Priyanka Bhowmik, Ph. D.

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Professional Summary

Creative and self-motivated team player with twelve years of research experience in the field of Molecular biology and Microbiology. Adept in easy integration in a multicultural environment with unique combination of detail-oriented mindset, driven personality, analytical skills, and proven ability to meet tight deadlines by working in a fast-paced work environment.

Professional Experience

- Assistant Professor, Department of Biological Sciences, School of Life Science & Biotechnology, Adamas University, April, 2022 to present
- Assistant Professor, Department of Microbiology, Techno India University, West Bengal, July 2018 to March, 2022
- DST-SERB National Post-Doctoral Fellow, ICMR NICED Virus Laboratory, ID & BG Hospital, Kolkata, From July'2016 to June'2018

Research Experience

As Independent Researcher
• Adamas University and Techno India University, West Bengal

Research Highlights
Current research interest involves drug resistance in environmental Gram-negative bacteria. The study mainly focuses on the diversity and distribution of multi drug resistant bacteria and antibiotic resistance genes in environmental samples, the resistance mechanism and the role of anthropogenic activity on this prevalence. Another aspect of my research involves studying different facets of bacterial community structure in relation to antimicrobial resistance.

• DST-SERB National Post-Doctoral Fellow
NICED ICMR VIRUS Laboratory, ID & BG Hospital, Kolkata, 2016-2018

Immunomodulatory role of *Mycobacterium indicus pranii* (MIP) against cervical cancer caused by Human Papilloma virus (HPV) Research Highlights *Mycobacterium indicus pranii* (MIP), previously known as Mycobacterium w, is a saprophytic cultivable mycobacterium that shares several antigens with M. tuberculosis. It has been found to be effective against leprosy, HIV infection, tuberculosis, Leishmaniasis and lung cancer. Recently it has been shown to be competent against warts caused by the human papilloma virus (HPV). HPVs are classified based on their oncogenic potential as low- or high-risk types. Low risk types cause common genital warts while infection with high-risk types have been linked with a range of epithelial cancers in humans. But the strongest evidence for their involvement in tumorigenesis is in cancer of the uterine cervix, the cervical cancer; the leading cause of female death in several developing countries including India,

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affecting 500,000 women each year HPV.As induction of Th1 type of immune response is crucial in overcoming the immuno-suppressive tumor microenvironment, we sought to analyze the immunotherapeutic potential of MIP as an immunomodulator in cervical cancer. Moreover, heat killed MIP demonstrated therapeutic cytotoxicity and apoptotic effect against most of the tested human cancer cells and was less potent towards non-cancerous human cells. Hence, in this study, we will also try to evaluate whether MIP immunotherapy could be beneficial as an adjunct to the standard chemotherapy in targeting the disoriented apoptosis in cervical cancer cells. Utilizing this knowledge, a new endeavor of exploiting MIP as a potential agent against cervical cancer can be started which may open up a new avenue to understand mechanisms involved in the destruction of tumor cells by immune cells which could facilitate the selection of protocols that will alter the milieu of the lesion with effective tumor killing.

Qualification

Doctor of Philosophy (Sc.) in Microbiology
Department of Microbiology, Bose Institute, Kolkata
Department of Microbiology, University of Calcutta, 2016

Master of Science in Microbiology 1st class
University of Calcutta, Kolkata, 2007

Bachelor of Science in Microbiology (Honours) 1st class
University of Calcutta, Kolkata, 2005.

Higher Secondary Examination (10+2) 1st division
West Bengal Council of Higher Secondary Education, 2002

Madhyamik Examination (10) 1st division
West Bengal Board of Secondary Education, 2000

Summary of PhD research

Biochemical Characterization of Mycobacteriophage Derived DnaB Ortholog Reveals New Insight into the Evolutionary Origin of DnaB Helicases.

Mentor: Prof. Sujoy K. DasGupta.

The bacterial replicative helicases known as DnaB are considered to be members of the RecA superfamily. All members of this superfamily, including DnaB, have a conserved C terminal domain, known as the RecA core. During my Ph.D. research, I have unearthed a series of mycobacteriophage encoded proteins in which the RecA core domain alone was present. These proteins were phylogenetically related to each other and formed a distinct clade within the RecA superfamily. This finding led to the characterization of a protein (D29Gp65) encoded by gene 65 of lytic mycobacteriophage D29, the product of which turned out to be a structure specific

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nuclease. Given its mode of action, it is very likely that Gp65 is involved in processing branched replication intermediates formed during the replication of phage DNA. Another mycobacteriophage encoded protein, Wildcat Gp80 (WCGp80) that roots deep in the DnaB family, was found to possess a core domain having significant sequence homology (Expect value < 10-5) with members of the D29Gp65 cluster. This indicated that Wildcat Gp80, and by extrapolation, other members of the DnaB helicase family, may have evolved from a single domain RecA core polypeptide belonging to this novel group. Biochemical investigations confirmed that Wildcat Gp80 was a helicase. Surprisingly, the investigations also revealed that a thioredoxin tagged truncated version of the protein in which the N-terminal sequences were removed was fully capable of supporting helicase activity, although its ATP dependence properties were different. **Thus, I found that DnaB helicase activity is primarily a function of the RecA core** although additional N-terminal sequences may be necessary for fine tuning its activity and stability. Based on sequence comparison and biochemical studies, **I proposed that DnaB helicases may have evolved from single domain RecA core proteins having helicase activities of their own, through the incorporation of additional N-terminal sequences.**

Skills and techniques

- Cultivate relationships with peers, lab technicians and specialists as part of collaborative research initiatives.
- Champion the professional development of junior-level graduates and lab technicians via training and supervision.
- Logically analyze technical and scientific problems, independently devise, and implement experimental strategies towards practical solutions.
- Excellent writing skills especially for scientific reports and publications. Fine oral communication skills for presenting progress at internal and external seminars/conferences.
- **Bioinformatic analyses of Mycobacteriophage database.** Utilized bioinformatic tools available in NCBI; phylogenetic analysis software like MEGA, CLUSTALW, Geneious, BioEdit, ESPript, I-TASSER, SWISS-MODEL etc.
- **Cloning of Mycobacteriophage genes**. Isolation and propagation of mycobacteriophages; isolation of mycobacterial and mycobacteriophage genomic DNA. Cloning of mycobacteriophage and Mycobacterium encoded genes; techniques involved were designing primers, PCR amplification, plasmid purification (using both classical methods as well as commercial kits), site directed mutagenesis, sequencing PCR (Dye terminator cycle method), sequence analysis etc.
- **Protein purification for in vitro studies**. Overexpression in various *E.coli* hosts, purification using ammonium sulphate precipitation. Well versed in chromatography-based protein purification techniques like affinity chromatography, size exclusion chromatography and ion exchange chromatography.
- **Biochemical analysis of proteins**. Qualitative assay of gene products using both native and denaturing PAGE, western blot and chemical cross linking. Quantitative assay of

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proteins under single and multiple turnover conditions using both radio-chemicals and fluorescence spectroscopy.

- **qPCR based relative quantification.** Monitoring fold change of apoptosis related gene transcripts.
- **Protein-DNA interaction studies.** Techniques involved were Dynamic light scattering (DLS), fluorescence quenching studies and UV-Visible spectrometry.
- **Generation and titration of polyclonal antibodies**.
- **Mammalian cell culture techniques**

Publications

1. Strategies to combat Gram-negative bacterial resistance to conventional antibacterial drugs: a review Priyanka Bhowmik*, Barkha Modi, Parijat Roy, Antarika Chowdhury, https://doi.org/10.24171/j.phrp.2022.0323 Impact Factor: 4.3,

2. "Versatility of Reverse Transcriptase Loop-Mediated Isothermal Amplification (RT-LAMP) from diagnosis of early pathological infection to mutation detection in organisms" Priyanka Bhowmik[2] Srishti Sen[1#], Shubhangi Tiwari[1#], Yoav Peleg[3], Boudhayan Bandyopadhyay [4*] Molecular Biology Reports Mol Biol Rep. 2024 Jan 25;51(1): 211.doi: 10.1007/s11033-023-09110-z. Impact Factor: 2.7

3. Book: Recent Trends and Developments in Algal Biofuels and Biorefinery. Chapter Title: Economic Environment Friendly and Low-Cost Lipid Extraction Methods. Priyanka Bhowmik[1*], Souvik Dutta[2] DOI: 10.1007/978-3-031-52319-9, 2024

4. Infectious medicine, Correlation between human gut microbiome and diseases Barkha Madhogaria[a], Priyanka Bhowmik [b1*] (corresponding author), Atreyee Kundu[a], https://doi.org/10.1016/j.imj.2022.08.004,

5. Barkha Modi, Sabarnee Bahadur, Priyanka Bhowmik, Soumyananda Chakraborti, Anjaneyulu Dirisala, Ali Hossain Khan, Abhrajyoti Ghosh, Sangita Mondal, Amit Ranjan Maity, Arnab Basu*; Curcumin and Colistin are Synergistic in Inhibiting the Growth and Biofilm Formation of Pseudomonas aeruginosa Isolated from Environmental Sample. Infectious Diseases Diagnosis & Treatment, 7(2), DOI: 10.29011/2577-1515.100218

6. Chiranjeet Saha, Sujata Saha, Asmita Chakraborty, Anjaneyulu Dirisala, Amit Ranjan Maity, Priyanka Bhowmik, Kunal Sikder, Soumyananda Chakraborti*, Arnab Basu*, Deciphering the Structural and Functional Properties of ABC-F ATPases. Infectious Diseases Diagnosis & Treatment, 7: 225. www.doi.org/ 10.29011/2577- 1515.100225

7. Isolation and characterization of 3rd Generation Cephalosporin Resistant Gram-positive bacteria from urban environmental soil of West Bengal, India JHULAN BASU, PRANAB GIRI, ATREYEE KUNDU AND PRIYANKA BHOWMIK*(corresponding author) J.

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8. Bioprospective potential of a novel Bacillus strain isolated from the rhizosphere of Azadirachta indica Linn. P. GIRI 1 *, J. BASU,2 H. SAHA1, K. BISWAS3 AND P. BHOWMIK (corresponding author) J. Mycopathol. Res. 60(1): 111-116, 2022; (ISSN 0971-3719)

9. J. Mycopathol. Res. 60(3) : 299-305, 2022; (ISSN 0971-3719). Current Status of Biological Degradation of Plastics by Fungi: A Review, NABANITA GHOSH1*, PRIYANKA BHOWMIK2 PRANAB GIRI AND ARNAB GANGULI

10. New look to Phytomedicine (1st Edition) Elsevier (Book), Book Chapter: Ethnomedicinal Wisdom: An approach for Antiviral Drug Development, Paperback ISBN: 9780128146194,2018

11. Biochemical Characterization of a Mycobacteriophage Derived DnaB Ortholog Reveals New Insight into the Evolutionary Origin of DnaB Helicases. Bhowmik P, DasGupta SK; PLoS One. 2015 Aug 3; 10(8):e0134762

12. The mycobacteriophage D29 gene 65 encodes an early-expressed protein that functions as a structure-specific nuclease.Giri N, Bhowmik P, Bhattacharya B, Mitra M, DasGupta SK; Journal of Bacteriology; 2009 Feb; 191(3):959-67

13. The Second brain; the Gut microbiome and lifestyle diseases: A review, Hindol Ray, Janatum Khatum, Srijan Haldar, Priyanka Bhowmik*, Biotechnologia, (accepted) 1/2025 vol. 106

14. Recent Advancements in Nanocomposites-Based Antibiofilm Food Packaging, Bandana Padhan, Priyanka Bhowmik, Joyjyoti Das, Journal of Polymer Materials DOI:10.32604/jpm.2024.059156

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On Request