

Curriculum Vitae  
**Kathleen Mulvaney**

45 First Ave, Apt 406 • Boston, MA 02129  
(716) 903-3922 • kmulvane@broadinstitute.org

**EDUCATION**

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UNIVERSITY OF NORTH CAROLINA CHAPEL HILL  
CHAPEL HILL, NC  
**PhD in Cell Biology** December 2016

**Dissertation: Proteomic dissection of KEAP1/NRF2 signaling identifies novel pathway interactors**

- Courses in Cell Biology, Biochemistry, Molecular Biology, Cancer Biology and Immunology
- Workshops in Critical Thinking, Grant Writing and Presenting Scientific Research

UNIVERSITY OF ROCHESTER  
ROCHESTER, NY  
**Bachelors of Science in Biology** May 2010

**Concentration in Molecular Genetics with Distinction in Research**

- Advanced coursework in Molecular Biology, Genetics, Biochemistry, Tumor Immunology, Microbiology, Cell Biology, Cognitive Science and Neuroscience

**RESEARCH EXPERIENCE**

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THE BROAD INSTITUTE; DANA FARBER CANCER INST.  
CAMBRIDGE, MA  
**Postdoctoral Fellow with Dr. William (Bill) Sellers** June 2017-Present

- Research focus on targeting protein-protein interactions for therapeutic development in cancer
- Therapeutically targeting PRMT5 on a novel binding interface in pancreatic cancer
- Led a productive team of 2-3 research associates funded by NIH and Deerfield Management support
- Collaborated with the Center for Development of Therapeutics to complete drug discovery project
- Culminated in two research publications and one patent

UNIVERSITY OF NORTH CAROLINA CHAPEL HILL  
CHAPEL HILL, NC  
**Postdoctoral Fellow with Dr. Ben Major** December 2016-May 2017

- Completed screen and manuscript identifying NRF2 interacting proteins and transcriptional regulators

UNIVERSITY OF NORTH CAROLINA CHAPEL HILL  
CHAPEL HILL, NC  
**Graduate Student with Dr. Ben Major** Spring 2011-December 2017

- Research focus on the KEAP1-NRF2 signaling pathway in cancer
- Described a function for KEAP1 in cell cycle regulation through ubiquitylation of MCM3
- Proteomic screening identified novel NRF2 interacting proteins and transcriptional regulators
- Culminated in successful defense of PhD, a first-author paper, a first-author review and three additional manuscripts

DANA FARBER CANCER INSTITUTE, HARVARD UNIVERSITY  
BOSTON, MA  
**Research Assistant with Dr. Alan Engelman** Summer 2009

- Performed ChIP-Sequencing project to determine lens epithelial derived growth factor, LEDGF, binding sites and thereby identify preferential HIV-1 integration sites throughout the genome

UNIVERSITY OF ROCHESTER  
ROCHESTER, NY  
**Lab Assistant with Dr. Shawn Murphy** February 2007 – May 2009

- Research Focus on Diffuse Large B-Cell Lymphoma and expression of MHC Class II and CIITA with the underlying goal of identifying the association between expression levels and patients' immunological responses to DLBCL tumors
- Culminated in writing and successful defense of senior thesis and two co-authored manuscripts

## **PUBLICATIONS**

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1. **Mulvaney, KM**; Blomquist, C; Acharya, N; Li, R; Ranaghan, MJ; O'Keefe, M; Rodriguez, DJ; Young, MJ; Kesar, D; Pal, D; Stokes, M; Nelson, AJ; Jain, SS; Yang, A; Mullin-Bernstein, Z; Columbus, J; Bozal, FK; Skepner, A; Raymond, D; ... Sellers, WR. Molecular basis for substrate recruitment to the PRMT5 methylosome. *Molecular Cell*. 2021, 81(17):17, P3481-3495.
2. McKinney, DC; McMillan, BJ; Ranaghan, MJ; Moroco, JA; Brousseau, M; Mullin-Bernstein, Z; O'Keefe, M; McCarren, P; Mesleh, M; **Mulvaney, KM**; Robinson, F; Singh, R; Bajrami, B; Wagner, FF; Hilgraf, R; Drysdale, MJ; Campbell, AJ; Skepner, A; Timm, DE; Porter, D; Kaushik, VK; Sellers, WR; Ianari, A. Discovery of a First-in-Class Inhibitor of the PRMT5–Substrate Adaptor Interaction. *Journal of Medicinal Chemistry*. 2021, 64 (15), 11148-11168.
3. Song, S; Nguyen, V; Schrank, T; **Mulvaney, KM**; Walter, V.; Wei, D.; Orvis, T.; Desai, N.; Zhang, J.; Hayes, DN; Zheng, Y.; Major, MB; Weissman, B. Loss of SWI/SNF chromatin remodeling alters NRF2 signaling in non-small cell lung carcinoma. *Mol Cancer Res*. 2020, Dec; 18(12):1777-1788.
4. Bowman BM; Montgomery SA Schrank TP, Simon JM, Ptacek TS, Tamir TY, **Mulvaney KM**, Weir SJ, Nguyen TT, Murphy RM, Makowski L, Hayes DN, Chen XL, Randell SH, Weissman BE, Major MB. A conditional mouse expressing an activating mutation in NRF2 displays hyperplasia of the upper gastrointestinal tract and decreased white adipose tissue. *J Pathol*. 2020 Oct;252(2):125-137.
5. **Mulvaney, KM**; Matson, J.; Siesser, P.; Tamir, TY; Goldfarb, D.; Jacobs, T.; Cloer, EW; Cook, JG; Major, MB. Identification and Characterization of MCM3 as a KEAP1 Substrate. *Journal of Biological Chemistry*, 2016 Nov 4; 291(45): 23719–23733.
6. Tamir, TY\*; **Mulvaney, KM\***; Major, MB. Dissecting the Keap1/Nrf2 pathway through proteomics. *Current Opinion in Toxicology*, (\*equal contribution) 2016, 1:118-24.
7. Guntas, G; Lewis, S; **Mulvaney, KM**; Cloer, E; Tripathy, A; Lane, T; Major, MB; Kuhlman, B. Engineering a genetically encoded competitive inhibitor of the KEAP1-NRF2 interaction via structure- based design and phage display. *Protein Eng Des Sel*. 2016 Jan;29(1):1-9.
8. Hast, BE; Goldfarb D\*; **Mulvaney KM\***; Hast MA; Siesser PF; Yan F; Hayes DN; Major MB. Proteomic analysis of ubiquitin ligase KEAP1 reveals associated proteins that inhibit NRF2 ubiquitination. *Cancer Research*. 2013 1;73(7):2199-210. (\*equal contribution)
9. Cycon, KA; **Mulvaney, KM**; Rimsza, LM; Persky, D.; Murphy, SP. Histone deacetylases (HDACs) contribute to the silencing of CIITA expression in DB diffuse large B cell lymphoma. *Immunology*. 2013 Oct; 140(2): 259–272.
10. Bushway, M.; Cycon, KA; **Mulvaney, KM**; Murphy, SP. Coordinate loss of MHC class II expression in the diffuse large B cell lymphoma cell line OCI-Ly2 is due to a novel mutation in RFX-AP. *Immunogenetics*. 2010, 62(2):109-16.

## **PUBLICATIONS IN PROGRESS**

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1. **Mulvaney, KM**; Bozal, FK; Sellers, WR. Monitoring and disrupting cellular PRMT5-substrate adaptor complex formation in in-tact and permeabilized cells using a split luciferase complementation assay. *STAR Protocols, Cell Press*. Manuscript in preparation.
2. Pal, D; Rodriguez, D; Chang, L; Robinson, F; Potter, D; Kesar, D; Li, R; Van Tienen, L; **Mulvaney, KM**; Jung, N; Jain, S; Park, J; Letai, A; Sellers, WR. WSB2 is a novel regulator of the cellular

apoptotic pathway and a therapeutic target in melanoma. Submitted to *Cancer Cell*.

## PROJECTS IN PROGRESS

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1. Identifying mechanisms of resistance and sensitizers to PRMT5 chemical inhibitors using single and digenic CRISPr KO screens.
2. In collaboration with Dr. Eric Fischer: Structurally resolving a full-length methylosome-substrate-substrate adaptor complex by Cryo-EM.

## PATENTS

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1. Arthur Campbell, Martin Drysdale, Robert Hilgraf, Alessandra Ianari, Patrick McCarren, David McKinney, Brian McMillan, **Kathleen Mulvaney**, Dale Porter, William Sellers, Ritu Singh, Florence Wagner. Co-inventor, PCT Application Serial No. PCT/US2021/045016, filed on August 6, 2021 and entitled, "Substrate Adaptor Inhibitors of PRMT5 and Uses Thereof". (inventors listed alphabetically)

## AWARDS

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- NIH F32 Ruth L. Kirschstein Postdoctoral Individual National Research Service Award (2018-2021)
- NIH LRP Award (2019-2021)
- Sigma Xi Research Society Graduate Student Travel Award (2015)
- National Science Foundation Graduate Research Fellowship Honorable Mention (2011, 2012)
- Degree with Distinction in Research: an honor awarded by the University of Rochester (2009)
- National Science Foundation David T. Kearns Scholar (2008-2010)
- Take Five Scholar: Awarded tuition-free fifth year by the University of Rochester to study "Influences on Cognitive and Personality Development" (2009- 2010)
- Academic Competitiveness Grant awarded by New York State (2007- 2008)
- International Baccalaureate Scholar awarded as a four-year merit scholarship (2005- 2009)

## PRESENTATIONS

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### NATIONAL MEETINGS

**FASEB Biological Methylation Conference** **June 2022, Accepted Abstract-Talk**

**AACR Annual Meeting** **April 2022, Accepted Abstract-Poster**

**AACR Annual Meeting** **April 2016**

- Presented "KEAP1 ubiquitinates MCM3 to regulate cell cycle in cancer" poster

**FASEB Ubiquitin Conference** **June 2014**

- Presented "KEAP1 ubiquitinates MCM3" poster to the ubiquitin-proteasome signaling community

### DANA FARBER HARVARD CANCER CENTER

**Mass. General Hospital Postdoc Association Invited Seminar** **February 2022**

- Presented "Drugging Enzymes in Cancer" to a general audience, invited seminar

**Ludwig Meeting Invited Seminar** **July 2021**

- Presented "Resolving substrate recruitment to the PRMT5 methylosome" invited seminar

**Molecular and Cellular Oncology Retreat** **June 2019**

- Awarded Best Poster Presentation: "PRMT5-substrate adaptor interface as a novel therapeutic target in MTAP null tumors"

### BROAD INSTITUTE

**Lunch and Learn** **July 2019**

- Co-led department-wide invited chalk talk: “Opportunities and challenges in following up cancer dependencies: lessons learned from PRMT5 and NXT1”  
UNIVERSITY OF NORTH CAROLINA CHAPEL HILL  
**University Research Day** **March 2015**
- Awarded Best Oral Presentation  
**IMSD Symposium** **November 2014**
- Awarded Best Oral Presentation  
UNIVERSITY OF ROCHESTER  
**Office of Admissions** **December 2008**
- Invited to present regionally to prospective students on undergraduate research opportunities

## **TEACHING EXPERIENCE**

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- HARVARD UNIVERSITY, HARVARD EXTENSION SCHOOL, CAMBRIDGE, MA  
**BIOS E-30 Epigenetics & Gene Regulation**  
**Teaching Assistant and Guest Lecturer** **Fall 2020, Fall 2021**
- Led weekly independent recitation and study sections, guided and graded the writing assignments
  - Teaching 2 lectures per seminar on cancer epigenetics (2021)
- BIOS E-16 Cell Biology**  
**Teaching Assistant** **Spring 2019; Spring 2021**
- Led weekly independent recitation and study sections
  - Guided and graded the writing assignments, problem sets, and exams
- BROAD INSTITUTE, CAMBRIDGE, MA  
**Graduate Student Mentoring** **September 2017-Present**
- Mentoring Harvard BBS students rotating in the lab in critical thinking and scientific research
- Research Associate Mentoring** **June 2017-Present**
- Mentoring and promoting the career development of three post-undergraduate researchers in the lab.
- UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL, NC  
**Science-at-Hand** **October 2014-May 2017**
- Give monthly scientific demonstrations and discuss careers in science with high school students.
- Undergraduate Mentoring** **January 2014- May 2017**
- Mentoring two undergraduate researchers on research projects for credit in the Major Lab.
- First Year Group** **Fall 2014**
- Peer mentor to first year students, advise on lab rotations and giving scientific presentations.
- North Carolina DNA Day** **April 2011; April 2013**
- Taught high school students about pharmacogenomics and encouraged exploring careers in science.
- UNIVERSITY OF ROCHESTER, ROCHESTER, NY  
**Upward Bound Tutoring** **Fall 2009-Spring 2010**
- National initiative to assist high school students from disadvantaged backgrounds enter college
- Refugee Tutoring** **Fall 2008-Spring 2011**

- Program to assist high school, middle school refugees from Turkey and Somalia relocated to the US

**Lab Teaching Assistant, Department of Chemistry**

**Fall 2006**

- Prepared laboratory set-up for general chemistry students and reviewed and graded lab reports.

**LABORATORY TECHNIQUES**

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**PROTEOMICS:** Experience with purification of protein complexes for identification by mass spectrometry (affinity, immunoprecipitation and BioID), isolation and detection of whole cell and targeted post-translational modifications (phosphorylation, ubiquitylation, methylation) by mass spectrometry, and analysis and visualization of mass spectrometry data (MaxQuant, Proteome Discoverer, Skyline, Spotlite, Cytoscape).

**MOLECULAR BIOLOGY & BIOCHEMISTRY:** Experience with mammalian cell culture (primary and immortalized), RNA and DNA isolation, qPCR, RNA-seq, genetic manipulation including CRISPr, cloning and site-directed mutagenesis, flow cytometry, chromatin immunoprecipitation, luciferase reporter assays, drug treatments and viability and proliferation assays, protein expression and purification, Western blotting, fixed and live-cell light and fluorescence microscopy, proximity ligation assays, mouse handling, MEF line derivation, subcutaneous xenografts, recombinant protein purification, size exclusion chromatography, and cellular and *in vitro* binding and ubiquitylation assays.

**GENOMICS, SCREENING AND NEXT-GEN SEQUENCING:** Experience with single and digenic CRISPr knockout screens, small molecule screening, library generation and Illumina sequencing.

**PROFESSIONAL MEMBERSHIPS**

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American Association for Cancer Research (AACR) (2016-present)

American Association for the Advancement of Science (AAAS) (2015-present)

**JOURNAL REVIEWER**

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Molecular Cancer Research (2019-present)