

Dr. URVASHI SHARMA

DBT-Ramalingaswami Fellow
/At par Scientist D level
Structural Biology of Therapeutic Targets
National Institute of Biologicals (NIB)
Plot No-32, Institutional Area
Sector-62, Noida -201309.
Mobile: 7303249962
Email: urvashi.s@nib.gov.in



Core Research Area

Combinatorial Drug Discovery, Structural Biology of Therapeutic Targets, Infectious Disease Biology, X-ray Crystallography

Short Biography

Dr. Urvashi Sharma graduated with master degree in Biochemistry and later trained as a Structural Biologist and Biophysicist from CSIR-National Chemical Laboratory (NCL), PUNE (2011) under the supervision of Prof (Dr) C. G. Suresh, where she deciphered the crystal structures of plant lectins recognizing complex sugars using X-ray crystallography. She did her postdoctoral research work in premier research institutes in Europe in the teams of Drs Nushin Aghajari and David JS Hulmes, at CNRS-Institute of Biology and Chemistry of Proteins (IBCP) Lyon, France. Along with colleagues at IBCP, she investigated into the structural mechanisms of procollagen chain trimerization and regulation of procollagen processing. She moved to Vlaams Instituut voor Biotechnologie (VIB)/UGhent, Belgium in the Advance live cell imaging group of Prof. Daniel VanDamme to contribute into structural characterization of novel hetero-hexameric Tplate complex of plants (850 kDa) playing key role in Clathrin mediated endocytosis by using a combination of Cryo-EM/X-ray crystallography methods. Dr Sharma did her latest short postdoctoral work into Prof Ravi Acharya's group at the University of BATH (2019), United Kingdom in the specialized area of Structural Biology Methods for Drug discovery against CVDs. Dr Sharma returned to India as a DBT-Ramalingaswami Faculty Fellow (late 2019) and started her own research group where she is investigating into the target validation of selected Glycosyl transferases (GTs) of *Mycobacterium tuberculosis* for their roles in TB drug discovery along with studies on human Zn-metallopeptidases of therapeutic importance in various diseases such as Arthritis, Fibrosis etc.

Research Interests

Theme1-Validation of novel Glycosyl transferases (GTs) of *Mycobacterium tuberculosis* (M.tb) in Cell wall biosynthesis.

Mycobacterium tuberculosis (M.tb.) is a virulent pathogen causing tuberculosis, a disease responsible for millions of deaths worldwide. Most of the first-line tuberculosis (TB) drugs are targeted against cell wall synthesis; however, the complete inhibitory mechanism remains unresolved. With the funding support from DBT, Govt of India, we have initiated structural studies of novel GTs of *Mycobacterium tuberculosis* (M.tb.) which are unique to the bug and appears to be high confidence drug targets. We will be employing classical tools in biochemistry

and biophysics for protein engineering and characterization including SAXS, X-ray crystallography and *In-silico* approaches to address these questions.

Theme2- Understanding the diverse roles of zinc-metallopeptidases in human health and disease.

Research interests in my team also includes studies on members of metzincin family of human zinc-metallopeptidases which are directly implicated in regulation of key physiological processes such as in maturation of fibrillar collagens and several components of extracellular matrix (ECM) and thus are key targets against Fibrosis, Arthritis etc.

Education & Research

- 2019-2012 Postdoctoral Research and Teaching for 7.5 years in France, Belgium, United Kingdom, and India in the areas of **Combinatorial Drug Discovery, Structural Biology of Therapeutic Targets, X-ray Crystallography.**
- 2011 **PhD Biotechnology (Specialization-Structural Biology),** CSIR-National Chemical laboratory (NCL)/SPPU PUNE UNIVERSITY, PUNE.
- 2005 **M.Sc (Biochemistry),** School of Biochemistry, Devi Ahilya Viswavidyalaya (DAVV), INDORE.

Employment

- June 2022-present **DBT-Ramalingaswami Fellow (at par Scientist 'D' level), Structural Biology of Therapeutics Targets,** National Institute of Biologicals (NIB), Noida.
- Oct 2019-June 2022 **DBT-Ramalingaswami Faculty Fellow**
Structural Biology of Therapeutics Targets, Institute of Bioinformatics and Applied Biotechnology (IBAB), Bengaluru & Jawaharlal Nehru University (JNU), New Delhi.
- Jan 2019-Sep 2019 **Research Associate,** Department of Biology and Biochemistry, University of Bath, BATH, UK.
- May 2017-Dec 2018 **Postdoctoral Scientist,** Advance Live Cell Imaging Group, Plant Systems Biology (PSB), VIB/UGENT, Ghent, Belgium.
- Feb 2016-April 2016 **Research Associate,** Department of Chemistry, Oklahoma State University (OSU), OK, USA (Short term position).
- June 2012-June 2014 **Postdoctoral Research Associate**
CNRS-Institute of Biology and Chemistry of Proteins (IBCP), Lyon, France.
- Oct 2005-Feb 2006 **Project Assistant II**
CSIR-Unit for Research and Development of Information Products (URDIP), PUNE.

Teaching

- March-Nov 2021 Thermodynamics and Bioenergetics,
Molecular Docking and Drug Design, IBAB MSc Course (Bangalore University).
- July 2016-Jan 2017 **Guest Lecturer,** Department of Studies & Research in Biochemistry, TUMKUR UNIVERSITY, Karnataka.

Lecture modules-Biochemistry of Proteins, Lipids and Nucleic Acids, Significance of heterocyclic compounds in biology, Oxidation-reduction reactions in biological system.

Practical courses- Purification of proteins/enzymes from natural sources, Molecular biology techniques for protein expression in *E.coli* host.

Jan-Dec
2009

Teaching Assistant-Department of Biotechnology, SPPU PUNE UNIVERSITY and Modern College, PUNE.

Handled undergraduate courses in Protein crystallization methods and overview of three-dimensional structure determination of proteins mainly by X-Ray crystallography.

Research Students Guided: (CSIR-JRF:1)

M.Sc Dissertation (Independently-3, Co-Supervision-2)

Nirban Dey, IBAB Bangalore (Feb-June 2021)

Shalini Ghosh, IBAB Bangalore (Feb-June 2021)

Namitha NA, IBAB Bangalore (Jan-July 2021)

Kim Lecomte (University of Ghent, BELGIUM, 2017-2018)

Hanne Vandeputte (professional Bachelor, 2018, HO GHENT, VIB, BELGIUM)

Awards/Fellowships and Recognition

2024-2019 **Ramalingaswami Re-Entry Fellowship cum Research Grant**, Department of Biotechnology (DBT), Govt. of India.

2021 **Joint coordinator and session chair** "*Membrane Protein Structure and Molecular Dynamic Simulations*" online workshop (13-15 March 2021) jointly organized by Department of Botany, SPPU Pune university & Sher-e-Kashmir university of agriculture sciences and technology, Jammu.

Session chair: B4 virtual Workshop on "*Big Data in Life Sciences and Healthcare*" (14-20 March 2021), organized by IBAB, Bangalore/IISER PUNE.

2020 **Best paper presentation-**
"The diverse roles of Zn-metalloproteinases in health and diseases", 3rd International Conference on Recent Trends in Bioengineering (ICRTB 2020), 31 Jan-01 Feb 2020, MITBIO, PUNE.

2016 **DBT-BIOCARE Women Scientist Award/Research Grant (Not Availed).**

2015-2014 Member of British Society of Matrix Biology (BSMB ID: 1607).

2011 Travel Award, INDO-US Science and Technology Forum (IUSSTF) to attend MTMS-2011, IIT MUMBAI.

2008 Life Membership: No LM 319, Indian Crystallographic Association (ICA).

2007 First Rank in PhD course work (April-September 2007), Division of Biochemical Sciences, CSIR-NCL, PUNE.

2005 Junior & Senior Research Fellowships in CSIR-UGC NET, (2006-2011) and ICMR-JRF (2005, Not Availed), Govt. of India.

2005 University 1st Rank M.Sc. Biochemistry, Devi Ahilya Viswavidyalaya (DAVV), INDORE.

2002 University 2nd Rank, B.Sc Chemistry (Hons.), BhimRao Ambedkar Bihar University (BRABU), Muzaffarpur, Bihar.

List of Research Publications

- [1] U. Sharma, S. Vadon-Le Goff, K. Harlos, Y. Zhao, C. Moali, J. Comet, D.J.S. Hulmes, N. Aghajari (2022). Dynamics of the secreted frizzled related protein Sizzled and potential implications for binding to bone morphogenetic protein-1 (BMP-1). *Sci. Rep.* 12, 14850. <https://doi.org/10.1038/s41598-022-18795->
Impact Factor-4.996.
- [2] S. Jose, M. Gupta, U. Sharma*, J-Q Saumeth, M Dwivedi* (2022), Potential of phytochemicals from *Brassica oleracea* targeting S2-domain of SARS-CoV-2 spike glycoproteins: Structural and molecular insights. *J. Mol. Struct.*, 1254,132369. **Impact factor-3.841.**
<https://doi.org/10.1016/j.molstruc.2022.132369>.
*Co-senior Authors.
- [3] U. Sharma, G. Cozier, E.D. Sturrock, K.R. Acharya (2020). Molecular Basis for Omapatrilat and Sampatrilat Binding to Neprilysin-Implications for Dual Inhibitor Design with Angiotensin-Converting Enzyme. *J. Med. Chem.*, 63:5488–5500. **DOI: 10.1021/acs.jmedchem.0c00441.** **Impact factor-8.039.**
- [4] D. Pulido, U. Sharma, S. Vadon-Le Goff, S-A. Hussein, S. Cordes, E. Bettler, C. Moali, N. Aghajari, E. Hohenester & D.J.S. Hulmes (2018). Structural basis for the acceleration of procollagen processing by procollagen C-proteinase enhancer-1. *Structure*, 26(10):1384-1392.e3. **DOI:https://doi.org/10.1016/j.str.2018.06.011.** **Impact factor-5.006.**
- [5] U. Sharma, L. Carrique, S. Vadon-Le Goff, N. Mariano, R.N. Georges, F. Delolme, P. Karpinnen, J. Myllyharju, C. Moali, N. Aghajari, D.J.S. Hulmes (2017) Structural basis of homo- and hetero-trimerization of collagen I. *Nature communications*,8:14671. **DOI:https://doi.org/10.1038/ncomms1467.** **Impact factor-14.91.**
- [6] U. Sharma, U. V. Katre & C. G. Suresh (2015). Crystal structure of a plant albumin from *Cicer arietinum* (chickpea) possessing hemopexin fold and hemagglutination activity. *Planta*, 241:1061-1073. <https://doi.org/10.1007/s00425-014-2236-6>. **Impact factor-4.54.**
- [7] U. Sharma, S. M. Gaikwad, C. G. Suresh, V. Dhuna, J. Singh, S. S. Kamboj (2011). Conformational Transitions in *Arisaema curvatum* Lectin: Characterization of an Acid Induced Active Molten Globule. *Journal of Fluorescence*, 21:753-763. **DOI: 10.1007/s10895-010-0766-2.** **Impact factor-2.52.**
- [8] U. Sharma & C. G. Suresh (2011). Purification, crystallization and X-ray characterization of a trypsin inhibitor protein from the seeds of chickpea (*Cicer arietinum*). *Acta Cryst.* F67:714-717. **DOI:10.1107/S1744309111015338.** **Impact factor-1.072.**

BOOK CHAPTER

A. Ramlal, N. Dey, U. Sharma* & A. Rajendran*. *In-silico* studies to reveal the

potential inhibitory capacity of soy isoflavonoids against Angiotensin-converting enzyme (ACE) (accepted for publication, “Sustainable Future for Humanity: The New Learning Curve” by Imperial Publications, Mumbai, September 2021 (* as co-corresponding author).

Invited Lectures at Conferences/Workshops/Academia

INTERNATIONAL

- [1] “*Molecular basis for Omapatrilat and Sampatrilat binding with Nephilysin: implications for drug design*”. The Southwest Structural Biology Consortium (SWSBC), University of Reading, UK (11-12 July 2019).
- [2] Good memories session: 1-day conference on “*Collagen in all its forms*” (09 Nov 2018), ENS, LYON, FRANCE.
- [3] “*Where the soulmates meet: crystal structure of C-propeptide homotrimer of procollagen I*”, BSMB meeting: Building the Extracellular Matrix: Molecules, Cells and Evolution (7 April 2014), University of Bristol, UK.

NATIONAL

- [1] Webinar cum research presentation at Faculty of Life Sciences & Biotechnology, South Asian University (SAU), New DELHI (13 May 2022).
- [2] Research Seminar at DBT-Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad (10 Nov 2021).
- [3] Research work presentation/seminar (virtual) at ICMR-National Institute of Virology (NIV), PUNE (27th Aug 2021).
- [4] “*Membrane Protein Structure and Molecular Dynamic Simulations*” online workshop (13-15 March 2021) organized by Dept of Botany, SPPU Pune University, PUNE.
- [5] “*The diverse roles of Zn-metalloproteinases in health and diseases*”, 3rd International Conference on Recent Trends in Bioengineering (ICRTB 2020), (31 Jan-01 Feb 2020), MITBIO, PUNE.
- [6] Research work presentation/seminar (virtual) at Indian Institute of Science Education and Research (IISER) Berhampur (17 March 2020).
- [7] Research work presentation/seminar at CSIR-Indian Institute of Chemical Technology (IICT) Hyderabad, (12 May 2019).
- [8] Research work presentation/seminar at Indian Institute of Science Education and Research (IISER) Kolkata (15 May 2019) and Indian Institute of Technology (IIT) Indore (18 May 2019).
- [9] Research Seminar at Kusuma School of Biological Sciences, Indian Institute of Technology (IIT) DELHI (Aug 2014).

Poster presentations in Conferences/Seminars

INTERNATIONAL

- [1] U. Sharma* & N. Nalrajan. “Homology modelling and ligand binding studies of a lipid binding FtsW/flippase protein of *Mycobacterium tuberculosis* “. eposter: PDB 50th Anniversary Symposium in Asia” organised by PDB JAPAN 24th Nov 2021, <https://pdj.org/news/pdb50asiasympo>
* Presenting and Corresponding author
- [2] U. Sharma, M. Vandorpe, E. Mylle, S. Savvides, A. Poterszman, D. Van Damme, 2018. “Understanding the structure-function mechanisms of TPLATE complex in Clathrin Mediated Endocytosis (CME) in plants”, AFC (Annual French Crystallography congress), 10-13 July 2018, Lyon, FRANCE.

- [3] U. Sharma, S.V.L. Goff, D. Pulido, S.A. Hussain, S. Cordes, N. Mariano, E. Bettler, C. Moali, N. Aghajari, E. Hohenester, D. J. S. Hulmes, 2018. “Structure and functions of procollagen C-propeptides in chain trimerization and control of C-terminal processing”, AFC (Annual French Crystallography congress), 10-13 July 2018, Lyon, FRANCE.
- [4] U. Sharma, N. Mariano, N. Aghajari and D.J.S. Hulmes, 2014. “Where the soulmates meet: crystal structure of C-propeptide homotrimer of procollagen I”, BSMB meeting: Building the Extracellular Matrix: Molecules, Cells and Evolution, 7-8 April 2014, University of Bristol, UK.
- [5] U. Sharma, N. Mariano, D.J.S. Hulmes and N. Aghajari, 2014. Fibrillar Collagen Trimerization: Structural Basis and Related Genetic Disorders, International Union of Crystallography (IUCr), 5-12 August 2014, Acta Cryst. A70, C1052, Montreal, CANADA. (Presenting Author-Dr Aghajari).
- [6] U. Sharma & C. G. Suresh, 2011. “Structure of a chickpea lectin (CAL) with four bladed β -propeller fold and specificity for complex sugars”, Indo-US Symposium/Workshop on “Modern trends in macromolecular structures”, 21-24 February, Department of Chemistry, IIT Bombay, Mumbai, INDIA.

NATIONAL

U. Sharma, N. Ahmed, M.V. Krishnasastri and C. G. Suresh, 2008. “Crystal structure of recombinant Jacalin at 2.0 Å”. 37th National Seminar of Crystallography (NSC), 6-8 February 2008, Jadavpur University, Kolkata, INDIA.

Research Funding

CURRENT

- [1] DBT-Ramalingaswami Re-entry Fellowship/research grant, (Nov 2018), ongoing (Oct 2019-Sep 2024), Total amount- INR 113.60 Lakhs (Research Contingency-42.5 lakhs excluding salary), Department of Biotechnology, Govt. of India.
- [2] National Institute of Biologicals (NIB): infrastructure & institutional funding support (Ministry of Health & Family Welfare, Govt. of India).

OTHERS

European INSTRUCT GRANT (PID-2876), in the group of Prof Van Damme, VIB (September 2017), to express endocytic Tplate complex (TPC) of plants in Insect cells using MultiBac approach at IGBMC-Instruct Platform, Strasbourg, France (completed).

NOTE: Prospective PhD students and postdoctoral applicants aspiring to contribute into protein structure-function studies for Drug Discovery & therapeutics in the ongoing research themes are encouraged for informal inquiries. Should you have any burning questions, please write at urvashi.s@nib.gov.in along with your CV and a brief description of your research interests.