Mirazul Islam, PhD

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Website: https://mirazul302.github.io/

Innovative cancer biologist with expertise in cancer genomics, stem cells, and single-cell multi-omics. Proven track record in developing single-cell lineage-tracing and CRISPR screening platforms, identifying novel stem cell populations, and uncovering mechanisms of cancer evolution. Committed to addressing fundamental questions in biomedical science through integrative experimental and computational approaches. **My NCI Early K99/R00 received strong score, while waiting for funding decision.**

Education and Training

- **Vanderbilt University Medical Center** – Nashville, TN
  NIH T32 Postdoctoral Fellow (Oct 2024–Present)
- **Vanderbilt University** – Nashville, TN
  PhD in Cell and Developmental Biology (Aug 2019–Sept 2024)
  Thesis title: Recording mammalian development, regeneration, and tumorigenesis at single-cell resolution. Committee: Drs. James Goldenring, Ian Macara, Christopher Wright, Omer Yilmaz
- **University of Michigan** – Ann Arbor, MI
  Graduate Student in Pathology (July 2018–July 2019)
- **University of Malaya** – Kuala Lumpur, Malaysia
  MS in Medical Science (Sept 2014–June 2016)
- **University of Dhaka** – Dhaka, Bangladesh
  BS in Biochemistry and Molecular Biology (Jan 2010–Mar 2014)

Research Interests

Intestinal biology, stem cell, developmental biology, cancer biology, single-cell technologies

Academic Research Experience

Vanderbilt University Medical Center – Nashville, TN
NIH T32 Postdoctoral Fellow (Robert Coffey's Lab) (Oct 2024–Present)

- Identified and validated a novel intestinal stem cell population (**pISCs**) in murine model
- Discovered a novel class of proteins that regulate cellular quiescence in intestine
- Deciphered the clonal dynamics of mammalian intestinal epithelium in homeostasis and regeneration

Vanderbilt University – Nashville, TN
PhD in Cell and Developmental Biology (Ken Lau's Lab) (Aug 2019–Sept 2024)

- Developed **NSC-seq**, a single-cell multi-modal platform for lineage recording
- Designed a '**molecular clock**' approach to record temporal events *in vivo* using CRISPR
- Revealed the clonal origin of human colonic precancers and their transition to malignancy

Broad Institute of MIT and Harvard & Dana-Farber Cancer Institute – Cambridge, MA
Research Technician (Adam Bass's Lab) (July 2016–June 2018)

- Analyzed genomic alterations in cancer patients as part of The Cancer Genome Atlas (TCGA)
- Performed gene expression profiling to characterize novel esophageal stem/progenitor cells
- Identified WRN as a **synthetic lethal** target in MSI cancers using CRISPR screen

Other Research Experiences:

- **University of Michigan** – Generated CRISPR-barcoded cell lines for lineage tracking

- **German Cancer Research Center (DKFZ)** – Developed methods for integrating DNA methylation & gene expression
- **University of Malaya** – Studied cytokine expression profiling in AML patients
- **Children's Hospital Los Angeles** – Retrospective analysis of AML treatment outcomes
- **Lawrence Berkeley National Laboratory-** CRISPR-Cas9 system-based gene knockout
- **Academia Sinica (Taiwan)-** Role of MLL-GAS7 onco-fusion protein in AML

Publications

Research Articles:

1. **Islam M**, Yang Y, Simmons AJ, Shah VM, Pavan MK, Xu Y, Tasneem N, Chen Z, Trinh LT, Molina P, Ramirez-Solano MA, Sadien I, Dou J, Chen K, Magnuson MA, Rathmell J, Macara IG, Winton DJ, Liu Q, Zafar H, Kalhor R, Church GM, Shrubsole MJ, Coffey RJ#, Lau KS#. Temporal recording of mammalian development and precancer. ***Nature***, 634, 1187–1195, 2024

2. **Islam M**, Yang Y, Simmons AJ, Xu Y, Fisher EL, Deng W, Grieb BC, Molina P, Caestecker CD, Ramirez-Solano MA, Liu Q, Tansey WP, Macara IG, Rathmell JC, Coffey RJ, Lau KS#. *Scalable single-cell pooled CRISPR screens with knockout vector libraries*. ***BioRxiv*** 2024. (*Under review in Nature Biotechnology*)

3. **Islam M**, Bechard M, Yang Y, Simmons AJ, Xu Y, Higginbotham J, Zhao P, Cao Z, Tasneem N, Glass S, Markham N, Revetta R, Ramirez M, Liu Q, Franklin J, Lau KS#, Coffey RJ#. Unbiased recording of clonal potency reveals species-specific regulation of mammalian intestine. ***BioRxiv*** 2025. (*Under review in Cell*)

4. Duronio GN, Liang X, Hebbar P, **Islam M**, Spisak, S, Sethi, N#. Truncating SOX9 alterations are heterozygous null alleles in genome stable colorectal cancer. ***Gastro Hep Advances***, 1(5), 709-713, 2022
5. Chen B*, Scurrah C*, McKinley ET, Simmons AJ, Ramirez-Solano MA, Zhu X, Markham NO, Heiser CN, Vega PN, Rolong A, Kim H, Sheng Q, Drewes JL, Zhou Y, Southard-Smith AN, Xu Y, Ro J, Jones AL, Revetta F, Berry LD, Hiroaki Niitsu, **Islam M**, Pelka K, Hofree M, Chen JH, Sarkizova S, Ng K, Giannakis M, Boland GM, Aguirre AJ, Anderson AC, Rozenblatt-Rosen O, Regev A, Hacohen N, Kawasaki K, Sato T, Goettel JA, Grady WM, Zheng W, Washington MK, Cai Q, Sears CL, Goldenring JR, Franklin JL, Su T, Huh WJ, Vandekar S, Roland JT, Liu Q, Coffey JC#, Shrubsole JM#, Lau KS#. Differential pre-malignant programs and microenvironment chart distinct paths to malignancy in human colorectal polyps. ***Cell***. 184 (26), 6262-6280, 2021
6. Tang Q, Efe G, Chiarella AM, Leung J, Chen M, Yamazoe T, Su Z, Pitarresi JR, Li J, **Islam M**, Karakasheva T, Klein-Szanto AJ, Pan S, Hu J, Natsugoe S, Gu W, Stanger BZ, Wong KK, Diehl JA, Bass AJ, Nakagawa H, Murphy ME, Rustgi AK#. Mutant p53 regulates Survivin to foster lung metastasis. ***Genes & development***. 35 (7-8), 2021
7. Tang Q, Lento A, Suzuki K, Efe G, Karakasheva T, Long A, Giroux V, **Islam M**, Wileyto EP, Klein-Szanto AJ, Nakagawa H, Bass AJ, Rustgi AK#. Rab11-FIP1 mediates epithelial-mesenchymal transition and invasion in esophageal cancer. ***EMBO reports***. 22(2), 2021
8. Sethi N*, Kikuchi O*, McFarland J, Zhang Y,Chung M, Kafker N, **Islam M**, Chakraborty A, Kaelin WG, Bass AJ#. Mutant p53 Induces a Hypoxia Transcriptional Program in Gastric and Esophageal Adenocarcinoma. ***JCI Insight***. 4 (15), August 2019

9. Chan E M*, Shibue T*, McFarland JM, Gaeta B, Ghandi M, Dumont N, Gonzalez A, McPartlan JS, Li T, Zhang Y, Liu JN, Lazaro JB, Gu P, Piett CG, Apffel A, Ali SO, Deasy R, Keskula P, Ng RW, Roberts EA, Reznichenko E, Leung L, Alimova M, Schenone M, **Islam M**, Maruvka YE, Liu Y, Roper J, Raghavan S, Giannakis M, Tseng YY, Nagel ZD, D'Andrea A, Root DE, Boehm JS, Getz G, Chang S, Golub TR, Tsherniak A, Vazquez F#, Bass AJ#. WRN Helicase is a Synthetic Lethal Target in Microsatellite Unstable Cancers. ***Nature***. 568(7753), April 2019
10. Korkut A, Zaidi S, Kanchi RS,...**Islam M**,.…The Cancer Genome Atlas Research Network, Mishra L#, Akbani R#. A Pan-Cancer Analysis Reveals High-Frequency Genetic Alterations in Mediators of Signaling by the TGF-β Superfamily. ***Cell Systems***. 7(4), October 2018
11. McBrayer SK, Mayers JR, DiNatale GJ, Shi DD, Khanal J, Chakraborty AA, Sarosiek KA, Briggs KJ, Robbins AK, Sewastianik T, Shareef SJ, Olenchock BA, Parker SJ, Tateishi K, Spinelli JB, **Islam M**, Haigis MC, Looper RE, Ligon KL, Bernstein BE, Carrasco RD, Cahill DP, Asara JM, Metallo CM, Yennawar NH, Heiden MV, Kaelin WG#. Transaminase inhibition by 2-hydroxyglutarate impairs glutamate biosynthesis and redox homeostasis in glioma. ***Cell***. 175(1), September 2018
12. Liu Y*, Sethi NS*, Hinoue T*, Schneider BG*, Cherniack AD, Vega FS, Seoane JA, Bowlby R, **Islam M**,..., Thorsson V#, Bass AJ#, Laird PW#. Comparative Molecular Analysis of Gastrointestinal Adenocarcinomas. ***Cancer Cell***. 33(4), April 2018
13. Pectasides E*, Stachler MD*, Derks S*, Liu Y*, Maron S*, **Islam M**,..… Bass AJ#, Catenacci DV#. Genomic Heterogeneity as a Barrier to Precision Medicine in Gastroesophageal Adenocarcinoma. ***Cancer Discovery***. 7(11), November 2017
14. **Islam M**#, Mohamed EH, Esa E, Kamaluddin NR, Zain SM, Yusoff YM, Assenov Y, Mohamed Z#, Zakaria Z. Circulating cytokines and small molecules follow distinct expression patterns in acute myeloid leukemia. ***British Journal of Cancer***. 117(10), September 2017
15. Giroux V, Lento AA, **Islam M**, Pitarresi JR, Kharbanda A, Hamilton KE, Whelan KA, Long A, Rhoades B, Tang Q, Nakagawa H, Lengner CJ, Bass AJ, Wileyto EP, Klein-Szanto AJ, Wang TC, Rustgi AK#. Novel long-lived esophageal progenitor cells contribute to homeostasis and regeneration. ***Journal of Clinical Investigation***. 127(6), June 2017
16. **Islam M**, Mohamed Z#, and Assenov Y#. Differential Analysis of Genetic, Epigenetic, and Cytogenetic Abnormalities in AML. ***International Journal of Genomics***. 2913648, June 2017
17. **Islam M**, Akataruzzaman M, and Mahmud Z. Comparative Sequence-Structure Analysis of Aves Insulin. ***Bioinformation***. 11(2), February 2015
18. Aktaruzzaman M, **Islam M**, Mohamed Z, Islam MS, Howlader MMR. Therapeutic efficacy of ivermectin, fenbendazole and albendazole against naturally occurring gastrointestinal nematodiasis infection in Black Bengal Goat of Bangladesh. ***International Journal of Biological Research***. 3 (1), 42-45. 2015
19. Haque ME, Sultana A, Shibib BA, **Islam M**. Antimicrobial, antioxidant and cytotoxic activities of Callistemon citrinus (Curtis) Skeels. ***Dhaka Univ J Pharm Sci.*** 11 (1), 51-4. 2012

Review Articles:

1. **Islam M**, Chen B, Spraggins JM, Kelly RT, Lau KS#. Use of Single Cell-omic Technologies to Study the Gastrointestinal Tract and Diseases, From Single Cell Identities to Patient Features. ***Gastroenterology***, 159 (2), 453-466. 2020
2. **Islam M#**, Mohamed Z#. Computational and pharmacological target of neurovascular unit for drug design and delivery. ***BioMed Research International***. 2015(731292), Oct 2015

3. **Islam M#**. Role of bioinformatics in developing country: Bangladesh. ***Current Trends in Technology & Science***. 2 (1), 160-165. 2013
4. **Islam M**, Kabir Y. Electronic Health Record Database for Modernizing Healthcare and Medical Research in the Perspective of Bangladesh. ***Bang J of Med Sci***. 17 (2), 171-175. 2011

Grants & Fellowships

- NIH T32 Postdoctoral Training Fellowship (Vanderbilt DDRC)
- Deciphering phylodynamics and lineage plasticity in human colon cancer. NIH Director's Early Independence Award (**DP5**) – Under review
- Identifying the genetic and microenvironmental bottlenecks of colorectal precancer-to-cancer progression at single-cell resolution. NCI Early **K99/R00** (scored; waiting for council meeting)
- Foundation grants under review: VICTR, Kids Beating Cancer, Michelson Foundation, Prevent Cancer Foundation, Colorectal Cancer Alliance
- Uncovering gut stem cell populations with unique developmental histories. Wrote the first draft for PI (Ken Lau). Vanderbilt DDRC 2023 (funded)
- Development of CRISPR-based barcoding for temporally tracking of cellular events. Wrote the first draft for PI (Ken Lau). Vanderbilt DDRC 2022 (funded)
- Funding support: GI SPORE and HTAN (Co-PI: Lau and Coffey)

Awards & Honors

- Provost Pathbreaking Discovery Award – Vanderbilt University (2024)
- VICC Graduate Student of the Year – Vanderbilt University (2024)
- Graduate Travel Fellowship, Vanderbilt University (2023)
- Graduate Student Fellowship – University of Michigan (2018)
- Travel Grant for 13th APFP Meeting, Thailand, Bangkok (2016)
- TIGP International Internship Scholarship – Academia Sinica, Taiwan (2015)
- Summer Oncology Fellowship – CHLA, USA (2015)

Invited Talks/Seminars/Journal Clubs:

1. Recording clonal dynamics of mammalian intestinal epithelium. EMBO Workshop: Lineage tracing: Dynamics, cellular memory, and somatic evolution. Spain, September 2025.
2. Species-specific regulation of mouse and human intestinal stem cells. The Epithelial Biology Center Symposium, VUMC, March 2025
3. Clonal dynamics of mammalian intestinal epithelium and tumorigenesis. Broad Institute of MIT and Harvard, January 2025
4. Temporal recording of mammalian development and regeneration. Genome Engineering Seminar Series at Harvard Medical School. December 2024
5. Exploring clonal dynamics in intestinal epithelial regeneration and early cancer. BME Seminar, Johns Hopkins University, September 2024
6. Clonal dynamics of homeostatic and regenerative intestinal epithelium. Rockefeller University, September 2024
7. Exploring clonal dynamics in intestinal epithelial regeneration and early cancer. Systems Biology Seminar, MD Anderson Cancer Center, August 2024
8. Single-cell recording reveals the polyclonal origins of colonic precancers. Vanderbilt-Ingram Cancer Center, annual retreat, 2024
9. Identifying an embryonic revival stem cell population in the intestine through temporal recording of development. Vanderbilt Center for Stem Cell Biology (VCSCB) Symposium, VU, 2024

10. Clonal analysis of intestinal epithelium following irradiation. Epithelial Biology Center, VUMC, 2023
11. Clonal analysis of intestinal tumor supports an oligoclonal model of tumor formation. Program in Developmental Biology, annual retreat, Vanderbilt, 2022
12. Direct sgRNA capture enable whole organism lineage tracking and CRISPR screen at single cell resolution. Cell and Developmental Biology, annual retreat, Vanderbilt, 2022

Conference Proceedings:

1. Islam M, et al. Identifying an embryonic revival stem cell population in the intestine through developmental history recording. 2nd Gastrointestinal Conference. Cancun, **Mexico**, 2024
2. Islam M, et al. Temporal recording of mammalian development and precancer. HTAN and HuBMAP Joint Meeting. Stanford, **CA**, 2024
3. Islam M, et al. Temporal recording of mammalian development and cancer. Single Cell Biology: From Development to Cancer. Keystone, **CO**, 2023
4. Islam M. et al. Native sgRNA capture and sequencing (NSC-seq) reveals tumor formation in Apc (Min/+) mice and in human colorectal cancer is an oligoclonal process. AACR Special Conference on Colorectal Cancer. Portland, **Oregon**, 2022
5. Chen B, Scurrah C, Mckinley E, Islam M, et al. Human Colorectal pre-cancer atlas identifies distinct molecular programs underlying to major subclasses of pre-malignant tumors. Stem Cell and Cancer. IRB Barcelona, **Spain**, 2021
6. Islam M. et al. Circulating cytokines, chemokines, and small molecules follow distinct expression patterns in acute myeloid leukemia. Tumor Immunology and Oncology. **Boston**. 2017
7. Islam M, Mohamed Z, and Assenov Y. Differential analysis of genetic, epigenetic, and cytogenetic abnormalities in AML. The 13th Asia Pacific Federation of Pharmacologist (APFP) Meeting, Bangkok, **Thailand**. February 2016
8. Islam M and Chao SL. N2A Cell Differentiation and GAS7 Expression Analysis. TIGP-IIP Summer Meeting, Taipei, **Taiwan**, May 2015

Academic Service & Professional Memberships

- **Editorial & Reviewing Activities:** *Blood, Blood Advances, Cancer Letters, BMC Cancer, BMC Genomics, International Journal of Genomics*
- **Grant Reviewer:** *MEET2WIN Oncology Partnering Grant, MATWIN, France (2018)*
- **Professional Memberships:** AACR, GSA, AAAS, AHA

Mentorship & Teaching

- **Mentored Undergraduate Students:** Vishal M. Shah (PhD Student, Boston University), Jiawei Wang (MD Student, Australia), Kyla Johnson (Undergrad, Fisk University)
- **Mentored Graduate Students**: Assisted numerous students across Vanderbilt campus to run NSC-seq experiments and data analysis for lineage tracking and CRISPR screen
- **Teaching-Related Experience:** Teach a graduate level course on Biology of Cancer
- **Outreach:** Founder & President of *Voluntary Work for Social Change* (VWSC), an initiative focused on developing quality educational content for high school students.
- **Teaching Interest:** Clonal dynamics of stem cells and development; Mechanism of tissue regeneration; Systems biology; Single-cell multi-omics; Data science

Immigration Status

Permanent Resident (Green Card Holder) – USA

Referees (upon request): Drs. Ken Lau, Robert Coffey, Anil Rustgi, Adam Bass, Omer Yilmaz