

Leandra K. Figueroa-Hall, Ph.D.

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Research Executive Summary

My research examines how the toll-like receptor 4 (TLR4) system via regulating inflammatory processes affects mental health. For this, I employ molecular and genetic techniques to understand how the peripheral (serum) and central (brain-enriched extracellular vesicles - BEEVs) immune systems are dysregulated in major depressive disorder (MDD) and other comorbid disorders including substance use disorder (SUD) and suicide. These techniques include high-sensitivity multiplex immunoassays, isolation and enrichment of BEEVs, and broad-based discovery approaches including microribonucleic acid (miRNA) sequencing and proteomic analyses. The importance of EV research in the psychiatric field is paramount as they may provide a unique, and possibly revolutionary approach to examine brain biology from a blood sample. As part of my K99/R00 Maximizing Opportunities for Scientific and Academic Independent Careers (MOSAIC-R00MH126950) grant funded by the National Institutes of Mental Health, my research aims are to 1) investigate peripheral and central immune responses in depressed vs. healthy individuals with the use of serum and astrocyte-enriched EVs; and 2) delineate immunoregulatory mechanisms in MDD by examining changes in immune-responsive and astrocyte-regulating miRNAs.

Education

B.Sc. Biology, University of the Virgin Islands, St. Thomas, USVI; 2008

M.Sc. Biomedical Research, University of Maryland-School of Medicine, Baltimore, MD; 2011
Department of Microbiology and Immunology; Mentor: the late Dr. Andrei E. Medvedev

Ph.D. Biomedical Sciences, Oklahoma State University (OSU)-Center for Health Sciences, (CHS), Tulsa, OK; 2017; Department of Pharmacology/Physiology; Mentor: Dr. Randall L. Davis

Post Graduate Training

Postdoctoral Fellow, Yale University, School of Medicine, Department of Pediatrics/Gastroenterology, New Haven, CT; 2017-2019

T32 NIH Training Grant (Internal Medicine DK00701741)

Mentors: Nadia A. Ameen, MBBS and Fred Gorelick, M.D.

Postdoctoral Research Associate, Laureate Institute for Brain Research, Tulsa, OK; 2019-2022

Mentors: Jonathan Savitz Ph.D. and Martin Paulus, M.D.

Project: *In vivo* inflammatory challenge to identify astrocyte-enriched extracellular vesicle TLR4-modulating miRNA signatures in depression

Employment History

Associate Investigator, Laureate Institute for Brain Research, Tulsa, OK; 2022-2024

Interests: 1) Defining the role of toll-like receptor 4 (TLR4) in inflammation-associated depression; and 2) Characterization and validation of human astrocyte-enriched extracellular vesicles

Affiliate: Research Assistant Professor, Oxley College of Health and Natural Sciences, The University of Tulsa (TU); 2023-2024

Principal Investigator, Laureate Institute for Brain Research, Tulsa, OK; 2024-

Interests: 1) Defining the role of toll-like receptor 4 (TLR4) in inflammation-associated depression and other mental health disorders, such as opioid use disorder; 2) Delineating stress-induced mechanisms in depression (e.g., release of damage-associated molecular patterns; inflammasome); 3) Characterization and validation of human microglial-enriched extracellular vesicles; 4) Unbiased, discovery-based biomarker discovery for inflammation-associated depression; 5) TLR4-mediated mechanisms in opioid use disorder.

Affiliate: Research Associate Professor, Oxley College of Health and Natural Sciences, TU; 2026-

Honors & Awards

- 2011** American Association of Immunologists (AAI); AAI Trainee Award
- 2014** Federation of American Societies for Experimental Biology (FASEB); Minority Travel Award
- 2014** Oklahoma State University (OSU); Research Day, Best poster for Department of Pharmacology/Physiology
- 2015** OSU; Regents' Distinguished Faculty Teaching Award Review and Selection Committee
- 2015** OSU; Research Day, 2nd place poster for Department of Pharmacology/Physiology
- 2015-2017** Society for Neuroscience (SFN); Neuroscience Scholars Program- NSP Associate
- 2016** FASEB; Travel Award for APS Writing and Reviewing for Scientific Journals Course
- 2016** FASEB; Travel Award for the Postdoctoral Preparation Institute 2016
- 2016** The American Physiological Society (APS); Minority Travel Fellowship Award
- 2018** APS; Travel Award for Experimental Biology
- 2017** OSU; Women's Faculty Council Student Research Award-Recognition for quality of research
- 2021** End2Cancer Conference; 1ST Place "Pitch Your Research"- oral presentation- \$1000 Travel Award
- 2022-2025** NIH Loan Repayment Program; NIMH 2022-2024. Renewed for 2024-2025
- 2024** The American College of Neuropsychopharmacology (ACNP); URM Near-Peer Mentorship Program

Professional Affiliations

- 2009-2016 American Association of Immunologists (AAI)
- 2012-2016 Society for Neuroscience (SFN)
- 2015, 2016 American Society for Pharmacology and Experimental Therapeutics (ASPET)
- 2015-2021 The American Physiological Society (APS)
- 2016- Society for the Advancement of Chicanos/Hispanics & Native Americans in Science (SACNAS)
- 2022- International Society of Extracellular Vesicles (ISEV)
- 2025- PsychoNeuroImmunology Research Society (PNIRS)

Professional Service- Laureate Institute for Brain Research

- 2020-2021, Diversity Committee-Secretary
- 2021-2023, LIBR Research Day Judge
- 2022-2023, Brownbag Series Coordinator
- 2023-present; Warren K. William Frontiers in Neuroscience Lecture Series Coordinator

Mentoring: high school, undergraduate, and medical students (OSU, Yale); TU undergraduates, research assistants and postdoctoral research associates at LIBR (TURC/LIBR Research Day/K Club/grant writing)

Scientific Collaborations: LIBR (Drs. Kaiping Burrows, Jennifer Stewart, Salvador Guinjoan, Jonathan Savitz, Haixia Zheng); University of Oklahoma (OU), Integrative Immunology Center (Dr. Kent Teague); OU, Health Sciences Center (Drs. Rajagopal Ramesh, Bethany Hannafon); University of California, San Diego (Dr. Victoria Risbrough); Oklahoma State University-CHS (Dr. Vikram Gujar); University of Southern California (Dr. Charisse Winston); and Mayo Clinic (Dr. Yang You).

Grant/Funding

K99MH126950- PI; NIH-NIGMS-NIMH; (K99/R00- MOSAIC); 2022-2024

Understand how depressed individuals with high inflammation differ in their peripheral and central immune responses to an inflammatory challenge with the use of serum and astrocyte-enriched extracellular vesicles (AEEV).

R00MH126950- PI; NIH-National Institute of General Medical Sciences (NIGMS)-National Institute of Mental Health (NIMH) [K99/R00-Maximizing Opportunities for Scientific and Academic Independent Careers (MOSAIC)]; 2024-2027

Identify differences in inflammation-related microRNAs between depressed and healthy individuals through the quantification of microRNA expression in both peripheral blood mononuclear cells and AEEV.

1L30MH131119- PI; NIMH; NIH Loan Repayment Program; 2022-2024; 2024-2025.

Oklahoma Shared Clinical Translational Resource (OSCTR) Pilot- PI; NIGMS-University of Oklahoma Health Sciences Center (U54GM104938); 2026-2027. *Inflammatory-Mediated Central Mechanisms in Opioid Use Disorder: A Pilot Project*

Understand how inflammatory-mediated central mechanisms in GLAST-specific AEEVs may lead to potential therapeutic strategies for treatment in opioid use disorder.

Grant Submissions

R21 National Institute on Drug Abuse (NIDA)- Peripheral and Central Immune Alterations in Opioid Use Disorder (Resubmission-Review April 2026)

Manuscripts in Preparation

Burrows K, **Figuroa-Hall LK**, Rada K, Cruddas K, Kuplicki R, Teague TK, Ramesh R, Risbrough V, Savitz J, Paulus MP. Astrocyte-enriched extracellular vesicle microRNA profiles in major depressive disorder: a case-control, transcriptomic study (*in preparation*)

Figuroa-Hall LK, Teague TK, Yeh HW, Zheng H, Kuplicki R, Burrow K, Jarrett CJ, El-Sabbagh N, Thomas M, Ewers I, Cha YH, Guinjoan S, Khalsa SS, Paulus MP, Irwin MR, Savitz J. Immunological and Clinical Effects of Inflammatory Challenge in Major Depressive Disorder versus Healthy Controls: A parallel group, double-blinded, placebo-controlled trial (*in preparation*)

McNaughton B., Burrows K., Yakshin A., Rob M., Kuplicki R., Savitz J., Stewart J., Paulus MP, Ironside M., and **Figuroa-Hall LK**. Lipids and cytokines are increased in major depressive disorder (*in preparation*)

Yakshin A., Green L., Martin E., Rob M., Burrows K., Paulus M.P., Stewart J.L., **Figuroa-Hall L.K.** Toll-like receptors in Opioid Use Disorder Review (*in preparation*)

Yousufi M., Burrows K., Rada K., Martin E., Savitz J., Risbrough V., Paulus M.P., **Figuroa-Hall LK**. Extracellular vesicles- a new immune system? (*in preparation*)

Peer-Reviewed Publications

Figuroa L, Xiong Y, Song C, Piao W, Vogel SN, Medvedev AE. The Asp299Gly polymorphism alters TLR4 signaling by interfering with recruitment of MyD88 and TRIF. *J Immunol.* 2012 May 1;188(9):4506-15. doi: 10.4049/jimmunol.1200202. Epub 2012 Apr 2. PubMed PMID: 22474023; PubMed Central PMCID: PMC3531971.

Figuroa-Hall LK, Anderson MB, Das S, Stevens CW, Davis RL. LPS-induced TLR4 Neuroinflammatory Signaling in CHME-5 Microglial Cells. *Neuroimmunology and neuroinflammation.* 2017 October; 4:219-231. doi: 10.20517/2347-8659.2017.38.

Figuroa-Hall LK, Stevens CW, Davis RL. Anti-inflammatory effects of fentanyl and morphine on LPS-induced TLR4 neuroinflammatory signaling. *Oklahoma State Medical Proceedings.* 2019 August; 3(3).

Ahsan MK, **Figuroa-Hall L**, Baratta V, Garcia-Milian R, Lam TT, Hoque K, Salas PJ, Ameen NA. Glucocorticoids and serum- and glucocorticoid-inducible kinase 1 are potent regulators of CFTR in the native intestine: implications for stress-induced diarrhea. *Am J Physiol Gastrointest Liver Physiol.* 2020 Aug 1;319(2):G121-G132. doi: 10.1152/ajpgi.00076.2020. Epub 2020 Jun 22. PMID: 32567324; PMCID: PMC7500270.

Figuroa-Hall LK, Paulus M, Savitz J. Toll-Like Receptor Signaling in Depression. *Psychoneuroendocrinology.* 2020;121:104843.

Burrows K, Stewart JL, Kuplicki R, **Figuroa-Hall L**, Spechler PA, Zheng H, Guinjoan SM; Tulsa 1000 Investigators; Savitz JB, Kent Teague T, Paulus MP. Elevated peripheral inflammation is associated with attenuated striatal reward anticipation in major depressive disorder. *Brain Behav Immun.* 2021 Mar;93:214-225. doi: 10.1016/j.bbi.2021.01.016. Epub 2021 Jan 26. PMID: 33508469; PMCID: PMC7979507.

- May AC, Burrows K, **Figueroa-Hall LK**, Kirlic N, White EJ, Smith R, Ekhtiari H, Paulus MP, Savitz J, Stewart JL; T1000 Investigators. Sex differences in circulating inflammatory mediators as a function of substance use disorder. *Drug Alcohol Depend.* 2021 Apr 1;221:108610. doi: 10.1016/j.drugalcdep.2021.108610. Epub 2021 Feb 15. Erratum in: *Drug Alcohol Depend.* 2021 Jul 1;224:108743. doi: 10.1016/j.drugalcdep.2021.108743. PMID: 33631550; PMCID: PMC8026624.
- Thomas M, Savitz J, Zhang Y, Burrows K, Smith R, **Figueroa-Hall L**, Kuplicki R, Khalsa SS, Taki Y, Teague TK, Irwin MR, Yeh FC, Paulus MP, Zheng H, On Behalf of Tulsa Investigators. Elevated Systemic Inflammation Is Associated with Reduced Corticolimbic White Matter Integrity in Depression. *Life (Basel)*. 2021 Dec 28;12(1):43. doi: 10.3390/life12010043. PMID: 35054436; PMCID: PMC8778940.
- Burrows K, **Figueroa-Hall LK**, Kuplicki R, Stewart JL, Alarbi AM, Ramesh R, Savitz JB, Teague TK, Risbrough VB, Paulus MP. Neuronally-enriched exosomal microRNA-27b mediates acute effects of ibuprofen on reward-related brain activity in healthy adults: a randomized, placebo-controlled, double-blind trial. *Sci Rep.* 2022 Jan 17;12(1):861. doi: 10.1038/s41598-022-04875-y. PMID: 35039595; PMCID: PMC8764091.
- Figueroa-Hall LK**, Xu B, Kuplicki R, Ford BN, Burrows K, Teague TK, Sen S, Yeh HW, Irwin MR, Savitz J, Paulus MP. Psychiatric symptoms are not associated with circulating CRP concentrations after controlling for medical, social, and demographic factors. *Transl Psychiatry.* 2022 Jul 12;12(1):279. doi: 10.1038/s41398-022-02049-y. PMID: 35821205; PMCID: PMC9276683.
- Zheng H, Teague TK, Yeh FC, Burrows K, **Figueroa-Hall LK**, Aupperle RL, Khalsa SS, Paulus MP, Savitz J. C-Reactive protein and the kynurenic acid to quinolinic acid ratio are independently associated with white matter integrity in major depressive disorder. *Brain Behav Immun.* 2022 Oct;105:180-189. doi: 10.1016/j.bbi.2022.07.011. Epub 2022 Jul 16. PMID: 35853557; PMCID: PMC9983279.
- Burrows K*, **Figueroa-Hall LK***, Alarbi AM, Stewart JL, Kuplicki R, Tan C, Hannafon BN, Ramesh R, Savitz J, Khalsa S, Teague TK, Risbrough VB, Paulus MP. Association between inflammation, reward processing, and ibuprofen-induced increases of miR-23b in astrocyte-enriched extracellular vesicles: A randomized, placebo-controlled, double-blind, exploratory trial in healthy individuals. *Brain Behav Immun Health.* 2022 Dec 24;27:100582. doi: 10.1016/j.bbih.2022.100582. PMID: 36605933; PMCID: PMC9807827. * **Shared co-first authorship**
- Burrows K, McNaughton BA, **Figueroa-Hall LK**, Spechler PA, Kuplicki R, Victor TA, Aupperle R, Khalsa SS, Savitz JB, Teague TK, Paulus MP, Stewart JL. Elevated serum leptin is associated with attenuated reward anticipation in major depressive disorder independent of peripheral C-reactive protein levels. *Sci Rep.* 2023 Jul 13;13(1):11313. doi: 10.1038/s41598-023-38410-4. PMID: 37443383; PMCID: PMC10344903.
- Welsh JA, Goberdhan DCI, O'Driscoll L, Buzas EI, Blenkiron C, Bussolati B, Cai H, Di Vizio D, Driedonks TAP, Erdbrügger U, et. al, **MISEV Consortium**; Théry C, Witwer KW. Minimal information for studies of extracellular vesicles (MISEV2023): From basic to advanced approaches. *J Extracell Vesicles.* 2024 Feb;13(2):e12404. doi: 10.1002/jev2.12404. PMID: 38326288; PMCID: PMC10850029.
- Burrows K*, **Figueroa-Hall LK***, Stewart JL, Alarbi AM, Kuplicki R, Hannafon BN, Tan C, Risbrough VB, McKinney BA, Ramesh R, Victor TA, Aupperle R, Savitz J, Teague TK, Khalsa SS, Paulus MP. Exploring the role of neuronal-enriched extracellular vesicle miR-93 and interoception in major depressive disorder. *Transl Psychiatry.* 2024 Apr 27;14(1):199. doi: 10.1038/s41398-024-02907-x. PMID: 38678012; PMCID: PMC11055873.* **Shared co-first authorship**
- Zhang Y, Munshi S, Burrows K, Kuplicki R, **Figueroa-Hall LK**, Aupperle RL, Khalsa SS, Teague TK, Taki Y, Paulus MP, Savitz J, Zheng H. Leptin's Inverse Association with Brain Morphology and Depressive Symptoms: A Discovery and Confirmatory Study Across 2 Independent Samples. *Biol Psychiatry Cogn Neurosci Neuroimaging.* 2024 Jul;9(7):714-725. doi: 10.1016/j.bpsc.2024.04.005. Epub 2024 Apr 16. PMID: 38631553.
- Stewart JL, Burrows K, May AC, McNaughton BA, Smith R, Kuplicki R, Paulus MP, **Figueroa-Hall L**. C-reactive protein concentrations diverge as a function of substance use disorder: A pre-registered replication in a

clinical sample. *Drug Alcohol Depend.* 2024 Jul 1;260:111323. doi: 10.1016/j.drugalcdep.2024.111323. Epub 2024 May 8. PMID: 38733735; PMCID: PMC11179960.

Munshi S, Alarbi AM, Zheng H, Kuplicki R, Burrows K, **Figueroa-Hall LK**, Victor TA, Aupperle RL, Khalsa SS, Paulus MP, Teague TK, Savitz J. Increased expression of ER stress, inflammasome activation, and mitochondrial biogenesis-related genes in peripheral blood mononuclear cells in major depressive disorder. *Mol Psychiatry.* 2025 Feb;30(2):574-586. doi: 10.1038/s41380-024-02695-2. Epub 2024 Aug 22. PMID: 39174649.

Figueroa-Hall LK*, Burrows K*, Alarbi AM*, Hannafon BN*, Hladik C, Tan C, Ramesh R, Stewart JL, Risbrough VB, Paulus MP, Teague TK. Comparison of Methods for Isolation and Characterization of Total and Astrocyte-Enriched Extracellular Vesicles from Human Serum and Plasma. *J Extracell Biol.* 2025 Feb 14;4(2):e70035. doi: 10.1002/jex2.70035. PMID: 39958973; PMCID: PMC11826443. * **Shared co-first authorship**

Savitz J, **Figueroa-Hall LK**, Teague TK, Yeh HW, Zheng H, Kuplicki R, Burrows K, El-Sabbagh N, Thomas M, Ewers I, Cha YH, Guinjoan S, Khalsa SS, Paulus MP, Irwin MR. Systemic Inflammation and Anhedonic Responses to an Inflammatory Challenge in Adults With Major Depressive Disorder: A Randomized Controlled Trial. *Am J Psychiatry.* 2025 Apr 23. Epub ahead of print. PMID: 40264292.

Li YJ, Kuplicki R, Ford BN, Kresock E, **Figueroa-Hall L**, Savitz J, McKinney BA. Gene age gap estimate (GAGE) for major depressive disorder: A penalized biological age model using gene expression. *Neurobiol Aging.* 2025 Jul;151:13-21. doi: 10.1016/j.neurobiolaging.2025.01.012. Epub 2025 Apr 1. PMID: 40187167.

Rojas L, Mann E, Ren X, Bethel D, Baughman N, Burrows K, Kuplicki R, **Figueroa-Hall LK**, Aupperle RL, Stewart JL, Guinjoan SM, Khalsa SS, Savitz J, Paulus MP, Wilhelm RA, John-Henderson NA, Yeh HW, White EJ. Major Depressive Disorder and Serum Inflammatory Biomarkers as Predictors of Reward-Processing Dysfunction in an American Indian Sample. *Biol Psychiatry Cogn Neurosci Neuroimaging.* 2025 Sep 9:S2451-9022(25)00263-0. doi: 10.1016/j.bpsc.2025.08.015. Epub ahead of print. PMID: 40935332.

Burrows K, McNaughton-Long BA, Yakshin AK, Coussa V, Kuplicki R, Aupperle RL, Savitz JB, Paulus MP, Stewart JL, **Figueroa-Hall LK**. Stimulant use disorder indicative of increased serum soluble intercellular adhesion molecule-1 concentrations with altered brain reward and interoceptive processing. *Brain Behav Immun.* 2026 Jan 5:106261. doi: 10.1016/j.bbi.2026.106261. Epub ahead of print. PMID: 41500325.

Book Chapter

Ameen N, Kopic S, Ahsan Md K, and **Figueroa-Hall LK** (2020). Secretory Diarrhea; Volume 2: Ion Transport Across Epithelial Tissues and Disease; Ion Channels and Transporters of Epithelia in Health and Disease Book 2nd Edition; (Hamilton KL and Devor DC), APS-Springer-Nature.

Academic Presentations

Laureate Institute for Brain Research

- 2021** Brownbag Series; Toll-like receptor (TLR) signaling in depression
- 2021** T1000; Predictors of Suicidal Thoughts and Behaviors in Community-Dwelling Psychiatric Patients: A One-Year Longitudinal Study
- 2022** Brownbag Series; TLR4 signaling in depression- Grant Overview
- 2024** LIBR Research Meeting; Extracellular vesicle methods for isolation of astrocyte-enriched EVs: A beginner's guide for Neuroscientists
- 2025** Blood-Based Biomarkers and Bioinformatics Workshop
- 2025** LIBR Research Meeting; Astrocyte-enriched extracellular vesicle miRNAs reveal inflammatory-related biological processes.

National/International Conferences

Leandra K. Figueroa and Andrei E. Medvedev (2011). Asp299Gly polymorphism decreases the TLR4-elicited activation of MyD88- and TRIF-dependent signaling pathways. Oral/Poster presentations at the annual meeting for the AAI.

- L.K. Figueroa-Hall**, D. Buck, S. Das, C. Stevens, and R.L. Davis (2012). β -Funaltrexamine inhibits IL-1R and TLR4-signaling pathways. Diversity Fellows Poster Session. Poster presentation at annual meeting for SFN.
- L.K. Figueroa-Hall**, D. Buck, S. Das, C. Stevens, and R.L. Davis (2013). Investigating the TLR4 signaling mechanisms in CHME-5 human microglial cells and the effects of β -Funaltrexamine treatment. Poster presentation at the annual meeting for the American Association of Immunologists (AAI).
- L.K. Figueroa-Hall**, S. Das, C.W. Stevens, and R.L. Davis (2015). Characterization of TLR4 neuroinflammatory signaling mechanisms and the effects of fentanyl citrate on CHME-5 human microglial cells. Poster presentation at the annual meeting for Society for Neuroscience (SFN).
- L.K. Figueroa-Hall**, S. Das, C.W. Stevens, and R.L. Davis (2016). Characterization of TLR4 neuroinflammatory signaling mechanisms and the effects of fentanyl citrate on CHME-5 human microglial cells. Poster presentation at the annual meeting for EB.
- Leandra K. Figueroa-Hall**, Md Kaimul Ahsan, Caihong Qiu, Yinghong Ma, and Nadia A. Ameen (2018). Generation of Myo5B-deficient experimental models to study Microvillus inclusion disease (MVID). Poster presentation at the annual meeting for Experimental Biology (EB)-APS and GI & Liver Section Trainee Symposium.
- Burrows K., **Figueroa-Hall, L. K.**, Alarm A.M., Tan C., Hannafon B.N., Hladik C., Ramesh R., Stewart J.L., Savitz J.B., Risbrough V.B., Teague T.K., & Paulus M.P. (2022). Comparison of neuronal-enriched extracellular vesicles using different extracellular vesicles isolation methods. Poster presentation to International Society of Extracellular Vesicles (ISEV)xTECH; Honolulu, Hawaii.
- Burrows, K., Stewart, J. L., **Figueroa-Hall, L. K.**, Kuplicki, R., Alarbi, A. M., Tan, C., Tulsa 1000 Investigators, Risbrough, V. B., McKinney, B. A., Ramesh, R., Savitz, J. B., Teague, T.K., Khalsa, S. S., & Paulus, M. P. (2022). Association of decreased microRNA-93 expression from neuronal-enriched extracellular vesicles and dysregulated brain interoceptive processing in major depressive disorder. Poster presented at ISEV2022; Lyon France.
- Leandra Figueroa-Hall**, Kaiping Burrows, Jennifer L. Stewart, Ahlam M. Alarm, Chibing Tan, Rayus Kuplicki, T. Kent Teague, Rajagopal Ramesh, Victoria B. Risbrough, Martin P. Paulus, Jonathan Savitz (2022). Toll-Like Receptor 4 Agonist Elicits an Inflammatory Response After *in vivo* Immune Challenge in Major Depressive Disorder. Data Blitz and poster presentation at the annual meeting for the ACNP; Phoenix, Arizona.
- Leandra K. Figueroa-Hall**, Kaiping Burrows, Ahlam M. Alarbi, Bethany N. Hannafon, Rajagopal Ramesh, Jennifer L. Stewart, Jonathan B. Savitz, Victoria B. Risbrough, T. Kent Teague, & Martin P. Paulus (2022). Comparison of next-generation sequencing data analysis on astrocyte-enriched extracellular vesicle microRNA using different platforms. Poster presentation at ISEVxTECH; Honolulu, Hawaii.
- Leandra K. Figueroa-Hall**, Kaiping Burrows, Ahlam M. Alarbi, Chibing Tan, T. Kent Teague, Brett McKinney, Rajagopal Ramesh, Yoon-Hee Cha, Salvador Guinjoan, Sahib Khalsa, Victoria B. Risbrough, Martin P. Paulus, and Jonathan Savitz (2022). Characterization of human astrocyte-enriched extracellular vesicle miRNAs after an *in vivo* lipopolysaccharide challenge. Oral presentation at the 2022 annual meeting of ISEV; Lyon, France.
- Burrows, K., **Figueroa-Hall, L. K.**, Alarbi, A. M., Stewart, J. L., Kuplicki, R., Tan, C., Hannafon, B.N., Ramesh, R., Savitz, J. B., Fan, C.C., Thompson W., Risbrough, V. B., Teague, T. K., & Paulus, M. P. (2023). Human neuronal-enriched extracellular vesicle microRNA profile in individuals diagnosed with COVID-19. Poster presented at ISEV2023; Seattle, Washington.
- Figueroa-Hall, L. K.**, Kaiping Burrows, Rayus Kuplicki, T. Kent Teague, Michael Irwin, Sahib Khalsa, Salvador Guinjoan, Martin P. Paulus, Jonathan Savitz (2023). Astrocyte-Enriched Extracellular Vesicle Vascular Injury Proteins and HSA-LET-7f-5p Expression after *in Vivo* Immune Challenge in Major Depressive Disorder. Virtual poster presentation at the annual meeting for the ACNP- Tampa, Florida.
- Burrows, K., Tan, C., Alarbi, A. M., **Figueroa-Hall, L. K.**, Hannafon, B.N., Ramesh, R., Risbrough, V. B., Teague, T. K., & Paulus, M. P. (2023). Comparison of neuronal-enriched extracellular vesicles using different neuronal enrichment methods. Poster presented at the 1st Symposium “Extracellular Vesicles in Nervous Systems”, Rome, Italy.

- Leandra K. Figueroa-Hall**, Ahlam M. Alarbi, Chibing Tan, Kaiping Burrows, Bethany Hannafon, Rajagopal Ramesh, Victoria B. Risbrough, Kent Teague, Martin P. Paulus (2023). Four distinct methods for exosome isolation and enrichment of astrocyte-enriched extracellular vesicles. Poster presentation at the ISEV's 1st symposium on EVs in the Nervous System; Rome, Italy.
- Figueroa-Hall, L. K.**, Burrows, K., Alarbi, A. M., Tan, C., Kuplicki, R., Stewart, J. L., Aupperle R., Hannafon, B.N., Ramesh, R., Savitz, J. B., Risbrough, V. B., Teague, T. K., Khalsa, S.K., Guinjoan S., & Paulus, M. P.(2023). Neuronal-enriched extracellular vesicle miR-182 and miR-486 expression display opposing directionality in non-suicidal and suicidal individuals with major depressive disorder. Poster presentation at the 2023 annual meeting of ISEV; Seattle, Washington.
- Burrows, K., **Figueroa-Hall, L. K.**, Alarbi, A. M., Tan, C., Hannafon, B.N., Ramesh R., Risbrough, V. B., Teague, T. K., & Paulus, M. P. (2024). Comprehensive evaluation of extracellular vesicle markers with different isolation methods. Poster presentation at ISEV2024; Melbourne, Australia.
- Figueroa-Hall, L. K.**, Burrows, K., Alarbi, A. M., Tan, C., Hannafon, B.N., Ramesh R., Risbrough, V. B., Teague, T. K., & Paulus, M. P. (2024). Astrocyte-enriched extracellular vesicle protein concentrations after proteinase K treatment. Poster presentation at ISEV2024; Melbourne, Australia.
- Figueroa-Hall, L. K.**, Burrows, K., Alarbi, A. M., Hannafon, B.N., Ramesh R., Risbrough, V. B., Teague, T. K., Paulus, M. P., & Savitz, J. (2024). TLR4 pathway proteins elevated in astrocyte-enriched extracellular vesicles. Oral presentation at ISEV's Blood EV Workshop; Seoul, South Korea.
- Rojas, L., Ren, X., Mann, E., Bethel, D., Wilhelm, R., Baughman, N., Burrows, K., **Figueroa-Hall, L.K.**, John-Henderson N.A., Kuplicki, R., Aupperle, R.L., Guinjoan, S.M., Savitz, J., Paulus, M.P., White, E.J. (2024). Serum inflammatory biomarkers as possible predictors of reward disruptions in an American Indian sample: A study on sex differences. Symposium oral presentation submitted to the annual meeting of Anxiety and Depression Association of America; Boston MA.
- Rojas, L., Mann, E., John-Henderson, N., Wilhelm, RA., Ren, X., Bethel, D., Baughman, N., Burrows, K., **Figueroa-Hall, LK.**, Aupperle, RL., Guinjoan, SM., Khalsa, SS., Savitz, J., Paulus, MP., White, EJ. (2024). Serum Inflammatory Biomarkers as Predictors of Disruptions to Inhibitory Control within an American Indian Sample: A Multimodal Study. Poster presentation at the annual meeting of the Association for Behavioral and Cognitive Therapies, Philadelphia, PA.
- Leandra Figueroa-Hall***, Kaiping Burrows, Rayus Kuplicki, T. Kent Teague, Michael Irwin, Sahib Khalsa, Salvador Guinjoan, Martin P. Paulus, Jonathan Savitz. Peripheral and central inflammatory proteins after *in vivo* immune challenge in major depressive disorder. Oral presentation at the 2025 annual meeting of the ISEV; Vienna, Austria.
- Kaiping Burrows, **Leandra K. Figueroa-Hall**, Bethany N. Hannafon, Rajagopal Ramesh, Victoria B. Risbrough, T. Kent Teague, Martin P. Paulus & Jonathan B. Savitz. Exploring the Role of CD9-Positive Extracellular Vesicles in Major Depressive Disorder: Associations with Symptom Severity and Potential Physiological Implications. Poster presentation at ISEV2025; Vienna, Austria.
- Leandra Figueroa-Hall**, Katilyn Terrell, Kaiping Burrows, Rayus Kuplicki, T. Kent Teague, Michael Irwin, Sahib Khalsa, Salvador Guinjoan, Martin P. Paulus, Jonathan Savitz. Astrocyte-enriched extracellular vesicle miRNAs reveal inflammatory-related biological processes. Invited Speaker- Oral Presentation at 2nd EViNS Symposium; 2025- Montreal, Canada.
- Leandra Figueroa-Hall**, Katilyn Rada, Kaiping Burrows, Rayus Kuplicki, T. Kent Teague, Sahib Khalsa, Salvador Guinjoan, Martin P. Paulus, Michael Irwin, Jonathan Savitz. Astrocyte-enriched extracellular vesicle MicroRNAs reveal inflammation-related gene targets for the Extracellular Vesicles as Potential Biomarkers in Psychiatry Panel- Oral Presentation at ACNP; 2026- Nassau, Bahamas.

State and Regional Conferences

- L.K. Figueroa-Hall**, S. Das, C.W. Stevens, R.L. Davis (2011). The D299G Polymorphism inhibits Signal Transduction by Interfering with the MyD88- and TRIF-dependent Signaling Pathways. Poster presentation for the Graduate Research Conference- University of Maryland, SOM.

- L. K. Figueroa-Hall**, E.K. Green, D.J. Buck, C.W. Stevens, and R.L. Davis (2012). Pro-Inflammatory Mediator-Activated TLR/IL-1R/NF- κ B Signaling is inhibited by β -Funaltrexamine. Poster presentation for OSU-CHS Research Day 2012.
- L.K. Figueroa-Hall**, S. Das, C.W. Stevens, R.L. Davis (2015). Characterization of TLR4 neuroinflammatory signaling mechanisms and the effects of fentanyl citrate on CHME-5 human microglial cells. Poster presentation for Research Partners Citywide Research Day, University of Oklahoma, Schusterman Center.
- L.K. Figueroa-Hall**, D. Buck, S. Das, C. Stevens, and R.L. Davis (2015). Investigating TLR4-signaling mechanisms in CHME-5 human microglial cells and the effects of β -Funaltrexamine treatment. Poster presentation for OSU-CHS Research Day 2015.
- L.K. Figueroa-Hall**, S. Das, C.W. Stevens, R.L. Davis (2015). TLR4, Opioids and the Inflammatory Response in the Brain”. Oral Presentation for 3MT Competition.
- L.K. Figueroa-Hall**, S. Das, C.W. Stevens, and R.L. Davis (2015). Investigating TLR4 neuro-inflammatory signaling mechanisms and the effects of opioid compounds in CHME-5 human microglial cells. Poster presentation for OSU-Tulsa Day 2015.
- L.K. Figueroa-Hall**, S. Das, C.W. Stevens, and R.L. Davis (2017). Opioid compounds modulate LPS-induced NF- κ B activation in microglial cells. Poster presentation for OSU-CHS Research Day 2017.
- Leandra K. Figueroa-Hall**, Md Kaimul Ahsan, Caihong Qiu, Yinghong Ma, and Nadia A. Ameen (2018). Generation of Myo5B-deficient experimental models to study Microvillus inclusion disease (MVID). Poster presentation at the 6th Annual Yale Pediatric Research Forum; Yale University, SOM.
- Leandra K. Figueroa-Hall**, Kaiping Burrows, Ahlam M. Alarbi, Jennifer L. Stewart, Rayus Kuplicki, Chibing Tan, Rajagopal Ramesh, Jonathan B. Savitz, Sahib Khalsa, T. Kent Teague, Victoria Risbrough, and Martin P. Paulus (2021). Ibuprofen-mediated astrocyte-enriched exosome miR-23b expression attenuates TNF and IL-17A to promote improved brain reward processing. Oral presentation at the annual End2Cancer meeting; Online, Oklahoma City, OK.
- Burrows K.**, Figueroa-Hall, L. K., Alarm A.M., Stewart J.L., Kuplicki R., Tan C., Ramesh R., Savitz J.B., Khalsa S., Teague T.K., Risbrough V.B, and Paulus M.P. (2021). Neuronally-enriched exosomal microRNA-27b mediates acute effects of ibuprofen on reward-related brain activity in healthy adults. Oral presentation at the annual End2Cancer meeting; Online, Oklahoma City, OK.
- Ciboney Ware, **Leandra K. Figueroa-Hall**, Sherille Bosfield, Melanie Curry, Cassandra Sturycz, Robin Aupperle, & Martin P. Paulus. The Impact of reporting the mental health status of marginalized adolescents: and ABCD Study (2022). Poster presented at LIBR Research Day. Laureate Institute for Brain Research; Tulsa OK.
- Coussa V., **Figueroa-Hall, L. K.**, Spechler P.A., Kuplicki R., Victor T.A., Aupperle R.L., Khalsa S.S., Savitz J., T. Teague, T. K., Paulus, M. P., Stewart, J. L., Burrows K. (2022). Serum Soluble Intercellular Adhesion Molecule 1 (sICAM-1) as a Biomarker for Neuroadaptation to Substance Use. Poster presented at LIBR Research Day, Laureate Institute for Brain Research, Tulsa OK.
- Figueroa-Hall LK** and Burrows K. (2023). A window into the depressed brain. Oral presentation at Zarrow Symposium; the Mental Health Association; Tulsa OK.
- Valerio Coussa, **Leandra Figueroa-Hall**, Rayus Kuplicki, Teresa A. Victor, K. Kale Thomas, Robin L. Aupperle, Sahib S. Khalsa, Jonathan Savitz, T. Kent Teague, Martin P. Paulus, Jennifer L. Stewart, Kaiping Burrows (2023). Opioid use indicative of increased serum soluble intercellular adhesion molecule 1 concentrations and altered brain reward processing. Poster presented at LIBR Research Day, Laureate Institute for Brain Research, Tulsa OK.
- KeAnna Nelson, Breanna A. McNaughton, Angela Yakshin, Kale Thomas, Amalie-Laeah M. Figueroa, Kaiping Burrows, Robin Aupperle, Jonathan Savitz, T. Kent Teague, Martin P. Paulus, **Leandra K. Figueroa-Hall** (2024). Serum cortisol and sleep disturbance/impairments in Major Depressive Disorder. Poster presented at LIBR Research Day, Laureate Institute for Brain Research, Tulsa OK
- Angela Yakshin, Kale Thomas, Amalie-Laeah M. Figueroa, Breanna McNaughton, Ying Wang,

- KeAnna Nelson, T. Kent Teague, Jonathan Savitz, **Leandra K. Figueroa-Hall**, & Kaiping Burrows (2024). Serum cortisol response to lipopolysaccharide challenge in major depressive disorder. Poster presented at LIBR Research Day, Laureate Institute for Brain Research, Tulsa OK.
- Derewonko, C., Kuplicki, R., Burrows, K, **Figueroa-Hall, L.K.**, & Ironside, M. (2025). The unique face of anxious depression: Differential effects of tumor necrosis factor on insula grey matter in anxious and non-anxious depression. Oral presentation at Laureate Institute for Brain Research, Tulsa OK.
- Cruddas, K., Novelli, R., Green, L.P., Hartsell, K., Yakshin, A.K., Thomas, K., McNaughton-Long, B., Paulus, M.P, **Figueroa-Hall, L.K.**, & Burrows, K. (2025) Neuronal-enriched extracellular vesicle microRNA associations with inflammation and neurotoxicity in major depressive disorder. Poster presentation at Laureate Institute for Brain Research, Tulsa OK.
- Yakshin, A.K., Green, L.P., Hartsell, K., Cruddas, K., Novelli, R., Kuplicki, R., Paulus, M.P, Burrows, K., & **Figueroa-Hall, L.K.** (2025). Inflammatory and metabolic markers associated with sleep in major depressive disorder. Poster presentation at Laureate Institute for Brain Research, Tulsa OK.
- Hartsell, K., Green, L.P., Cruddas, K., Yakshin, A.K., Novelli, R., Thomas, K., McNaughton-Long, B., Kuplicki, R., Paulus, M.P, **Figueroa-Hall, L.K.**, & Burrows, K. (2025). Adult ADHD symptoms in adults with major depressive disorder are linked to emotional distress, not inflammation. Poster presentation at Laureate Institute for Brain Research, Tulsa OK.
- Green, L.P., Foreman, K.L., Kuplicki, R., Yakshin, A.K., Cruddas, K., Novelli, R., Hartsell, K., Thomas, K., Ironside, M., Paulus, M.P, Burrows, K., & **Figueroa-Hall, L.K.** (2025). The D299G toll-like receptor 4 single nucleotide polymorphism may have a protective effect against an inflammatory phenotype in anxious depression. Poster presentation at Laureate Institute for Brain Research, Tulsa OK.

TEACHING

University of Maryland, School of Medicine, Department of Medical Research Technology
2009-2010, Guest Lecturer for Undergraduate Senior Applied Cellular and Molecular Biology, “Two-Component Regulatory Systems”

Oklahoma State University-CHS

2012-2013, Teaching Assistant for OSU-CHS Summer Academy, “Mysteries of Biomedical Sciences”

Tulsa Community College

2013, Metro Campus. Guest Lecturer for Physiology, “Toll-like Receptors: An In-Depth Look”

2015, Southeast Campus. Guest Lecturer for Intro to Biology for Majors, “TLR4 and Neuroinflammation”

Oklahoma State University’s American Indians into Psychology Program

2021, Guest Lecture: “Toll-like receptor signaling in depression”

Phoenix Rising Alternative High School

2021, “What makes the body go round”?

University of Tulsa

2020, Guest Lecture: “Toll-like receptor signaling in depression”- Introduction to Neuroscience

2024, “Extracellular vesicle methods for isolation of astrocyte-enriched EVs: A beginner’s guide for Neuroscientists”- Department of Psychology- Neuroscience

2025, “Extracellular vesicle methods for isolation of astrocyte-enriched EVs: A beginner’s guide for Neuroscientists”- Department of Chemistry/Biochemistry

LIBR; RA Professional Development Series

2025, “Conferences: Abstracts, Submissions, Posters, and Presentation/Talks”

Northeastern State University

2026, “Astrocyte-enriched extracellular vesicle MicroRNAs reveal inflammation-related gene targets”- Department of Biology

Ad hoc Reviewer

American Journal of Physiology- Cell Physiology
American Journal of Physiology - Regulatory, Integrative and Comparative Physiology
Bosnian Journal of Biomedical Sciences
Brain and Behavior
Brain, Behavior, and Immunity
British Journal of Pharmacology
Cellular and Molecular Biology of Glia (CMBG) Study Section-NIH
JAMA Psychiatry
Journal of Affective Disorders
Journal of Drug and Alcohol Dependence
Journal of Extracellular Vesicles
Physiological Genomics
Psychological Medicine

Society for the Advancement of Chicanos, Latinos, and American Indians

2016, Abstract Reviewer

Annual Biomedical Research Conference for Minority Students (ABRCMS)

2016, 2022, 2023 Abstract Reviewer

Yale University, School of Medicine

2018-2019, Yale Postdoctoral Association- Secretary

Oklahoma State University

2015-2016, Judge for OSU Scholar Development Research Symposium
2016, Judge for OSU 2016 Research Day (Medical Student Posters)
2017-Present, Manuscript Reviewer for Oklahoma State Medical Proceedings

The American Physiological Society

2016-Experimental Biology; Judge for APS Bruce Undergraduate Poster Session
2016- FASEB Postdoctoral Preparation Institute 2016
2016- Writing and Reviewing for Scientific Journals Course
2018- Experimental Biology; Judge for APS Undergraduate Poster Session

TABERC/SFN/OPS Annual Meeting

2017, Judge for high school poster session

ISEVxTECH

2023, Poster Reviewer

Community Service- Fostering Opportunity, Collaboration, and Understanding in Science

(FOCUS)

Laureate Institute for Brain Research

2020-Present; Philanthropy and Community Involvement- LIBR FOCUS Subcommittee, **Co-Chair**
2024-Present; FOCUS' Training & Fellowship Subcommittee- **LIBR Accelerated Summer Research Coordinator**

2012-2015

Eugene Field (EF) Elementary School, Tulsa, OK

2015-2016, Reading Partners; 2013-2014, Lunch Buddy Program; 2013-2014, Global Gardens

Oklahoma State University, CHS, Biomedical Sciences Graduate Student Association

2014-2017, Member: Curious Cowboys STEM Camp; Roy Clark Elementary STEM Night; EF Science Fair

2015; Videoconference: Professional Development Series (organizer):

- “An Introduction to Fellowship Opportunities and Grant Writing”, by Dr. Albert Avila, NIH-NIDA
- “Manuscript: Authorship and the Submission/Review Process,” by Dr. Sue Barman, Michigan State

University

2013-2014, President: Curriculum Oversight Committee-Graduate Student Member; EF Science Fair

2012-2013, Vice-President: Zumbathon for Alliance for Lupus Research (Organizer); EF Science Fair