Jaskaran Singh

Neuroscience PhD Candidate

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Profile

Neuroscience researcher investigating amyotrophic lateral sclerosis (ALS) with **multi-omic data integration, CRISPR/Cas9 zebrafish models, and single-cell transcriptomics**. Experienced in **high-throughput data analysis** (Single-cell RNA, ATAC-seq & Hi-C), molecular cloning, and **developing automated image-analysis** pipelines. Great presentation, writing and scientific study-design skills with **3 high impact peer-reviewed publications** (4 in review and process) and secured **>CAD 66k** in competitive fellowships and trainee awards.

Education

Ph.D. Biology (Neuroscience)

Oct 2021 – Present

Institut national de la recherche scientifique, Quebec

Thesis: Deciphering multifactorial mechanisms of ALS

Integrated BS-MS (Biology Majors)

2015 – 2020

Indian Institute of Science Education & Research, Mohali

CPI 8.2/10 • Master's thesis: Zebrafish brain regeneration

- Completed two-year interdisciplinary core in **Physics** (Mechanics, EM, Thermodynamics), **Chemistry** (Organic/Physical, Quantum), **Mathematics** (Group Theory, Probability & Statistics), and **Interdisciplinary Sciences** (Python, Electronics) before specialising in **Biology**.

Work Experience (Highlights)

Led more than 8 research projects spanning **Computational Biology** to **Regeneration**, **Neurodegeneration** and **Developmental Neurobiology** using cellular and animal models (***C. elegans***, ***Drosophila*** and ***Zebrafish***).

Gene X regulates DNA-damage-driven cerebellar degeneration in ALS

Doctoral project • INRS, Patten Lab

- Identified Gene X as a mediator of DNA Damage and repair in C9orf72-ALS zebrafish
- Rescue of cerebellar neurodegeneration via *in vivo* Gene X mRNA over-expression
- Integrated scRNA-seq, CRISPR knockouts, Image analysis and Behavioural assays

Toll-like-receptor "X" as chromatin gatekeeper in ALS

Doctoral project • INRS, Patten Lab

- Elucidated TLR 'X' as a pivotal regulator of neuromuscular pathology using iPSC-MNs, pharmacological and genetic zebrafish models
- Multi-omic (ATAC-seq & Hi-C) data generation and analysis revealed TLR"X"-dependent chromatin landscape changes in ALS

Skills

</> Computational

Python (NumPy, Matplotlib, Pandas, Cooler), **R** (tidyverse, edgeR, DiffBind, ChIPseeker, clusterProfiler), **MATLAB**, **command line tools** (Cutadapt, MultiQC, Bowtie2, Picard, SAMtools/BCFtools, deepTools, BEDTools, MACS2, MEME-ChIP)

Laboratory Techniques

CRISPR Knockout | Microinjection | Cryosectioning | Genotyping | Immunohistochemistry | Western Blotting | Single-cell omics | Confocal microscopy | Zebrafish behavioural assays | Zebrafish Brain dissection

Languages

English (Fluent) | Punjabi (Native) | Hindi (Native) | French (Beginner)

Management & Collaboration

- **Collaborated with an international**, cross-disciplinary team of **clinicians, geneticists, bioinformaticians, statisticians, and basic scientists**, on a high-impact translational study (EIPR1 project; in revision at Brain).
- Spearheaded the project and **managed an international collaboration with computational biologists** to decipher the changes in chromatin organisation by loss of TLR "X" signalling in ALS.
- **Developed the NMJ Analyser** program and coordinated its adoption by external groups, accelerating neuromuscular-junction screening in drug-discovery pipelines.

Grants & Honours

- **FRQS Doctoral Fellowship** - Province-wide top-tier doctoral scholarship
- **Rising-Star Trainee Award** in ALS research (Awarded 2 times) - Brain Canada Foundation
- **Armand-Frappier Doctoral Scholarship** - Fondation Armand-Frappier
- **Cermo-FC Doctoral Scholarship** - Center of Excellence in Research on Orphan Diseases
- **INSPIRE Scholarship** for Higher Education - Awarded to Top 1 percentile students nationwide

Teaching & Supervision

- Supervised summer interns (McGill & UdeM undergraduates), 2023–24
- Teaching Assistant – Biology Lab, IISER Mohali (2020)
- Mentor, 'Apprentis chercheurs' Program, INRS (Mentored 6 high school students)

Notable Accomplishments

- Granted Travel Award to present in a scientific meeting by International Brain Research Organisation
- Granted Travel Award to present in a scientific meeting by Fondation Armand Frappier
- Invited attendee – NMD4C Summer School
- Top-62 All-India Rank – Council of Scientific & Industrial Research-NET

Publications

Published

1. **Singh, Jaskaran**, Y. E. Pan, and S. A. Patten, "Nmj analyser: A novel method to quantify neuromuscular junction morphology in zebrafish," *Bioinformatics*, vol. 39, no. 12, btad720, 2023.
2. **Singh, Jaskaran** and S.A. Patten, "Modeling neuromuscular diseases in zebrafish," *Frontiers in Molecular Neuroscience*, vol. 15, p. 1054573, 2022.
3. M. Breuer, M. Rummler, **Singh, Jaskaran**, S. Maher, P. Jamadagni, C. Zaouter, N. Pilon, B. M. Willie, and S. A. Patten, "Chd7 regulates craniofacial cartilage development via controlling htr2b expression," *Journal of Bone and Mineral Research*, 2024.

In Review/Process

1. **Singh, Jaskaran**, L. Lescouzères, C. Zaouter, M. Chaineau, G. Haghi, T. M. Durcan, and S. A. Patten., "X gene is a critical mediator of DNA damage and subsequent cerebellar neuronal loss in c9orf72 ALS," (In Review), 2025.
2. **Singh, Jaskaran**, L. Lescouzères, M. Lal, M. Chaineau, G. Haghi, T. M. Durcan, K. S. Sandhu, and S. A. Patten., "TLR"X" maintains the neuromuscular system and chromatin landscape around genes central to ALS," (In Process), 2025.
3. S. Ghosh, **Singh, Jaskaran**, N.S. Damseh, M. Severino, L. Faivre, J. Heitz, A.-S. Denommé-Pichon, A. E. Golding, R. D. Pace, M. Jarnik, B. Abu-Libdeh, H. Lochmuller, H. M. Shaked, J. E. Neil, G. Mochida, S. Edvardson, O. Elpeleg, S. A. Patten, and J. S. Bonifacino., "Homozygous missense variants in eipr1 cause a neurodevelopmental disorder linked to defective endosomal recycling," In Revision (Brain, Oxford Academic), 2025.
4. M. Breuer, G. Fortier, **Singh, Jaskaran**, B. Kassa, P. Jamadagni, C. Zaouter, and S. A. Patten., "Chd7 regulates lipid metabolism and swim bladder inflation in zebrafish," (In Review), 2025.

Key Conference Presentations

- 18th International Zebrafish Conference, Kyoto, 2024
- 35th Int. Symposium on ALS/MND, Montréal, 2024
- ALS Canada Research Forum, Toronto, 2024
- 16th Zebrafish Disease Model Conference, Durham, 2023

Scientific Outreach

- Volunteered at 17th International Zebrafish Conference
- Volunteered at Scientific Foundation Day, IISER Mohali
- Member of Neuromuscular Disease Network for Canada (NMD4C)

Contributions to Society

- Organised **Blood Donation Camps**
- Organized **free food events (Langar)** for under-privileged people in Mohali, India
- Wrote and acted in a short film exploring the sensitive issues of **transgender inequality** and **caste discrimination** in India
- Volunteered for **science communication** in local schools

References

Prof. Kessen Patten • INRS, Canada
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Prof. Rajesh Ramachandran • IISER Mohali, India
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