



**Dr. Jhimli Dasgupta**  
PG Department of Biotechnology  
Qualification: M.Sc (Chemistry), Ph.D  
(Structural Biology)

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**Honors/Awards**

1. 'Innovative Young Biotechnologist Award (IYBA 2010)' from the Ministry of Science and Technology, DBT, Govt. of India;
2. 'Sir P. C. Ray Research Award-2004' for best thesis from University of Calcutta, India;

**Research experience:**

- Postdoctoral Research Associate, University of Southern California, CA, USA
- Postdoctoral fellow, Kasha Laboratory, Florida State University, USA
- PhD in Structural Biology, Saha Institute of Nuclear Physics, India

**Research interests and the projects running in the lab**

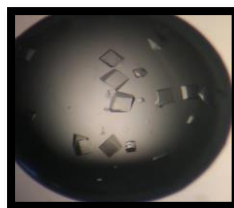
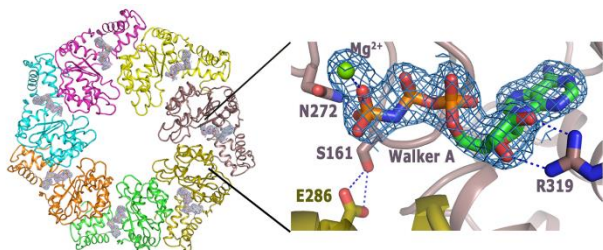
**(1) Structural and functional insights of the molecular motors such as  $\sigma$ -54 dependent transcription activators, involved in flagellar gene transcription:**

*(a) Structural and functional aspects of the AAA<sup>+</sup> ATPase FliC that control flagellar synthesis and biofilm formation in motile bacteria.*

*(b) FliA, the master transcription regulator of flagellar synthesis in motile bacteria: Structural insights, oligomerisation, functional implications, and regulation by the second messenger c-di-GMP.*

**(2) Revelation of the sensory signal and mechanisms sensor Histidine kinases playing a pivotal role in flagellar synthesis and motility of motile pathogenic bacteria.**

**(3) Understanding the mechanism of nutrient uptake by pathogenic bacteria using ABC transporters to target 'Trojan horse mechanism' of drug delivery.**



## Teaching

### (a) Theory modules:

1. Chemical kinetics and Structural Enzymology
2. Protein chemistry and Biophysical techniques to understand protein-protein, Protein-DNA interactions
3. Bioinformatics
4. Protein crystallography and structure function paradigm
5. Proteomics

### (b) Practical modules:

1. Recombinant DNA technology
2. Enzymology
3. Bioinformatics project

## Journal Publications

1. Peeali Mukherjee, Shubhangi Agarwal, Sritapa Basu Mallick, Jhimli Dasgupta. PAS domain of flagellar histidine kinase FlrB exhibits novel architecture, and binds Heme as sensory signal in unconventional fashion. **bioRxiv**, 2023 doi: <https://doi.org/10.1101/2023.06.29.547052>
2. Shrestha Chakraborty, Shubhangi Agarwal, Arindam Bakshi, Sanjay Dey, Maitree Biswas, Biplab Ghosh, Jhimli Dasgupta. The N-terminal FleQ domain of the *Vibrio cholerae* flagellar master regulator FlrA plays pivotal structural roles in stabilizing its active state. **FEBS Lett.** 2023 Jul 4. doi: 10.1002/1873-3468.14693 Epub ahead of print.
3. Saha I, Chakraborty S, Agarwal S, Mukherjee P, Ghosh B, Dasgupta J. Mechanistic insights of ABC importer HutCD involved in heme internalization by *Vibrio cholerae*. **Sci Rep.** 2022 May 3;12(1):7152. doi:10.1038/s41598-022-11213-9.
4. Chakraborty S, Biswas M, Dey S, Agarwal S, Chakraborty T, Ghosh B, Dasgupta J. The heptameric structure of the flagellar regulatory protein FlrC is indispensable for ATPase activity and disassembled by cyclic-di-GMP. **J Biol Chem.** 2020 Dec 11;295(50):16960-16974. doi: 10.1074/jbc.RA120.014083.
5. Nsp7 and Spike Glycoprotein of SARS-CoV-2 are envisaged as Potential Targets of Vitamin D and Ivermectin. J Dasgupta, U Sen, A Bakshi, A Dasgupta, K Manna, C Saha, RK De, ...**Preprints.** 2020 May 5. doi: 10.20944/preprints202005.0084.v1
6. Agarwal S, Dey S, Ghosh B, Biswas M, Dasgupta J. Mechanistic basis of vitamin B12 and cobinamide salvaging by the *Vibrio* species. **Biochim Biophys Acta Proteins Proteom.** 2019 Feb;1867(2):140-151. doi: 10.1016/j.bbapap.2018.11.004.
7. Agarwal S, Dey S, Ghosh B, Biswas M, Dasgupta J. Structure and dynamics of Type III periplasmic proteins VcFhuD and VcHutB reveal molecular basis of their distinctive ligand binding properties. **Sci Rep.** 2017 Feb 20;7:42812.
8. Dey S, Biswas M, Sen U, Dasgupta J. Unique ATPase Site Architecture Triggers cis-Mediated Synchronized ATP Binding in Heptameric AAA+-ATPase Domain of Flagellar Regulatory Protein FlrC. **J Biol Chem.** 2015 Apr 3;290(14):8734-47.
9. Agarwal S, Biswas M, Dasgupta J. Purification, crystallization and preliminary X-ray analysis of the periplasmic haem-binding protein HutB from *Vibrio cholerae*. **Acta Crystallogr F.** 2015 Apr;71(Pt 4):401-4.

10. Biswas M, Dey S, Khamrui S, Sen U, Dasgupta J. Conformational barrier of CheY3 and inability of CheY4 to bind FliM control the flagellar motor action in *Vibrio cholerae*. **PLoS One.** 2013 Sep 16;8(9):e73923.
11. Richards KF, Bienkowska-Haba M, Dasgupta J, Chen XS, Sapp M. Multiple heparan sulfate binding site engagements are required for the infectious entry of human papillomavirus type 16. **J Virol.** 2013 Nov;87(21):11426-37.
12. Dey S, Dasgupta J. Purification, crystallization and preliminary X-ray analysis of the AAA+  $\sigma$ 54 activator domain of FlrC from *Vibrio cholerae*. **Acta Crystallogr Sect F.** 2013 Jul;69(Pt 7):800-3.
13. Majumder S, Khamrui S, Dasgupta J, Dattagupta JK, Sen U. Role of remote scaffolding residues in the inhibitory loop pre-organization, flexibility, rigidification and enzyme inhibition of serine protease inhibitors. **Biochim Biophys Acta.** 2012 Jul;1824(7):882-90.
14. Biswas M, Khamrui S, Sen U, Dasgupta J. Overexpression, purification, crystallization and preliminary X-ray analysis of CheY4 from *Vibrio cholerae* O395. **Acta Crystallogr Sect F.** 2011 Dec 1;67(Pt 12):1645-8.
15. Dasgupta J, Bienkowska-Haba M, Ortega ME, Patel HD, Bodevin S, Spillmann D, Bishop B, Sapp M, Chen XS. Structural basis of oligosaccharide receptor recognition by human papillomavirus. **J Biol Chem.** 2011 Jan 28;286(4):2617-24.
16. Khamrui S, Biswas M, Sen U, Dasgupta J. Cloning, overexpression, purification, crystallization and preliminary X-ray analysis of CheY3, a response regulator that directly interacts with the flagellar 'switch complex' in *Vibrio cholerae*. **Acta Crystallogr Sect F.** 2010 Aug 1;66(Pt 8):944-7.
17. Khamrui S, Majumder S, Dasgupta J, Dattagupta JK, Sen U. Identification of a novel set of scaffolding residues that are instrumental for the inhibitory property of Kunitz (STI) inhibitors. **Protein Sci.** 2010 Mar;19(3):593-602.
18. Tsai SJ, Sen U, Zhao L, Greenleaf WB, Dasgupta J, Fiorillo E, Orrú V, Bottini N, Chen XS. Crystal structure of the human lymphoid tyrosine phosphatase catalytic domain: insights into redox regulation. **Biochemistry.** 2009 Jun 9;48(22):4838-45.
19. Orrú V, Tsai SJ, Rueda B, Fiorillo E, Stanford SM, Dasgupta J, Hartiala J, Zhao L, Ortego-Centeno N, D'Alfonso S; Italian Collaborative Group, Arnett FC, Wu H, Gonzalez Gay MA, Tsao BP, Pons-Estel B, Alarcon-Riquelme ME, He Y, Zhang ZY, Allayee H, Chen XS, Martin J, Bottini N. A loss-of-function variant of PTPN22 is associated with reduced risk of systemic lupus erythematosus. **Hum Mol Genet.** 2009 Feb 1;18(3):569-79.
20. Thomas M, Dasgupta J, Zhang Y, Chen X, Banks L. Analysis of specificity determinants in the interactions of different HPV E6 proteins with their PDZ domain-containing substrates. **Virology.** 2008 Jul 5;376(2):371-8.
21. Dasgupta J, Dattagupta JK. Structural determinants of *V. cholerae* CheYs that discriminate them in FliM binding: comparative modeling and MD simulation studies. **J Biomol Struct Dyn.** 2008 Apr;25(5):495-503.
22. Bishop B, Dasgupta J, Klein M, Garcea RL, Christensen ND, Zhao R, Chen XS. Crystal structures of four types of human papillomavirus L1 capsid proteins: understanding the specificity of neutralizing monoclonal antibodies. **J Biol Chem.** 2007 Oct 26;282(43):31803-11.
23. Zhang Y#, Dasgupta J#, Ma RZ, Banks L, Thomas M, Chen XS. Structures of a human papillomavirus (HPV) E6 polypeptide bound to MAGUK proteins: mechanisms of targeting tumor suppressors by a high-risk HPV oncoprotein. **J Virol.** 2007 Apr;81(7):3618-26.
24. Bishop B#, Dasgupta J#, Chen XS. Structure-based engineering of papillomavirus major capsid I1: controlling particle assembly. **Virol J.** 2007 Jan 8;4:3.

25. Dasgupta J, Khamrui S, Dattagupta JK, Sen U. Spacer Asn determines the fate of Kunitz (STI) inhibitors, as revealed by structural and biochemical studies on WCI mutants. **Biochemistry**. 2006 Jun 6;45(22):6783-92.
26. Khamrui S, Dasgupta J, Dattagupta JK, Sen U. Single mutation at P1 of a chymotrypsin inhibitor changes it to a trypsin inhibitor: X-ray structural (2.15 Å) and biochemical basis. **Biochim Biophys Acta**. 2005 Aug 31;1752(1):65-72.
27. Sen U, Dasgupta J, Choudhury D, Datta P, Chakrabarti A, Chakrabarty SB, Chakrabarty A, Dattagupta JK. Crystal structures of HbA2 and HbE and modeling of hemoglobin delta 4: interpretation of the thermal stability and the antisickling effect of HbA2 and identification of the ferrocyanide binding site in Hb. **Biochemistry**. 2004 Oct 5;43(39):12477-88.
28. Dasgupta J, Sen U, Dattagupta JK. In silico mutations and molecular dynamics studies on a winged bean chymotrypsin inhibitor protein. **Protein Eng**. 2003 Jul;16(7):489-96.
29. Dasgupta J, Sen U, Choudhury D, Datta P, Chakrabarti A, Chakrabarty SB, Chakrabarty A, Dattagupta JK. Crystallization and preliminary X-ray structural studies of hemoglobin A2 and hemoglobin E, isolated from the blood samples of beta-thalassemic patients. **Biochem Biophys Res Commun**. 2003 Apr 4;303(2):619-23.

### **Book Publication:**

Chapter 3. Structural Insights of Cobalamin and Cobinamide Uptake by ABC Importer of *Vibrio* Species. Arunima Bhattacharya<sup>1#</sup>, Samridhi Bhattacharya<sup>1#</sup>, Shubhangi Agarwal<sup>1,2</sup> and Jhimli Dasgupta<sup>1</sup>. <sup>1</sup>Post Graduate Department of Biotechnology, St. Xavier's College (Autonomous), Kolkata, West Bengal, India; <sup>2</sup>Weill Cornell Medicine, Department of Anaesthesiology, New York, USA. In: Advances in Health and Disease. Volume 57; Editor: Lowell T. Duncun. ISBN:979-8-88697-098-2. © 2022 Nova Science Publishers, Inc.

# Equal contribution.

### **Research Grants**

#### **Running:**

- (1) Investigating the mechanistic basis of downstream-enhancer-binding and c-di-GMP mediated transcription regulation of *Vibrio cholerae* FlrC. Granting agency: **DAE(BRNS)**.
- (2) Investigating structure function relationship of the ATPase-GTPase duo FlhFG that critically regulates flagellar gene transcription and chemotaxis of *Vibrio cholerae*. Granting agency: **MHRD-STARS**.

#### **Completed:**

- (1) Understanding the molecular basis of autophosphorylation and phosphotransfer activities of a unique cytosolic sensor Histidine kinase, FlrB, that regulates flagellar synthesis and colonization in *Vibrio cholerae*. Granting Agency: **WBDBT**
- (2) Investigating the molecular mechanism of heme uptake and translocation by ABC transporter system HutB-CD of *Vibrio cholerae*. Granting Agency: **UGC(DAE)-CSR**, Duration: 2016-2021
- (3) Structural and mechanistic insights of the bacterial enhancer binding proteins FlrA and VpsR of *Vibrio cholerae* and their regulation by second messenger c-di-GMP. Granting Agency: **DST(SERB)**, Duration: 2016-2020

(4) Structure and functional insights into the periplasmic Fe(III) and heme binding proteins FhuD and HutB of *Vibrio cholerae* to unravel the mechanism of iron uptake in survival strategy. Granting Agency: **DAE (BRNS)**, Duration: 2013-2016

(5) Structural and functional studies on transcriptional activator FlrC and its cognate kinase FlrB in *V. cholerae*: a step to understand their role in motility and colonization. Granting Agency: **DBT (IYBA)**, Duration: 2011-2015

(6) Understanding the role of multiple copies of chemotaxis response regulators (CheYs) present in *Vibrio cholerae*, and their interactions with motor protein FliM: Structural and functional studies. Granting Agency: **CSIR**, Duration: 2009-2012

### **CURRENT LAB MEMBERS**



**Shrestha Chakraborty**  
**(BRNS Fellow)**



**Peeali Mukherjee**  
**DST-INSPIRE Fellow**



**Indrila Saha**  
**(UGC-DAE Fellow)**



**Ruchira Das**  
**DST-INSPIRE Fellow**



**Arnab Pal**  
**MHRD-STARS Fellow**



**Ratna Das**  
**DBT Fellow**

**Lab Alumni:**



**Dr. Maitree Biswas**  
**PhD awarded: 2016**  
**Former Postdoctoral fellow,**  
**University of British Columbia, Canada**  
**Current position: Scientist, Primary Peptides Inc.,**  
**Unit F142, 2211 Westbrook Mall, Vancouver BC V6T**  
**2B5, Canada**



**Dr. Sanjay Dey**  
**PhD awarded: 2016**  
**Postdoctoral fellow, IGBMC, Alsace, France;**  
**Former Postdoctoral fellow, Penn State University,**  
**USA**



**Dr. Shubhangi Agarwal**  
**Ph.D. Awarded: 2018**  
**Former Postdoctoral fellow, University of Stuttgart-**  
**Hohenheim, Germany**  
**Current position: Postdoctoral fellow, Weill Cornell**  
**Medicine, Department of Anesthesiology, NY 10065**