

Dr. Rajesh Kumar
Associate Professor and Head of Department
Centre for Chemical Sciences
School of Basic & Applied Sciences
Central University of Punjab
Bathinda- 151001
Email Id: rajesh.kumar@cup.edu.in
hod.chem@cup.edu.in
rajeshchem01@gmail.com



Administrative experiences: Head of Department, 02 Jan. 2016 to till date

Teaching and Reserch Experience : Physical and Inorganic Chemistry

1. **Associate Professor:** December 2015 -Till date, Centre for Chemical Sciences, Bathinda, Punjab, India.
2. **Associate Professor:** July 2014 -December 2015, School of Chemistry and Biochemistry, Thapar University, Patiala, Punjab, India.
3. **Assistant Professor:** July 2006-Jun 2014, School of Chemistry and Biochemistry, Thapar University, Patiala, Punjab, India.
4. **Post-doc:** Canadian Institutes of Health Research Post-Doctoral Fellow (Jan 2007-Jan 2009), Centre for Blood Research and Department of Biochemistry and Molecular Biology, University of British Columbia, Canada (**Mentor Prof. Grant Mauk**)

Academic Details:

1. **Ph.D.** (Feb 2006) from School of Chemistry, University of Hyderabad, Hyderabad, (**Supervisor: Prof. Abani K. Bhuyan**).
2. **M. Phill.** (2001) from School of Chemistry, University of Hyderabad, Hyderabad.

Research Interest: Bioinorganic and Biophysical Chemistry

1. Interactions of nanoparticles and ionic liquids with biomolecules.
2. Advanced thermodymaic studies of biomolecules using isothermal and differential scanning calorimeters (ITC and DSC)
3. Advanced ultrafast protein folding study using laser flash photolysis and fluorescence correlation spectroscopy (FCS) in confogal microscopy in confocal microscopy.
4. Structural and functional studies of metalloproteins using NMR, circular dichrosim (CD), steady state and time reolved fluorecence. and millisecond stopped mixing device
5. Mechanical unfolding study by single-molecule force spectroscopy

Honors and Awards:

1. Canadian Blood Services/Canadian Institutes of Health Research Personal Research Award in the Area of Transfusion Science (2006-2009)
2. DST Young Scientist Award (2010)
3. NET Qualified in Chemical Sciences.
4. DST/DBT-SRF

Research Collaborators:

1. Dr. Deepak Sharma, Senior Scientist, IMTECH, CSIR, Chandigarh
2. Prof. P. Guptasarma, Department of Biological Sciences, IISER, Mohali
3. Prof. Abani K. Bhuyan, School of Chemistry, University of Hyderabad
4. Prof. Grant A Mauk, Department of Biochemistry and Molecular Biology, University of British Columbia, Canada

Sponsored Research Projects:

1. **Title of the Project:** The Mechanism of Reductive Release of Iron from Serum Transferrin, Rs.-43 lakhs funded by ICMR (adhoc (43 lacs) (duration 3 years)
2. **Title of the Project:** Kinetic and Thermodynamic Studies of the Effects of Synergistic and Nonsynergistic Anions on Blood Plasma Transferrin funded by SERB-DST(Extra Mural Research Scheme) (Rs.52.5 lakhs) (duration 3 years)
3. **Title of the Project:** "The Role of Macromolecular Crowding on Structure, Function, Stability and Folding of Serum Transferrin" DBT sponsored (25 lacs) (duration 3 years)
4. **Title of Project:** Structural, Kinetic and Thermodynamic Studies on Macromolecular Crowding on Eye Lens Crystallins (cost= Rs. 3 lacs, 2017-2019)
5. **Title of the Project:** pH-dependent stability and microsecond-folding kinetics of horse ferrocytochrome c, Rs. 11.5 lakhs sponsored by UGC (Major Research Project).
6. **Title of the Project:** Kinetic and Thermodynamics Studies on the Effect of Chaotropic and Kosmotropic Cosolvents on Horse Ferrocytochrome c, Rs. 21.2 lakhs sponsored by CSIR (Extra Mural Research Scheme).
7. **Title of the Project:** The Kinetics and Mechanism of Iron Release from Transferrins: Rs.-18.5 lakhs sponsored by DST (DST-Young Scientist Scheme).
8. **Title of the Project:** The Mechanism of Iron Release from Transferrins Rs. 1.0 lacs (duration one year) (university research grant- in-aid scheme, Thapar University, Patiala)
9. **Title of project:** The Mechanism of Iron Release from Human Transferrin, sanctioned by canadian Blood service/canadian institutes of health research (Canadian dollar (104,400 (duration two years)

Research Papers in Referred Journals:

1. Jain, R., Agarwal, M., Kumar, R., Sharma, D., and **Kumar, R.*** (2018) **Effects of lyotropic anions on thermodynamic stability and dynamics of horse cytochrome c** Biophysical Chemistry. 240, 88-97.
2. Kumar, S. Sharma, D., and **Kumar, R.*** (2017) **Role of Macromolecular Crowding on Stability and Iron Release Kinetics of Serum Transferrin.** J Phys Chem B. ;121(37):8669-8683.
3. **Kumar, R.*** (2016) **Analysis of the pH-dependent thermodynamic stability, local motions, microsecond folding kinetics of carbonmonoxycytochrome c.** Archive of Biochemistry and Biophysics, 606, 16-25.
4. Jain, R., Kumar, R., Kumar, S., Chhabra, R., Agarwal, M., and **Kumar, R.*** (2015) **Analysis of the pH-Dependent Stability and Millisecond Folding Kinetics of Horse Cytochrome c.** Archive of Biochemistry and Biophysics 585, 52-63
5. Kumar, R., Sharma, D., Jain, R., Kumar, S., and **Kumar, R.*** (2015) **Role of macromolecular crowding and salt ions on the structural-fluctuation of a highly compact configuration of carbonmonoxycytochrome c.** Biophysical Chemistry 207, 61-73.
6. Rishu Jain, Deepak Sharma, Sandeep Kumar, **Rajesh Kumar*.** "Factor defining the effects of glycine betaine on the thermodynamic stability and internal dynamics of horse cytochrome c", Biochemistry (ACS), 53(32) (2014) 5221-5235.
7. Sandeep Kumar, Deepak Sharma, Rajesh Kumar, **Rajesh Kumar.*** "Electrostatic effects controls the stability and iron release kinetics of ovotransferrin", J. Biol. Inorg. Chem., 19(6) (2014) 1009-1024.
8. Sandeep Kumar, Deepak Sharma, **Rajesh Kumar*.** "Effect of urea and alkylureas on the stability and structural fluctuation of the M80-containing ω -loop of horse cytochrome c", Biochimica et Biophysica Acta, 1844(3) (2014) 641-655.
9. Rishu Jain, Sandeep Kaur, **Rajesh Kumar*.** "Guanidine hydrochloride-induced alkali-molten globule model of horse ferrocytochrome c", Journal of Biochemistry, 153(2) (2013) 161-177.
10. Rishu Jain, Deepak Sharma, **Rajesh Kumar*.** "Effects of Alcohols on the Stability and Low-Frequency Local Motions that Control the Slow Changes in Structural Dynamics of Ferrocytochrome c", Journal of Biochemistry, 154 (4) (2013)
11. **Rajesh Kumar*.** Rishu Jain, Rajesh Kumar. "Viscosity-Dependent Structural Fluctuation of the M80-Containing Ω -Loop of Horse Ferrocytochrome c", Chemical Physics, 418 (2013) 57-64.
12. **Rajesh Kumar.** A. Grant Mauk. "Protonation and Anion Binding Control the Kinetics of Iron Release from Human Transferrin", J. Phys. Chem. B (ACS), 116(12) (2012) 3795-3807.

13. **Rajesh Kumar**, A. Grant Mauk. “**Atypical Effects of Salts on the Stability and Irons Release Kinetics of Human Serum Transferrin**”, J. Phys. Chem. B., 113(36) (2009) 12400-12409.
14. **Rajesh Kumar***, A. Grant Mauk. “**Iron Release from Human Transferrin in the Absence of Chelators Involves Five Kinetic Steps at Acidic pH**”, J. Biol. Inorg. Chem.14, (2009) S185-S224.
15. **Rajesh Kumar**, Abani K. Bhuyan. “**Entropic Stabilization of Myoglobin by Subdenaturing Concentrations of Guanidine Hydrochloride**”, J. Biol. Inorg. Chem., 14(1) (2009) 11-21.
16. **Rajesh Kumar**, Abani K. Bhuyan. “**Viscosity Scaling for the Glassy Phase of Protein Folding**”, J. Phys. Chem. B 112(39) (2008) 12549-12554.
17. M. Yadaiah, **Rajesh Kumar**, Abani K. Bhuyan. “**Glassy dynamics in the folding landscape of cytochrome c: Detected by laser photolysis**”, Biochemistry, 46(9) (2007) 2545-2551.
18. **Rajesh Kumar***, Abani K. Bhuyan. “**Effect of guanidine hydrochloride on stability and dynamics of myoglobin**”, J. Biol. Inorg. Chem., 112 (2007) S223-S230.
19. **Rajesh Kumar**, N. Prakash Prabhu, D. Krishna Rao, Abani K. Bhuyan, “**The Alkali Molten Globule State of Horse Fericytochonne c: Observation of Cold Denaturation**”, J. Mol. Biol., 364(3) (2006) 483-495.
20. D. Krishna Rao, **Rajesh Kumar**, M. Yadaiah, Abani K. Bhuyan. “**The Alkali Molten Globule State of Ferrocycytochrome c: Extraordinary Stability, Persistent Structure, and Constrained Overall Dynamics**” Biochemistry, 45(10), (2006) 3412-3420.
21. **Rajesh Kumar**, N. Prakash Prabhu, Abani K. Bhuyan. “**Ultrafast Events in the Folding of Ferrocycytochrome c**”, Biochemistry, 44 (26) (2005) 9359-9367.
22. **Rajesh Kumar**, Abani K. Bhuyan. “**Two-state Folding of Horse Ferrocycytochrome c: Analyses of Linear Free Energy Relationship, Chevron Curvature, and Stopped-Flow Burst Relaxation Kinetics**”, Biochemistry, 44(8) (2005) 3024-3033.
23. N. Prakash Prabhu, **Rajesh Kumar**, Abani K. Bhuyan. “**Folding barrier in horse cytochrome c: Support for a classical folding pathway**”, J. Mol. Biol., 337(1) (2004) 195-208.
24. **Rajesh Kumar**, N. Prakash Prabhu, M. Yadaiah, Abani K. Bhuyan. “**Protein stiffening and entropic stabilization in the subdenaturing limit of guanidine hydrochloride**”, Biophysical J., 87(4) (2004) 2656-2662.
25. Abani K. Bhuyan, **Rajesh Kumar** (2002) “**Kinetic barriers to the folding of horse cytochrome c in the reduced state**”, Biochemistry, 41(42) (2002) 12821-12834.

List of PhD Thesis Supervised (03):

1. Kinetic and thermodynamic studies on the effect of chaotropic and kosmotropic cosolvents on proteins by Ms. Rishu Jain
2. Kinetic and thermodynamic studies on the effect of amino acids, alcohols, crowding agents, and lyotropic salts on proteins by Mr. Rajesh Kumar
3. Modulating protein stability and dynamics by osmolytes and electrolytes by Mr. Sandeep Kumar

List of PhD Ongoing: 03 students

1. Modulating protein stability and dynamics by denaturants, surfactants, and antimicrobial preservatives by Mr. Mukesh Kumar
2. Modulating protein stability, folding and dynamics by ionic liquid Miss Mansi Garg
3. Kinetic and thermodynamic studies on the effects of metal oxide nanoparticles on proteins by Miss Beeta Kumari.

Major Equipments Available in the Lab



Millisecond Stopped Flow (Biologic, France)

Circular Dichroism/ Fluorescenc/
Absorbance Spectrometer (MOS 500)
(Biologic, France)

(FPLC, GE Health (USA)) (DBT)