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Current Designation	Associate Professor, Department of Biophysics University of Delhi, South Campus				
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Educational Qualifications					
Degree	Institution				Year
Ph.D.	National Institute of Immunology Structural Analysis and Functional Consequences of Carbohydrate Mimicry Research Supervisor: Dr. Dinakar. M. Salunke				1998-2003
PG	M.Sc (Biotech), University of Roorkee (now IIT, Roorkee)				1996-1998
UG	B.Sc (Zoology, Botany, Chemistry), HNB Garhwal University				1993-1996
Career Profile:					
<p>June 2004 – Feb 2008: Post-doctoral Research Associate with Dr. Arcady Mushegian, at Bioinformatics Centre, Stowers Institute for Medical Research, Kansas city, USA</p> <p>Feb 2010– March 2018: Assistant Professor, Department of Biophysics (University of Delhi)</p> <p>March 2018 - Current: Associate Professor, Department of Biophysics (University of Delhi)</p>					
Areas of Interest / Specialization					
<p>Our lab research expertise includes Structural Biology, Computational Biology and Bioinformatics. We aim to understand the mechanistic of cellular processes and biological pathways. For exploring these questions, we use various biochemical, biophysical techniques along with <i>in-silico</i> tools.</p> <p>Our current research avenues include:</p> <ul style="list-style-type: none"> <li>❖ Human protein (mis) folding diseases: archaeal proteostasis machinery as the model</li> <li>❖ Virulence factors as drug targets: understanding the role of evolutionary divergence</li> <li>❖ Prosequences as Intra-molecular chaperones (IMCs): role in protein folding memory</li> <li>❖ Literature text mining based hypothesis generation: network creation, to replace manual “literature review”</li> <li>❖ Novel biophysical assays for chaperone activity: NTA based methods</li> <li>❖ Role of mechanical forces in initiating protein folding: cell free translation systems</li> </ul>					
Research Guidance:					
<ol style="list-style-type: none"> <li>1. Supervision of Doctoral Thesis : 4 awarded , 2 ongoing</li> <li>2. Supervision of MPhil thesis: 2 awarded</li> <li>3. Mentorship projects: DSKothari PDF, DST-WoSA, CSIR-SRA, DBT-BioCARE, ICMR-RA</li> </ol>					

## Publications Profile

### Research papers published in Refereed/Peer Reviewed Journals

1. Singhal N, Sharma A, Aswal M, Singh N, Kumar M, **Goel M**. Identification of binding partners of CsaA - an archaeal chaperonic protein of *Picrophilustorridus*. *Protein PeptLett*. 2020 Nov 26. doi: 10.2174/0929866527999201126205131. Epub ahead of print. PMID: 33243110.
2. Yadav A, Sharma V, Pal J, Gulati P, Goel M, Chandra U, Bansal N, Saha S. DNA replication protein Cdc45 directly interacts with PCNA via its PIP box in *Leishmaniadonovani* and the Cdc45 PIP box is essential for cell survival. *PLoSPathog*. 2020;16(5):e1008190. Published 2020 May 15. doi:10.1371/journal.ppat.1008190
3. Singhal N, Sharma A, Kumari S, Garg, A, Rai, R, Singh N, Kumar M, **Goel M**. Biophysical and Biochemical Characterization of Nascent Polypeptide-Associated Complex of *Picrophilustorridus* and Elucidation of Its Interacting Partners. *Front Microbiol*. 2020;11:915. Published 2020 May 26. doi:10.3389/fmicb.2020.00915 PMID: 32528429
4. Kaushik V, Prasad S, **Goel M**. Biophysical and biochemical characterization of a thermostable archaeal cyclophilin from *Methanobrevibacterium*. *Int J BiolMacromol*. 2019 Jul 29;139:139-152. doi: 10.1016/j.ijbiomac.2019.07.149. [Epub ahead of print] PubMed PMID: 31369788
5. Rani S, Sharma A, **Goel M**. (2018) Insights into archaeal chaperone machinery: a network-based approach. *Cell Stress Chaperones* Nov;23(6):1257-1274
6. Kaushik V, Verma VV, **Goel M**. (2018) Functional divergence and comparative in-silico study of Cas4 proteins of DUF83 class. *J MolRecognit*. 31(5):e2694.
7. Rani S, A Sharma, **Goel M**. Navigating the structure-function-evolutionary relationship of CsaA chaperone in archaea. (2018)*Critical Reviews in Microbiology*, 44(3):274-289.
8. Kumari S, Pal RK, Gupta R, **Goel M**. High Resolution X-ray Diffraction Dataset for *Bacillus licheniformis* Gamma GlutamylTranspeptidase-acivicin complex: SUMO-Tag Renders High Expression and Solubility. *Protein J*. 2017 Feb;36(1):7-16. PubMed PMID: 28120227.
9. Kumar S, Jain KK, Rani S, Bhardwaj KN, Goel M, Kuhad RC. In-Vitro Refolding and Characterization of Recombinant Laccase (CotA) From *Bacillus pumilus* MK001 and Its Potential for Phenolics Degradation. (2016) *MolBiotechnol*. Dec;58(12):789-800. PubMed PMID: 27771851.
10. Rani S, Srivastava A, Kumar M, **Goel M**. (2016) CrAgDb--a database of annotated chaperone repertoire in arachaeal genomes. *FEMS MicrobiolLett*. Mar; 363 (6).
11. Singh Y, Gupta N, Verma VV, Goel M, Gupta R. (2016) Selective disruption of disulphide bonds lowered activation energy and improved catalytic efficiency in TALipB from *Trichosporonasahii* MSR54: MD simulations revealed flexible lid and extended substrate binding area in the mutant. *BiochemBiophys Res Commun*. Mar 25;472(1):223-30.
12. Verma VV, Gupta R, **Goel M**. (2015) Phylogenetic and evolutionary analysis offunctional divergence among Gamma glutamyltranspeptidase (GGT) subfamilies. *Biol Direct*. Sep

13. Ranjan P, Kashyap R.S, Goel M, Veetil S.K, Kateriya S (2014) Cellular organelles facilitate dimerization of a newly identified ArffromChlamydomonasreinhardtii. *J. of Phycology*, 50(6), 1137-1145.
14. Srivastava A, Singhal N, GoelM, Viridi JS, Kumar M (2014) CBMAR: a comprehensive Beta-lactamase molecular annotation resource. Database (Oxford). Doi: 10.1093/database/bau111. Print 2014.
15. Srivastava A, Singhal N, GoelM, Viridi JS, Kumar M (2014) Identification of family specific fingerprints in  $\beta$ -lactamase families. *Scientific World Journal*. 2014:980572. ISSN: 2356-6140 (Print) ISSN: 1537-744X
16. Minakhin, L., Goel, M., Berdygulova, Z., Ramanculov, E., Florens, L., Glazko, G., Karamychev, V.N., Slesarev, A.I., Kozyavkin, S.A., Khromov, I., Ackermann, H.W., Washburn, M., Mushegian, A., Severinov, K. (2008) Genome comparison and proteomic characterization of Thermusthermophilus bacteriophages P23-45 and P74-26: siphoviruses with triplex-forming sequences and the longest known tails. *J Mol Biol*. 378(2):468-80.
17. Roux, M.M., Radeke, M.J., Goel, M., Mushegian, A., Foltz, K.R. (2008) 2DE identification of proteins exhibiting turnover and phosphorylation dynamics during sea urchin egg activation. *Dev. Biol*. 313(2):630-47.
18. Savalia, D., Westblade, L., Goel, M., Florens, L., Kemp, P., Akulenko, N., Pavlova, O., Ian Molineux, I., Washburn, M., Ackermann, H.W., Mushegian, A., Gabisonia, T., Severinov, K. (2008) Genomic and Proteomic Analysis of Phi32, a Novel Phage of E. coli *J. Mol. Biol*. 377(3):774-89.
19. Sea Urchin Genome Sequencing Consortium; Mushegian, A., Goel, M., (2006) The genome of the sea urchin *Strongylocentrotus purpuratus*. *Science*. 314(5801):941-52.
20. Goel, M., Mushegian, A. (2006) Intermediary metabolism in sea urchin: the first inferences from the genome sequence. *Dev Biol*. 300(1):282-92.
21. Bradham, C.A., Foltz, K.R., Beane, W.S., Arnone, M.I., Rizzo, F., Coffman, J.A., Mushegian, A., Goel M., Morales, J., Geneviere, A.M., Lapraz, F., Robertson, A.J., Kelkar, H., Loza-Coll, M., Townley, I.K., Raisch, M., Roux, M.M., Lepage, T., Gache, C., McClay, D.R., Manning, G. (2006) The sea urchin kinome: a first look. *Dev Biol*. 300(1):180-93.
22. Goel, M., Damai, R.S., Sethi, D.K., Kaur, K.J., Maiya, B.G., Swamy, M.J. and Salunke D.M. (2005) Crystal Structures of the PNA-Porphyrin Complex in the Presence and Absence of Lactose: Mapping the Conformational Changes on Lactose Binding, Interacting Surfaces, and Supramolecular Aggregations. *Biochemistry*44(15):5588-96.
23. Goel, M.\*, Krishnan, L.\*, Kaur, S., Kaur, K.J. and Salunke, D.M. (2004) Plasticity within the Antigen-Combining Site May Manifest as Molecular Mimicry in the Humoral Immune Response. *J Immunol*. 173(12):7358-67. (\* Equal contribution).
24. Goel, M., Anuradha P., Kaur, K.J., Maiya B.G., Swamy, M.J. and Salunke, D.M. (2004) Porphyrin binding to jacalin is facilitated by the inherent plasticity of the carbohydrate-binding site: novel mode of lectin-ligand interaction. *ActaCrystallogr D BiolCrystallogr*.

60(Pt 2):281-8.

25. Goel, M., Jain, D., Kaur, K.J., Kenoth, R., Maiya, B.G., Swamy, M.J., Salunke, D.M. (2001) Functional equality in the absence of structural similarity: An added dimension to molecular mimicry. *J. Biol. Chem* 276:39277-39281.
26. Kaur, K., Jain, D., Goel, M. and Salunke, D.M. (2001) Immunological Implications of Structural Mimicry between a Dodecapeptide and a Carbohydrate moiety *Vaccine*. 19:3124-3130.
27. Jain, D., Kaur, K., Goel, M. and Salunke, D.M. (2000) Structural Basis of Functional Mimicry between Carbohydrate and Peptide Ligands of ConA. *Biochem. Biophys. Res. Commun.* 272:843-849

#### Conference Organization/ Presentations

Summer school for Bioinformatics (a two week intensive course for under-graduate students of DU, any branch of life science) in May-June 2012, 2013 and 2014.

#### Research Projects (Major Grants/Research Collaboration)

##### Ongoing:

1. **ICMR (Nov 2020 –Oct 2017)** The role of prosequences in modulating the structure of proteins. (~ 33 Lakhs)
2. **DST-SERB: (17-March 2020 –16-March 2023)** Characterization of the functional specificity of archaeal Cas4 (CRISPR associated protein 4) proteins for potential applications in genome editing strategies. (~ 50 Lakhs)
3. **ICMR (July 2019- June 2022)** Accelerating drug discovery path by delineating the structural differences leading to functional divergence in virulence factor proteins found in pathogenic bacteria. (~ 58 lakh)
4. **CSIR (July 2018- June 2021)** Archaeal FKBP model systems for understanding their role in protein folding and disease: in-silico analysis and structural characterization (~34 lakh)

##### Completed:

1. **ICMR (July 2017- June 2020)** Exploring the role of HSP70 (DnaK, DnaJ&GrpE) in protein folding diseases: Using archaea as model systems (~ 44 lakh)
2. **RGYI (Jun 2012- Dec 2016)(Rapid grant for Young Investigator) from DBT:** Crystallographic structure determination of archaeal CRISPR-CAs proteins
3. **UGC (2012-2015):** Computational analysis of Cas proteins in *Picrophilustorridus* in comparison to other thermoacidophiles and mesophiles and their role in driving CRISPR function.
4. **ICMR (2012-2015):** Comparative genomics of B-lactamase genes including in-silico analysis to identify sequences for B-lactamase inhibitors. (With Dr. JS Viridi, Microbiology & Dr. Manish Kumar, Biophysics).
5. **CSIR (2011-2014):** Crystal structure determination and functional analysis of Gamma Glutamyltranspeptidase (GGT) from *Bacillus Licheniformis* ER-15. (With Dr. Rani Gupta, Microbiology).
6. **DU-DST (2011-2012):** Biodiversity of Environmental Virus Microbiome by Comparative

Metagenomics. (With Dr. Rajeev Kaul, Microbiology).

#### Awards and Distinctions

1. CSIR-JRF NET (1998) JRF
2. GATE 1998 All India rank 50, 95.44 percentile
3. University of Roorkee (1998) **Chancellor's Gold medal** for Best student in M.Sc/M.Tech (Sciences)
4. University of Roorkee (1998) **University medal** for First in class in M.Sc (Biotech)
5. Dr. A.N. Khosla medal, 1998 Smt. SushilavatiKhosla medal and Dr. G.B. Pande medal in M.Sc. (Final) and Dr. G. Pande medal for M.Sc. (previous) from University of Roorkee.

#### Association With Professional Bodies

1. Editing: Associate Editor, Frontiers in Genetics.
2. Science mentor for Frontiers for Young Minds
3. Life Member, Indian Biophysical Society

#### Administrative Assignments

1. Resident Tutor at Geetanjali PG Women's Hostel (July 2010 – June 2012)
2. Warden at Geetanjali PG Women's Hostel (22 July 2012 - 15 Apr 2017)
3. Election Officer (2014)