

Shoeb Ahmad

M.Sc., Ph.D. (Biotechnology)

Assistant Professor

Department of Biotechnology,
School of Biosciences and Biotechnology,
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Permanent Address

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Sir Syed Nagar,
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Career Summary

Present Designation	Assistant Professor		
Ph.D.	Discipline: Protein Engineering and Structural Biochemistry <i>(From Centre for Cellular and Molecular Biology, CSIR-CCMB, Hyderabad, IND)</i>		
Postdoctoral Research Experience	6 Years and 7 Months (FRANCE and SWITZERLAND)		
Teaching Experience	2 Academic Years		
Courses Taught	Applied Biochemistry, Industrial Biotechnology, Animal Biotechnology Biochemistry, Molecular Biology and Bio-techniques <i>(UG and PG Students)</i>		
Research Expertise	Molecular Biology, Biochemistry and Structural Biology, Protein Engineering, Directed Molecular Evolution, Protein-protein and Protein-drug interaction.		
Publications	• Total	:	11
	• As First Author	:	5
	• Cumulative Impact Factor	:	43.23
	• Average Impact Factor (Best 4)	:	6.46
	• Citations	:	308
	• h-index	:	9
	• i10-index	:	8
Most Significant Publications (Best 4)	1. Nature Communications (2017)	Impact Factor:	12.124
	2. Nature-Scientific Reports (2016)	Impact Factor:	5.578
	3. Journal of Molecular Biology (2011)	Impact Factor:	4.001
	4. Journal of Molecular Biology (2008)	Impact Factor:	4.146
Patent/Technology Transfer	1. Patent Filed/1 Technology Transfer		
Research Grant	1. International; FRM, France-110400 EUROS/Approx. 83 Lakh 2. UGC-FRP Startup Grant, India: Dec 2018-Dec2021-10 Lakh		
National Examinations Qualified	1. CSIR-UGC-JRF	2000 and 2001	Among top 20%
	2. UGC-NET	2000 and 2001	
	2. ICMR-JRF	2001	Rank-29
	3. GATE	2001	Rank-9; Percentile: 99.5

Educational Qualification

<i>Course</i>	<i>Year</i>	<i>Subject</i>	<i>University/Institute</i>	<i>Percentage</i>	<i>Remarks</i>
Ph.D.	2009	Biochemistry	Centre for Cellular and Molecular Biology (CSIR-CCMB), Hyderabad, INDIA.	Awarded	Outstanding thesis award
Thesis title			Structural studies on thermostable variants of <i>Bacillus subtilis</i> lipase evolved by <i>in vitro</i> methods		
M.Sc.	2001	Biotechnology	Aligarh Muslim University, Aligarh, India.	73.2 %	II Position
B.Sc.	1999	Biochemistry	Aligarh Muslim University, Aligarh, India.	81.8 %	Faculty Topper

Teaching Experience

<i>Position</i>	<i>University/Department</i>	<i>Tenure</i>	<i>Course taught</i>
Assistant Professor	BABA GHULAM SHAH BADSHAH UNIVERSITY, Rajouri- J&K, INDIA.	September 2017 onwards	Animal and Industrial Biotechnology
Assistant Professor	ALIGARH MUSLIM UNIVERSITY, RCA, Aligarh, INDIA.	June 2016 - September 2017	Biochemistry, Molecular Biology and Bio-techniques (UG and PG Courses)
Assistant Professor (Contractual)	ALIGARH MUSLIM UNIVERSITY, Faculty of Medicine (Unani), Aligarh, INDIA.	October 2015 – June 2016	Applied Biochemistry (PG Course of Medical Students)

Research Experience

<i>Position</i>	<i>University/Institute</i>	<i>Tenure</i>	<i>Duration</i>
Postdoctoral Research Associate	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE (CNRS), Institute of Integrative Biology of the Cell (I2BC), Gif sur Yvette, FRANCE.	February 2012 – August 2015	3 Years, 7 months
Guest Postdoctoral Fellow	UNIVERSITY OF ZURICH, Department of Biochemistry, SWITZERLAND.	June – August 2012	3 Months
Project Research Associate	CENTRE FOR CELLULAR AND MOLECULAR BIOLOGY (CSIR-CCMB), Hyderabad, INDIA.	January 2009 – January 2012	3 Years

Awards and Distinctions

<i>Award/Honor</i>	<i>Year</i>	<i>Agency/Institution</i>
Eli Lilly Asia Outstanding Thesis Award	2009	Eli Lilly Co. USA.
Best Poster Award	2007	11 th ADNAT Convention, Centre for Cellular and Molecular Biology, INDIA. (International Symposium)
Best Poster Award	2007	National Symposium , Vellore Institute of Technology, INDIA.
Second Position	2001	M.Sc. (Biotechnology) , Aligarh Muslim University, INDIA.
All India Rank -9	2001	GATE-2001 (Indian Institute of Technology, IIT-Kanpur)
Highest Rank in Faculty of Life Sciences	1999	B.Sc. (Biochemistry) , Aligarh Muslim University, INDIA.

Fellowships

<i>Fellowship</i>	<i>Period</i>	<i>Funding Agency</i>
Postdoctoral Fellowship	2012-2015	Centre National de la Recherche Scientifique (CNRS), FRANCE.
Postdoctoral Fellowship	2009-2012	Council of Scientific and Industrial Research (CSIR), INDIA.
Senior Research Fellowship (SRF)	2004-2008	Council of Scientific and Industrial Research (CSIR), INDIA.
Junior Research Fellowship (JRF)	2002-2004	Council of Scientific and Industrial Research (CSIR), INDIA.
Master's Student Fellowship	1999-2001	Department of Biotechnology (DBT), Govt. of INDIA.

Extramural Research Grant

<i>Project Title</i>	<i>Funding Agency</i>	<i>Duration</i>	<i>Grant Amount</i>
1. The mechanism for microtubule depolymerization by kinesins.	Foundation for Medical Research (FRM), France.	July 2013-June 2015 (24 Months)	EURO 110,400 (INR 83 Lacs approx.)
2. Structural Mapping of Enzymes involved in drug resistance	University Grants Commission, (UGC-FRP), India	Dec 2018-Dec2021	10 Lakh

Patent Filed

1. N. Madhusudhana Rao and **Shoeb Ahmad: Development and Applications of Thermostable Lipases.** Patent Filed: 2574DEL2009 (Country: INDIA).

Technology developed and transferred

- ✚ Engineered and generated a highly robust recombinant Lipase of bacterial origin, having tremendous potential of industrial applications.
- ✚ Successfully transferred the technology to Central Leather Research Institute (CSIR-CLRI), Chennai for production, testing and application in leather processing under NIMITLI Programme of CSIR.

Publications (All in High Impact Peer Reviewed International Journals)

- **Research Articles:** **11**
- **Cumulative Impact Factor:** **43.23**
- **Average Impact Factor (Best 4):** **6.46**
- **Citations:** **308**
- **h-index:** **9**
- **i10-index:** **8**

List of Publications

1. Insight into microtubule disassembly by kinesin-13s from the structure of Kif2C bound to tubulin.
Wang W., Cantos-Fernandes S., Lv Y., Kuerban H., **Ahmad S.**, Wang C and Gigant B.
***Nature Communications* 2017** Jul 10;8(1): 70, doi: 10.1038/s41467-017-00091-9 ISSN: 2041-1723 (Online)
[Impact Factor: 12.124; Citations: 10] [\[PMID: 28694425\]](#)
2. Destabilizing an interacting motif strengthens the association of a designed ankyrin repeat protein with tubulin.
Ahmad S., Pecqueur L., Dreier B., Hamdane D., Nicaise M. A., Plückthun A., Knossow M. and Gigant B.
***Nature-Scientific Reports* 2016** Jul 6; 6:28922. doi: 10.1038/srep28922 ISSN: 2045-2322
[Impact Factor: 5.578; Citations: 12] [\[PMID: 27380724\]](#)
3. Engineering deamidation-susceptible asparagines leads to improved stability to thermal cycling in a lipase.
Bhanuramanand K. **Ahmad S.** and Rao N. M.
***Protein Science* Oct 2014;** 23(10): 1479-90. ISSN: 1469-896X/0961-8368 [\[PMID: 25043738\]](#)
[Impact Factor₂₀₁₄: 2.861; Citation: 4]
4. Probing protein stability and proteolytic resistance of *Bacillus subtilis* lipase by loop scanning: A comprehensive mutational analysis.
Ahmad S., Kumar V., Ramanand B. K. and Rao N. M.
***Protein Science* March 2012;** 21(3): 433-46. ISSN: 1469-896X/0961-8368 [\[PMID: 22246996\]](#)
[Impact Factor₂₀₁₁: 2.798; Citations: 41]
5. *In vitro* evolved non-aggregating and thermostable lipase: Structural and thermodynamic investigation.
Kamal M. Z.*, **Ahmad S.***, Molugu T.R., Vijayalakshmi A., Deshmukh M.V., Sankarnarayanan R. and Rao N.M.
***J Mol Biol.* Oct. 28 2011;** 413 (3): 726-41. (* Eq. Contr.) ISSN:0022-2836 [\[PMID: 21925508\]](#)
[Impact Factor₂₀₁₁: 4.001; Citations: 54]
6. Stabilizing effect of polyols is sensitive to inherent stability of protein.
Kamal M.Z, **Ahmad S.** and Rao N.M.
***Biophys Chem.* June 2011;** 156(1): 68-71. ISSN:0301-4622 [\[PMID: 21295397\]](#)
[Impact Factor₂₀₁₁: 2.203; Citations: 5]

7. Stability curves of laboratory evolved thermostable mutants of a *Bacillus subtilis* lipase.
Kamal M.Z., **Ahmad S.**, Yedavalli P. and Rao N.M.
Biochimica et Biophysica Acta (BBA) - Proteins & Proteomics, Sep. **2010**; 1804(9): 1850-1856. ISSN: 1570-9639 [\[PMID: 20599630\]](#)
[Impact Factor₂₀₁₀: 2.773; Citations: 11]
8. Thermally denatured state determines refolding in lipase: Mutational analysis.
Ahmad S. and Rao N. M.
Protein Science June **2009**; 18(6): 1183-96. ISSN: 1469-896X/0961-8368 [\[PMID: 19472328\]](#)
[Impact Factor₂₀₀₉: 2.937; Citations: 38]
9. Thermostable *Bacillus subtilis* lipases: *in vitro* evolution and structural insights.
Ahmad S., Kamal M. Z., Sankaranarayanan R. and Rao N.M.
J Mol Biol. Aug 29 **2008**; 381(2): 324-40. ISSN:0022-2836 [\[PMID: 18599073\]](#)
[Impact Factor₂₀₀₈: 4.146; Citations: 105]
10. Structural basis for the remarkable stability of *Bacillus subtilis* lipase (Lip A) at low pH.
Rajkumara E., Priyamvada A., **Ahmad S.**, Sankaranarayanan R. and Rao N.M.
Biochimica et Biophysica Acta (BBA) - Proteins & Proteomics, February **2008**; 1784(2): 302-311. ISSN: 1570-9639 [\[PMID: 18053819\]](#)
[Impact Factor₂₀₀₈: 2.233; Citations: 19]
11. Crystallization and preliminary X-ray crystallographic investigations on several thermostable forms of a *Bacillus subtilis* lipase.
Rajkumara E., Priyamvada A., **Ahmad S.**, Shanmugam V.M., Rao N.M. and Sankaranarayanan R.
Acta Crystallogr D Biol Crystallogr, January **2004**; 60 (1): 160-162. ISSN:0907-4449 [\[PMID: 14684916\]](#)
[Impact Factor₂₀₀₄: 1.693; Citations: 9]

Symposia Attended

➤ International	9	➤ National	6
➤ Poster Presentations (International)	3	➤ Poster Presentations (National)	4
➤ Invited Lecture (International/ National)	1/1	➤ Best Poster Awards	2

INTERNATIONAL SYMPOSIA [9]

1. International Conference on International Conference on Future Diagnostic, Therapeutic and Theranostics Modalities, December 29-31, 2018, Interdisciplinary Biotechnology Unit, Aligarh Muslim University, Aligarh, India.
2. *Emerging Trends in Biological Sciences* (March 6-8, 2016), Aligarh Muslim University, Aligarh, INDIA.
3. *Emerging Opportunities and Future Avenues in Pharmaceutical Sciences* (February 23-25, 2016), Azad College of Pharmacy and Research, Lucknow, INDIA.
4. *Symposium on French Microtubule Network* (July 1-3, 2013), University of Marseille, Marseille, **FRANCE**.
5. *BioAsia: The Global Bio-business Forum* (2010), Federation of Asian Biotech Association, All India Biotech Association and Hyderabad Central University, Hyderabad, INDIA.
6. *11th ADNAT Convention on Advances in Structural Biology and Structure Prediction* (2007), Centre for Cellular and Molecular Biology, Hyderabad, INDIA.

7. **International Symposium on Bio-nanotechnology and Pharmaceuticals** by Purdue University, USA, and CCMB, India (March 13-14, 2008), at CSIR-CCMB, Hyderabad, INDIA.
8. **International Symposium on Molecules, Machines and Network** (January 5-9, 2004), NCBS-TIFR, Bangalore, INDIA.
9. **International Symposium on Current Excitement in Biology** (November 24-29, 2002), CSIR-CCMB, Hyderabad, INDIA.

ORAL/POSTER PRESENTATIONS AT INTERNATIONAL CONFERENCES [3]

1. **Shoeb Ahmad et al. (2018)** Unusual Structural Solutions: Through Directed Molecular Evolution. International Conference on International Conference on Future Diagnostic, Therapeutic and Theranostics Modalities, December 29-31, 2018, Interdisciplinary Biotechnology Unit, Aligarh Muslim University, Aligarh, India.
2. **Shoeb Ahmad et al.** (2016). Unfolding of an Interacting Motif Strengthen Protein-Protein Interaction: A Directed Evolution Study. *Emerging Trends in Biological Sciences*, Aligarh Muslim University, Aligarh, INDIA.
3. **Shoeb Ahmad** (2010). Robust lipase engineered using protein design and *in vitro* evolution. *BioAsia: The Global Bio-business Forum*, Hyderabad, INDIA.
4. **Ahmad S.** and Rao N.M. (2007). Mutational analysis of thermostability in lipase: influence of charge in residual structure on refolding. *11th ADNAT Convention on Advances in Structural Biology and Structure Prediction*, Centre for Cellular and Molecular Biology, Hyderabad, INDIA. **(Best Poster Award)**

NATIONAL SYMPOSIA [7]

1. National Seminar on "Ethnobotany and Traditional Knowledge in Biodiversity Conservation", 8th & 9th March, 2018, organized by Department of Botany, Baba Ghulam Shah Badshah University, Rajouri, Jammu and Kashmir.
2. Training course on Ethics and Values in Public Governance, 19th-20th April 2017, organized by Residential Coaching Academy, Aligarh Muslim University, Aligarh.
3. National Symposium cum Bioinformatics Workshop on Current trends in Proteomics and Bioinformatics (Sponsored by UGC, DST, and DBT, Govt. of India) March 16-17, 2017, Interdisciplinary Biotechnology Unit, Aligarh Muslim University, Aligarh, India.
4. *Annual Symposium of Indian Biophysical Society (NCMB IBS-2009)*, Centre for Cellular and Molecular Biology, Hyderabad, INDIA.
5. *National Symposium on Protein Science and Engineering* (2007), Vellore Institute of Technology, Vellore, INDIA.
6. *IV Annual Symposium of Biotechnology Society of India on Over expression, Systems and Challenges* (2006), Centre for Cellular and Molecular Biology, Hyderabad, INDIA.
7. *National Conference on Stability and Stabilization of Biomolecules* (2001), Interdisciplinary Biotechnology Unit, Aligarh Muslim University, Aligarh, INDIA.

POSTER PRESENTATIONS AT NATIONAL CONFERENCES [4]

1. **Ahmad S.** and Rao N. M. (2009). Evolving aggregation resistant lipase: reversal of thermal unfolding pathway. *Annual Symposium of Indian Biophysical Society (NCMB IBS-2009)*, Centre for Cellular and Molecular Biology, Hyderabad, INDIA.
2. Kumar V., **Ahmad S.** and Rao N. M. (2009). Role of loops in protein stability and protease susceptibility. *Annual Symposium of Indian Biophysical Society (NCMB IBS-2009)*, Centre for Cellular and Molecular Biology, Hyderabad, INDIA.
3. **Ahmad S.** and Rao N.M. (2007) Directed evolution of *Bacillus subtilis* lipase for thermostability. *National Symposium on Protein Science and Engineering*, Vellore Institute of Technology, Vellore, INDIA. **(Best Poster Award)**

4. Uday T.S., **Ahmad S.** and Rao N.M. (2006). Designing protease resistant lipase. *IV Annual Symposium of Biotechnology Society of India on Over expression, Systems and Challenges*, Centre for Cellular and Molecular Biology, Hyderabad, INDIA.

INVITED LECTURES [2]

1. **Invited Lecture on "Destabilizing an interacting motif strengthens association in protein-protein interaction: An in vitro evolution study"** at **National Symposium cum Bioinformatics Workshop** on Current trends in Proteomics and Bioinformatics (Sponsored by UGC, DST, and DBT, Govt. of India) March 16-17, 2017, Interdisciplinary Biotechnology Unit, Aligarh Muslim University, Aligarh, INDIA.
2. **Invited Lecture on "Recent Trends in Protein Engineering and Drug Design at International Conference** on Exploring Opportunities and Future Avenues in Pharmaceutical Sciences (February 23-25 2016), Azad Institute of Pharmacy and Research, Lucknow, INDIA.

TRAINING COURSE ORGANIZED/ATTENDED [2]

1. Co-organizing secretary of Training course on Ethics and Values in Public Governance, 19th-20th April 2017, Organized by Residential Coaching Academy, Aligarh Muslim University, Aligarh, INDIA.
2. **Participated in** Short-term training course on 'Recent Trends in Protein Chemistry Relevant to Biological Sciences', 7-23 November 2017, organized by Interdisciplinary Biotechnology Unit, Aligarh Muslim University, Aligarh, INDIA.

Teaching Skills

- **Biochemistry**
- **Enzymology**
- **Biophysics**
- **Biochemical & Biophysical techniques**
- **Molecular Biology**
- **Cell Biology**
- **Genetics**
- **Genetic Engineering & Recombinant DNA Technology**
- **Microbiology & Virology**
- **Structural Biology**
- **Protein Engineering**
- **Genomics, Proteomics and Bioinformatics**

Research Skills

- ✓ **Molecular Biology:** Extensive experience in routine molecular biology techniques including **genomic and plasmid DNA isolation, bacterial transformation, electroporation, PCR based site-directed mutagenesis** including **multiplex-PCR, random and saturation mutagenesis** along with **DNA sequencing**. Well proficient in RNA handling including **RNA isolation, in vitro transcription, translation and reverse transcription** for cDNA synthesis.
- ✓ **Cloning and Expression:** Well proficient in molecular **cloning and expression** of homologous and heterologous proteins, with or without affinity tag in **Escherichia coli** and **Bacillus subtilis**.
- ✓ **Protein Expression and Purification:** Competent in **recombinant protein expression, purification** and characterization using different chromatographic techniques including **Affinity, Hydrophobic interaction, Ion exchange and Size-exclusion chromatography**. Extensive experience of manual purification as well on automated FPLC systems.

- ✓ **Protein Characterization:** Extensive experience in biophysical and biochemical characterization of protein/enzymes by exploiting spectroscopic, chromatographic and calorimetric techniques. These include **absorption, fluorescence and circular dichroism spectroscopy** along with **analytical gel filtration, DLS, ITC and DSC** as well as **mass spectrometry**.
- ✓ **Electrophoresis:** Experienced in electrophoretic techniques including **IEF, 2-D gel electrophoresis, ELISA, western blotting and DNA sequencing**.
- ✓ **Chromatography:** Experienced in chromatographic techniques including **LC, HPLC and FPLC**.
- ✓ **Mass Spectrometry:** Well versed with MS techniques including **LC-MS/MS, ESI-MS and MALDI-TOF MS**.
- ✓ **Protein – Protein Interaction:** Significant experience in monitoring and characterizing protein – protein interaction by using **analytical gel filtration, fluorescence (anisotropy and FRET), Stopped flow fluorescence** and **ELISA**.
- ✓ **Directed Evolution Techniques:** Extensive experience of directed evolution techniques including optimization of suitable **expression system in *Escherichia coli* and *Bacillus subtilis*** for **high-throughput screening (HTS)** of mutants. **Generation of mutant libraries using error-prone PCR, DNA shuffling** along with gene **site-saturation mutagenesis**. Development of efficient **screening platforms** for improved **stability and enzymatic function** including **thermostability, hyper-thermostability, catalytic proficiency, cold-adaptation, organic solvent resistance and proteolytic resistance**. Also experienced in **medium and high-throughput screening** of enzymes using **manual as well as automated screening platforms**. Well experienced in ***in vitro* display technique of ribosome display**, to evolve engineered proteins for selective binding against target protein(s).
- ✓ **X-Ray Crystallography:** Experienced in **protein crystallization** using sitting/hanging drop vapor diffusion method using both **manual as well as robotic crystallization setups**. **Crystal harvesting, storage and data collection at synchrotron**. Also experienced in **diffraction data processing and structure determination by molecular replacement**.
- ✓ **Softwares:** Well versed with data analysis software, **non-linear regression analysis software** (Microcal Origin, MS Excel), **structure analysis software** (Swiss-PDB viewer, RasMol, PyMOL, Coot) and **softwares for X-ray diffraction data processing and structure determination**.

Research Interests

- **Investigation of Protein structure-function/property relationship.**
- **Protein Engineering and Directed Molecular Evolution.**
- **Protein Stability, Folding and Misfolding.**
- **Investigating the Structural Mechanism of multi-drug resistance in pathogenic bacteria.**
- **Design and evolution of recombinant HIV vaccines for improved affinity against neutralizing antibodies.**

"How protein structure determines its function and what are the rules governing this relationship?" This is one of the most basic and sought after question in biology. The objective is to decipher the rules involved, which can then be employed to generate "designer proteins" with desired properties and function. Though, with extensive work and substantial gain in knowledge, engineering proteins for desired features by employing rational approaches is still in infancy, primarily due to the complex nature of structure-function relationship. However, another approach, known as "directed or *in vitro* evolution", has proved to be extremely successful in last several years. It mimics natural evolution on laboratory time scale and is proved especially worthy in modulating those properties, the structural basis of which is either too complex or not so well understood. This has paved the way to explore the structural basis of complex

properties, which was very challenging till recent past. In pursuit to answer above question, I want to focus my future to explore protein structure – function/property relationship, by primarily employing directed evolution. With respect to startup and long-term objectives, I want to focus my research in the following areas:

[1] Generation of recombinant vaccine for HIV by employing **Structure based design and directed evolution approaches** (display techniques) to engineer and optimize interactions between vaccine antigens and neutralizing antibodies. **[2] Understanding of protein-protein interaction** and how this interaction can be **blocked during pathogenic conditions**, particularly **during ordered protein aggregation**. **[3] Structural mapping of proteins involved in conferring antibiotic resistance to bacteria**, in order to identify novel binding sites, which could be targeted as potential inhibitor binding sites to tackle the issue of growing antibiotic resistance of pathogenic microbes.

Language Proficiency

Oral: English, Hindi, and Urdu

Written: English, Hindi, and Urdu

Personal Details

Date of Birth : 22-06-1977
Father's Name : Mr. Sibtey Hasan
Mother's Name : Mrs. Sajida Khatoon
Spouse's Name : Ms. Asra Fatima

(Shoeb Ahmad)
March 2019.