

ARPIT KATIYAR PhD

*Molecular Biologist & Functional Genomicist / AI in Omics technology /
In Vitro & In Vivo Disease Modeling | Bioinformatics & Computational Biology*



FEBS-International Prize Awardee-2021

Biochemical Society for Stress Response - Best Oral Presentation Awardee 2019

RESEARCH PROFILE

Postdoctoral molecular biologist with a decade of research spanning the HSF1-driven mitochondrial unfolded protein response (mtUPR), nuclear regulation of mitochondrial proteostasis, and functional interpretation of pathogenic variants in rare and neurodegenerative disease. Combines wet-lab functional validation — CRISPR/Cas9 genome editing, minigene splicing assays, patient-derived NSC and iPSC-based models — with computational variant prioritisation (SpliceAI, AlphaGenome-guided analysis, exome/WGS) to convert genetic association signals into causal molecular mechanisms. FEBS Open Bio International Prize winner (2021) for HSF1-mtUPR discovery work; author on 10 peer-reviewed publications including EMBO Journal and Nature Communications; **over citations 358, i10-index 7**.

AWARDS & RECOGNITION

- **2021** FEBS Open Bio Prize Winner (International) — for HSF1/mtUPR mitochondrial chaperone induction work.
- **2022** Demonstrator, 19th ICMR Course on Medical Genetics and Genetic Counselling — in-house lab set-up for tpPCR-based trinucleotide repeat expansion detection (Huntington disease, SCA), SGPGIMS Lucknow.
- **2019** PhD Oral Presentation Award, Biochemical Society for Stress Response, Japan.

EDUCATION

PhD, Biochemistry and Molecular Biology 2015 – 2020

Graduate School of Medicine, Yamaguchi University, Japan

Thesis: “Role of HSF1 in the mitochondrial unfolded protein response in mammals” · Mentor: Dr. Mitsuaki Fujimoto (Nakai Lab)

MSc, Biotechnology 2011 – 2013

Dept. of Bioscience and Bioengineering, IIT Bombay, India

CGPA 8.43/10 · All India Rank 84, IIT JAM · GATE 2013 (Biotechnology)

SCHOLASTIC ACHIEVEMENTS

- Yamaguchi University Scholarship for Graduate Research Students (2018–2020).
- Otsuka Toshimi Scholarship, awarded by a leading pharmaceutical company in Japan (2016–2018).
- University stipend as a Visiting Foreign Researcher (2014–2015).
- Department of Biotechnology (DBT) Scholarship, Ministry of Human Resource Development, Government of India, for 2-year MSc programme (2011–2013).
- IIT Merit-cum-Means Scholarship, IIT Bombay (2011–2012).
- Secured All India Rank 84 in IIT JAM Entrance Exam (acceptance rate ~0.3%); GATE 2013 in Biotechnology.
- Qualified national-level PhD/Masters entrance examinations at Jawaharlal Nehru University (JNU) and National Institute of Immunology (NII), India.

POSTDOCTORAL APPOINTMENTS

Postdoctoral Associate — Department of Neurosurgery 2024 – 2025

Houston Methodist Research Institute, USA · Mentor: Dr. M.L. Hegde

- Identified differentially expressed mitochondrial energy metabolism genes in Parkinson's disease brain tissue and screened mitochondrial dysfunction signatures via RT2 profiling array.
- Performed GO enrichment analysis (Ingenuity Pathway Analysis) linking biological processes to submitochondrial function in differentially expressed gene sets.
- Validated candidate genes and α -synuclein-mediated mitochondrial dysfunction in patient-derived NSCs by qPCR and western blot.

Postdoctoral Associate — Department of Molecular and Human Genetics 2023 – 2024

Baylor College of Medicine, USA · Mentor: Dr. Rui Chen

- Identified splice-altering variants in a large Inherited Retinal Disease (IRD) cohort via exome/genome analysis.
- Systematically evaluated SpliceAI predictions on deep-intronic variants using an in vitro minigene assay in HEK293 cells; achieved ~50% functional validation of predicted aberrant splicing events.
- Developed and validated a prototype high-throughput minigene splicing assay for large-scale genetic variant screening.

EARLIER RESEARCH EXPERIENCE

Senior Research Demonstrator 2020 – 2023

Sanjay Gandhi Post-Graduate Institute of Medical Sciences (SGPGIMS), India · Mentor: Dr. Anshika Srivastava

- Generated TRIM and Lamtor gene knockout/knock-in cellular models by CRISPR/Cas9 (heterozygous and homozygous edits with clonal selection) for functional variant studies.
- Functionally validated a COQ7 splice mutation causing a hereditary spastic paraplegia (HSP)-like phenotype, and PRUNE1 exonic variants, via minigene splicing reporter assays.
- Designed a triplet repeat-primed PCR (tpPCR) assay to detect trinucleotide repeat expansions in Huntington disease and spinocerebellar ataxia patients in an Indian cohort.

PhD Researcher 2015 – 2020

Graduate School of Medicine, Yamaguchi University, Japan . Mentor: Dr. Mitsuaki Fujimoto

- Showed HSF1 is required for activation of mitochondrial chaperone genes (HSP60, HSP10, mtHSP70) during the mtUPR, and that HSF1 promotes mitochondrial oxygen consumption and membrane potential.
- Used ChIP to show constitutive HSF1 occupancy at mitochondrial chaperone gene promoters, enhanced during mtUPR induction, and identified SSBP1 as an HSF1-associated co-activator in mtUPR gene regulation.

Visiting Research Fellow 2014 – 2015

Graduate School of Medicine, Yamaguchi University, Japan

- Studied nucleo-cytoplasmic shuttling of HSF1 during heat shock via NLS site-directed mutagenesis, nuclear stress body formation, and DNA-binding activity on HSP gene promoters in HEK293/HeLa cells.

MSc Thesis Project 2011 – 2013

Mentor: Dr. Ashutosh Kumar, IIT Bombay, India

Structural and conformational studies of α -synuclein protein in the fibrillar state by computational approach

- Investigated structural polymorphism of α -synuclein in amyloid-forming oligomers and the fibrillar state, using experimental chemical shift data with the TALOS+ program to determine secondary structure in natively folded and aggregated forms.

- Modelled structural and conformational dynamics of α -synuclein across fibrillar states using the CS-ROSETTA protocol; identified residues 36–41 and 48–56 as forming parallel/antiparallel β -sheets critical for amyloid formation.

SELECTED PEER-REVIEWED PUBLICATIONS

(Author name bold/underlined; ICMJE/Vancouver style)

1. **Katiyar A**, Fujimoto M, Tan K, Kurashima A, Srivastava P, Okada M, Takii R, Nakai A. HSF1 is required for induction of mitochondrial chaperones during the mitochondrial unfolded protein response. FEBS Open Bio. 2020. — *FEBS Open Bio International Prize, 2021*
2. Takii R, Fujimoto M, Matsumoto M, Srivastava P, **Katiyar A**, Nakayama KI, Nakai A. The pericentromeric protein shugoshin 2 cooperates with HSF1 in heat shock response and RNA Pol II recruitment. EMBO J. 2019;38(24):e102566.
3. Vaish S, **Katiyar A**, Raju V, Kvarnung M, Bird L, Srivastava A. Biallelic variants in ITSN1 are implicated in neurodevelopmental disorders with severe intellectual disability. System bio. 2022 (23).
4. Fujimoto M, Takii R, **Katiyar A**, Srivastava P, Nakai A. Poly(ADP-ribose) polymerase 1 promotes the human heat shock response by facilitating heat shock transcription factor 1 binding to DNA. Mol Cell Biol. 2018;38(13):e00051-18.
5. **Katiyar A**, Phadke SR, Srivastava A. Expanding the clinical and mutation spectrum of PRUNE1 syndrome. Research Sym.bio 2021(21).
6. Fujimoto M, Takii R, Takaki E, **Katiyar A**, Nakato R, Shirahige K, Nakai A. The HSF1-PARP13-PARP1 complex facilitates DNA repair and promotes mammary tumorigenesis. Nat Commun. 2017;8:1638.
7. Oka S, Shiraishi K, Fujimoto M, **Katiyar A**, Takii R, Nakai A, Matsuyama H. Role of heat shock factor 1 in conserving cholesterol transportation in Leydig cell steroidogenesis via steroidogenic acute regulatory protein. Endocrinology. 2017;158(8):2648–2658.
8. Takii R, Fujimoto M, Matsuura Y, Wu F, Oshibe N, Takaki E, **Katiyar A**, Akashi H, Makino T, Kawata M, Nakai A. HSF1 and HSF3 cooperatively regulate the heat shock response in lizards. PLoS One. 2017;12(7):e0180776.
9. Sahoo B, Srivastava M, **Katiyar A**, Ecelbarger C, Tiwari S. Liver or kidney: who has the oar in the gluconeogenesis boat and when? World J Diabetes. 2023.
10. Sadawana M, **Katiyar A**, Ramachandran R, Bellare J, Srivastava R. Organic and aqueous dispersible tetrapods for biosensing applications. In: 2013 IEEE Sensors. IEEE; 2013.

INVITED TALKS & CONFERENCE PRESENTATIONS

- Invited talk, “HSF1 is required for induction of mitochondrial chaperones during mitochondrial stress response,” FEBS Congress, Lisbon, Portugal (2022).
- Oral talk, “HSF1 regulates proteotoxic stress response in mammals,” Biochemical Society for Stress Response, Osaka University, Japan (2019).
- Poster, “Expanding the clinical and mutation spectrum of PRUNE1 syndrome,” Research Symposium, Lucknow (2021).
- Poster presentations, Annual Meetings of the Molecular Biology Society of Japan (2016, 2017, 2018) — HSF1 and mitochondrial/proteotoxic stress response.

TECHNICAL SKILLS

- **Genomics & Variant Interpretation:** exome/WGS analysis, SpliceAI, AlphaGenome-guided variant prioritisation, GO/pathway enrichment (Ingenuity Pathway Analysis)
- **Functional Genomics:** CRISPR/Cas9 genome editing (KO/KI, clonal selection), minigene splicing reporter assays, high-throughput splicing assay development
- **Cell & Molecular Biology:** patient-derived NSC/fibroblast and immortalised cell culture (HEK293, HeLa, MEF), DNA transfection (nucleofection, lipofection), ChIP, co-immunoprecipitation, western blot, qPCR/RT2 profiling arrays

- **Model Systems:** primary neuron isolation (enteric and dopaminergic neurons from mouse), *C. elegans*
- **Imaging:** confocal microscopy, immunofluorescence, fluorescence-based subcellular localisation assays
- **Computational:** BLAST, CLUSTALW, AutoDock, HADDOCK; statistical analysis of computational/structural data

PROFESSIONAL MEMBERSHIPS

- Society for Indian Academy of Medical Genetics (2022–2023).
- Molecular Biology Society of Japan (2016–2019).

LEADERSHIP ACCOMPLISHMENTS

- **M.Sc. Representative**, Bioscience & Bioengineering, IIT Bombay (2012–2013) — supervised academic and non-academic issues for the master's cohort (~30% of department strength).
 - **Library Secretary**, Hostel-13, IIT Bombay (2011–2012) — maintained the academic book bank and magazine collection serving 600 students; introduced regional-language newspapers in 7 languages.
 - **National Cadet Corps (NCC)**, IIT Bombay (2011–2012) — awarded 'B' and 'C' certificates as a cadet of the 2MEHR Engineering Regiment.
 - **Event Coordinator, Techfest 2012**, IIT Bombay — 12-member Hospitality Service team for Asia's largest science and technology festival.
 - **Organiser, Generation-2012**, departmental technical event, BSBE, IIT Bombay — led logistics and publicity for an event drawing ~150 student participants nationally.
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