Mohit Rastogi

Brain Development and Disease Department,
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Educational Qualifications:

Italian Institute of Technology & **University of Genova** (Genova, Italy) Nov 2017 - April 2021

- Ph.D. in Neuroscience and Brain Technologies
- Thesis Project: "Multi-omics approach in Down syndrome resolves new regulators in two regions of the human brain."

Amity Institute of Biotechnology, **Amity University** (Noida, India) Aug 2007 - Dec 2013

- B. Tech /M. Tech Biotechnology (Integrated), 6 years
- Thesis Project: "Evaluation of sodium nitroprusside as a radiation countermeasure agent using zebrafish as a vertebrate model organism."

Research and Training Experience:

Italian Institute of Technology (Genova, Italy) May 2021 - Present
Postdoctoral Researcher; Advisor: Laura Cancedda, Ph.D.

- Analysing the properties of induced pluripotent stem cells (iPSCs) derived neurons from Down syndrome (DS) and control individuals using calcium imaging and multi-electrode arrays.
- Produced and transduced lentivirus in iPSC derived neural progenitors and neurons for performing co-culture with rat primary cortical neurons and labelling axon initial segment.
- Studying dysregulation at the level of long non-coding RNAs and circular RNAs in the hippocampus and cortex from DS individuals.
- Integrating dysregulated transcripts, proteins, and non-coding RNAs in DS by performing weighted gene correlation network analysis.
- Performed proteomics analysis for a collaborative project on effect of early life stress on brain development and found candidate proteins at different ages of stress for pharmaceutical intervention.

Italian Institute of Technology & **University of Genova** (Genova, Italy) Nov 2017 - April 2021
Ph.D. scholar; Advisor: Laura Cancedda, Ph.D.

- Carried out RNA sequencing and proteomics analysis on Down syndrome (DS) mouse models and human DS brains to find the differential transcript and protein expression.
- Investigated the role of alternative splicing, RNA binding proteins, and microRNAs as layers of gene regulation in dysregulation observed in DS.
- Established differentiation protocol for iPSC-derived neurons and microglia and inspected potential phenotypic-, gene-, and protein- level differences using iPSCs derived neurons from DS and control individuals.
- Analysed the properties of axon initial segment in *in vitro* systems such as wildtype and Ts65Dn mouse model dissociated hippocampal culture using immunocytochemistry and confocal imaging.

Institute of Genomics and Integrative Biology (New Delhi, India) April 2016 - August 2017
Junior Research Fellow (JRF)
Advisors: Beena Pillai, Ph.D., Binukumar BK, Ph.D., and Arpita Konar, Ph.D.

- Studied peri-pubertal stress and aggression in adult life in a mouse model by performing behavioural assays to induce stress at a young age and monitor the aggression phenotype.
- Investigated this social dynamic using western blotting, qRT-PCR, RNA-seq, and global methylation.
- Analysed the strength of 3' UTRs (alternative spliced) for significantly altered genes in HIV-infected patients using Luciferase assay.

Technical skills:

- Molecular genetics: Genomic DNA isolation, genotyping, sub-cloning, plasmid preparation, lentivirus production, RNA isolation, real-time PCR.
- Cell culture: Human induced pluripotent stem cell culture (iPSC), differentiation to neural progenitors and neurons, differentiation of iPSC to microglia, primary hippocampal culture, mammalian cell line culture, single nuclei isolation from animal tissue for snRNA-seq.
- Imaging: Fluorescence microscopy and image analysis using ImageJ, calcium imaging.
- Biochemistry and immunochemistry: Protein lysate preparation, protein quantitation, gel electrophoresis, western blotting, immunocytochemistry, immunohistochemistry, luciferase assay.
- Sequencing: Total RNA-seq and small RNA-seq library preparation, Analysis of total RNA-seq and small RNA-seq data, WGCNA analysis, Alternative splicing analysis using VAST-tools, Intermediate understanding of single cell and nucleus RNA sequencing analysis.
- Animal work: Mouse husbandry, mouse brain dissection and perfusion, microtome sectioning.
- Programming and software skills: Proteomics analysis using Perseus; R, Command-line interface, Adobe Illustrator, Adobe InDesign, Cytoscape; Intermediate level in MATLAB and Python.

Publications:

- Rescuing over-activated microglia restores cognitive performance in juvenile animals of the Dp(16) mouse model of Down syndrome. Bruno Pinto, Giovanni Morelli, **Mohit Rastogi**, Annalisa Savardi, Amos Fumagalli, Andrea Petretto, Martina Bartolucci, Emilio Varea, Tiziano Catelani, Andrea Contestabile, Laura E. Perlini, Laura Cancedda, Neuron 2020;108:1-18. DOI: 10.1016/j.neuron.2020.09.010
- Brain region specific methylation and Sirt1 binding changes in MAOA promoter is associated with sexual dimorphism in early life stress induced aggressive behaviour. Arpita Konar, **Mohit Rastogi**, Aksheev Bhambri, Neurochem Int. 2019 Oct; 129:104510. DOI: 10.1016/j.neuint.2019.104510

Manuscripts in preparation:

- "Integrative multi-omics analysis reveals conserved cell-projection deficits in human Down syndrome brains."; **Mohit Rastogi**, Martina Bartolucci, Marina Nanni, Diego Vozzi, Andrea Petretto, Stefano Gustincich, Andrea Contestabile, Laura Cancedda; Article manuscript in preparation, to be submitted for peer review in August 2022.

- "Heterogeneous $GABA_AR$-mediated responses coexist in physiological and pathological mature neuronal networks at increasing scale of complexity."; Ilaria Colombi, Micol Alberti, **Mohit Rastogi**, Marina Nanni, Andrea Contestabile, Laura Cancedda; Article manuscript in preparation, to be submitted for peer review in September 2022.
- "Metabolomic profiling of brains of Down syndrome mouse model suggests upregulation of key metabolites."; Luca Goldoni, **Mohit Rastogi**, Andrea Contestabile; Article manuscript in preparation, to be submitted for peer review in September 2022.

Conferences Presentations and Talks:

- Participated and presented a poster at CAJAL course on Single Cell Profiling and Analysis in neuroscience 2022 in Bordeaux, France.
- Participated and presented a poster at International course on Non-Coding Genome, 11th edition 2022 in Paris, France.
- Presented an e-poster at Keystone eSymposia on Neuroimmune Interactions in Health and Disease 2021.
- Presented an e-poster at CSHL Eukaryotic mRNA Processing virtual meeting 2021.
- Presented an e-poster at EMBL in Italy: A Brave New World of RNA Virtual Event 2021.
- Presented an e-poster at FENS 2020 Virtual Forum.
- Selected for a short talk and presented a poster at T21RS Down syndrome Research Society 2019 conference in Barcelona, Spain.
- Presented a poster at EMBO workshop on Network Inference in Biology and Disease 2019 in Naples, Italy.
- Participated in Neuroscience School of Advanced Studies (NSAS) course on "Neural Stem Cells: Development and Brain Repair" 2019 in Venice, Italy.

Impact Activities:

Coordinator (Institute of Genomics and Integrative Biology**,** New Delhi, India) 2016 – 2017

- Organized Council of Scientific & Industrial Research (CSIR) open day

Head Coordinator (Amity University, Noida, India) 2010 – 2011

- Organized social and cultural events during National Annual Cultural Festival.
- Managed technical placements during the IT recruitment season.

Coordinator (Amity University, Noida, India) 2008 – 2010

- Organized social and cultural events during National Annual Cultural Festival.
- Arranged talks and quizzes during National Annual Biotechnology Festival.

References:

Dr. Laura Cancedda
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Dr. Andrea Contestabile
Italian Institute of Technology, Genova, Italy
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Dr. Arpita Konar
Institute of Genomics and Integrative Biology, New Delhi, India
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