Dr. Dilip Kumar, Ph.D.
Assistant Professor (Ashoka University)
Trivedi School of Biosciences
E-mail: dkumar.structbio@gmail.com, dilip.kumar@ashoka.edu.in
Contact no:+1-8329026508/+91-9818376815

Research Interests:
Protein Engineering, Structural Biology, X-ray crystallography, cryo-EM, Protein Bioinformatics, Virology, RNA viruses, Infectious Disease, Biochemistry and Molecular Biology

Educational details:
Ph. D. in Biotechnology, CSIR- Institute of Genomics and Integrative Biology/Savitribai Phule Pune University (India); Aug, 2008-May, 2014
M. Sc. in Biomedical Sciences, Dr. B.R. Ambedkar Center for Biomedical Research (A.C.B.R.), University of Delhi (India); Aug, 2006-June, 2008
B. Sc. in Biotechnology, Kurukshetra University (India); July, 2003-June, 2006

Research experience:
Assistant Professor, Ashoka University, Sonipat, Haryana, India
July 2022- Present, Trivedi School of Biosciences, Department of Biology
Research Projects: Exploring therapeutic potential of neutralizing monoclonal antibodies.

Postdoctoral Research Associate, Baylor College of Medicine, Houston:
Aug, 2015- May, 2022, Department of Biochemistry and Molecular Biology (Prof. B.V.V. Prasad)
Research Project: Structural and functional study of Replication and Transcription Complexes from RNA viruses (Rotavirus, X-ray crystallography and Cryo-EM). Determined first full-length cryo-EM (~2.7 Å) structure of rotavirus capping enzyme, VP3.

Research Associate, CSIR-Institute of Genomics and Integrative Biology, New Delhi
July, 2014- June, 2015, Chemical and Systems Biology Unit (Dr. Kausik Chakraborty)
Research Project: Structural & biophysical study of Nourseothricin Acetyl Transferase.

Doctoral Research Project, CSIR-Institute of Genomics and Integrative Biology
Aug, 2008-May, 2014, Structural Biology Unit (Dr. Bhupesh Taneja/Dr. Rakesh Sharma)
Research Project: Structural and biophysical study of nucleic acid modulating enzymes from mycobacteria. Determined the first full-length crystal structure of nanoRNase (MSMEG_2630) from *M. smegmatis*. Supervisory experience: Masters' students. Managed lab Instrumentation facilities.

M. Sc. dessertation, A.C.B.R., University of Delhi:
Dec 2007-May, 2008, Medicinal chemistry lab (Dr. P M Luthra)
Research Peoject: *In silco* analysis of dimerization study of human A2a receptor.

Publications (Peer reviewed):

1. **Dilip Kumar***, Xinzhe Yu*, Sue E. Crawford, Rodolfo Moreno, Joanita Jakana, Banumathi Sankaran, Ramakrishnan Anish , Soni Kaundal, Liya Hu, Mary K Estes, Zhao Wang, B. V. Venkataram Prasad. 2.7 Å Cryo-EM structure of rotavirus core protein VP3, a unique capping machine with a helicase activity. **Science Advances,** 15 Apr 2020: Vol. 6, no. 16, eaay6410.
2. Adarsh Kumar Chiranjivi, **Dilip Kumar**, Rajesh Kumar, Hilal Ahmad Parray, Shubbir Ahmed, Chandra Sekhar Kumar, Tripti Shrivastava, Manidipa Banerjee, B.V. Venkataram Prasad, Supratik Das. Generation of soluble, cleaved, well-ordered, native-like dimers of dengue virus 4 envelope protein ectodomain (sE) suitable for vaccine immunogen design. **International Journal of Biological Macromolecules**, 217 (2022) 19–26.
3. Catherine L Lawson, Andriy Kryshtafovych, Paul D Adams, Pavel V Afonine, Mathew L Baker, Benjamin A Barad, Paul Bond, Tom Burnley, Renzhi Cao, Jianlin Cheng, Grzegorz Chojnowski, Kevin Cowtan, Ken A Dill, Frank DiMaio, Daniel P Farrell, James S. Fraser, Mark A Herzik Jr., Soon Wen Hoh, Jie Hou, Li-Wei Hung, Maxim Igaev, AgnelP. Joseph, Daisuke Kihara, **Dilip Kumar**, Sumit Mittal, Bohdan Monastyrskyy, Mateusz Olek, Colin M Palmer, Ardan Patwardhan, Alberto Perez, Jonas Pfab, Grigore D. Pintilie, Jane S. Richardson, Peter B. Rosenthal, Daipayan Sarkar, Luisa U. Schäfer, Micahel F Schmid, Gunnar F. Schröder, Mrinal Shekhar, Dong Si, Abishek Singharoy, Genki Terashi, Thomas C. Terwilliger, Andrea Vaiana, Liguo Wang, Zhe Wang, StephanieA. Wankowicz, Christopher J. Williams, Martyn Winn, Tianqi Wu, Xiaodi Yu, Kaiming Zhang, Helen M Berman, Wah Chiu. Cryo-EM model validation recommendations based on outcomes of the 2019 EMDataResource challenge. **Nature Methods**, 18, pages156–164 (2021).
   Covered in news and views: https://www.nature.com/articles/s41592-021-01062-1.
4. Mitra S, **Kumar D**, Hu L, Sankaran B, Moosa MM, Rice AP, Ferreon JC, Ferreon ACM, Prasad BVV. Influenza A virus protein NS1 exhibits strain-independent conformational plasticity. **J Virol.** 2019 Aug 2. 917-919. doi: 10.1128/JVI.00917-19.
5. Srivastav R*, **Kumar D***, Grover A, Singh A, Manjasetty B, Sharma R, Taneja B. Unique subunit packing in mycobacterial nanoRNase leads to alternate substrate recognitions in DHH phosphodiesterases. **Nucleic Acids Res**. 2014 Jul; 42(12):7894-910. *Equal contribution
6. Kumar A, Kumar S, **Kumar D**, Mishra A, Dewangan R, Srivastav P, Ramachandran S, Taneja B.(2013). Crystal structure of Rv3717 reveals a novel amidase from *Mycobacterium tuberculosis*.**Acta crystallographica. Section D, Biological crystallography**. (ISSN 0907-4449) 2013 Dec; 69 (Pt 12):2543-54.
7. **Dilip Kumar**, Xinzhe Yu, Sue Crawford, Liya Hu, Mary K Estes, Zhao Wang and BVV Prasad. Cryo-EM structure of rotavirus VP3 reveals novel insights into its role in RNA capping and endogenous transcription. **Springer Nature Book Chapter** (Applications of Microscopy in Materials and Life Sciences, 211-220).

Manuscripts under revision:

1. Gaurav Kumar, **Dilip Kumar**, Shalini Mishra, Manish Sharma. The protein sulfyhydrome suggest pleotropic modulation in the brain during hypobaric hypoxia.

Submitted PDB entries : 4LS9, 4LQ6, 4HJN, 5C82, 6O01, 6NRL, 6OQE, 6O6B, 6O3V
Submitted EMDB entries: EMD-0632, EMD-20159

Technical Expertise:

Structural Biology: Crystallization and structure determination of macromolecular complexes. Mosquito and Tritek crystalpro robotics system handling. CCP4 Software package, Phenix software suite, COOT, Refmac and Buster refinement package. Data collection at home source and Elettra synchrotron, cryo-EM vitrobot for sample preparations, optimization and cryo-EM single particle analysis on Relion software, EMAN2, SPHIRE, CCPEM, cisTEM and cryoSPARC.
Computational biology: RosettaCommons software suite, Pymol, ChimeraX and Chimera visualization software, iSOLDE software, AutoDock vina and PatchDock, ClusPro docking softwares, Lig plus.
Molecular biology and Biochemistry: Gene cloning, site-directed mutagenesis, recombinant proteins expression (bacterial, insect cells and mammalian expression system), purification and biochemical characterization.
Biophysics: Protein-ligand interaction by using ITC, Bio-Layer Interferometry Octet system, Characaterization of biophysical protperties of proteins by using CD, DSC, fluorescence spectroscopy, SEC-MALLS.

Awards and Achievements:

1. First prize (Saleh Wakil Memorial Prize) for oral presentation at BMB/PHARM/CPSB research conference, October 10-October 11, 2019.
2. ASV postdoctoral travel grant and short-listed for Oral talk at ASV2019 from July 19-July 24, 2019, University of Minnesota, MN.
3. NIH travel award for Shotgun talk and poster presentation at dsRNA virus symposium in Houffalize, Belgium from September 24-September 29, 2018.
4. OPCW (Organization for Prohibition of Chemical Weapons) International travel grant for international school of crystallography 45th course: Present and future Methods in Biomolecular Crystallography, Erice, Italy (30th May-10th June, 2012).
5. Travel grant by Department of Science and Technology (DST), Govt. of India to perform X-ray Diffraction spectrum at XRD-1 beam line, Ellettra synchrotron, Trieste, Italy.
6. Junior Research fellowship/Senior Research Fellowship by Council of Scientific and Industrial Research (CSIR), HRDG, Govt. of India.
7. GATE (Graduate Aptitude Test in Engineering) fellowship in Life Science - 2008 qualified (95.6 percentile).

Conferences & Workshops:

1. RosettaCommons Workshop; Aug 24-Aug 28, 2020, Vanderbilt University, Nashville, USA.
2. S2C2-cryoem-image-processing-workshop organized by Stanford SLAC Cryo-EM center; June 10-June 12, 2020.

3. Sealy Center for Structural Biology/UTMB Workshop on CryoEM Data Processing; May 6-May 9, 2019.
4. 23rd Annual Structural Biology Symposium, Levin Hall, UTMB, May 6, 2018, Galveston, Texas.
5. 3rd International SPHIRE Workshop on Single Particle Analysis of High Resolution data; November 6-November 8, 2017, Rice University, Houston, Texas.
6. Poster presentation at BMB Research Conference 2017; October 19-October 20, 2017.
7. 7th Annual SIBYLS Bio-SAXS workshop 2016, Advanced Light Source (ALS) at Lawrence Berkeley National Laboratory, Berkeley, CA, USA (October 4 -October 5, 2016).
8. Cryo-EM Training: Summer 2016, Baylor College of Medicine, Houston, Texas, USA (June 14-June 16, 2016).
9. NCMI Workshop on Single Particle Reconstruction, Structural Variability and Modeling, Baylor College of Medicine, Houston, Texas, USA (October 30-November 2, 2015).
10. Poster presentation at NXCM2014 (New Advances in X-ray Diffraction and Cryo-Electron Microscopy, INSA, New Delhi Organized by RCB (December 15-December 17, 2014).
11. Oral presentation at NSC42 and International workshop on application of X-ray crystallography for drug discovery, New Delhi, India (November 21-November 23, 2013).
12. Poster presentation at ICBFF and Indian Institute of Science, Banglore, India (January 8-January 11, 2013).
13. Poster presentation at International school of crystallography 45th course: Present and future Methods in Biomolecular Crystallography, Erice, Italy (May 30-June 10, 2012).
14. Poster presentation International Interdisciplinary Science Conference- 2012 on Protein folding and Disease, Jamia Milia Islamia, New Delhi, India (December 8-December 10, 2012).
15. Participated in CCP4 workshop from Crystals to structures; February 15-February 19, 2010, JNU, New Delhi, India.

References:

Prof. B.V.V. Prasad, Alvin Romansky Chair in Biochemistry
Verna and Marrs McLean Department of Biochemistry and Molecular Biology
Baylor College of Medicine, N410, Alkek Building, One Baylor Plaza
Houston, Texas-77030, Phone: 713-798-5686, E-mail: vprasad@bcm.edu

Prof. Mary K Estes, Distinguished Service Professor
Department of Molecular Virology and Microbiology
Baylor College of Medicine, One Baylor Plaza
Houston, Texas-77030, Phone: 713-798-3585, E-mail: mestes@bcm.edu

Dr. Bhupesh Taneja, Principal Scientist
Lab No. 320, CSIR-IGIB, South campus, Sukhdev Vihar, Mathura road, New Delhi-110025, Phone: +91 11 27667 602; E-mail: btaneja@igib.res.in