

BIOGRAPHICAL SKETCH

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NAME: Debasmita Paul, PhD

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POSITION TITLE: Postdoctoral Scholar, Jaiswal Lab, Department of Pathology, Stanford School of Medicine

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EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
Presidency College, University of Calcutta, India	BSc	08/2007	07/2010	Physiology
University of Calcutta, India	MSc	07/2010	06/2012	Genetics
All India Institute of Medical Sciences (AIIMS), New Delhi, India	PhD	02/2015	11/2020	Molecular Neuroscience

A. Personal Statement

I am a multidisciplinary neuroscience researcher with training spanning neurophysiology, genetics, molecular neuroscience, and human brain transcriptomics. My long-term goal is to establish an independent research program focused on neuroimmune mechanisms of brain aging and neurodegeneration, with emphasis on microglial biology, blood–brain barrier integrity, and somatic mutations such as clonal hematopoiesis (CHIP).

I obtained my BSc in Physiology from Presidency College, University of Calcutta, followed by an MSc in Genetics from the University of Calcutta. I completed my PhD in Molecular Neuroscience at the Centre of Excellence for Epilepsy, Department of Neurosurgery, All India Institute of Medical Sciences (AIIMS), New Delhi, in a highly collaborative clinical–translational environment spanning neurosurgery, neuropathology, and forensic sciences. My doctoral work focused on molecular mechanisms of drug-resistant epilepsy, including TGF- β /SMAD3 signaling and MMP9 pathways in mesial temporal lobe epilepsy with hippocampal sclerosis (MTLE-HS), leading to peer-reviewed publications in *Epilepsy Research*, *Neurology India*, and *Scientific Reports*. I further expanded my expertise as a Researcher at the Sudha Gopalakrishnan (SG) Brain Centre, IIT Madras, applying single-nucleus transcriptomics to study brain evolution across species.

Currently, as a Postdoctoral Scholar in the Jaiswal Lab, Department of Pathology at Stanford School of Medicine, I investigate clonal hematopoiesis of indeterminate potential (CHIP) mutations in aging and Alzheimer's disease, focusing on microglial states in the human cortex. This work is supported by the Knight Initiative for Brain Resilience. Most recently, I contributed as a co-author to a *Nature* study using somatic mutations to trace the ontogeny of microglia in the aging human brain, directly extending my research on microglial origin and CHIP. My research integrates human brain genomics with neuroimmunology to understand how somatic mutations shape neuroinflammatory states and contribute to neurodegeneration.

B. Positions, Scientific Appointments and Honors

Positions

- 2024–Present: Postdoctoral Scholar, Jaiswal Lab, Dept. of Pathology, Stanford School of Medicine, Stanford, CA (Funded: R01 AG088656, NIH)
- 2021–2023: Post doctoral Researcher, SG Brain Centre, Indian Institute of Technology (IIT) Madras, India
- 2015–2020: PhD Fellow, Centre of Excellence for Epilepsy, AIIMS, New Delhi, India
- 2014–15: Junior Research Fellow, THSTI, Faridabad, India
- 2014: Junior Research Fellow, National Institute of Immunology, New Delhi, India

Awards and Fellowships

- 2023 Poster Award — Vellore Institute of Technology
- 2018–2021 Doctoral Fellowship — Indian Council of Medical Research (ICMR)
- 2016 Travel Award — 12th European Congress on Epileptology, Prague
- 2015 GATE (Life Sciences) — National Level Examination Qualifier
- 2014 Summer Training Fellowship — INSA-IAS-NASI Summer Fellowship Program

Professional Memberships

- 2017–Present: Member, Indian Epilepsy Society
- 2019–Present: Member, Indian Academy of Neurosciences
- 2023–Present: Member, Asia and Pacific Bioinformatics Network

C. Contributions to Science

1. a) Neurogenomics of Aging, CHIP, and Alzheimer's Disease

As a Postdoctoral Scholar in the Jaiswal Lab at Stanford School of Medicine, my current research examines how clonal hematopoiesis (CHIP) somatic mutations alter microglial states in the aging and Alzheimer's disease brain. This work, supported by the NIH R01 grant and the Knight Initiative for Brain Resilience at Stanford, integrates human genomic, transcriptomic, and neuroimmune data to define how systemic somatic mutations influence neuroinflammation and neurodegeneration. (Current work: ongoing)

b) Somatic Mutations Reveal the Ontogeny of Microglia in Human Aging

As a co-author on this Nature study, I contributed to work using accumulated somatic mutations as natural lineage barcodes to trace the origin of human microglia. Applying this approach across 20 aged individuals, combined with single-cell lineage tracing using mitochondrial DNA variants, the study found that bone marrow-derived myeloid cells infiltrate the brain in all individuals examined and can comprise a large fraction of the microglial pool with age. Cohort-level analysis further revealed a protective association between most forms of clonal hematopoiesis and Alzheimer's disease, directly complementing my ongoing postdoctoral work on CHIP and microglial states in the aging brain.

- Belk JA, Zhang Y, Reilly EE, Shi Q, Liu DD, Womack-Gambrel N, Linde M, Ma L, **Paul D**, Enciso AM, Kalluru R, Weiss J, Li R, Eastman AE, Zhu C, Chakravarthy A, Bukhari S, Bhattacharya D, Raj S, Richard D, Brioschi S, Chrostek MR, Nachun D, Arends CM, Gopakumar J, Tengesdal IW, Bynum A, Mitchell S, Sandor K, Zhang W, Vardarajan B, Cobos I, Born DE, West RB, Brunet A, Colonna M, Bharani KL, Vogel H, Montine TJ, Latimer CS, Weissman IL, Matusiak M, Hooper JE, Keene CD, Chang HY, Jaiswal S. (2026) Somatic mutations reveal the ontogeny of microglia in human aging. *Nature*. <https://doi.org/10.1038/s41586-026-10939-0> (in press)

2. TGF- β /SMAD3 Signaling and MMP9 Pathways in Drug-Resistant Epilepsy

My doctoral research characterized aberrant TGF- β /SMAD3 signaling and its interaction with MMP9 in hippocampal sclerosis (MTLE-HS) using human neurosurgical brain tissue. This work identified potential molecular biomarkers relevant to epileptogenesis and surgical prognosis.

- **Paul D**, Dixit AB, Srivastava A, Tripathi A, Prakash D, Sarkar C, Ramanujam B, Banerjee J, Chandra PS (2018) Altered TGF- β /SMAD3 signaling in patients with hippocampal sclerosis. *Epilepsy Research*, 146:144–150. PMID: 30153648, <https://doi.org/10.1016/j.epilepsyres.2018.08.004>
- **Paul D**, Srivastava A, Banerjee J, Tripathi M, Doddamani R, Lalwani S, Siraj F, Sharma MC, Chandra PS, Dixit AB. (2023) Exploring the role of MMP9 and its association with TGF β signaling in MTLE-HS. *bioRxiv*. <https://doi.org/10.1101/2023.07.22.550041> (Preprint)

3. ATF3 and Transcriptional Dysregulation in Temporal Lobe Epilepsy

I identified Altered expression of Activating Transcription Factor 3 (ATF3) in hippocampal tissue from MTLE-HS patients, extending the molecular landscape of transcriptional dysregulation in drug-resistant epilepsy.

- **Paul D**, Dixit AB, Srivastava A, Banerjee J, Tripathi M, Suman P, Doddamani R, Lalwani S, Siraj F, Sharma MC, Chandra PS, Singh RK (2022) Altered expression of ATF3 in the hippocampus of patients with MTLE-HS. *International Journal of Neuroscience*, 134(3):267–273. PMID: 35822277, <https://doi.org/10.1080/00207454.2022.2100777>

4. Human Brain Tissue–Based Translational Neuroscience

At AIIMS, New Delhi, I worked in a multidisciplinary team with neurosurgeons, neurologists, and neuropathologists to process region-specific human cortical and hippocampal tissue for molecular profiling. I contributed to multi-omic studies integrating DNA methylation and RNA sequencing in focal cortical dysplasia and hippocampal sclerosis.

- Dixit AB, Srivastava A, Sharma D, Tripathi M, **Paul D**, Lalwani S, Doddamani R, Sharma MC, Banerjee J, Chandra PS. (2020) Integrated genome-wide DNA methylation and RNAseq in hippocampal sclerosis. *Neurology India*, 68:307–13. PMID: 32189710, <https://doi.org/10.4103/0028-3886.280649>
- Srivastava A, Dixit AB, **Paul D**, Tripathi M, Sarkar C, Chandra PS, Banerjee B (2017) Cytokine/chemokine regulatory networks in hippocampal sclerosis and focal cortical dysplasia. *Scientific Reports*, 7:15904. PMID: 29162878, <https://doi.org/10.1038/s41598-017-16041-w>