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

Member, Lineberger Comprehensive Cancer Center, University of North Carolina, Chapel Hill, NC (2024)

Previous

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

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

Emerging Leader Award in Metabolomics Service Cores, Metabolomics Association of North America, 2024
NRI Research Development Award, 2023
UNC NORC Pilot and Feasibility (P&F) Award, 2023
Travel Award - 12th International Conference on Complement Therapeutics in Rhodes, Greece, 2019
Best postdoctoral poster presentation award - 20th 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

MEMBERSHIPS

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
Metabolomics Association of North America, 2021-Present

BIBLIOGRAPHY (*denotes students)

1. Nieman DC, Sakaguchi CA, Williams JC, Pathmasiri W, **Rushing BR**, McRitchie S, Sumner SJ. Selective Influence of Hemp Fiber Ingestion on Post-Exercise Gut Permeability: A Metabolomics-Based Analysis. Nutrients. 2025 Apr 19;17(8):1384. doi: 10.3390/nu17081384. PMID: 40284247; PMCID: PMC12030204.

2. Hoffman SS, Tang Z, Dunlop A, Brennan PA, Huynh T, Eick SM, Barr DB, **Rushing B**, McRitchie SL, Sumner S, Taibl KR, Tan Y, Panuwet P, Lee GE, Eatman J, Corwin EJ, Ryan PB, Jones DP, Liang D. Impact of prenatal phthalate exposure on newborn metabolome and infant neurodevelopment. Nat Commun. 2025 Apr 2;16(1):2539. doi: 10.1038/s41467-025-57273-z. PMID: 40175358; PMCID: PMC11965525.

3. Falcone IG*, **Rushing BR**. Untargeted Metabolomics Reveals Acylcarnitines as Major Metabolic Targets of Resveratrol in Breast Cancer Cells. Metabolites. 2025; 15(4):250.

4. Cao HH*, Molina S, Sumner S, **Rushing BR**. An untargeted metabolomic analysis of acute AFB1 treatment in liver, breast, and lung cells. PLoS One. 2025 Jan 30;20(1):e0313159. doi: 10.1371/journal.pone.0313159. PMID: 39883710; PMCID: PMC11781672.

5. Fu G*, Molina S, Krupenko SA, Sumner S, **Rushing BR**. Untargeted Metabolomics Reveals Dysregulation of Glycine- and Serine-Coupled Metabolic Pathways in an ALDH1L1-Dependent Manner In Vivo. Metabolites. 2024 Dec 10;14(12):696. doi: 10.3390/metabo14120696. PMID: 39728477; PMCID: PMC11677661.

6. Joseph S, Zhang X, Droby GN*, Wu D, Bae-Jump V, Lyons S, Mordant A, Mills A, Herring L, **Rushing B**, Bowser JL, Vaziri C. MAPK14/p38α shapes the molecular landscape of endometrial cancer and promotes tumorigenic characteristics. Cell Rep. 2024 Dec 20;44(1):115104. doi: 10.1016/j.celrep.2024.115104. Epub ahead of print. PMID: 39708320.

7. Cruz AK, Alves MA, Andresson T, Bayless AL, Bloodsworth KJ, Bowden JA, Bullock K, Burnet MC, Neto FC, Choy A, Clish CB, Couvillion SP, Cumeras R, Dailey L, Dallmann G, Davis WC, Deik AA, Dickens AM, Djukovic D, Dorrestein PC, Eder JG, Fiehn O, Flores R, Gika H, Hagiwara KA, Pham TH, Harynuk JJ, Aristizabal-Henao JJ, Hoyt DW, Jean-François F, Kråkström M, Kumar A, Kyle JE, Lamichhane S, Li Y, Nam SL, Mandal R, de la Mata AP, Meehan MJ, Meikopoulos T, Metz TO, Mouskeftara T, Munoz N, Gowda GAN, Orešic M, Panitchpakdi M, Pierre-Hugues S, Raftery D, **Rushing B**, Schock T, Seifried H, Servetas S, Shen T, Sumner S, Carrillo KST, Thibaut D, Trejo JB, Van Meulebroek L, Vanhaecke L, Virgiliou C, Weldon KC, Wishart DS, Zhang L, Zheng J, Da Silva S. Multiplatform metabolomic interlaboratory study of a whole human stool candidate reference material from omnivore and vegan donors. Metabolomics. 2024 Nov 4;20(6):125. doi: 10.1007/s11306-024-02185-0. PMID: 39495321.

8. Nieman DC, Sakaguchi CA, Williams JC, Woo J, Omar AM, Mulani FA, Zhang Q, Pathmasiri W, **Rushing BR**, McRitchie S, Sumner SJ, Lawson J, Lambirth KC. A Multiomics Evaluation of the Countermeasure Influence of 4-Week Cranberry Beverage Supplementation on Exercise-Induced Changes in Innate Immunity. Nutrients. 2024; 16(19):3250. https://doi.org/10.3390/nu16193250.

9. Francis EC, Kechris K, Johnson RK, Rawal S, Pathmasiri W, **Rushing BR**, Du X, Jansson T, Dabelea D, Sumner SJ, Perng W. Maternal Serum Metabolomics in Mid-Pregnancy Identifies Lipid Pathways as a Key Link to Offspring Obesity in Early Childhood. International Journal of Molecular Sciences. 2024; 25(14):7620. https://doi.org/10.3390/ijms25147620

10. Pathmasiri, W†, **Rushing, BR**†, McRitchie, S, Choudhari, M*, Du, X, Smirnov, A, Pelleigrini, M, Thompson, MJ, Sakaguchi, CA, Nieman, DC and Sumner, SJ. "Untargeted metabolomics reveal signatures of a healthy lifestyle." Sci Rep. 2024; 14: 13630.
    †Authors contributed equally to this work

11. Robert O Wright, Konstantinos C Makris, Pantelis Natsiavas, Timothy Fennell, **Blake R Rushing**, Ander Wilson, Members of the Exposomics Consortium , A long and winding road: culture change on data sharing in exposomics, Exposome, Volume 4, Issue 1, 2024, osae004, https://doi.org/10.1093/exposome/osae004

12. Chung, MK, House, JS, Akhtari, FS, Makris, KC, Langston, MA, Islam, KT, Holmes, P, Chadeau-Hyam, M, Smirnov, AI, Du, X, Thessen, AE, Cui, Y, Zhang, K, Manrai, AK, Motsinger-Reif, A, Patel, CJ, Adamu, Y, Adebamowo, C, Akhtari, F, Akhtari, F, Argos, M, Arunachalam, S, Baumert, B, Beglarian, E, Berger, K, Bhutani, J, Bisson, W, Breton, C, Cai, L, Chao, M-r, Chatziioannou, AC, Cheng, Q, Chung, MK, Chung, MK, Chung, MK, Clark, R, Cohen Hubal, E, Conti, D, Cooke, M, Costello, E, Cui, Y, Dierickx, E, Dolinoy, D, Du, X, Engel, L, Gao, P, Gaulke, C, Giebelhaus, RT, Goodrich, J, Grafanaki, K, Gullapalli, R, Habre, R, Haidari, A, Harari, H, Hart, J, He, J, Holmes, P, Hood, DB, House, J, Hu, H, Hu, C-w, James, P, Jankowska, M, Ji, H, Srimathi, K, Konstantinou, C, Lai, Y, Langston, M, Lasalle, J, Leang, A, Liang, D, Liao, J, Luo, J, Makris, KC, Manz, K, Miller, G, Motsinger-Reif, A, Ouidir, M, Page, G, Pan, S, Parker, G, Paul, K, Peluso, A, Penning, T, Pierce, B, Prajapati, N, Prins, G, Quintana, PJE, Rajasekar, A, Ramesh, A, Ruden, D**, Rushing, B**, Scholl, E, Schüssler-Fiorenza Rose, SM, Shah, R, Shahriar, M, Siwakoti, R, Soares, L, Soliman, G, States, JC, Stingone, J, Sturla Irizarry, S, Sun, Y, Sundseth, S, Teitelbaum, S, Thessen, A, Tong, AP, Vijayakumar, N, Walker, R, Wang, Y, Whyte, K, Wilson, A, Wu, L, Wu, KL, Yuan, Xj, Zhang, Q, Zhang, X, Zhao, N and Zhu, Y. Decoding the exposome: data science methodologies and implications in exposome-wide association studies (ExWASs). Exposome. 2024; 4:osae001

13. 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. 105:488-498.

14. **Rushing BR,** Thessen AE, Soliman G, Armandla R, Sumner S. The exposome and nutritional pharmacology and toxicology. Exposome. 2023. 3(1):osad008..

15. **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.

16. **Rushing BR.** Unlocking the Molecular Secrets of Antifolate Drug Resistance: A Multi-Omics Investigation of the NCI-60 Cell Line Panel. Biomedicines. 2023 Sep 14;11(9):2532. doi: 10.3390/biomedicines11092532. PMID: 37760973; PMCID: PMC10526174.

17. **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.

18. Lynch DH†, **Rushing BR**†, 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.
†Authors contributed equally to this work

19. 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.

20. 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.
Selected as one of *Nature Communication's* Extramural Papers of the Month

21. **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

22. **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.

23. **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

24. Strom C*, 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

25. Sharma J†, **Rushing BR†,** Hall M, Helke K, McRitchie S, Krupenko N, Sumner S, Krupenko S. Sex-specific metabolic effects of dietary folate withdrawal in wild type and Aldh1l1 knockout mice. Metabolites. 2022; 12(5):454. doi: 10.3390/metabo12050454
†Authors contributed equally to this work

26. 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.*

27. Strom, C*.; 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. The Influence of Maternal Aerobic Exercise, Blood DHA and EPA Concentrations on Maternal Lipid Profiles. Int. J. Environ. Res. Public Health. 2022; 19, 3550.

28. **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
Selected as one of the “Hot Topic Papers Published in 2022” in *Metabolites*

29. Murphy, Molly J.*, **Rushing, Blake R**., Sumner, Susan J., & Hackney. Anthony C. Dietary Supplements for Athletic Performance in Women: Beta-Alanine, Caffeine, and Nitrate. International Journal of Sport Nutrition and Exercise Metabolism. 2022 Feb 23;32(4):311-323. doi: 10.1123/ijsnem.2021-0176. PMID: 35196646.
Selected for issue’s featured Open Access article.

30. Walters DM, Al-Khulafi NM, **Rushing BR**, Selim MI. 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. 2022; 19, 1071-1074.

31. Li S, Li Y, **Rushing BR**, Harris SE, McRitchie SL, Jones JC, Dominguez D, Sumner SJ, Dohlman HG. Multi-omics analysis of multiple glucose-sensing receptor systems in yeast. Biomolecules. 2022; 12(2). 175.

32. Li YY†, **Rushing BR†**, Schroder M, Sumner S, Kay CD. Exploring the Contribution of (Poly)phenols to the Dietary Exposome using High Resolution

Mass Spectrometry Untargeted Metabolomics. Mol Nutr Food Res. 2022. doi: 10.1002/mnfr.202100922.
†Authors contributed equally to this work

33. **Rushing BR**, McRitchie S, Arbeeva L, Nelson AE, Azcarate-Peril MA, Li YY, Qian Y*, Pathmasiri W, Sumner SCJ, Loeser RF. Fecal metabolomics reveals products of dysregulated proteolysis and altered microbial metabolism in obesity-related osteoarthritis. Osteoarthritis Cartilage. 2022; Jan;30(1):81-91. doi: 10.1016/j.joca.2021.10.006.

34. Li, S., Li, Y., **Rushing, B. R**., McRitchie, S. L., Jones, J. C., Sumner, S. J., and Dohlman, H. G. Multi-omics analysis of glucose-mediated signaling by a moonlighting Gb protein Asc1/RACK1. PLOS Genetics. 2021; 17(7). e1009640. doi: 10.1371/journal.pgen.1009640. PMID: 34214075; PMCID: PMC8282090

35. **Rushing BR,** Rohlik D*, Roy S, Skaff DA, Garcia, BL. Targeting the Initiator Protease of the Classical Pathway of Complement Using Fragment-Based Drug Discovery. Molecules. 2020; 25(17): 4016.

36. Polli JR*, **Rushing BR**, Lish L, Lewis L, Selim MI, Pan X. 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. 2020; 745:140639. doi: 10.1016/j.scitotenv.2020.140639.

37. 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. Screening for Opioid and Stimulant Exposure in Utero via Targeted and Untargeted Metabolomics Analysis of Umbilical Cords. Ther Drug Monit. 2020; 42(5). 787-794.

38. Rushing AW, **Rushing BR,** Hoang K, Sanders SV*, Peloponese JM, Polakowsi N, Lemasson I. HTLV-1 basic leucine zipper factor protects cells from oxidative stress by upregulating expression of Heme Oxygenase I. PLoS Pathogens. 2019; 15(6). e1007922

39. **Rushing BR**, Selim MI. Aflatoxin B1: A review on metabolism, toxicity, occurrence in food, occupational exposure, and detoxification methods. Food and Chemical Toxicology. 2018; 124. 81-100.

40. **Rushing BR,** Selim MI. Adduction to arginine detoxifies aflatoxin B1 by eliminating genotoxicity and altering toxicokinetic properties. Oncotarget. 2018; 9(4): 4559-4570.

41. **Rushing BR,** Selim MI. Structure and oxidation of pyrrole adducts formed between aflatoxin B2a and biological amines. Chem Res Toxicol. 2017; 30(6): 1275-1285.

42. Starr JM, **Rushing BR**, Selim MI. Solvent-dependent transformation of aflatoxin B1 in soil. Mycotoxin Res. 2017; 33(3): 197-205.

43. **Rushing BR,** Qing H, Franklin JN, McMahen R, Dagnino S, Higgins CP, Strynar MJ, DeWitt JC. Evaluation of the immunomodulatory effects of 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)-propanoate in C57BL/6 mice. Tox Sci. 2016; 156(1): 179-189.

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45. **Rushing B**, Wooten A, Shawky M*, Selim MI. 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. 2016; 14(3): 8-14.

46. Tipple CA, Caldwell PT, Kile BM, Beussman DJ, **Rushing B**, Natalie MJ, Whitchurch CJ, Grime M, Stockham, Eckenrode BA. Comprehensive characterization of commercially available canine training aids. Forensic Sci Int. 2014; 242: 242-254.

PRESENTATIONS/ABSTRACTS

1. **Rushing BR.** *Looking Inside Cancer's Kitchen* at UNC NRI's 3-Minute Nutrition Theories event in Kannapolis, NC (2025).

2. **Rushing BR.** *Metabolomics and PDXNet* at the PDXNet Annual Meeting as part of the American Association of Cancer Research Annual meeting in Chicago, IL (2025).

3. Falcone I, **Rushing BR.** *Untargeted metabolomics reveals acylcarnitines as major metabolic targets of resveratrol in breast cancer cells* at the 4th Annual UNC NORC Student Research Symposium (2025).

4. Fu G, **Rushing BR**, Graves L, Nieman D, Pelligrini M, Thompson M, Sakaguchi C, Sumner S. *Multi-omics signatures of healthy vs unhealthy lifestyles reveal associations to diseases* at the 4th Annual UNC NORC Student Research Symposium (2025).

5. **Rushing BR.** *Linking nutrient metabolism with precision oncology* at the North Carolina Research Campus Annual Catalyst Symposium (2025, *Keynote speaker).

6. **Rushing BR.** *The Exposome, Nutritional Pharmacology and Toxicology: A New Application for Metabolomics* at the Metabolomics and Human Health Gordon Research Conference in Ventura, California (2025).

7. Fu G, **Rushing BR**, Graves L, Nieman D, Pelligrini M, Thompson M, Sakaguchi C, Sumner S. *Multi-omics signatures of healthy vs unhealthy lifestyles reveal associations to diseases* at the Metabolomics and Human Health Gordon Research Conference in Ventura, California (2025).

8. **Rushing BR.** *Using untargeted metabolomics in the quest for precision oncology* at UNC's Department of Urology Grand Rounds (2025).

9. **Rushing BR.** *Metabolomics and Precision Oncology* at UNC's Genitourinary Oncology Unit Grand Rounds (2024).

10. **Rushing BR.** *The Metabolomics and Exposome Laboratory at the UNC Nutrition Research Institute* at the Metabolomics Association of North America annual meeting in Tampa, Florida (2024).

11. **Rushing BR**. *Metabolomic Signatures of Triple Negative Breast Cancer Reveal Novel Mechanisms of Drug Resistance and Chemosensitization* at the NIEHS Environmental Health Sciences Core Centers annual meeting in Baltimore, Maryland (2024).

12. **Rushing BR.** *Metabolomics and Multi-omics in the Age of Precision Oncology and Personalized Medicine* at the UNC CancerEpi Seminar Series (2024).

13. **Rushing BR.** *NC HHEAR Hub: All of Us Diabetes Exposomics Ancillary Study* at the August HHEAR steering committee meeting (2024)

14. **Rushing BR.** *The Microbiome and the Exposome in Nutrition and Precision Health* at the HHEAR Grantee meeting in Durham, NC (2023).

15. **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).

16. **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).

17. 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).

18. 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).

19. 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).

20. 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).

21. 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).

22. **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).

23. 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).

24. 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).

25. 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).

26. Li Y†, **Rushing BR**†, Sumner S†. *Metabolomics, the Exposome, and Precision Health* for the 2022 Nutrigenomics (NGx) course hosted by UNC-Chapel Hill's Nutrition Research Institute. †Co-Presenters

27. 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.

28. Conway C*, Smirnov A, Li Y, **Rushing BR**, McRitchie S, Fennell T, Sumner S, Du Xiuxia. *A Web Resource for Environmentally Relevant Compounds* for the 2022 annual ASMS meeting.

29. **Rushing BR**†**,** Pathmasiri W†, Li Y-Y*. Harmo*nizing untargeted data across platforms* at the HHEAR December 2021 Virtual Steering Committee Meeting. †Co-presenters.

30. **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).

31. 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).

32. 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).

33. **Rushing BR.** *Mycotoxins: Invisible Threats to Food Safety and Public Health* at UNC Nutrition Research Institute's Appetite for Life series (2021).

34. **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).

35. 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).

36. 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).

37. 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).

38. **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.

39. 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.

40. 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.

41. 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.

42. 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.

43. 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

44. **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).

45. **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).

46. **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).

47. **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).

48. 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).

49. **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).

50. **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).

51. **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).

52. 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).

53. **Rushing BR,** Selim MI. *Proteomic and metabolomic approaches to evaluating the safety of a novel detoxification product of aflatoxin B1.* At the

North Carolina Society of Toxicology (NCSOT) Fall meeting at the National Institute of Environmental Health Sciences (NIEHS) in Durham, NC (2017).

54. 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).

55. **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).

56. **Rushing BR,** Selim MI. *Protective toxicokinetic and toxicodynamic changes associated with aflatoxin B1 detoxification* at the American Chemical Society annual meeting in Washington D.C. (2017).

57. **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).

58. 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).

59. **Rushing BR**, Selim MI. *Development of a novel treatment method to reduce the global burden of aflatoxin B_1* at the National Environmental Health Association annual meeting in Grand Rapids, MI (2017).

60. **Rushing BR**, Selim MI. *Aflatoxin B_1 Reacts With Dietary Amines To Form A Novel Pyrrole Adduct With Reduced Genotoxicity* at the Society of Toxicology annual meeting in Baltimore, MD (2017).

61. **Rushing BR**, Selim MI. *Chemical modifications made by dietary compounds prevent genotoxic actions of aflatoxin B_1* at Research and Creative Achievement Week at East Carolina University in Greenville, NC (2017).

62. **Rushing BR**, Selim MI. *Development of a novel treatment method to reduce the global burden of aflatoxin B_1* at the National Environmental Health Association annual meeting in Grand Rapids, MI (2017).

63. **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).

64. **Rushing BR**, Selim MI. *Safer food through chemistry* at East Carolina University's 3-minute thesis competition in Greenville, NC (2016).

65. **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).

66. **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).

67. **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).

68. **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).

69. **Rushing BR**, Selim MI. *The Role and Mechanism of Dietary Proteins in the Detoxification of Aflatoxin B_1, a Potent Hepatocarcinogen and Common Food Contaminant* at Research and Creative Achievement Week at East Carolina University in Greenville, NC (2015)

70. **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).

71. **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).

72. **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).

73. **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. Kirwan J, Lasky-Su J, Dunn W, **Rushing** BR, Liang L. *Navigating Transitions in Early Career Stages* Panel Discussion at the Metabolomics and Human Health Gordon Research Seminar in Ventura, California (2025).

2. **Rushing BR***. Metabolomics and the Exposome in Precision Oncology* at UNC's Center for Environmental Health Science (CEHS) teachers workshop on Investigating the exposome & environmental influences in cancer (2025).

3. **Rushing BR** and Xiuxia Du. *MCAC Workshop – Analysis of Untargeted Metabolomics Data* at the 2024 Artificial Intelligence Summit workshop at Westpoint, NY.

4. 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.

5. **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 2025
        - 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.

    - Undergraduate Research Experience in Nutrition/Honors Research in Nutrition (NUTR295/691H/692H)

        - These courses are undergraduate independent research opportunities for bachelor of science in public health (BSPH) nutrition students. Students start with NUTR 295, where they engage in introductory nutrition research under faculty supervision

through directed readings or laboratory studies. NUTR 295 can be repeated over multiple semesters, and students may pursue an honors thesis by enrolling in NUTR 691H and NUTR 692H, typically taken in the fall and spring of their senior year, respectively.

- I have taught 5 independent research students through these courses since Spring 2021. Three of them chose to do an honors thesis and all graduated with highest honors.

- 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

Name	Field	Year	Training Topic	Position at time of training	Current Position (if known, or different from current)
Urvi Patel	Pathology	2024-2025	Metabolomics, multi-omics, cancer	Undergraduate	-
Meghan Cole	Mathematics	2024-2025	Metabolomics, cancer	Undergraduate	-
Zoe Winston	Mathematics	2023-2024	Metabolomics	Undergraduate	-
Braden York	Nutrition	2023-2024	Metabolomics	Undergraduate	-
Isabella Falcone	Nutrition	2023-2025	Metabolomics, cancer	Undergraduate	-
Heidi Cao	Nutrition	2023-2024	Metabolomics, cancer	Undergraduate	
Grace Fu	Nutrition	2022-2025	Metabolomics, multi-omics, cancer	Undergraduate and Masters	-
Halle Fogle	Nutrition	2022-2025	Metabolomics	Graduate student	-
Lilly Chiou	Pathology	2022-2025	Metabolomics, multi-omics, cancer	Graduate student	
Rodrigo Guillen, PhD	Pathology	2021	Metabolomics, cancer	Postdoc	-
Sayali Joseph, PhD	Pathology	2021-2025	Metabolomics, multi-omics, cancer	Postdoc	
Deepika Jayaprakash, BS	Pathology	2021-2023	Metabolomics, cancer	Graduate student	-
Gaith Droby, BS	Pathology	2021-2025	Metabolomics, multi-omics, cancer	Graduate student	-
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	Undergraduate	Medical Student (UNC-Chapel Hill)
Molly Jean Murphy, MPH	Nutrition	2020	Performance Nutrition	Masters student	Eating Disorder Specialist
Spencer Tilley, BS	Nutrition	2020	Metabolism, Cancer, Tobacco Use	Undergraduate	Masters student (UNC-Charlotte)
Yunzhi Qian, MS	Biostatistics	2020	Biostatistics & Metabolomics	Graduate Student	-
Madison Schroder, BS	Chemistry	2020	Metabolomics & the 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	-
Joseph Polli	Chemistry	2017	Environmental Contaminant Analysis	Undergraduate Student	Senior Principal Scientist at Novartis
Hunter Dail	Toxicology	2017	Environmental Contaminant Analysis	High school student	Undergraduate
Denise Ramirez	Chemistry	2017	Analysis of saliva in smokers	Undergraduate student	-
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

GRANT FUNDING

Current

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.
*Status of Support: Active
Project Number: 1R01CA282657-01A1
Name of PD/PI: Rushing, Blake
Role: Principal Investigator
Source of support: NIH/NCI
Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC
Project/Proposal Start and End Date: (MM/YYYY) 08/2024-07/2029
*Total Award Amount (including Indirect Costs): $3.9M
% Effort: 25

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) 08/2023-07/2025
*Total Award Amount (including Indirect Costs): $100,000
% Effort: 10

Molecular Subtype Specific Metabolomic Characterization of Bladder Cancer

Major Goals: Bladder cancer, the fifth most common malignancy in the U.S., includes non-muscle invasive (NMIBC) and muscle-invasive (MIBC) types, further classified into basal and luminal molecular subtypes. While metabolic reprogramming is a hallmark of cancer, the metabolic distinctions among bladder cancer subtypes remain poorly understood. This study hypothesizes that MIBC, NMIBC, basal, and luminal tumors exhibit distinct metabolic profiles. We will analyze 150 bladder tumor tissues using broad-spectrum metabolomics and lipidomics to identify metabolites and pathways distinguishing MIBC vs. NMIBC and basal vs. luminal subtypes. Multi-omics integration with RNA-seq data will reveal subtype-specific metabolic features. This work aims to uncover novel biomarkers and therapeutic targets, advancing precision medicine for bladder cancer.

*Status of Support: Active
Project Number: N/A
Name of PD/PI: Rushing, Blake; Bjurlin, Marc
Role: Co-Principal Investigator
*Source of Support: UNC Lineberger Comprehensive Cancer Center
*Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC
Project/Proposal Start and End Date: (MM/YYYY) 02/2025-01/2026
*Total Award Amount (including Indirect Costs): $50,000
% Effort: 0

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
% Effort: 15

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 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- 05/31/2026
* Total Award Amount (including Indirect Costs): $10.4M
% Effort: 8.3

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): $285,910
% Effort: 15

Targeting Obesity Via Diet and Drugs for the Treatment of Endometrial Cancer

Major Goals: Given that obesity is a causal risk factor in ~ 65% of endometrial cancers (ECs) and portends a poor prognosis, effective interventions to target weight loss are

desperately needed in EC patients, potentially in combination with chemotherapy/immunotherapy. To better understand the anti-obesity and anti-tumorigenic benefits of intermittent energy restriction (IER) diet *vs.* dual GLP-1/GIP receptor agonist therapy, we will compare IER *vs.* tirzepatide +/- paclitaxel or PD-1 inhibitor therapy in pre-clinical EC mouse models and assess tirzepatide in a pre-operative window study of EC.

Status of Support: Active
Project Number: CA230461
Name of PD/PI: Victoria Bae-Jump
Source of Support: DOD
Primary Place of Performance: The University of North Carolina at Chapel Hill
Project/Proposal Start and End Date: (MM/YYYY) (if available): 09/30/2024 – 09/29/2027
Role: Co-Investigator
Total Award Amount (including Indirect Costs): $1,555,000
% Effort: 5

Defining the Human Metabotype [Human metabolic status defined through genetic, diet, environmental exposures and exercise perturbations]

Major Goals: To derive a signature of health and wellness that includes genetics, diet, environmental exposures, and exercise.

Activity Code: U24
Status of Support: Active
Project Number: 1U24OD038425
Name of PD/PI: Subramaniam, UCSD; Sumner, UNC Chapel Hill; Teitelbaum, MSSM; Wheeler, Stanford
Agency: NIH Office of the Director: U24OD038425
Primary Place of Performance: UNC Nutrition Research Institute, Kannapolis, NC
Project/Proposal Start and End Date: (MM/YYYY) 09/01/2024 – 08/30/2027
Role: Co-Investigator
Total Award Amount (including Indirect Costs): $2,706,795
% Effort: 15

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.

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) 12/2022-11/2023
*Total Award Amount (including Indirect Costs): $75,000
% Effort: 15

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 metabotypes. This information will be used to identify precision metabolic targets for triple negative breast cancer therapy.

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
% Effort: 10

SERVICE

- *Service at Prior Institutions (East Carolina University)*
    - 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.

- UNC Committee Service
    - Diversity, Equity, and Inclusion Committee for the Nutrition Research Institute 2021-2023
    - Diversity, Equity, and Inclusion Committee for the UNC Nutrition Department, 2021-2024
    - Bachelor of Science in Public Health (BSPH) committee, 2021-2024
    - UNC Nutrition Department Curriculum Committee, 2024-2025

- 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”
    - *Metabolites*
        - Guest editor for Special Issue: “Metabolomics Techniques in Nutrition and Pharmacy Research”

- 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

- Discussion Moderator
    - 2025 Metabolomics and Human Health Gordon Research Seminar session on “The Human Microbiome and its Influence on Health and Disease”