

A facultative mutualist

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Abstract

This review summarizes the academic foundation and research trajectory of Pritam Saha. Foundational studies culminated in a B.Sc. in Microbiology from Kalyani Mahavidyalaya, followed by an M.Sc. in Medical Biotechnology from the School of Tropical Medicine, Kolkata. Methodological expertise includes multicolour flow cytometry, cell culture, and *in vivo* murine model handling. Integrating these multidisciplinary approaches has driven significant contributions to infectious disease research.

Introduction

Modern infectious disease research requires a deep understanding of how pathogens attack and how the immune system defends. This document outlines the progression of the author whose academic and practical training bridges these critical domains. Initial theoretical coursework provided advanced proficiency in immunology, recombinant DNA technology, and biochemistry.

Transitioning into applied research at the DpN Lab within the Department of Biochemistry at IISc, the author engaged in several key projects. Primary methodologies involved deciphering immune cell dynamics in mouse models of infection, utilizing both virulent and attenuated strains of *Salmonella* Typhimurium to model sepsis. Additional characterization involved investigating the functional loss of *rffG* and *rfbB* genes and their subsequent effects on bacterial morphology and virulence.

Most recently, the author's research focus has involved combating antimicrobial resistance through the identification of small-molecule adjuvants designed to enhance *Escherichia coli* sensitivity to nitrofurantoin, with specific emphasis on the Lon and MarA pathways. This foundational overview contextualizes the author's technical repertoire—spanning molecular biology, primary cell isolation, and bioinformatics—and establishes a framework for ongoing contributions to the fields of molecular biology and immunogenetics.

Results

Professional research output encompasses significant contributions to the understanding of antimicrobial sensitivity mechanisms in *E. coli*¹, interferon-gamma immunomodulation², and the evolving therapeutic paradigms of Dengue infection³. Furthermore, empirical observations detailing the alteration of colony morphology and virulence in *Salmonella* Typhimurium⁴ and the diagnostic utility of carbon dots⁵ have been successfully documented and published.

Discussion and Conclusions

These cumulative experiences indicate a robust academic trajectory characterized by active participation in the broader scientific discourse, evidenced by the author's role on the local organizing committee for Immunocon '24, an international immunology conference hosting 700 attendees at IISc. Prior scientific engagement included membership at the Birla Industrial and Technological Museum (BITM) Kolkata Biotechnology Lab. Beyond rigorous laboratory benchwork, cognitive optimization is demonstrated through competitive speedcubing (3x3 Rubik's Cube, average solve time <30s) and strategic participation in analytical sports including chess, badminton, and cricket. The continual development of a digital portfolio indicates a strong commitment to open-access science communication.

Materials & Methods

Model Organisms & Cell Culture: Experimental *in vivo* protocols utilized C57BL/6 murine models. *In vitro* assays were performed using established bacterial and animal tissue culture techniques, encompassing primary cell isolation and continuous cell line maintenance.

Molecular & Cellular Assays: Cellular characterization was achieved via multicolour flow cytometry, total and differential blood counts, and compound light microscopy. Molecular quantification and extraction were conducted using qRT-PCR, ELISA, gel electrophoresis, and RNA extraction methodologies.

Computational Analysis: Bioinformatics pipelines were developed and executed utilizing Python and R programming languages, integrating BLAST and Multiple Sequence Alignment algorithms for genomic data interpretation.

Data availability

Comprehensive digital documentation of this author's portfolio, independent projects, and codebase is publicly hosted at <https://pritamsaha.co.in> and maintained at <https://github.com/pritawwm>.

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Ethics Declaration

All murine handling, pathogenic infections, and primary cell isolation procedures utilizing the C57BL/6 model organism were executed in strict adherence to institutional animal ethics guidelines and standard biosafety protocols at the Indian Institute of Science. The author declares no competing financial interests.

Supplementary Information

Theoretical Coursework: The author has completed coursework encompassing Inorganic and Physical Chemistry, alongside comprehensive biological courses including Recombinant DNA Technology, Immunogenetics, Gene-based Diagnosis and Therapy, Medical Microbiology, and Instrumentation & Bio-techniques.

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