascades involving adaptor proteins like MyD88 and TRIF, leading to the production of pro-inflammatory cytokines such as IL-8, IL-1β, and TNF-α. Neutrophils are rapidly recruited to the site of infection, where they phagocytose and kill extracellular bacteria. However, excessive neutrophil infiltration can cause tissue damage, compromising the epithelial barrier and exacerbating inflammation.

Adaptive Immune Response

Humoral Immunity: The adaptive immune response is characterized by the activation of B and T lymphocytes. B cells produce specific antibodies against *S. Typhi* antigens, including outer membrane proteins like porins. Studies have shown that TLR2 and TLR4 signaling is essential for optimal antibody responses. TLR4 influences the primary IgM response, while TLR2 is crucial for IgG production, particularly the IgG3 subclass.

Cell-Mediated Immunity: T cells, especially CD4+ and CD8+ subsets, play pivotal roles in controlling *S. Typhi* infection. CD4+ T cells produce cytokines such as interferon-gamma (IFN-γ) and interleukin-17 (IL-17), which activate macrophages and enhance bacterial clearance. Notably, IFN-γ responses are elevated during both acute and convalescent phases of typhoid fever.

CD8+ T cells contribute by directly killing infected host cells and producing cytokines like IFN-γ, TNF-α, and IL-2. Multifunctional CD8+ T cells, capable of producing multiple cytokines simultaneously, have been associated with protection against typhoid fever.

Cytokine Profiles and Immune Modulation: The cytokine milieu during *S. Typhi* infection reflects a complex interplay between pro-inflammatory and regulatory signals. Elevated levels of IFN-γ, IL-6, and TNF-α receptors have been observed in patients, indicating robust Th1-type responses. However, anti-inflammatory mediators like IL-10 and IL-1 receptor antagonist (IL-1RA) are also upregulated, suggesting mechanisms to prevent excessive inflammation .

Implications for Vaccine Development: Current typhoid vaccines, including the Vi polysaccharide and Ty21a, have limitations in efficacy, especially in young children. Understanding the immunological responses to *S. Typhi* has informed the development of newer vaccines, such as conjugate vaccines that link the Vi polysaccharide to a protein carrier, enhancing immunogenicity. These vaccines elicit stronger and longer-lasting

immune responses, offering improved protection across various age groups.

The immune response to *S. Typhi* involves a coordinated effort between innate and adaptive immunity. While innate mechanisms provide immediate defense, adaptive responses, particularly T cell-mediated immunity, are crucial for long-term protection. Insights into these immunological processes are instrumental in guiding the development of effective vaccines and therapeutic interventions against typhoid fever.

References

1. Schadich E, Dzubak P, Hajduch M. Role of *Salmonella Typhi* Vi antigen and secretory systems on immune response. Current pharmaceutical design. 2016;22(41):6251-60
2. Pham OH, McSorley SJ. Protective host immune responses to *Salmonella* infection. Future microbiology. 2015 Jan 1;10(1):101-10.
3. Broz P, Ohlson MB, Monack DM. Innate immune response to *Salmonella typhimurium*, a model enteric pathogen. Gut microbes. 2012;3(2):62-70.
4. Dhingra D, Marathe SA, Sharma N, Marathe A, Chakravortty D. Modeling the immune response to *Salmonella* during typhoid. International Immunology. 2021;33(5):281-98.
5. Wang M, Qazi IH, Wang L, Zhou G, Han H. Salmonella virulence and immune escape. Microorganisms. 2020;8(3):407.

Correspondence: Dr. Tarana Jahan, Assistant Professor, Department of Microbiology, Monno Medical College, Monno City, Gilando, Manikganj, Bangladesh; Email: tarana.nipa01@gmail.com; Cell no.: +8801684605056; ORCID: http://orcid.org/0000-0002-9405-6990

[Journal of Current and Advance Medical Research, January 2024;11(1):1-2]