

Updated 01/22/2024

**Blake R. Rushing, PhD**

*Research Assistant Professor, Nutrition Research Institute  
Department of Nutrition  
Department of Pathology and Laboratory Medicine  
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**EDUCATION**

Postdoctoral Research Associate	Nutrition Research Institute, Kannapolis, NC (2019-2020)
Postdoctoral Scholar	East Carolina University, Greenville, NC (2018-2019)
PhD, Pharmacology & Toxicology	East Carolina University, Greenville NC (2018) Dissertation: Detoxification mechanisms to protect against aflatoxin B1-mediated carcinogenesis.
BS, Chemistry	Catawba College, Salisbury, NC (2013). Graduated with honors.

**PROFESSIONAL EXPERIENCE**

***Current***

Research Assistant Professor, Department of Nutrition, Nutrition Research Institute, University of North Carolina, NC (2020-present) – Primary Appointment

Research Assistant Professor, Department of Pathology & Laboratory Medicine (joint appointment), School of Medicine, University of North Carolina, NC (2022-present) – Secondary Appointment

Associate Member, Lineberger Comprehensive Cancer Center, University of North Carolina, Chapel Hill, NC (2023-present)

***Previous***

Postdoctoral Research Associate, Department of Nutrition, Nutrition Research Institute, University of North Carolina, Kannapolis, NC (2019-2020)

Updated 01/22/2024

Postdoctoral Scholar, Department of Microbiology & Immunology, Brody School of Medicine, East Carolina University, Greenville, NC (2018-2019)

Graduate Research Associate, Department of Pharmacology & Toxicology, Brody School of Medicine, East Carolina University, Greenville, NC (2013-2018)

Intern, Department of Pharmacology & Toxicology, Brody School of Medicine, East Carolina University, Greenville, NC (2012).

Intern, Counterterrorism and Forensic Science Research Unit, Federal Bureau of Investigation, Quantico, VA (2011)

Staff scientist, Catawba Analytical Research Laboratory, Catawba College, Salisbury, NC (2010-2013).

## **HONORS AND AWARDS**

Travel Award - 12th International Conference on Complement Therapeutics in Rhodes, Greece, 2019

Best postdoctoral poster presentation award - 20<sup>th</sup> Annual Neuroscience Symposium of the East Carolina Chapter of the Society for Neuroscience, 2018

3rd place - NCSOT Poster Competition Award, 2017

ACS Environmental Chemistry Division Certificate of Merit, 2017

Association of Environmental Health Academic Programs (AEHAP) Student Research Competition Award, 2017

SOT's Frank C. Lu student award (Food Safety Specialty Section), 2017

1st place - oral presentation competition at Research and Creative Achievement Week (ECU), 2016

1st place - NCSOT Graduate Student Platform Presentation Competition, 2016

Graduate and Professional Student Senate (GPSS) travel award, 2015-2016

Supplemental Scholarship of the Foundation for Toxicology and Agromedicine, 2014

Whitener Award Recipient, 2013

The Chemistry Prize, 2012

Gamma Sigma Epsilon Chapter Vice President, 2012-2013

American Chemical Society Chapter President, 2012-2013

Alpha Chi Member, 2011-2013

Junior Marshall, 2011-2012

American Chemical Society Treasurer, 2010-2012

President's List, 2009-2013

Dean's List, 2009-2013

Catawba College Honors Program Participant, 2009-2013

First Family Scholarship Recipient, 2009-2013

## GRANT FUNDING

### Current

#### **UNC Lineberger Special Cancer Research Seed Grant**

Major Goals: This project aims to combine the analysis of human samples and preclinical models of triple negative breast cancer (TNBC) to understand how metabolism is dysregulated in TNBC, and potential metabolic vulnerabilities that arise as a result of this disease. Metabolomic profiling of matched normal breast and triple negative breast cancer tissues will be performed to identify differential metabolic pathways which will be investigated in cell culture models as therapeutic targets. Hits will be validated *in vivo*.

\*Status of Support: Active

Project Number: N/A (internal pilot funds)

Name of PD/PI: Rushing, Blake

Role: Principal Investigator

\*Source of Support: UNC Nutrition Research Institute

\*Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC

Project/Proposal Start and End Date: (MM/YYYY) 08/2023-07/2024

\*Total Award Amount (including Indirect Costs): \$50,000

#### **Metabolomics and Clinical Assays Center**

Major Goals: The goal of the MCAC is to participate in the development of a common protocol for the Nutrition for Precision Health Powered by the All of Us Research Program, and conduct metabolomics and clinical assay analyses. Specifically, my role in this project is leading the untargeted analysis of tens of thousands of human biospecimens and making biological connections between diet, the metabolome, and clinical chemistry profiles. I play a lead role in designing/executing untargeted analysis, controlling sample/data quality, biological interpretations, and training scientists at all levels through multiple national collaborations.

\*Status of Support: Active

Project Number: 1U24CA268153-01

Name of PD/PI: Sumner, Susan

Role: Co-Investigator (untargeted lead)

\*Source of Support: NIH Common Fund/NCI

\*Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC

Project/Proposal Start and End Date: (MM/YYYY) 1/2022-1/2027

\*Total Award Amount (including Indirect Costs): \$19.2M

#### **Human Health Exposure Analysis Resource (HHEAR) Hub**

Major Goals: The goal of this center is to use untargeted methods to assess a wide array of environmental exposures and how they affect an individual's health and wellbeing. Specifically, my role in this project is leading the untargeted analysis of tens

Updated 01/22/2024

of thousands of human biospecimens and making biological connections between exposome, metabolome, and health outcome data. I play a lead role in study designs, data analysis plans, quality control, software development, biological interpretations, and training scientists at all levels through multiple national collaborations.

\*Status of Support: Active

Project Number: 1U2CES03085

Name of PD/PI: Sumner, S; Du, X; Fennell, T

Role: Co-Investigator (untargeted lead)

\*Source of Support: NIH/NIEHS

\*Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC

Project/Proposal Start and End Date: (MM/YYYY) (if available): 09/01/2019-08/31/2024

\* Total Award Amount (including Indirect Costs): \$10.4M

### **Metabolomics of World Trade Center-Lung Injury: Biomarker Validation, Longitudinal Assessment and Dietary Intervention.**

Major Goals: The goal of this project is to take a multi-omics approach to uncover improved methods to diagnose world trade center-lung injury (WTC-LI), uncover predictors of disease prognosis, uncover surveillance markers of treatment response, and detect markers for further disease development. Furthermore, these molecular signatures will be used to develop nutritional interventions for the treatment of WTC-LI.

\*Status of Support: Active

Project Number: 2 U01 OH011300-05

Name of PD/PI: Nolan, Anna

Role: Co-Investigator (PI of UNC subcontract)

\*Source of Support: CDC/NIOSH

\*Primary Place of Performance: NYU Grossman School of Medicine

Project/Proposal Start and End Date: (MM/YYYY) (if available): 07/01/2022 – 06/30/2026

\* Total Award Amount (including Indirect Costs): \$2,1398,500

Pending

### **Creation of the Human Cancer Metabolome Atlas**

Major Goals: The goal of this project is to comprehensively map and understand the intricate metabolic heterogeneity of tumors and its link to tumor genetics. This initiative aims to identify novel biomarkers, therapeutic targets, and metabolic pathways that play critical roles in cancer development and progression, ultimately advancing our knowledge of cancer metabolism and facilitating the development of more effective diagnostic and treatment strategies. Additionally, this will be established as a public resource to the greater cancer research community. Dr. Shankar Subramaniam (MPI) oversees the Metabolomics Workbench which will house all data and provide open-source analysis resources.

Updated 01/22/2024

Activity Code: R01

Role: Principal investigator

Source of support: NIH/NCI

Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC

Status: Scored in 15<sup>th</sup> percentile, impact score 31. Awaiting funding decision.

### **Why is ALDH1L1 downregulated in cancer?**

Major goals: The goal of this proposal is to investigate the role of ALDH1L1 – a major metabolic enzyme directly involved in folate metabolism – as 1) a determinant of tumorigenesis and invasiveness, 2) a metabolic regulator of malignant cell proliferation, and 3) a tool for cancer treatment.

Activity Code: R01

Source of support: NIH/NCI

Role: MPI

Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC

Status: Will be re-submitted June 2024

### **Inter-relationship of bariatric surgery and the microbiome in mitigating obesity-driven endometrial cancer.**

Major goals: The research aims to investigate how bariatric surgery, through altering microbiome and metabolic factors, impact endometrial cancer prevention and treatment with the ultimate goal of improving public health outcomes for this obesity-driven disease. My role as a co-investigator in this project will be to conduct metabolomics analysis and analyze its connection to surgical/microbial interventions.

Activity Code: R01

Source of support: NIH/NCI

Name of PI/PD: Bae-Jump, Victoria

Role: Co-investigator

Primary Place of Performance: UNC-Chapel Hill

Status: Resubmitted (prior score of 43)

### Completed

### **NRI Research Development Award**

Major Goals: The goal of this pilot project is to uncover the relationship between breast cancer metabolism and chemotherapy response using untargeted metabolomics. This information will be used to design novel therapeutic strategies to target resistant/advanced breast cancers with an emphasis on dietary polyphenols, microbiome metabolites, and modulators of folate metabolism.

\*Status of Support: Active

Project Number: N/A (internal pilot funds)

Name of PD/PI: Rushing, Blake

Role: Principal Investigator

\*Source of Support: UNC Nutrition Research Institute

Updated 01/22/2024

\*Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC  
Project/Proposal Start and End Date: (MM/YYYY) 12/2022-11/2023

\*Total Award Amount (including Indirect Costs): \$75,000

### **UNC NORC Pilot and Feasibility (P&F) Award**

Major Goals: The goal of this pilot project is to use multi-omics analyses to understand the metabolic heterogeneity of triple negative breast cancers and the influence of patient metadata/clinical information in tumor metabolotypes. This information will be used to identify precision metabolic targets for triple negative breast cancer therapy.

\*Status of Support: Active

Project Number: P30DK056350 (Pilot & Feasibility Funding).

Name of PD/PI: Rushing, Blake

Role: Principal Investigator

\*Source of Support: NIH/NIDDK

\*Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC  
Project/Proposal Start and End Date: (MM/YYYY) 2/2023-2/2024

\*Total Award Amount (including Indirect Costs): \$10,000

## **SELECTED COMMITTEES AND PROFESSIONAL ORGANIZATIONS**

Triangle Area Mass Spectrometry (TAMS) Discussion Group, 2015-2019

American Chemical Society, 2017-2018

National Environmental Health Association, 2017-2018

Society of Toxicology, 2017-2018

North Carolina Society of Toxicology, 2016-2018

American Society of Mass Spectrometry, 2016-2017

American Association for Cancer Research, 2020-Present

American Society for Pharmacology and Experimental Therapeutics (ASPET), 2021-Present

American Society of Nutrition, 2021- Present

Metabolomics Society, 2021- Present

Diversity, Equity, and Inclusion Committee for the Nutrition Research Institute 2021-2023

Diversity, Equity, and Inclusion Committee for the UNC Nutrition Department, 2021-2023

Bachelor of Science in Public Health (BSPH) committee, 2021-2023

## **BIBLIOGRAPHY (\*denotes students)**

1. You M, Shamseldin HE, Fogle HM, **Rushing BR**, AlMalki RH, Jaafar A, Hashem M, Abdulwahab F, Abdel Rahman AM, Krupenko NI, Alkuraya FS,

- Krupenko SA. Further delineation of the phenotypic and metabolomic profile of ALDH1L2-related neurodevelopmental disorder. *Clin Genet*. 2024 *In Press*.
2. **Rushing BR**, Thessen AE, Soliman G, Armandla R, Sumner S. The exposome and nutritional pharmacology and toxicology. *Exposome*. 2023. *In Press*.
  3. **Rushing BR**. Multi-omics analysis of NCI-60 cell line data reveals novel metabolic processes linked with resistance to alkylating anti-cancer agents. *International Journal of Molecular Sciences*. 2023. 24(17), 13242.
  4. **Rushing BR**, Molina S, Sumner S. Untargeted metabolomics reveals mechanisms of acquired doxorubicin resistance in triple-negative breast cancer cells. *Metabolites*. 2023. 13(7), 865.
  5. Lynch DH<sup>†</sup>, **Rushing BR**<sup>†</sup>, Pathmasiri W, McRitchie S, Batchek DJ, Petersen CL, Gross S, Sumner S, Batsis J. Baseline Serum Biomarkers Predict Response to a Weight Loss Intervention in Older Adults with Obesity: A Pilot Study. *Metabolites*. 2023. 13(7), 853.  
<sup>†</sup>Authors contributed equally to this work
  6. Emily MJ Fennell\*, Lucas J Aponte-Collazo, Wimal Pathmasiri, **Blake R Rushing**, Natalie K Barker, Megan C Partridge, Yuan-Yuan Li, Yoshimi Endo Greer, Laura E Herring, Stan Lipkowitz, Susan Jenkins Sumner, Edwin J Iwanowicz, Lee M Graves. Multi-omics Analyses Reveal ClpP Activators Disrupt Essential Mitochondrial Pathways in Triple-negative Breast Cancer. *Frontiers Pharmacology*. 2023. 14:1136317. doi: 10.3389/fphar.2023.1136317.
  7. Taibli KR, Dunlop AL, Barr DB, Li Y, Eick S, Kannan K, Ryan PB, Schroder M, **Rushing BR**, Fennell T, Chang C, Tan Y, Marsit C, Jones DP, Liang D. Newborn Metabolomic Signatures of Maternal Serum Per- and Polyfluoroalkyl Substance Levels and Reduced Length of Gestation: A Prospective Analysis in the Atlanta African American Maternal-Child Cohort. *Nature Communications*. 2023. 14(1):3120. doi: 10.1038/s41467-023-38710-3.
  8. **Rushing BR**, Wiggs A\*, Molina S, Schroder M, Sumner S. Metabolomics analysis reveals novel targets of chemosensitizing polyphenols and omega-3 polyunsaturated fatty acids in triple negative breast cancer cells. *International Journal of Molecular Sciences* 2023, 24(5):4406. <https://doi.org/10.3390/ijms24054406>
  9. **Rushing BR**, Fogle HM, Sharma J, You M, McCormac JP, Molina S, Sumner S, Krupenko NI, Krupenko SA. Exploratory Metabolomics Underscores the Folate Enzyme ALDH1L1 as a Regulator of Glycine and Methylation

Reactions. *Molecules*. 2022 Dec 1;27(23):8394. doi: 10.3390/molecules27238394. PMID: 36500483; PMCID: PMC9740053.

10. **Rushing, B.R.** †; Tilley, S.\*†; Molina, S.; Schroder, M.; Sumner, S. Commonalities in Metabolic Reprogramming between Tobacco Use and Oral Cancer. *Int. J. Environ. Res. Public Health* 2022, 19, 10261. <https://doi.org/10.3390/ijerph191610261>  
†Authors contributed equally to this work
11. Strom S, McDonald S, Remchak M, Kew K, **Rushing BR**, Houmard J, Tulis D, Pawlak R, Kelley G, Chasan-Taber, Newton E, Isler C, DeVente J, Raper M, May L. 2022. Maternal Aerobic Exercise, But Not Blood DHA, and EPA Concentrations, Influence Infant Body Composition. *Int. J. Environ. Res. Public Health* 2022, 19(14), 8293; <https://doi.org/10.3390/ijerph19148293>
12. Sharma J†, **Rushing BR**†, Hall M, Helke K, McRitchie S, Krupenko N, Sumner S, Krupenko S. 2022. Sex-specific metabolic effects of dietary folate withdrawal in wild type and Aldh111 knockout mice. *Metabolites*. 12(5):454. doi: 10.3390/metabo12050454  
†Authors contributed equally to this work
13. Wiggs A\*, Molina S, Sumner S, **Rushing BR**. 2022. A Review of Metabolic Targets of Anticancer Nutrients and Nutraceuticals in Triple Negative Breast Cancer. *Nutrients*. 2022 May 10;14(10):1990. doi: 10.3390/nu14101990.
14. Strom, C.J.; McDonald, S.M.; Remchak, M.-M.; Kew, K.A.; **Rushing, B.R.**; Houmard, J.A.; Tulis, D.A.; Pawlak, R.; Kelley, G.A.; Chasan-Taber, L.; Newton, E.; Isler, C.; DeVente, J.; Raper, M.; May, L.E. 2022. The Influence of Maternal Aerobic Exercise, Blood DHA and EPA Concentrations on Maternal Lipid Profiles. *Int. J. Environ. Res. Public Health*. 19, 3550.
15. **Rushing, B.R.**; Schroder, M.; Sumner, S.C.J. Comparison of Lysis and Detachment Sample Preparation Methods for Cultured Triple-Negative Breast Cancer Cells Using UHPLC–HRMS-Based Metabolomics. *Metabolites* 2022, 12, 168. <https://doi.org/10.3390/metabo12020168>
16. Murphy, Molly J. \*, **Rushing, Blake R.**, Sumner, Susan J., & Hackney. Anthony C. 2022. Dietary Supplements for Athletic Performance in Women: Beta-Alanine, Caffeine, and Nitrate. *International Journal of Sport Nutrition and Exercise Metabolism*. Advance online publication. <https://doi.org/10.1123/ijsnem.2021-0176>. Selected for issue's featured Open Access article.
17. Walters DM, Al-Khulafi NM, **Rushing BR**, Selim MI. 2022. Respiratory and cardiovascular effects of ambient particulate matter from dust storm and non-



- dust storm periods in Kuwait. *International Journal of Environmental Science and Technology*. 19, 1071-1074.
18. Li S, Li Y, **Rushing BR**, Harris SE, McRitchie SL, Jones JC, Dominguez D, Sumner SJ, Dohlman HG. 2022. Multi-omics analysis of multiple glucose-sensing receptor systems in yeast. *Biomolecules*. 12(2). 175.
19. Li YY<sup>†</sup>, **Rushing BR**<sup>†</sup>, Schroder M, Sumner S, Kay CD. 2022. Exploring the Contribution of (Poly)phenols to the Dietary Exposome using High Resolution Mass Spectrometry Untargeted Metabolomics. *Mol Nutr Food Res*. doi: 10.1002/mnfr.202100922.  
<sup>†</sup>Authors contributed equally to this work
20. **Rushing BR**, McRitchie S, Arbeeve L, Nelson AE, Azcarate-Peril MA, Li YY, Qian Y\*, Pathmasiri W, Sumner SCJ, Loeser RF. 2022. Fecal metabolomics reveals products of dysregulated proteolysis and altered microbial metabolism in obesity-related osteoarthritis. *Osteoarthritis Cartilage*. Jan;30(1):81-91. doi: 10.1016/j.joca.2021.10.006.
21. Li, S., Li, Y., **Rushing, B. R.**, McRitchie, S. L., Jones, J. C., Sumner, S. J., and Dohlman, H. G. 2021. Multi-omics analysis of glucose-mediated signaling by a moonlighting Gb protein Asc1/RACK1. *PLOS Genetics*. 17(7). e1009640. doi: 10.1371/journal.pgen.1009640. PMID: 34214075; PMCID: PMC8282090
22. **Rushing BR**, Rohlik D\*, Roy S, Skaff DA, Garcia, BL. 2020. Targeting the Initiator Protease of the Classical Pathway of Complement Using Fragment-Based Drug Discovery. *Molecules*. 25(17): 4016.
23. Polli JR\*, **Rushing BR**, Lish L, Lewis L, Selim MI, Pan X. 2020. Quantitative analysis of PAH compounds in DWH crude oil and their effects on *Caenorhabditis elegans* germ cell apoptosis, associated with CYP450s upregulation. *Science of the Total Environment*. 745:140639. doi: 10.1016/j.scitotenv.2020.140639.
24. Mamillapalli S\*, Smith-Joyner A, Forbes L\*, McIntyre K, Poppenfuse S\*, **Rushing B**, Strom C, Danell A, May L, Kuehn D, Kew K, Ravisankar S. 2020. Screening for Opioid and Stimulant Exposure in Utero via Targeted and Untargeted Metabolomics Analysis of Umbilical Cords. *Ther Drug Monit*. 42(5). 787-794.
25. Rushing AW, **Rushing BR**, Hoang K, Sanders SV\*, Peloponese JM, Polakowski N, Lemasson I. 2019. HTLV-1 basic leucine zipper factor protects cells from oxidative stress by upregulating expression of Heme Oxygenase I. *PLoS Pathogens*. 15(6). e1007922

26. **Rushing BR**, Selim MI. 2018. Aflatoxin B1: A review on metabolism, toxicity, occurrence in food, occupational exposure, and detoxification methods. *Food and Chemical Toxicology*. 124. 81-100.
27. **Rushing BR**, Selim MI. 2018. Adduction to arginine detoxifies aflatoxin B1 by eliminating genotoxicity and altering toxicokinetic properties. *Oncotarget*. 9(4): 4559-4570.
28. **Rushing BR**, Selim MI. 2017. Structure and oxidation of pyrrole adducts formed between aflatoxin B2a and biological amines. *Chem Res Toxicol*. 30(6): 1275-1285.
29. Starr JM, **Rushing BR**, Selim MI. 2017. Solvent-dependent transformation of aflatoxin B1 in soil. *Mycotoxin Res*. 33(3): 197-205.
30. **Rushing BR**, Qing H, Franklin JN, McMahan R, Dagnino S, Higgins CP, Strynar MJ, DeWitt JC. 2016. Evaluation of the immunomodulatory effects of 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)-propanoate in C57BL/6 mice. *Tox Sci*. 156(1): 179-189.
31. **Rushing BR**, Selim MI. 2016. Effect of dietary acids on the formation of aflatoxin B2a as a means to detoxify aflatoxin B1. *Food Addit Contam Part A*. 33(9): 1456-1467.
32. **Rushing B**, Wooten A, Shawky M\*, Selim MI. 2016. Comparison of LC–MS and GC–MS for the Analysis of Pharmaceuticals and Personal Care Products in Surface Water and Treated Wastewaters. *Current Trends in Mass Spectrometry, a supplement to LCGC North Am., LCGC Europe, and Spectroscopy*. 14(3): 8-14.
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## PRESENTATIONS/ABSTRACTS

1. **Rushing BR**. *The Microbiome and the Exposome in Nutrition and Precision Health* at the HHEAR Grantee meeting in Durham, NC (2023).
2. **Rushing BR**, Fennell T, Pathmasiri W, Sumner S. *Harnessing the power of metabolomics for the development of targeted intervention strategies* at the International Society of Exposure Science annual meeting (2023).

3. **Rushing BR**, Molina S, Sumner S. *Novel metabolic mechanisms that drive drug resistance in triple negative breast cancer and potential targets to improve therapeutic response* at the Metabolomics Society annual meeting in Niagara Falls, Canada (2023).
4. Fu G, Molina S, Krupenko S, Sumner S, **Rushing BR**. *Untargeted metabolomics reveals dysregulation of glycine and serine-coupled metabolic pathways* at the 2nd Annual UNC NORC Student Research Symposium (2023).
5. Autumn G, Hullings, Annie Green Howard, Katie A. Meyer, Kari E. North, Christy L. Avery, Sachin Mhatre, Wei Sha, Yuanyuan Li, **Blake Rushing**, Susan Sumner, Xiuxia Du, Cora E. Lewis, Penny Gordon-Larsen. *Modification of Diet-Metabolite Associations by Self-Reported Race and Sex in the Coronary Artery Risk Development in Young Adults Study* at the UNC NORC Student Research Symposium (2023).
6. Annie Green Howard, Sachin Mhatre, Wei Sha, Don Lloyd-Jones, **Blake Rushing**, Susan McRitchie, Xiuxia Du, Yuanyan Li, Susan Sumner, Kari North, Christy Avery, Penny Gordon-Larsen. *Heterogeneity in obesity in relation to related to hypertension: investigating the role of metabolic pathways* at the annual AHA Epidemiology Lifestyle conference (2023).
7. Rabjohns EM, **Rushing BR**, Joseph S, Vaziri C, Bowser JL. *Loss of CD73 Promotes a Cancer Stem Cell Phenotype in Endometrial Cancer via Metabolic Reprogramming* at the UNC-Duke Joint Pathology Retreat (2023).
8. Mohanraj Krishnan, Annie Green Howard, Heather M Highland, Donald Lloyd-Jones, **Blake Rushing**, Susan Sumner, Kari E North, Penny Gordon-Larsen, Christy L Avery, Misa Graff. *Genome-wide association study of the human metabolome in CARDIA identifies an association of the OPLAH locus with 5-oxo-L-proline in individuals with African ancestry* at the American Society of Human Genetics annual meeting (2022).
9. **Rushing BR**, Pathmasiri W, Seelinger M, Loeser R, Sumner S. *Exposome analysis of stool samples from individuals with obesity-related osteoarthritis* at University of North Carolina-Chapel Hill's Interdisciplinary Nutrition Sciences Symposium (2022).
10. Smirnov A, Hall J, Liao Y, Brumit D, Li Y, **Rushing BR**, McRitchie S, Sumner S, Ponnuru R, Madamwar K, Suresh V, Du X. *ADAP: An Integrated Informatics Pipeline for Untargeted Mass Spectrometry-Based Metabolomics Big Data* at the Metabolomics Association of North America (MANA) annual meeting (2022).

11. Hall J, Smirnov A, Li Y, **Rushing BR**, Liao Y, McRitchie S, Sumner S, Du X. *ADAP-BIG: A platform-independent and graphical software tool for preprocessing large-scale mass-spectrometry based metabolomics and exposomics data* at the American Society of Mass Spectrometry (ASMS) annual meeting (2022).
12. Conway C, Smirnov A, Li Y, **Rushing BR**, McRitchie S, Fennell T, Sumner S, Du X. *Developing a Web Resource for Exposome Research* at the American Society of Mass Spectrometry (ASMS) annual meeting (2022).
13. Li Y<sup>†</sup>, **Rushing BR**<sup>†</sup>, Sumner S<sup>†</sup>. *Metabolomics, the Exposome, and Precision Health* for the 2022 Nutrigenomics (NGx) course hosted by UNC-Chapel Hill's Nutrition Research Institute. <sup>†</sup>Co-Presenters
14. Kay C, Smirnov A, Li Y, **Rushing BR**, Conway C, Yang Z, Yang J, Sumner S, Du X. *MetaboFood®: A cloud knowledgebase for mass spectrometry-based precision nutrition* for the 2022 annual ASMS meeting.
15. Conway C\*, Smirnov A, Li Y, **Rushing BR**, McRitchie S, Fennell T, Sumner S, Du X. *A Web Resource for Environmentally Relevant Compounds* for the 2022 annual ASMS meeting.
16. **Rushing BR**<sup>†</sup>, Pathmasiri W<sup>†</sup>, Li Y-Y\*. *Harmonizing untargeted data across platforms* at the HHEAR December 2021 Virtual Steering Committee Meeting. <sup>†</sup>Co-presenters.
17. **Rushing BR**, Li Y-Y, Schroder M, Coble R, Sumner S. *Using UHPLC High Resolution Mass Spectrometry to Analyze Stool and Seminal Plasma* at the Metabolomics Association of North America (MANA) annual meeting (2021).
18. Conway C, Smirnov A, Li Y, **Rushing BR**, McRitchie S, Fennell T, Sumner S, Du X. *Development of a Knowledgebase of Environmentally Relevant Compounds for Exposomics* at the Metabolomics Association of North America (MANA) annual meeting (2021).
19. Smirnov A, Liao Y, Fahy E, Subramaniam S, Li Y, **Rushing BR**, McRitchie S, Sumner S, Du X. *ADAP-KDB Spectral Knowledgebase: an online resource for searching and prioritizing untargeted metabolomics data* at the Metabolomics Association of North America (MANA) annual meeting (2021).
20. **Rushing BR**. *Mycotoxins: Invisible Threats to Food Safety and Public Health* at UNC Nutrition Research Institute's Appetite for Life series (2021).
21. **Rushing BR**, McRitchie S, Liubov A, Nelson A, Azcarate-Peril MA, Li Y-Y, Qian Y, Sumner S, Loeser R. *Untargeted Fecal Metabolomics to Investigate*

- the Role of the Microbiome and Nutrients in Osteoarthritis* at the American Society of Nutrition (ASN) annual meeting (2021).
22. Hall J, Smirnov A, Li Y, **Rushing BR**, Liao Y, McRitchie S, Sumner S, Du X. *ADAP-BIG: A graphical desktop software tool for preprocessing multi-batch mass spectrometry-based raw untargeted metabolomics data* at the American Society of Mass Spectrometry (ASMS) annual meeting (2021).
  23. Conway C, Smirnov A, Li Y, **Rushing BR**, McRitchie S, Fennell T, Sumner S, Du X. *Development of a Library of Environmentally Relevant Compounds for Exposomics* at the American Society of Mass Spectrometry (ASMS) annual meeting (2021).
  24. Sharma J, **Rushing BR**, Krupenko N, Sumner S, Krupenko S. *Effect of Folate Diet on Liver Metabolomics in Wild Type and Aldh1l1 Knockout Mice* at the American Society of Nutrition (ASN) annual meeting (2021).
  25. **Rushing BR**, McRitchie S, Liubov A, Nelson A, Azcarate-Peril MA, Li Y-Y, Qian Y, Pathmasiri W, Sumner S, Loeser R. *The Internal Exposome Reveals Mechanisms of Increased Intestinal Permeability in Osteoarthritis* at the Metabolomics Online 2021 annual meeting.
  26. Li, Y. Y., **Rushing, B.**, Xiuxia Du, Timothy Fennell, Kay, C., and Sumner, S.J. (2021) *The Dietary Exposome and Nutritional Intervention* in Metabolomics 2021 Online, June 22 - 24, 2021.
  27. Smirnov, A., Li, Y., **Rushing, B.**, Liao, E., Hall, J., McRitchie, S., Sumner, S., and Du, X. (2021) *ADAP-BIG: A Platform-Independent and Scalable Software Tool for Preprocessing Large-Scale Mass Spectrometry-based Metabolomics and Exposomics Data* in Metabolomics Online 2021. June 22 - 24, 2021.
  28. Kay, C., Smirnov, A., Li, Y., **Rushing, B.**, Yang, Z., Conway, C., Yang, J., Sumner, S., and Du, X. (2021) *MetaboFood-KDB: A Cloud Knowledgebase for Searching Metabolomics and Exposomics Data for Nutritionally Relevant Compounds* in Metabolomics Online 2021. June 22 - 24, 2021.
  29. McRitchie, S., Du, X., Kay, C., Li, Y., Pathmasiri, W., **Rushing, B.**, Smirnov, A., Sumner, S., and Fennell, T. (2021) *Exposome Research Informs Precision Medicine and Precision Nutrition* in Metabolomics 2021 Online, June 22 - 24, 2021.
  30. Yuan-Yuan Li, Reza Ghanbari, Wimal Pathmasiri, **Blake Rushing**, Susan McRitchie, Hossein Poustchi, Amaneh Shayanard, Gholamerza Roshandel, Arash Etemadi, Jonathan Pollock, Reza Malekzadeh, and Susan Sumner (2021) (Presenter: Sumner): *Exposome Research Informs the Development*

*of a Nutrient Cocktail to Mitigate Against Addiction in Metabolomics 2021*  
Online, June 22 - 24, 2021

31. **Rushing BR**, Li Y-Y. *Applications of Untargeted Metabolomics in Two Matrices: Developing a Stool Reference Material and Analysis of Seminal Plasma* at the HHEAR Grantee Meeting (2021).
32. **Rushing BR**, McRitchie S, Liubov A, Nelson A, Azcarate-Peril MA, Li Y-Y, Qian Y, Pathmasiri W, Sumner S, Loeser R. *Fecal Metabolomics Reveals Products of Dysregulated Proteolysis and Altered Microbial Metabolism in Obesity-Related Osteoarthritis* at University of North Carolina-Chapel Hill's Interdisciplinary Nutrition Sciences Symposium (2021).
33. **Rushing BR**, McRitchie S, Li Y, Qian Y, Sumner S, Loeser R. *Untargeted Metabolomics to Investigate the Role of the Microbiome in Osteoarthritis* at the Metabolomics Association of North America (MANA) annual meeting (2020).
34. **Rushing BR**, Rohlik D, Garcia BL. *Fragment based discovery of novel small molecules which bind and inhibit C1r* at the 12th International Conference on Complement Therapeutics in Rhodes, Greece (2019).
35. Ryan Garrigues, Charles Booth, Denise Rohlik, **Blake Rushing**, and Brandon Garcia. *Structure-Function Relationships of Borrelial Classical Pathway-specific Complement Inhibitors* at the 12th International Conference on Complement Therapeutics in Rhodes, Greece (2019).
36. **Rushing BR**, Rohlik D, Garcia BL. *Small molecule screening reveals novel inhibitors of the classical pathway of the complement system* at Research and Creative Achievement Week at East Carolina University in Greenville, NC (2019).
37. **Rushing BR**, Garcia BL. *Keeping the brain classy with complement* at the 3-minute research presentation for the postdoctoral scholar association's "Meet and Greet" with ECU's Vice Chancellor in Greenville, NC (2019).
38. **Rushing BR**, Rohlik D, Garrigues RJ, Garcia BL. *Development of small molecule inhibitors of the classical pathway of complement* at the East Carolina Chapter of the Society for Neuroscience annual meeting in Greenville, NC (2018).
39. Strom CJ, Kew KA, **Rushing BR**, May LE, Isler C, Newton E. *Maternal aerobic exercise and DHA levels during pregnancy influences infant heart outcomes* at the American College of Sports Medicine annual meeting in Minneapolis, MN (2018).

40. **Rushing BR**, Selim MI. *Proteomic and metabolomic approaches to evaluating the safety of a novel detoxification product of aflatoxin B<sub>1</sub>*. At the North Carolina Society of Toxicology (NCSOT) Fall meeting at the National Institute of Environmental Health Sciences (NIEHS) in Durham, NC (2017).
41. Forbes LA, Mamillapalli S, **Rushing BR**, Smith-Joyner AM, Strom CJ, Kuehn D, Kew K, Ravisankar S. *Quantitative Method for Drugs of Abuse in Umbilical Cords using Liquid Chromatography/Mass Spectrometry* at Mayo Clinic (2017).
42. **Rushing BR**, Selim MI. *Using Proteomics to Investigate Protection Against Aflatoxicosis in Human Hepatocytes* at the Triangle Area Mass Spectrometry meeting in Durham, NC (2017).
43. **Rushing BR**, Selim MI. *Protective toxicokinetic and toxicodynamic changes associated with aflatoxin B<sub>1</sub> detoxification* at the American Chemical Society annual meeting in Washington D.C. (2017).
44. **Rushing BR**, Wooten AR, Selim MI. *Preliminary investigation of seasonal changes in pesticides and PPCPs in surface water in eastern North Carolina* at the American Chemical Society annual meeting in Washington D.C. (2017).
45. Pan X, Poll J, **Rushing BR**, Selim MI, Zhang B. *PAH compounds identified in crude oil utilizing GCMS induce germ cell apoptosis in *Caenorhabditis elegans** at the American Chemical Society annual meeting in Washington D.C. (2017).
46. **Rushing BR**, Selim MI. *Development of a novel treatment method to reduce the global burden of aflatoxin B<sub>1</sub>* at the National Environmental Health Association annual meeting in Grand Rapids, MI (2017).
47. **Rushing BR**, Selim MI. *Aflatoxin B<sub>1</sub> Reacts With Dietary Amines To Form A Novel Pyrrole Adduct With Reduced Genotoxicity* at the Society of Toxicology annual meeting in Baltimore, MD (2017).
48. **Rushing BR**, Selim MI. *Chemical modifications made by dietary compounds prevent genotoxic actions of aflatoxin B<sub>1</sub>* at Research and Creative Achievement Week at East Carolina University in Greenville, NC (2017).
49. **Rushing BR**, Selim MI. *Development of a novel treatment method to reduce the global burden of aflatoxin B<sub>1</sub>* at the National Environmental Health Association annual meeting in Grand Rapids, MI (2017).
50. **Rushing BR**, Selim MI. *Identification of a novel aflatoxin-amino acid adduct and its potential as a detoxification product using high resolution and tandem*

- mass spectrometry* at the Triangle Area Mass Spectrometry (TAMS) meeting in Durham, NC (2017).
51. **Rushing BR**, Selim MI. *Safer food through chemistry* at East Carolina University's 3-minute thesis competition in Greenville, NC (2016).
  52. **Rushing BR**, Selim MI. *Protecting against aflatoxin B1 mutagenicity using dietary compounds* at the North Carolina Society of Toxicology (NCSOT) Fall meeting at the National Institute of Environmental Health Sciences (NIEHS) in Durham, NC (2016).
  53. **Rushing BR**, Selim MI. *Structural Characterization and Mutagenicity of the Aflatoxin B2a-Amino Acid Adduct as a Potential Detoxification Product* at Research and Creative Achievement Week at East Carolina University in Greenville, NC (2016).
  54. **Rushing BR**, Selim MI. *Structural Characterization and Mutagenicity of the Aflatoxin B2a-Amino Acid Adduct as a Potential Detoxification Product* at the American Society of Mass Spectrometry annual meeting in San Antonio, TX (2016).
  55. **Rushing BR**, Wooten AR, Shawky MB, Selim MI. *Comparison of LC-MS and GC-MS Analysis of Pharmaceuticals and Personal Care Products in Surface Water and Treated Wastewaters* at the American Society of Mass Spectrometry annual meeting in San Antonio, TX (2016).
  56. **Rushing BR**, Selim MI. *The Role and Mechanism of Dietary Proteins in the Detoxification of Aflatoxin B<sub>1</sub>, a Potent Hepatocarcinogen and Common Food Contaminant* at Research and Creative Achievement Week at East Carolina University in Greenville, NC (2015)
  57. **Rushing BR**, Selim MI. *Emerging New Contaminants and their Metabolites in Surface and Wastewaters in Eastern North Carolina* at the Pittcon annual meeting in New Orleans, LA (2015).
  58. **Rushing BR**, DeWitt, JC. *Immunotoxic effects of undecafluoro-2-methyl-3-oxahexanoic acid in mouse models*. At the American Chemical Society annual meeting in New Orleans, LA (2013).
  59. **Rushing BR**, Miderski CA. *Effects of Oxide Layer Thickness on Wavelengths Reflected from Anodized Niobium Using AFM* at Catawba College's Interdisciplinary Research Symposium in Salisbury, NC (2012).
  60. **Rushing BR**, DeWitt, JC. *Immunotoxic Effects of Undecafluoro-2-methyl-2-oxahexanoic Acid in Mouse Models* at the Brody School of Medicine at East



Carolina University's Summer Biomedical Research Program (SBRP) poster session in Greenville, NC (2012).

## WEBINARS/WORKSHOPS

1. O'Donovan C, Masanori A, **Rushing BR**. *Data Standardization and Reuse through Public Repositories* at the Metabolomics 2023 annual meeting in Niagara Falls, ON. Note: Shankar Subramaniam was originally scheduled to be the third presenter.
2. **Rushing BR**, Selim MI. *Comparison of LC-MS and GC-MS Analysis of Pharmaceuticals and Personal Care Products in Surface Water and Treated Wastewaters* through LCGC (2015).

## TEACHING EXPERIENCE

- UNC
  - Nutritional Biochemistry (NUTR 714)
    - Co-Director, Spring 2024
    - Co-Director, Spring 2023
    - Co-Instructor, Spring 2022
    - Lecturer and Assistant, Spring 2021
    - NUTR714 is taught to ~ 40 MPH-RD candidates and covers biochemical concepts of macro and micronutrients including metabolism, chemical structures, applications in health and disease, and health disparities.
- ECU
  - Lecturer in Principles of Toxicology (PHAR 7680)
    - "Toxicology of solvents and vapors" at East Carolina University, 2017.
  - Lecturer in Pharmacology and Pharmacotherapeutics (PADP 6500)
    - "Pharmacology of anticoagulants and hematopoietic drugs" at East Carolina University, 2016-2018.
  - Lecturer in Physiological Proteogenomics (PHLY 7704)
    - "Applications of mass spectrometry in biomedical science" and "Applications of liquid and gas chromatography in biomedical sciences" at East Carolina University, 2014-2016.
  - Lecturer in Advanced Research Techniques (PHAR 7670)
    - "Principles of chromatography and mass spectrometry" at East Carolina University, 2014-2016.

- Lecturer in Cytometric Techniques (MCBI 7430)
  - “Analytical sample preparation techniques for analysis of biological molecules” at East Carolina University, 2014.
- Tutor for Biochemistry I (BIOC 7301)
  - Covered topics such as protein composition and structure, carbohydrates and glucoconjugates, cellular transport, glycolysis/TCA cycle/oxidative phosphorylation, enzyme kinetics, gluconeogenesis, and lipid metabolism. 2015-2016
- Small group leader for Pharmacology and Pharmacotherapeutics (PADP 6500)
  - Led several discussion-based exercises for a small group of 9-12 students in the physician’s assistant program. Students were given a case study in advance detailing patients who exhibited certain symptoms and were challenged to diagnose and prescribe pharmacological agents to these patients. 2016

### Mentoring/Co-Mentoring

<b>Name and degree when trained</b>	<b>Field</b>	<b>Start Year</b>	<b>Training Topic</b>	<b>Position at time of training</b>	<b>Current Position</b>
Heidi Cao	Nutrition	2023-2024	Metabolomics, cancer	Undergraduate	
Grace Fu	Nutrition	2022-2024	Metabolomics, cancer	Undergraduate	-
Rodrigo Guillen, PhD	Pathology	2021	Metabolomics, cancer	Postdoc	-
Deepika Jayaprakash, BS	Oral & Craniofacial Biomedicine	2021	Metabolomics, cancer	Graduate student	-
Gaith Droby, BS	Genetics and Molecular Biology	2021	Metabolomics, cancer	Graduate student	-
Wimal Pathmasiri, PhD	Nutrition	2021	Metabolomics harmonization	Assistant Professor	-
Sabrina Molina, BS	Biology	2021	Metabolomics, cancer, exposome	Intern	Research Assistant
Emily Fennell	Pharmacology	2020	Metabolomics, cancer	Graduate Student	-
Annie Green Howard, PhD	Biostatistics	2020	Metabolomics and pathway analysis	Associate Professor	-

Alleigh Wiggs, BS	Nutrition	2020	Metabolism and Breast Cancer	BSPH Candidate	Medical Student (UNC-Chapel Hill)
Molly Jean Murphy, MPH	Nutrition	2020	Performance Nutrition	RD Candidate	Eating Disorder Specialist
Spencer Tilley, BS	Nutrition	2020	Metabolism, Cancer, Tobacco Use	BSPH Candidate	Master's student (UNC-Charlotte)
Yunzhi Qian, MS	Biostatistics	2020	Biostatistics & Metabolomics	Graduate Student	-
Madison Schroder, BS	Chemistry	2020	Exposome	Research Assistant	-
Rachel Coble, BS	Chemistry	2020	One Carbon Metabolism	Research Assistant	-
Justin Chandler, TBS	Biology	2019	Metabolism and Precision Nutrition	Student Intern	-
Herman Freeman, BS	Biology	2019	Metabolism and Precision Nutrition	Intern	Medical School UNC
Denise Rohlik, BS	Microbiology	2018	Complement immunity and drug development	Graduate Student	-
Charles Booth, BS	Microbiology	2018	Complement immunity	Graduate Student	-
Hunter Dail	Toxicology	2017	Environmental Contaminant Analysis	High school student	Undergraduate
Denise Ramirez	Chemistry	2017	Analysis of saliva in smokers	Undergraduate ECU	-
Cody Strom, BS	Chemistry	2017	Analysis of vitamin B12 in infant blood	Graduate student	-
Swathi Mamillapalli, BS	Chemistry	2017	Analysis of saliva in smokers	Graduate Student	Clinical Research Associate at University of Iowa
Annalisa Smith-Joyner, BS	Chemistry	2017	Analysis of saliva in smokers	Graduate Student	-
Vidya Venkataganesan	Toxicology	2016	Environmental Contaminant Analysis	High school student	Undergraduate
Marcus Shawky	Toxicology	2014	Environmental Contaminant Analysis	High school student	Undergraduate
Ahmed Aldhafiri	Pharmacology/ Toxicology	2014	Endocannabinoid Analysis	Graduate Student	Assistant Professor
Yasir Mohammed	Pharmacology/ Toxicology	2014	Polyphenol Analysis	Graduate student	Postdoctoral Research Fellow

					at University of Maryland
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## **ADDITIONAL SERVICE AND OUTREACH**

- Graduate Student Assistant for the Summer Biomedical Research Program (SBRP), 2014-2017.
- Brody Graduate Association (BGA) Department of Pharmacology & Toxicology Representative. Fall 2014-Spring 2015.
- BGA Philanthropy Committee member. Fall 2014-Spring 2015.
- Hosted a local section meeting for the Carolina-Piedmont section of the American Chemical Society at the Nutrition Research Institute. Fall 2019 and Fall 2022.

## **EDITORIAL APPOINTMENTS**

- *International Journal of Environmental Research and Public Health*
  - Guest editor for Special Issue: “Nutrition, Lifestyle, and Diet-Related Non-communicable Diseases Prevention and Treatment”

## **PEER REVIEW SERVICE**

- Manuscript Reviewer
  - Oncotarget
  - PLoS One
  - Cellular Physiology and Biochemistry
  - World Journal of Surgical Oncology
  - Trends in Food Science & Technology
  - Scientific Reports
  - Addiction Neuroscience
- Grant Reviewer
  - Graduate Women in Science – Cancer Section
  - UNC Nutrition Obesity Research Center (NORC) Pilot & Feasibility Program

## **ANALYTICAL INSTRUMENTATION EXPERIENCE**

Updated 01/22/2024

Experience with the following analytical instruments:

- Gas chromatography (GC) coupled to a quadrupole mass spectrometer (MS).
- Liquid chromatography (LC) coupled to the following detectors: ultraviolet spectrophotometer, triple quadrupole mass spectrometer (MS/MS aka Tandem MS), quadrupole-time of flight mass spectrometer (QTOF), time of flight mass spectrometer (TOF), triple time of flight mass spectrometer (TripleTOF), Q-Exactive Orbitrap, Orbitrap IQ-X .
- Matrix assisted laser desorption ionization (MALDI) coupled to TOF/TOF.
- Nuclear Magnetic Resonance (NMR)
- Vendor experience (including software for operation and data analysis): Agilent, Bruker, AB Sciex, Thermo Scientific.