

Amit Ghosh, PhD

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Nationality: Indian

CURRENT POSITION:

Assistant Professor, Department of Biological Sciences, School of Life Science and Biotechnology, Adamas University, Kolkata, India

JOB EXPERIENCE:

- **Assistant Professor**, Department of Biotechnology, **Brainware University**, Kolkata, India [1st August 2023-31st September 2023]
- **Officer (Biochemist)**, **Thyrocare Technologies Ltd.** (Kolkata) [7th March 2022-19th July 2023]
 - **Job Description:**
 - Specimens analysis using Clinical Biochemistry (C.L.I.A., C.M.I.A., E.C.L.I.A., Photometry and H.P.L.C.), Report releaseing (Critical Calls & CHN), Laboratorrt complaints and communications, Monitoring diagnostic performance (Sample retention study, Analytical measurement range (AMR), Pipette carryover, Inter-analyzer study, etc.)
- **Technical assistant at Towa Optics (India) Pvt. Ltd.** [February 2021- February 2022],
 - **Job Role:** Confocal Laser Scanning Microscope Operator Model: Nikon A1R at National Institute of Biomedical Genomics (NIBMG), Kalyani, West Bengal, India
 - **Job Description:**
 - Single Optical Sections Imaging, Time-Lapse and Live Cell Imaging, Z-Series and Three-Dimensional Imaging, Transmitted Light Imaging

TEACHING EXPERIENCE:

- **JIS university**, Department of Biotechnology, West Bengal (Aug 2018 – Apr 2019)
Subjects: General Microbiology (Theory & Practical) , RDT (Theory & Practical), Industrial Biotechnology
- **Govt. College of Nursing**, Kolkata, West Bengal (Nov 2018 – Apr 2019)
Subjects:Basic and Post Basic Biochemistry
- **Sarsuna College**, Department of Microbiology, West Bengal (Sep 2017 – Sep 2018)

Subjects: Introduction to Microbiology and Microbial Diversity, Biochemistry, Bacteriology
Practicals

EDUCATIONAL QUALIFICATION

- **Post Doctoral Research Fellow (2019-2020)** in National Institute of Plant Genome Research, New Delhi, Supervisor: **Dr. Senjuti Sinharoy**
- **Ph.D in Biochemistry (2019)**

Thesis Title: Characterization of Molecular and Cellular Events during Nodulation of Model Legume, *Lotus japonicus*

Advisor: Prof. Anirban Siddhanta, Department of Biochemistry, University of Calcutta

Summary of Ph.D Research

Legume roots are infected by nitrogen fixing bacteria, Rhizobia to form root nodule in which symbiotic nitrogen fixation is established. In the nodule, nitrogenase that catalyzes anaerobic symbiotic nitrogen fixation is protected by the sequestration of O₂ by Leghemoglobin (LegH). The modulation of the oxygen binding capacity of LegH by different post-translational modifications is not yet benchmarked. Our results show that *in vitro* serine phosphorylation of recombinant LegH from *Lotus japonicus*, a model legume caused a reduction in its oxygen sequestration ability. Although mass spectrometry revealed a few phosphorylated serine residues in the LegH, molecular modeling study showed that particularly S45 is the most critical one, along with S55, however the latter with lesser impact on its molecular environment responsible for oxygen sequestration. Separate S45D and S55D mutants of recombinant LegH also corroborated the results obtained from molecular modeling study. Consistent with our observation, recently, it has been reported that in *Medicago truncatula* S44 phosphorylation occurs *in vivo*. An existence of conserved serine phosphorylation across the evolutionary border suggests that this phosphorylation might have a crucial regulatory role during SNF. After successful interaction between legumes and Rhizobia, two sets of plant genes are expressed in root cortical cells; early and late nodulins. Apart from LegH, Nodulin 16 of *Lotus japonicus* (Nlj16) is another member of late nodulin gene product. Though a number of late nodulins were discovered, so far no signaling network or no interacting pairs are known among those members. In an attempt to identify and characterize the interaction among late nodulins, our results show that Nlj16 and LegH interact to stimulate oxygen sequestration by LegH *in vitro*. This binding is also validated by dynamic light scattering and fluorescence anisotropy measurements. Most importantly, fluorescent immunohistochemistry and co-immunoprecipitation studies of nodule sections strongly suggest that LegH and Nlj16 interact in the nodule symbiosomes to modulate oxygen sequestration by LegH. Thus, this work lays foundation for further investigation on serine phosphorylation of LegH, its interaction with Nlj16 and their functional role as the plausible regulations for the oxygen sequestration by LegH during nodulation and symbiotic nitrogen fixation

- **Master of Science** (2010) Microbiology (70.9%) from Bidhannagar College, West Bengal State University, West Bengal , India.
- **Bachelor of Science** (2008) Microbiology (Honors) (57.37%) Physics & Chemistry (Pass), University of Calcutta, West Bengal , India.
- **Higher Secondary (12th)** (2005) (69.4%) WBCHSE, West Bengal , India.
- **Secondary (10th)** (2003) (83.5%) WBBSE, West Bengal , India.

AWARDS/ FELLOWSHIPS RECEIVED

- **2017:** Received CSIR NET-Senior Research Fellowship (**CSIR SRF**)
- **2012:** Received CU DBT IPLS Senior Research Fellowship
- **2011:** Received CU DBT IPLS Junior Research Fellowship
- **2011:** Qualified Graduate Aptitude Test in Engineering in Life science (**GATE 2011**)

RESEARCH EXPERIENCE:

- **Post Doctoral Research Fellow**, National Institute of Plant Genome Research, New Delhi [**May 2020- December 2020**]
Project: Understanding the role of hemoglobin in peanut root nodule development
- **Project Fellow**, National Institute of Plant Genome Research, New Delhi [**Apr 2019 – May 2020**]
Project: Understanding the role of nodule specific PIN-LIKES (PILS) protein in peanut root nodule development
- **Senior Research Fellow**, Dept. of Biochemistry, University of Calcutta [**Apr 2017- Mar 2019**]
Project: Determination of the functional interactions between Leghemoglobin and Nlj16 during the biogenesis of the nodule and symbiotic N₂ fixation in *Lotus japonicus*
- **Project Fellow**, Dept. of Biochemistry, University of Calcutta [**Oct 2015 - Mar 2017**]
Project(s): Study of symbiotic plant-microbe interaction using *Lotus japonicus* as a model
Biochemical Studies on Subcellular Localization of Phosphoinositide Kinases in Mammalian Cell Lines
- **Junior and Senior Research Fellow**, (DBT-CU-IPLS, Govt. of India) [**Sep 2011 - Sep 2015**]
Project: Study of symbiotic plant-microbe interaction using *Lotus japonicus* as the model legume
- **Research Assistant**, Dept. of Biochemistry, University of Calcutta [**June & July 2009**]
Project: Heterologous Expression and affinity purification of hexa-histidine tagged phosphatidylinositol-4-phosphate-5-kinase type-I α (human) using Ni-NTA system

PUBLICATIONS

- Chapter Title: **Bio-stimulating Role of Plant Growth Promoting Microorganisms in the Sustainable Production of Micro Greens**, Book: Recent Trends and Applications of Leguminous Microgreens as Functional Foods, DOI : 10.1007/978-3-031-75678-8, Springer; **2024th edition**, ISBN-10 : 3031756770 (**Accepted**)
- Oindrila Bhattacharjee , Bikash Raul, **Amit Ghosh**, Akanksha Bhardwaj , Kaustav Bandyopadhyay and Senjuti Sinharoy. Nodule INception-independent epidermal events lead to

bacterial entry during nodule development in peanut (*Arachis hypogaea*). **New Phytologist** (2022) doi: 10.1111/nph.18483

- **Amit Ghosh**, Aniruddho Das, Md Azimuddin Ashrafi, Sudeshna Saha, Firoz Molla, Maitrayee Das Gupta, Anirban Siddhanta, Nodulin 16 of *Lotus japonicus* (Nlj16) regulates the recruitment of Leghemoglobin (LegH) to the infected nodule cell membrane during symbiotic nitrogen fixation, **BioRxiv** (2022), doi: <https://doi.org/10.1101/2022.07.21.500945>
- Bikash Raul, Oindrila Bhattacharjee, **Amit Ghosh**, Priya Upadhyay, Kunal Tembhare, Ajeet Singh, Tarannum Shaheen, Asim Kumar Ghosh, Ivone Torres- nJerez, Nick Krom, Josh Clevenger, Michael Udvardi, Brian E. Scheffler, Peggy Ozias-Akins, Ravi Datta Sharma, Kaustav Bandyopadhyay, Vineet Gaur, Shailesh Kumar and Senjuti Sinharoy, Microscopic and transcriptomic analyses of Dalbergoid legume peanut reveal a divergent evolution leading to Nod Factor dependent epidermal crack-entry and terminal bacteroid differentiation. **Molecular Plant Microbe Interactions** (2021). <https://doi.org/10.1094/MPMI-05-21-0122-R>
- **Amit Ghosh**, Kaushik Bhar and Anirban Siddhanta , Oxygen sequestration by Leghemoglobin is positively regulated via its interaction with another late nodulin, Nlj16 of *Lotus japonicus*. **Journal of Plant Biochemistry and Biotechnology** (2019). <https://doi.org/10.1007/s13562-019-00494-3>
- Kaushik Bhar*, Atanu Maity*, **Amit Ghosh*** , Tanusree Das, Shubhra Ghosh Dastidar and Anirban Siddhanta, Phosphorylation of Leghemoglobin at S45 is Most Effective to Disrupt the Molecular Environment of Its Oxygen Binding Pocket. **The Protein Journal** (2015). <https://doi:10.1007/s10930-015-9608-z>
***Equal contribution.**
- Rajarshi Chakrabarti, Sulagna Sanyal, **Amit Ghosh**, Kaushik Bhar, Chandrima Das and Anirban Siddhanta. Phosphatidylinositol 4-phosphate 5-kinase 1 α modulates ribosomal RNA gene silencing through its interaction with histone H3 lysine 9 trimethylation and heterochromatin protein HP1- α . **The Journal of Biological Chemistry** (2015). <https://doi:10.1074/jbc.M114.633727>

SEMINARS/WORKSHOP:

- **Oral presentation** in National Symposium on Recent Trends in Plant and Microbial Research, (2013). Department of Botany, University of North Bengal
- **Oral presentation** in Programme of the Advisory Committee Meeting of CAS (Phase II) (2013) Department of Biochemistry, University of Calcutta
- **Oral presentation** in Annual DBT-CU-IPLS conference 2014, 10-12 January 2014 Sundarban.
- **Poster presentation** in International Symposium Trends in Plant Science Research, Kolkata, (2014) Department of Botany, University of Calcutta.
- **Poster Presentation** in the Conference on Informatics and Integrative Biology (CIIB-2014), Bose Institute, Kolkata.
- **Oral presentation** in Interdisciplinary Programme of Life Sciences for advanced Research and Education, DBT-University of Calcutta, Conference (2015)
- **Poster presentation** in an international seminar entitled “Scientific Advances and Challenges Against Cancer and Infectious Diseases.” **July 16, 2024**

TECHNICAL SKILLS:

Imaging Techniques

- Operation of Confocal Laser Scanning Microscope (Nikon A1R) and Fluorescence Microscope Ti2 Eclipse Nikon
- Microtomy of root nodule samples and fluorescence immunohistochemistry using Confocal Microscopy; SEM and TEM of root nodules; Morphology analysis using Fluorescence Stereo Microscope

Recombinant DNA technology

- Sub-cloning; Heterologous fusion protein (GST, His, MBP, SUMO and TEV protease tagged) expression, and affinity purification; Site-directed Mutagenesis (Quick change-SDM); DNA sequencing; GATEWAY cloning; D-TOPO & LR clonase systems for RNAi mediated hairy root knock-down and Real Time PCR technology

Protein Biochemistry

- SDS-PAGE, Gradient Gel Electrophoresis, Affinity Column and Gel Filtration Chromatography, MALDI TOF MS-MS analysis

Immunotechniques

- Generating polyclonal antibody in animals (Rabbit and Guinea pig), Western Blot, Immunoprecipitation, Immunohistochemistry

Biophysical techniques

- Fluorescence Spectroscopy (ANS Quenching, Anisotropy), Dynamic Light Scattering and CD spectroscopy, ITC and Absorption spectroscopy

Plant growth and maintenance

- Germination and maintenance of *Lotus japonicus* *Medicago truncatula* and *Arachis hypogea*; study of legume-Rhizobia interaction, hairy root transformation with *A. rhizogens*

Animal Cell culture:

- Generation and maintenance of stable cell lines (HEK293) using standard transfection protocol

REFERENCES:

Dr. Senjuti Sinharoy, National Institute of Plant Genome Research

E-mail: ssinharoy@nipgr.ac.in

Professor Anirban Siddhanta, Department of Biochemistry, University of Calcutta,

E-mail: asiddhanto@yahoo.com

Professor Rajat Banerjee, Department of Biotechnology, University of Calcutta,

E-mail: rbbcgc@caluniv.ac.in

DECLARATION:

I hereby declare that the details and information given above are complete and true to the best of my knowledge.

Dr. Amit Ghosh