Mirazul Islam, PhD

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Education

- **Vanderbilt University Medical Center** – Nashville, TN
  Postdoctoral Fellow (Oct 2024–Present)
- **Vanderbilt University** – Nashville, TN
  PhD in Cell and Developmental Biology (Aug 2019–Sept 2024)
- **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 lineage tracking

Academic Research Experience

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

- Identified and validated a novel intestinal stem cell population (pISCs) in murine model
- Discovered an evolutionary adaptation for mitigating cancer risk in humans

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 and temporal recording
- Revealed the clonal origin of human colonic precancers and their transition to malignancy
- Deciphered the clonal dynamics of mammalian intestinal epithelium in homeostasis and regeneration

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

- Analyzed somatic mutations and copy number alterations in GI cancer patients as part of TCGA
- Performed gene expression profiling to characterize novel esophageal progenitor cells

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-** Role of MLL-GAS7 onco-fusion protein

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 mouse and human intestinal stem cells. ***BioRxiv*** 2025. (*Under review in Nature*)
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#. From single cell identities to patient subtypes: application of single-cell -omic approaches to understand the digestive system in health and disease. ***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

- Deciphering phylodynamics and lineage plasticity in human colon cancer. NIH Director's Early Independence Award (**DP5**) – Under review (2024)
- Identifying the genetic and microenvironmental bottlenecks of colorectal precancer-to-cancer progression at single-cell resolution. NCI Early **K99/R00** – Under review (Feb 2025)
- 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 (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. Clonal dynamics of mammalian intestinal epithelium and tumorigenesis. Broad Institute of MIT and Harvard, January 2025.
2. Temporal recording of mammalian development and regeneration. Genome Engineering Seminar Series at Harvard Medical School. December 2024.
3. Exploring clonal dynamics in intestinal epithelial regeneration and early cancer. BME Seminar at Johns Hopkins University, September 2024.
4. Clonal dynamics of homeostatic and regenerative intestinal epithelium. Rockefeller University, September 2024.
5. Exploring clonal dynamics in intestinal epithelial regeneration and early cancer. Systems Biology Seminar at MD Anderson Cancer Center, August 2024.
6. Single-cell recording reveals the polyclonal origins of colonic precancers. Vanderbilt-Ingram Cancer Center annual retreat, 2024.
7. 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.
8. Clonal analysis of intestinal epithelium following irradiation. Epithelial Biology Center, VUMC, 2023.
9. Clonal analysis of intestinal tumor supports an oligoclonal model of tumor formation. Program in Developmental Biology annual retreat, Vanderbilt, 2022.
10. 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. Published in conference abstract book, ID: P-PG-04
8. Islam M and Chao SL. N2A Cell Differentiation and GAS7 Expression Analysis. TIGP-IIP Summer Meeting, Taipei, **Taiwan**, May 2015
9. Islam M and Ashraf A. Demographic Survey of Antibiotic Use in Bangladesh. Human Genome Meeting and International Congress of Genetics. **Singapore**. April 2013. Published in conference abstract book, Page: 245

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 Students:** Vishal M. Shah (PhD, Boston University), Jiawei Wang (MD Student, Australia), Kyla Johnson (Undergrad, Fisk University)
- **NSC-seq Platform**: Helped trainees to run experiments
- **Teaching & Outreach:** Founder & President, Voluntary Work for Social Change (VWSC)

Immigration Status

Permanent Resident (Green Card Holder) – USA

PhD Thesis Committee

1. Ken Lau (Supervisor)
2. Robert Coffey (Committee member)
3. James R. Goldenring (Committee chair)
4. Ian Macara (Committee member)
5. Christopher V. Wright (Committee member)
6. Omer Yilmaz (External committee member, MIT)

Referees

1. Dr. Ken Lau, PhD (Professor at Vanderbilt University)
2. Dr. Robert Coffey, MD (Professor at Vanderbilt University Medical Center)
3. Dr. Anil Rustgi, MD (Professor at Columbia University)
4. Dr. Adam Bass, MD (Global Head of Oncology at Novartis)
5. Dr. Omer Yilmaz, MD, PhD (Professor at MIT)