**Article type:** Editorial

**Home Page URL:** https://www.alliedacademies.org/immunology-case-reports/

# Biomarkers for diagnosing parasitic immunopathology.

**Jafar Riyan***

Department of Molecular Pathology, Hospital of Zhengzhou University, China

**Correspondence to:** Jafar Riyan, Department of Molecular Pathology, Hospital of Zhengzhou University, China, E-mail: jafariyan@mums.ac.ir

***Received:*** *02-Jan-2025, Manuscript No. AAICR-25-169266;* ***Editor assigned:*** *03-Jan-2025, Pre QC No. AAICR-25-169266(PQ);* ***Reviewed:*** *18-Jan-2025, QC No. AAICR-25-169266;* ***Revised:*** *24-Jan-2025, Manuscript No. AAICR-25-169266(R);* ***Published:*** *31-Jan-2025, DOI: 10.35841/aaicr-8.1.190*

## Introduction

Parasitic infections continue to pose significant health burdens worldwide, especially in tropical and subtropical regions. Beyond the direct damage inflicted by parasites, many pathologies stem from the host's immune response—ranging from benign modulation to severe immunopathology. Accurate diagnosis and monitoring of these conditions require robust biomarkers that reflect not only parasitic load but also the underlying immune dynamics. As immunological tools evolve, identifying and validating biomarkers for parasitic immunopathology becomes increasingly essential for precision diagnostics, prognostics, and therapeutic strategies [1, 2].

Immunopathology refers to tissue damage and dysfunction caused by the immune response rather than the pathogen itself. In parasitic diseases such as: excessive or misdirected immune responses can lead to chronic inflammation, fibrosis, autoimmunity, or immune suppression. These sequelae often persist even after parasitic clearance, necessitating diagnostic tools that go beyond traditional parasitological methods. Signatures of immune activation, suppression, or skewing, Indicators of humoral immunity and chronic exposure [3, 4].

These are increasingly relevant in identifying individuals at risk for post-treatment sequelae. Multiplex immunoassays allow simultaneous detection of dozens of cytokines and proteins in minimal sample volumes. Single-cell RNA-seq reveals cellular heterogeneity and immune dysfunction at unprecedented resolution. Metabolomics and proteomics uncover systemic perturbations related to parasitic immunopathology, such as oxidative stress and tissue remodeling. Immune cell phenotypes and activation states, Host transcriptomic and genomic responses, Signatures of systemic immune dysregulation, Helminth infections like schistosomiasis induce strong Th2 responses marked by elevated IL-4 and IL-5. Malaria and leishmaniasis activate Th1 pathways involving IFN-γ and TNF-α. High IL-10 levels often correlate with immune suppression or disease tolerance in chronic infections. These profiles can distinguish between active inflammation, immune modulation, and therapeutic responsiveness. Elevated IgE is common in helminth infections and associated with hypersensitivity and eosinophilia [5, 6].

IgG subclasses help distinguish recent vs chronic infection. In some cases, IgG4 may indicate immune tolerance rather than protective immunity. Monitoring antibody kinetics can aid in staging disease and evaluating vaccine responses. Regulatory T cells (Tregs) expressing FOXP3 are linked to immunosuppression in filarial and leishmanial infections. Th17 cells are implicated in exacerbating tissue damage in cutaneous leishmaniasis and cerebral malaria. Eosinophil counts remain standard for parasitic allergy and helminthiasis evaluation. Flow cytometry and single-cell profiling have made these markers more accessible for field studies [7, 8].

Early diagnosis and staging of parasitic disease, Monitoring treatment response and detecting relapse, Identifying individuals at risk of immunopathological complications. Transcriptomic markers like SOCS1, IL12B, and STAT6 differentiate immune activation patterns. Host gene expression panels are being developed to classify severity in malaria and visceral leishmaniasis. Advances in point-of-care RNA profiling may soon enable bedside immunopathology assessments. Dysregulated microRNA expression, such as miR-155 or miR-146a, has been observed in immune cells during chronic parasitic infections. Epigenetic markers modulate cytokine production and immune

memory, making them potential diagnostic targets [9, 10].

## Conclusion

Biomarkers have moved from experimental curiosities to clinical essentials in the diagnosis and management of parasitic immunopathology. As immune profiling technologies become more refined and accessible, personalized parasitology—where disease is diagnosed and managed based on individual immune signatures—is within reach. From cytokine storms to immune silence, decoding these biological signals is vital to alleviating the global burden of parasitic diseases.

## References


1. Ahorsu DK, Lin CY, Imani V, et al. The fear of COVID-19 scale: development and initial validation. Int J Mental Health Addiction. 2020:1-9.
2. Liston A, Humblet-Baron S, Duffy D, et al. Human immune diversity: from evolution to modernity. Nat Immunol. 2021;22(12):1479-89.
3. Schaller M. The behavioural immune system and the psychology of human sociality. Philosophical Transactions Royal Society B: Biol Sci. 2011;366(1583):3418-26.
4. Makhanova A, Shepherd MA. Behavioral immune system linked to responses to the threat of COVID-19. Personality and Individual Differences. 2020;167:110221.
5. Shook NJ, Sevi B, Lee J, et al. Disease avoidance in the time of COVID-19: The behavioral immune system is associated with concern and preventative health behaviors. PloS one. 2020;15(8):e0238015.


**Citation:** Riyan J. Biomarkers for diagnosing parasitic immunopathology. Immunol Case Rep. 2025;8(1):190.