RACHEL EDGAR

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RESEARCH INTERESTS

My research leverages genomic, epigenomic, and transcriptomic data to investigate immune-mediated diseases in humans. I focus on individual cell types and cellular systems, using computational biology to understand their variation and impact on disease mechanisms.

EDUCATION

Ph.D - BIOLOGICAL SCIENCE; EMBL-EBI 2018-2022

University of Cambridge

Thesis – Multiomics Of The Human Gut Toward Insight Into Childhood Inflammatory Bowel Disease Pathogenesis

Supervisors - Drs. Daniel Zerbino and Paul Flicek

M.Sc. - FACULTY OF SCIENCE; GENOME SCIENCE AND TECHNOLOGY 2012-2014

University of British Columbia

Thesis – Meta-analysis of Human DNA Methylation Data

Supervisor – Dr. Paul Pavlidis

B.Sc. - HONOURS SPECIALIZATION IN GENETICS 2008-2012

University of Western Ontario

Fourth Year Thesis- Using the Mouse Diversity Genotyping Array to compare the burden and nature of somatic mutations in the cerebellum of harlequin mice

Supervisor – Dr. Kathleen Hill

WORK EXPERIENCE

Postdoctoral Fellow – MacParland and Bader Labs 2022-Present

University Health Network - University of Toronto

Research Focus – Single-cell gene expression of human liver

- Creation of an atlas of the healthy human pediatric liver
- Prediction of transplant outcomes from liver single-cell RNAseq

Research Assistant – Kobor Lab 2014-2018

Centre for Molecular Medicine and Therapeutics - University of British Columbia

Research Focus –Human epigenetics using array technology (450K)

- Investigating the use of blood as surrogate for brain tissue in epigenetics
- Performing EWAS on early life social status and DNA methylation

FUNDING

Operating Funding

Chan Zuckerberg Initiative Pediatrics and Ancestry Networks for the HCA Next Generation Researcher Pilot Projects program — Nov. 2023

Funded as Principal Investigator
Co-investigators: Gary Bader; Sonya MacParland
Title: Impact of sample processing on liver resident immune cells
Value: **$19,320 (USD)** over 1 year

Fellowships

CIHR Fellowship (Postdoctoral) — Apr. 2025

Value: **$210,000 (CAD)** over 3 years

Ajmera Transplant Centre Research Fellowship (Postdoctoral) — May. 2024

Value: **$20,000 (CAD)** over 1 year

CanHepC Trainee fellowship (Postdoctoral) — Sept. 2022

Value: **$80,000 (CAD)** over 2 years

TEACHING AND MENTORING

- Lecturer for Compute Ontario Summer School — June 2025
- Guest lecturer for University of Toronto's Molecular Genetics course Advanced 'omics methods, paired analysis principles, and their applications — Apr., 2025
- Guest lecturer for University of Toronto's Cell and Engineering Approaches to Preserve and Rejuvenate Organs Research Day — Apr., 2025
- Guest lecturer University of Toronto Regenerative Medicine program — Feb., 2025
- Teaching assistant for Canadian Bioinformatics Workshop - Single Cell RNA-seq Analysis — 2023- 2024
- Guest lecturer for University of Toronto's Department of Laboratory Medicine and Pathobiology Research Day — Apr, 2024
- Guest lecturer for University of Toronto's Cell and Engineering Approaches to Preserve and Rejuvenate Organs Research Day — Apr., 2024
- Instructor for the EMBL International PhD Programme Basic Training Module — Oct., 2019
- Instructor for the EMBL International PhD Programme 2nd year course — Nov., 2019

PUBLICATIONS

Preprints

Edgar RD*, Nakib D*, Camat*, Chung S, Lumanto P, Atif J, Perciani CT, Ma XZ, Thoeni C, Selvakumaran N, Manuel J, Sayed B, Huysentruyt K, Ricciuto A, McGilvray I, Avitzur Y, Bader GD and MacParland SA. A Single-Cell Atlas Of Human Pediatric Liver Reveals Age-Related Hepatic Gene Signatures. bioRxiv, April 2025

Peer Reviewed - First Author

**Equal contributions*

Dennison TW*, **Edgar RD***, Payne F* Nayak K, Ross ADB, Cenier A, Glemas C, Giachero F, Foster A, Harris R, Kraiczy J, Salvestrini C, Stavrou G, Torrente F, Brook K, Trayers C, Elmentaite R, Youssef G, Tel B, Winton DJ, Skoufou-Papoutsaki N, Adler S, Buffler P, Azabdaftari A, Jenke A, Natasha G, Thomas N, Miele E, Al-Mohammad A, Guarda G, Kugathasan S, Venkateswaran S, Clatworthy MR, Castro-Dopico T, Suchanek O, Strisciuglio C, Gasparetto M, Lee S, Xu X, Han N, Zerbino DR, Teichmann SA, Nys J, Heuschkel R, Perrone F and Zilbauer M. Patient derived organoid biobank identifies epigenetic dysregulation of intestinal epithelial MHC-I as a novel mechanism in severe Crohn's Disease. *Gut.* 2024; Online First.

Edgar RD*, Perrone F*, Foster AR, Payne F, Lewis S, Nayak KM, Kraiczy J, Cenier A, Torrente F, Salvestrini C, Heuschkel R, Hensel KO, Harris R, Jones DL, Zerbino DR* and Zilbauer M*. Culture Associated DNA Methylation Changes Impact on Cellular Function of Human Intestinal Organoids. *Cellular and Molecular Gastroenterology and Hepatology*. 2022; 14(6):1295-1310

Edgar RD, Jones MJ, Meaney MJ, Turecki G and Kobor MS. BECon: a tool for interpreting DNA methylation findings from blood in the context of brain. *Translational Psychiatry*. 2017; 7:e1187

Edgar RD, Jones MJ, Robinson WP and Kobor MS. An empirically driven data reduction method on the human 450K methylation array to remove tissue specific non-variable CpGs. *Clinical Epigenetics*. 2017; 9:11

Edgar R, Tan PPC, Portales-Casamar E, Pavlidis P. Meta-analysis of human methylomes reveals stably methylated sequences surrounding CpG islands associated with high gene expression. *Epigenetics and Chromatin*. 2014; 7(1):28

Peer Reviewed - Contributing Author

Ryan CP, Jones MJ, **Edgar RD**, Lee NR, Kobor MS, McDade TW, Kuzawa CW. Immune cell type and DNA methylation vary with reproductive status in women: possible pathways for costs of reproduction. *Evolution, Medicine & Public Health*. 2022; 10(1):47-58

Hüls A, Robins C, Conneely KN, **Edgar R**, De Jagerg PL, Bennett DA, Wingo AP, Epstein MP, Wingo TS. Brain DNA Methylation Patterns in CLDN5 Associated With Cognitive Decline. *Biological Psychiatry*. 2022; 91(4):389-398

Shannon CP, Blimkie TM, Ben-Othman R, Gladish N, Amenyogbe N, Drissler S, **Edgar RD**, Chan Q, Krajden M, Foster LJ, Kobor MS, Mohn WW, Brinkman RR, Le Cao KA, Scheuermann RH, Tebbutt SJ, Hancock REW, Koff WC, Kollmann TR, Sadarangani M, Lee AH. Multi-Omic Data Integration Allows Baseline Immune Signatures to Predict Hepatitis B Vaccine Response in a Small Cohort. *Frontiers in Immunology*. 2020; doi: 10.3389/fimmu.2020.578801

Ben-Othman R, Cai B, Liu AC, Varankovich N, He D, Blimkie TM, Lee AH, Gill EE, Novotny M, Aevermann B, Drissler S, Shannon CP, McCann S, Marty K, Bjornson G, **Edgar RD**, Lin DTS, Gladish N, MacIsaac J, Amenyogbe N, Chan Q, Llibre A, Collin J, Landais E, Le K, Reiss SM, Koff WC, Havenar-Daughton C, Heran M, Sangha B, Walt D, Krajden M, Crotty S, Sok D, Briney B, Burton DR, Duffy D, Foster LJ, Mohn WW, Kobor MS, Tebbutt SJ,

Brinkman RR, Scheuermann RH, Hancock REW, Kollmann TR, Sadarangani M. Systems Biology Methods Applied to Blood and Tissue for a Comprehensive Analysis of Immune Response to Hepatitis B Vaccine in Adults. *Frontiers in Immunology.* 2020; doi: 10.3389/fimmu.2020.580373

Gasparetto M, Payne F, Nayak K, Kraiczy J, Glemas C, Philip-McKenzie Y, Ross A, **Edgar RD**, Zerbino DR, Salvestrini C, Torrente F, Ventham NT, Kalla R, Satsangi J, Sarkies P, Heuschkel R, Zilbauer M. Transcription and DNA Methylation patterns of blood derived CD8+ T cells are associated with age and Inflammatory Bowel Disease but do not predict prognosis. *Gastroenterology*. 2020; doi: 10.1053/j.gastro.2020.08.017

McEwen LM, O'Donnell KJ, McGill MG, **Edgar RD,** Jones MJ, MacIsaac JM, Lin DTS, Ramadori K, Morin A, Gladish N, Garg E, Unternaehrer E, Pokhvisneva I, Karnani N, Kee MZL, Klengel T, Adler NE, Barr RG, Letourneau N, Giesbrecht GF, Reynolds JN, Czamara D, Armstrong JM, Essex MJ, de Weerth C, Beijers R, Tollenaar MS , Bradley B, Jovanovic T, Ressler KJ, Steiner M, Entringer S, Wadhwa PD, Buss C, Bush NR, Binder EB, Boyce WT, Meaney MJ, Horvath S & Kobor MS. The PedBE clock accurately estimates DNA methylation age in pediatric buccal cells. *PNAS*. 2019; doi: 10.1073/pnas.1820843116

Bush NR, **Edgar RD**, Park M, MacIsaac JL, McEwen LM, Adler NE, Essex M, Kobor MS and Boyce WT. The Biological Embedding of Early Life Socioeconomic and Family Adversity in Children's Genome-wide DNA Methylation. *Epigenomics*. 2018; 10(11):1445-1461

McEwen LM, Jones MJ, Lin DTS, **Edgar RD**, Husquin LT, MacIsaac JL, Ramadori KE, Morin AM, Rider CF, Carlsten C, Quintana-Murci L, Horvath S, and Kobor MS. Systematic evaluation of DNA methylation age estimation with common preprocessing methods and the Infinium MethylationEPIC BeadChip array. *Clinical Epigenetics*. 2018; 10:123

O'Donnell KJ, Glover V, Lahti J, Lahti M, **Edgar RD**, Räikkönen K, O'Connor TG. Maternal prenatal anxiety and child COMT genotype predict working memory and symptoms of ADHD. *PLOS One*. 2017; 12:6

McEwen LM, Morin AM, **Edgar RD**, MacIsaac JL, Jones MJ, Dow WH, Rosero-Bixby L, Kobor MS, Rehkopf DH. Differential DNA methylation and lymphocyte proportions in a Costa Rican high longevity region. *Epigenetics Chromatin*. 2017; 10:21

Portales-Casamar E, Lussier AA, Jones MJ, MacIsaac JL, **Edgar RD**, Mah SM, Barhdadi A, Provost S, Lemieux-Perreault LP, Cynader MS, Chudley AE, Dubé MP, Reynolds JN, Pavlidis P, Kobor MS. DNA methylation signature of human fetal alcohol spectrum disorder. *Epigenetics & Chromatin*. 2016; 9(1):25

Reviews and Opinion Pieces

Atif J, Udhesister STP, Abdelnabi MN, D'Souza S, Hung JH, **Edgar RD**, Gobran, ST, Gomez-Escobar, E, Greenwald, ZR, Gallardo-Flores, CE, Fontaine, G, Jeong, D, Lanice-Delaunay, C, Lawton, D, Makuza, JD, Masterman, C, Marathe, G, Mortazhejri, S, Li, J, Palmer, M, Passos-Castilho, AM, Sag, M, Shengir, M, Wallace, HL, Mendlowitz, AB. Impacts of the COVID-19 pandemic on hepatitis C elimination in Canada: Where do we go from here? Canadian Liver Journal. 2022; 5(4): 441-444

Book Chapters

Jones MJ, Islam SA, **Edgar RD**, Kobor MS. Adjusting for Cell Type Composition in DNA Methylation Data Using a Regression-Based Approach. *Methods Mol Biol Clifton NJ*. 2015; v:1589

INVITED TALKS

BBS Seminar Series - McMaster University Seminar Series McMaster University	Oct., 2024
New Single Cell & Spatial Assays and Updates in High-Throughput Sequencing Applications at Princess Margaret Genomics Centre	May, 2024
Primary Sclerosing Cholangitis Partner Canada Conference	Oct., 2023
Canadian Institute for Advanced Research - Child & Brain Development	Feb., 2016
Graduate Student and Post Doctoral Fellow Society Workshop	Nov., 2015

CONFERENCE PRESENTATIONS

Ajmera Research Day	Oral presentation	May, 2025
The International Conference on Intelligent Systems for Molecular Biology (ISMB)	Poster presentation	July., 2024
Canadian Liver Meeting	Oral presentation	Mar., 2024
CZI Single-Cell Biology 2023 Annual Meeting	Poster presentation	Nov., 2023
American Association for the Study of Liver Diseases: The Liver Meeting	Poster presentation	Nov., 2023
Canadian Liver Meeting	Poster presentation	Mar., 2023
Canadian Conference on Epigenetics	Poster presentation	Nov., 2021
Wellcome Genome: Epigenomics of Common Disease	Poster presentation	Nov., 2020
EMBO-EMBL Multiomics to Mechanisms Symposium	Poster presentation	Sep., 2019
Canadian Human and Statistical Genetics Meeting	Poster presentation	June, 2018
Wellcome Genome: Epigenomics of Common Diseases	Poster presentation	Nov., 2016
AllerGen's Research Conference	Poster presentation	May, 2016
Canadian Human and Statistical Genetics Meeting	Poster presentation	April, 2015
Canadian Human and Statistical Genetics Meeting	Oral presentation	May, 2014
GSAT/BTP/IOP Retreat	Oral presentation	Mar., 2014
Vancouver Bioinformatics Users Group (VanBUG) Holiday Social	Oral presentation	Dec., 2013
Centre for High-throughput Biology Annual Retreat	Poster presentation	Oct., 2013

SELECTED HONOURS AND AWARDS

EBI PhD Student Seminars Day - Best 4th Year Presentation	June 2022
EBI PhD Student Seminars Day - Best 2nd Year Presentation	Mar. 2019
UBC Science Co-op Supervisor Recognition Award	Dec., 2018
AllerGen Travel Award	Nov., 2016

AllerGen Research Skills Award	June, 2015
Graduation with Distinction, B.Sc	April, 2012
Dean's Honours List, Western Scholars	2009-2011

SERVICE AND OUTREACH ACTIVITIES

Program Committee Member ISMB/ECCB	Feb. 2025
Presentation judge for University of Toronto's Regenerative Medicine Research Day	April 2024
Organized the Panoramics Xenium Symposium	April 2024
Events manager for Panoramics - a pan-Canadian collaborative working cluster	Jan. 2023
Panelist for a University of Toronto Immunology Department IMMspire career panel	April 2023
Arranged a PhD seminar series for EMBL-EBI predoctoral students	2019 -2020

PEER REVIEWER

Pacific Symposium on Biocomputing
Two manuscripts
2025 Precision Medicine Session

Intelligent Systems for Molecular Biology
Six manuscripts
2025 General Computational Biology Track

Frontiers in Endocrinology Bioinfomatics EMBO reports Genome Medicine