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https://scholar.google.com/citations?user=ltUvrvgAAAAJ&hl=en

OBJECTIVE

Structural biologist with expertise in leading and managing structural biology projects, encompassing both wet-lab operations and computational workflows. Skilled in developing strategies, coordinating teams, and executing projects effectively to achieve research objectives.

SUMMARY

- Structure biologist proficient in **cryo-EM** single particle analysis and **X-ray crystallography**.
- Proficient in negative stain and cryo-EM sample preparation, Freezing Cryo EM grids, Grid screening, data collection and processing, model building, and refinement.
- Proficient in protein crystallization, crystal handling, data processing, structural determination, and comprehensive analysis.
- Proficient in **protein clone construct design**, cloning, protein engineering, and biochemical/biophysical characterization.
- Proficient in **protein expression in *E. coli***, Insect cells, and mammalian cell systems.
- Proficient in **Protein Purification** using affinity chromatography, Ion exchange, Size exclusion, etc.
- Excellent written, oral, and interpersonal communication skills.
- Expertise in **Nanobody library preparation**- screening and selection using cell based (Phage display) and cell free i.e. Ribosome display approaches
- Knowing the **R & D (Cancer antigens)** industrial chain from purification optimization, scale up, coordinating with QC for transfer to manufacturing department from 3 years of industrial experience at Yashraj biotechnology Ltd, Mumbai, India.
- Multi-tasking to thrive in a fast-paced interdisciplinary environment.
- Strong team player with excellent communication skills, adept at collaborating effectively within multidisciplinary groups to achieve shared objectives and deliver high-quality results.

EXPERIENCE

Postdoctoral Scholar, Dr. Tino Pleiner lab, Stanford University (July 2024- Present)

- Structural characterization of ion channel biogenesis factors. particular focus on understanding the role of the ER membrane protein complex in the biogenesis of the CaV 1.2 ion channel.
- Structural and biophysical characterization using cryo EM of entire macromolecular complex involved in biogenesis of CaV 1.2.
- Other collaborative projects: Raising nanobody library against synaptic vesicles and eventually high affinity nanobody binders towards the receptors which can be used as tags for in-situ tomography studies.
- Other projects involve raising nanobodies and nanobody engineering towards proteins involved in death effectors in pathogenic bacteria such as MRSA (Methicillin resistant Staphylococcus aureus infection). In essence this project aims to develop nanobody induced cell death in antibiotic resistant bacteria.

Postdoctoral Scholar, Dr. Georgios Skiniotis lab, Stanford University (July 2023- July 2024)

- Structural and functional study of GPCR:
- To vesiculate membrane expressing GPCR aiming to preserve some transient interactions with binding partners and lipids that may stabilize them.
- To study the dynamics of a Family C GPCR by extracting it from mammalian cells by site-specifically labelling it by unnatural amino acid incorporation strategy.

Postdoctoral Scholar, Dr. Jikui Song lab, University of California riverside (July 2022-July 2023)

- To understand the 'Structural basis for STAT2 antagonization by DENV2 NS5': Solved the cryoEM structure of the complex at a resolution of 3.5 Å and did biochemical assays to investigate the structural basis of this interaction. The study is now published in the Journal 'Communications biology*'* in the year 2024.
- Another Project aimed to investigate the complex of an epigenetic regulator with the Nucleosome core particle (NCP) which will help understand how the interaction of this protein with NCP helps recruit other methyltransferases to NCP at the chromatin by structural characterization of the complex using cryoEM.
- Other Project involved in in-vitro reconstitution of human interferon stimulatory gene factor-3 (ISGF3) complex for structural and biophysical characterization.

Doctoral Student, Dr. Jikui Song lab, University of California Riverside (September 2017-June 2022)

Dissertation title: Structure function investigation of SARS CoV-2 viral proteins

Selected Contributions:

- Successfully completed the project to investigate the SARS CoV-2 viral protein complex NSP 7-8 which acts as a cofactor to the canonical Polymerase NSP12. Solved the X-ray crystal structure of SARS CoV-2 NSP 7-8 complex and did biophysical characterization to study dynamic association of this cofactor with NSP12. This study has been published in the Journal 'Nucleic Acids Res' in the year 2021.
- Successfully initiated and completed the project to characterize the structural basis of complex formation between SARS CoV-2 'Nucleocapsid protein' and human core stress granule protein 'G3BP1'. The interaction site between the two proteins were narrowed down to first 25 amino acids being indispensable for binding on N protein and first 175 amino acids of the human G3BP1 protein. This was done through extensive ITC assays. Solved the structure of this SARS CoV-2 N 1-25 in complex with human G3BP1 at a resolution of 2.5 Å. This study has been published in the 'Journal of Molecular Biology' in the year 2022.
- Contributed to other collaborative projects related to epigenetics in the lab.
- Supervised new graduate students, and undergraduate students in the lab.

July 2017- September 2017: Preparing for moving to the United States (Visa Paperwork) to start PhD program

Junior Executive, R & D department for Native proteins, Yashraj Biotechnology Ltd., Mumbai, India (Jun 2014-July 2017)

- Involved in the purification process optimization of both existing products and new products in the R&D department. I was mainly involved in process optimization of Cancer antigens like PSA-ACT and human Transferrin. Products were mainly optimized with respect to purity and yield. Optimized processes were then transferred to the manufacturing department for bulk sale on approval from QC department. These purified cancer antigens are used in diagnostic kits as calibrators.
- Process development of the purification optimization of other cancer antigens like Alpha Feto Protein and A1M.
- Successfully mediated cross-departmental communication like Qulity control and Manufacturing and Quality assurance department during process transfer from R& D department to manufacturing department for cancer antigen PSA-ACT.

Research Intern, Dr. Ashok Varma Lab, Advanced Centre for Treatment, Research, and Education in Cancer(ACTREC), Navi-Mumbai, MH,India (August 2013-May 2014)

- Assisted senior graduate students in the lab to study and characterize proteins involved in breast cancer like 'ZBRK1' and 'BRCA1'. Studies involved protein-purification and characterizing the proteins to study their secondary structures using Circular Dichroism and fluorescence spectroscopy. My contribution led me to be coauthors in two papers published in the lab.
- My efforts led to successfully publishing the projects in the journals 'BBRC' and 'JBSD' in the year 2014 and 2017.

Research Intern, Department of Molecular Biology
, Bhabha Atomic Research Centre (BARC), Trombay, MH, India (December 2012-May 2013)

- **Role of Cyclic AMP Receptor Protein in Persister cell formation in *'Escherichia coli'*.** This project was done as part of M.Tech dissertation thesis. My main role in this short duration of five months was to standardize the persister cell assay. Persisters were of interest because of the role they play in recalcitrance of many infectious diseases because of bacterial biofilms,ergo knowing the proteins that regulate them could corroborate the existing knowledge regarding refractory behavior of certain infections like tuberculosis.

EDUCATION

- **Department of Biochemistry, University of California** **Riverside, CA,USA**
  Ph.D. in Biochemistry and molecular biology Sept 2017– Jun 2022
- **D.Y Patil university** **Navi-Mumbai, MH, India**
  M.Tech in Biotechnology August 2006 - Jun 2013

RESEARCH PUBLICATION

- Beyond Stress Granules: G3BP1 and G3BP2 Redundantly suppresses SARS CoV-2 infection; Duo Xu, **M Biswal**, Quan-Qing Zhang, Chenjin Ye, Luis Martinez-Sobrido, Jikui Song, Rong Hai (Under Review, Journal-Viruses)

- A conformational selection mechanism of flavivirus NS5 for species-specific STAT2 inhibition; **M Biswal**, W Yao , J Lu , J Chen , R Hai, J Song, Communications biology, 2024.

- Two conserved oligomer interfaces of NSP7 and NSP8 underpin the dynamic assembly of SARS- CoV-2 RdRP; **M Biswal**, S Diggs, D Xu, N Khudaverdyan, J Lu, J Fang, G Blaha, R Hai, J Song, Nucleic Acids Research,2021

- SARS-CoV-2 Nucleocapsid Protein Targets a Conserved Surface Groove of the NTF2-like Domain of G3BP1; **M Biswal,** J Lu, J Song, Journal of Molecular Biology, 2022

- Substrate deformation regulates DRM2-mediated DNA methylation in plants; J Fang, SM Leichter, J Jiang,**M Biswal**, J Lu, ZM Zhang, W Ren, J Zhai, Science Advances 7 (23), eabd9224

- Complex DNA sequence readout mechanisms of the DNMT3B DNA methyltransferase, M Dukatz, SAdam, **M Biswal**, J Song, P Bashtrykov, A Jeltsch, Nucleic acids research 48 (20), 11495-11509

- Review Devil's tools: SARS-CoV-2 antagonists against innate immunity, D Xu , **M Biswal** , A Neal , R Hai,; Current research in virological science; Volume 2, 2021, 100013

- Mechanistic basis for maintenance of CHG DNA methylation in plants
  J Fang, J Jiang, SM Leichter, J Liu, **M Biswal**, N Khudaverdyan, X Zhong, J song.
  Nature Communications 13 (1), 1-12

- Structure of DNMT3B homo-oligomer reveals vulnerability to impairment by ICF mutations; L Gao, Y Guo, **M Biswal**, J Lu, J Yin, J Fang, X Chen, Z Shao, M Huang, Y Wang, G Wang, J Song; Nature Communications 13 (1), 1-11

- Structural basis to characterize transactivation domain of BRCA1, LR Yadav, **MN Biswal**, MV Hosur, NSKumar, AK Varma, Journal of Biomolecular Structure and Dynamics 35 (1), 1-7

- Tetrameric ZBRK1 DNA binding domain has affinity towards cognate DNA in absence of zinc ions, LR Yadav, **MN Biswal**, MV Hosur, AK Varma, Biochemical and biophysical research communications 450(1), 283-28

SKILL SETS

- **EM single particle reconstruction**
  - Negative staining and cryo-EM sample and grid preparation, grid screening.
  - Cryo-EM data collection and processing using CryoSPARC and Relion.
  - Model building using COOT.
  - Structure refinement using Phenix.
  - Structure presentation using Pymol and Chimera.

- **X-ray crystallography**
  - Protein crystallization, crystal optimization and Seeding.
  - Crystal diffraction data collection and analysis using HKL2000.
  - Phase determination and refinement using CCP4 and Phenix suites.
  - Model building using COOT.
  - Structure presentation using Pymol and Chimera.

- **Molecular biology and Biochemistry**
  - Molecular cloning.
  - Expressing vector construction design and protein expression in *E.coli,* insect cell, and mammalian cell system.
  - Protein purification using metal affinity chromatography, antibody affinity chromatography, molecular sieve exclusion chromatography, ionic exchange etc.
  - Protein identification using SDS-PAGE, native-page, silver stain ,western blotting, etc.
  - In-vitro translation assays, Thermal shift assays, Protein chemical cross-linking assays.
  - Nanobody library preparation.

- **Language and Computer Skills**
  - Language: English (listening, speaking, reading, writing)
  - Windows, Linux, macOS, CCP4 software suites, Phenix software suites, COOT, CryoSPARC, Relion, Chimera, Pymol, Microsoft, Graphpad-prism, Microsoft Remote Desktop, SnapGene. (proficient)
  - Soft Skills: Team leadership, Team building, Strategic partnership development, Team player, Mentoring, Documentation, Organization, Communication, Presentation, Scientific question conceiving and research strategy design, Creative thinking, Critical thinking, Self-motivated, Dedicated, Detail oriented, Innovative, Thought Provoking, Persistent.

TEACHING EXPERIENCE (as a Teaching assistant [TA] during doctoral studies)

BIOL LA- 1 Quarter

Introduction to Lab (BCH 015)- 1 Quarter

ADVANCED BIOCHEMISTRY LAB (BCH 162) – 9 quarters

HONORS AND AWARDS

- 2017 - Best Poster presentation award, Wedding Symposium, University of California Riverside
- 2021 - Mary K. and Randolph T. Wedding Prize: Awarded to the student who has made the most significant contribution to the peer reviewed scientific literature in biochemistry and

molecular biology, UC Riverside.

- 2022 - HEERF Dissertation Year Fellowship, 2022, UC Riverside.