

BIOGRAPHICAL SKETCH

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NAME: Ferguson, Laura

eRA COMMONS USER NAME (credential, e.g., agency login): lauraferguson

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Oklahoma	BS	09/2009	Electrical Engineering
University of Texas at Austin	PhD	05/2018	Neuroscience
Dell Medical School	Postdoctoral	06/2025	Neuroscience

A. Personal Statement

My research centers on the biology of addiction and related psychiatric disorders, with a focus on how communication between the brain and periphery shapes behavior and treatment response. As an Assistant Professor of Pharmacology and Psychiatry at the University of North Carolina's Bowles Center for Alcohol Studies, I direct a translational laboratory that integrates molecular, behavioral, and computational approaches in both mice and humans.

A major theme of my work is the discovery of blood-based biomarkers and the use of transcriptome-guided drug discovery and repurposing to identify new therapeutic strategies. By leveraging systems-level analyses and gene network approaches, my lab is uncovering molecular programs that link central and peripheral processes and can causally influence alcohol consumption. These efforts aim to establish precision medicine strategies for addiction and related conditions. I have published 21 peer-reviewed articles, including 9 as first, co-first, or senior author, demonstrating my capacity to lead interdisciplinary, high-impact research.

Representative publications:

1. **Ferguson LB**, Roberts AJ, Mayfield RD, Messing RO. Blood and brain gene expression signatures of chronic intermittent ethanol consumption in mice. *PLoS Comput Biol.* 2022 Feb;18(2):e1009800. doi: 10.1371/journal.pcbi.1009800. eCollection 2022 Feb. PubMed Central PMCID: PMC8853518.
2. **Ferguson LB**, Patil S, Moskowitz BA, Ponomarev I, Harris RA, Mayfield RD, Messing RO. A Pathway-Based Genomic Approach to Identify Medications: Application to Alcohol Use Disorder. *Brain Sci.* 2019 Dec 16;9(12). doi: 10.3390/brainsci9120381. PubMed Central PMCID: PMC6956180.
3. **Ferguson LB**, Zhang L, Kircher D, Wang S, Mayfield RD, Crabbe JC, Morrisett RA, Harris RA, Ponomarev I. Dissecting Brain Networks Underlying Alcohol Binge Drinking Using a Systems Genomics Approach. *Molecular neurobiology.* 2018. doi: 10.1007/s12035-018-1252-0. PubMed Central PMCID: PMC6459809.
4. **Ferguson LB**, Ozburn AR, Ponomarev I, Metten P, Reilly M, Crabbe JC, Harris RA, Mayfield RD. Genome-Wide Expression Profiles Drive Discovery of Novel Compounds that Reduce Binge Drinking in Mice. *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology.* 2017. doi: 10.1038/npp.2017.301. PubMed Central PMCID: PMC5916369.

B. Positions, Scientific Appointments, and Honors

Positions and Employment

July 1, 2025 – Present	Assistant Professor, UNC Chapel Hill
2018 – 2025	Postdoctoral Fellow, Dell Medical School
2011 – 2018	Graduate Student, University of Texas at Austin
2010 – 2011	Research Engineer & Scientist, University of Texas at Austin
2010 – 2011	Math & Physics Tutor, Austin Community College
2009 – 2010	Applications Engineer, National Instruments
2008 – 2008	Student Engineer, Southwest Research Institute

Other Experience and Professional Memberships

2024	Short Course Organizer & Presenter, Transcriptomic Studies in Neuroscience Research (2024) 56th Meeting of the Winter Conference on Brain Research. Breckenridge, CO.
2023	Symposium Organizer & Chair, Next Generation Biomarkers for AUD (2023) 46th Annual Research Society on Alcohol Scientific Meeting. Bellevue, WA.
2021 – Present	Editorial Board: Frontiers in Molecular Neuroscience, Methods and Model Organisms
2018 – Present	Reviewer for Journals: Molecular Psychiatry, Molecular Neurobiology, Scientific Reports, Addiction Biology, BMC Genomics, Alcohol, Brain Research, IEEE Transactions on Neural Systems and Rehabilitation Engineering, Alcoholism: Clinical and Experimental Research, Molecular Genetics and Genomics, Molecular Aspects of Medicine, Neuroscience Insights, Translational Research
2017 – Present	Member, Research Society on Alcoholism
2011 – Present	Member, Society for Neuroscience
2014	Teaching Assistant, Neurobiology of Addiction
2012 – 2013	Vice President, Neuroscience Graduate Student Association
2011 – 2012	Volunteer Instructor, Downs Syndrome Association of Central Texas
2008 – 2009	Vice President, Institute of Electrical and Electronics Engineers, OU Chapter
2007 – 2008	Historian, Institute of Electrical and Electronics Engineers, OU Chapter

Honors

2023 – 2028	K99/R00, NIAAA (AA030821)
2023	Best Poster Award , BBC Conference Travel Award, Translational Research in SUDs, San Antonio, TX
2023	BBC Conference Travel Award, Translational Research in SUDs, San Antonio, TX
2022	Shine Award for Excellence in Research by a Trainee
2021	NIDA-NIAAA Early Career Investigator Showcase
2020 – 2021	NRSA F32, NIAAA (AA028148)
2018 – 2020	Alcohol Research Training Grant, University of Texas at Austin
2019	Invited Guest, Texas Orange Jackets Tea (the oldest honorary women's service organization on the UT campus)
2018	Dissertation Writing Fellowship, University of Texas at Austin
2016 – 2017	Graduate Dean's Prestigious Fellowship Supplement, University of Texas at Austin
2016	Best Poster Award , Big Data in Biology, University of Texas at Austin
2015 – 2017	NRSA F31, NIAAA (AA024332)
2014	Conference Travel Award, NIAAA
2014	Symposium Award, International Union of Biochemistry and Molecular Biology
2013	Early Career Investigator Conference Award, NIAAA
2013 – 2015	Alcohol Research Training Grant, University of Texas at Austin
2012 – 2014	Bruce Jones Fellowship, University of Texas at Austin
2011 – 2012	Dean's Excellence Award, University of Texas at Austin
2009	Director's Award for public service in engineering, IEEE (OU branch)

2006 – 2008 Electrical Engineering Dept Scholarship, University of Oklahoma

2005 – 2009 Engineering College Dean's Honor Roll, University of Oklahoma

C. Contributions to Science

1. **PPAR actions in brain.** Drugs that target PPAR receptors have demonstrated therapeutic effects for numerous brain diseases, including drug addiction. However, little was known about cell type distribution in brain or effects of these drugs on brain gene expression. I conducted a full transcriptome analysis of brain and liver tissue in mice following PPAR agonist treatment and identified genes and gene networks recruited by these compounds in key brain areas for addiction, PFC and amygdala. This included the finding that a subset of transposable elements was activated by PPAR agonists in brain and liver, potentially contributing to their carcinogenic effects in rodent liver. Contrary to the popular idea that PPAR agonists are anti-inflammatory and would be acting through the brain's resident immune cells, microglia, I found a predominately neuronal signature of these drugs in brain. Together with others in the group, I performed qRT-PCR and immunohistochemistry in mouse and human brain samples to determine baseline levels and cell type distribution of each PPAR isotype, which confirmed an almost exclusive neuronal localization of PPARs. Additionally, I collaborated with an outside company to confirm the ability of fenofibric acid (the active metabolite of fenofibrate, a PPAR agonist) to cross the blood-brain-barrier.
 - a. **Ferguson LB**, Most D, Blednov YA, Harris RA. PPAR agonists regulate brain gene expression: Relationship to their effects on ethanol consumption. *Neuropharmacology*. 2014. Epub 2014/07/19. doi: 10.1016/j.neuropharm.2014.06.024. PubMed PMID: 25036611.
 - b. **Ferguson LB**, Zhang L, Wang S, Bridges C, Harris RA, Ponomarev I. Peroxisome Proliferator Activated Receptor Agonists Modulate Transposable Element Expression in Brain and Liver. *Front Mol Neurosci*. 2018;11:331. doi: 10.3389/fnmol.2018.00331. PubMed PMID: 30283300; PMCID: PMC6156381.
 - c. Warden A, Truitt J, Merriman M, Ponomareva O, Jameson K, **Ferguson LB**, Mayfield RD, Harris RA. Localization of PPAR isotypes in the adult mouse and human brain. *Scientific Reports*. 2016;6:27618. Epub 2016/06/11. doi: 10.1038/srep27618. PubMed PMID: 27283430; PMCID: 4901333.
 - d. Blednov YA, Benavidez JM, Black M, **Ferguson LB**, Schoenhard GL, Goate AM, Edenberg HJ, Wetherill L, Hesselbrock V, Foroud T, Harris RA. Peroxisome proliferator-activated receptors alpha and gamma are linked with alcohol consumption in mice and withdrawal and dependence in humans. *Alcoholism, Clinical and Experimental Research*. 2015;39(1):136-45. Epub 2014/12/18. doi: 10.1111/acer.12610. PubMed PMID: 25516156; PMCID: 4308472.
2. **First evidence for transcriptome-based drug discovery to target an addiction-related trait.** Alcohol Use Disorder (AUD) is chronic, relapsing condition and a major public health problem. Though recovery is possible, there are few pharmaceutical treatments available to aid in the recovery process. Decades of alcohol research supports the idea that alcohol alters gene expression patterns in brain. I hypothesized that drug perturbations producing anti-correlated patterns may reduce alcohol drinking. I constructed gene network signatures using brain gene expression data from two genetic rodent models of important AUD risk characteristics and their controls (High Alcohol Drinking (HAD-1)/Low Alcohol Drinking (LAD-1) rats and High Drinking in the Dark (HDID-1)/Heterogeneous Stock (HS) mice). Using these signatures, my drug selection algorithm identified several novel compounds that decreased ethanol intake or BALs in these lines when tested by collaborators, including trichostatin-A for HAD rats, and terreic acid and tergelide for HDID-1 mice.
 - a. **Ferguson LB**, Ozburn AR, Ponomarev I, Metten P, Reilly M, Crabbe JC, Harris RA, Mayfield RD. Genome-Wide Expression Profiles Drive Discovery of Novel Compounds that Reduce Binge Drinking in Mice. *Neuropsychopharmacology*. 2017. doi: 10.1038/npp.2017.301. PubMed PMID: 29251283. PubMed Central PMCID: PMC5916369.

- b. **Ferguson LB**, Harris RA, Mayfield RD. From gene networks to drugs: systems pharmacology approaches for AUD. *Psychopharmacology*. 2018. doi: 10.1007/s00213-018-4855-2. PubMed PMID: 29497781. PubMed Central PMCID: PMC6298603.
 - c. **Ferguson LB**, Patil S, Moskowitz BA, Ponomarev I, Harris RA, Mayfield RD, Messing RO. A Pathway-Based Genomic Approach to Identify Medications: Application to Alcohol Use Disorder. *Brain Sci*. 2019 Dec 16;9(12). doi: 10.3390/brainsci9120381. PubMed PMID: 31888299; PubMed Central PMCID: PMC6956180.
3. **Identification of an accessible transcriptome (blood) for transcriptome-based diagnostic tools and drug discovery.** Brain gene expression profiles can predict disease status as well as predict drugs effective for reducing excessive alcohol consumption. However, it is not possible to obtain brain specimens from human patients which limits the usefulness of this approach. This study investigated the extent to which blood can act as a surrogate for brain tissue and predict CIE-induced alcohol dependence status. This information lays critical groundwork for developing molecular-based diagnosis and treatment options for alcoholic patients and provides insights into the biological mechanisms that might contribute to the transition from recreational alcohol use to excessive drinking.
 - a. **Ferguson LB**, Roberts AJ, Mayfield RD, Messing RO. Blood and brain gene expression signatures of chronic intermittent ethanol consumption in mice. *PLoS Comput Biol*. 2022 Feb;18(2):e1009800. doi: 10.1371/journal.pcbi.1009800. eCollection 2022 Feb. PubMed PMID: 35176017; PubMed Central PMCID: PMC8853518.

Complete List of Published Work: <https://www.ncbi.nlm.nih.gov/myncbi/laura.ferguson.2/bibliography/public/>