Aaryn Mustoe, Ph.D.

Behavioral Endocrinologist; Primatologist
Southwest National Primate Research Center
Texas Biomedical Research Institute
San Antonio, Texas
amustoe@txbiomed.org
amustoe@tamusa.edu

POSITIONS

Pres—2022 ***Staff Scientist***
Southwest National Primate Research Center, Texas Biomedical Research Institute

Pres—2023 ***Adjunct Faculty***
Texas A&M University-San Antonio, Department of Natural Sciences; and Office of First-Year Experience

2022—2020 ***Visiting Assistant Professor***
Department of Biology, University of Nebraska at Omaha

2020—2017 ***Postdoctoral Research Associate***
Department of Pharmacology and Experimental Neuroscience, University of Nebraska Medical Center; Callitrichid Research Center, University of Nebraska at Omaha

EDUCATION

2016 ***Ph.D., University of Nebraska at Omaha:*** Department of Psychology, Neuroscience & Behavior
Dissertation: Oxytocin and the social roots of cooperation in marmoset monkeys

2009 ***B.S., University of Wisconsin-Oshkosh***: Department of Biology, Department of Psychology

PUBLICATIONS *https://orcid.org/0000-0001-7618-8810*

2023 **Mustoe A**. A tale of two hierarchies: Hormonal and behavioral factors underlying sex differences in social dominance in cooperative breeding callitrichids. Hormones and Behavior, 147, 105293.

2022 **Mustoe A**, & French J. Sexual Behavior in Marmosets in the Context of Cooperative Breeding. In T. Shackelford (Ed.), The Cambridge Handbook of Evolutionary Perspectives on Sexual Psychology (Cambridge Handbooks in Psychology, pp. 464-493). Cambridge: Cambridge University Press. doi:10.1017/9781108943581.022

2021 Zhu L, Suhr Van Haute M, Kok CR, Yang Q, Pillai R, Sinha R, Hassenstab H, **Mustoe A**, Moriyama E, Hutkins R, French JA, Benson AK. Captive Common Marmosets (Callithrix jacchus) Are Colonized throughout Their Lives by a Community of Bifidobacterium Species with Species-Specific Genomic Content That Can Support Adaptation to Distinct Metabolic Niches. mBio 12 (4).

2020 Zhu L, Suhr Van Haute MJ, Hassenstab H, Smith C, Rose D, **Mustoe A**, Benson AK, French JA, Fecal short-chain fatty acid concentrations increase in newly paired male marmosets (Callithrix jacchus) mSphere 5 (5).

2020 Zhu L, Clayton J, Suhr Van Haute MJ, Yang Q, Hassenstab H, **Mustoe A**, Knights D, Benson AK, French JA. Sex bias in gut microbiome transmission in newly paired marmosets (Callithrix jacchus) mSystems 5 (2).

2019 **Mustoe A**, Schulte N, Taylor JH, French JA, Toews ML. Leu8 and Pro8 oxytocin agonism differs across human, macaque, and marmoset vasopressin 1a receptors. Scientific Reports 9, 15480.

2019 Pierce ML, Mehrotra S, **Mustoe A**, French JA, Murray TF. A comparison of the ability of Leu8- and Pro8-oxytocin to regulate intracellular Ca^{2+} and Ca^{2+}-activated K^+ channels at human and marmoset oxytocin receptors. Molecular Pharmacology, 95 (4), 376-385

2018 Cavanaugh J, **Mustoe A**, Womack S, French JA. Oxytocin modulates mate-guarding behavior in marmoset monkeys. Hormones and Behavior, 106. 150-161.

2018 **Mustoe A**, Taylor JH, French JA. Oxytocin structure and function in New World monkeys: From pharmacology to behavior. Integrative Zoology, 13, 634-654.

2018 Cavanaugh J, **Mustoe A**, French JA. Oxytocin regulates reunion affiliation with a pairmate following social separation in marmosets. American Journal of Primatology. 80(10),

2018 French JA, Cavanaugh J, **Mustoe A**, Carp SB, Womack SL. Social monogamy in nonhuman primates: Phylogeny, phenotype, and physiology. Journal of Sex Research, 55, 410-34

2016 **Mustoe A**, Harnisch AM, Hochfelder B, Cavanaugh J, French JA. Inequity aversion strategies between marmosets are influenced by partner familiarity and sex but not oxytocin. Animal Behaviour, 114, 69-79.

2016 French JA, Frye B, Cavanaugh J. Ren D, **Mustoe A**, Rapaport L, Mickelberg J. Gene changes may minimize masculinizing and defeminizing influences of exposure to male cotwins in female callitrichine primates. Biology of Sex Differences, 7:28.

2016 French JA, Taylor JH. **Mustoe A**, Cavanaugh J. Neuropeptide diversity and regulation of social behavior in New World monkeys. Frontiers in Neuroendocrinology. 42, 18-39.

2015 Taylor JH, **Mustoe A**, Hochfelder B, French JA. Reunion behavior after social separation is associated with enhanced HPA recovery in young marmoset monkeys Psychoneuroendocrinology. 57, 93-101.

2015 **Mustoe A**, Cavanaugh J, Harnisch AM, Thompson BE, French JA. Do marmosets care to share? Oxytocin treatment reduces prosocial behavior toward strangers. Hormones and Behavior. 71, 83-90

2015 Ren D, Lu G, Moriyama H, **Mustoe A**, Harrison EB, French JA. Genetic diversity in oxytocin ligands and receptors in new world monkeys. Plos One. 10(5): e0125775

2014 Cavanaugh J, **Mustoe A**, Taylor JH, French JA. Oxytocin facilitates fidelity in well-established marmoset pairs by reducing sociosexual behavior toward opposite-sex strangers. Psychoneuroendocrinology. 46, 1-10.

2014 **Mustoe A**, Taylor JH, Birnie AK, Huffman MC, French JA. Gestational cortisol and social play shape development of marmosets' HPA functioning and behavioral responses to stressors. Developmental Psychobiology, 56, 1229-1243.

2014 Taylor JH, **Mustoe A**, French JA, Behavioral responses to social separation stressor change across development and are dynamically related to HPA activity in marmosets. American Journal of Primatology, 76(3), 239-248.

2013 French JA, **Mustoe A**, Cavanaugh J, Birnie AK. The influence of steroid hormones on female aggression in 'atypical' mammals. Philosophical Transactions of the Royal Society B: Biological Sciences. 368: 20130084.

2012 **Mustoe A**, Jensen HA, French JA. Describing ovarian cycles, pregnancy characteristics, and the use of contraception in female white-faced marmosets, Callithrix geoffroyi. American Journal of Primatology, 74(11), 1044–1053.

2012 **Mustoe A**, Birnie AK, Korgan AC, Santo JB, French JA, Natural variation in gestational cortisol is associated with patterns of growth in marmoset monkeys (Callithrix geoffroyi). General and Comparative Endocrinology, 175(3), 519-226.

2012 French, JA, Smith AS, Gleason AM, Birnie AK, **Mustoe A**, Korgan AC. Stress reactivity in young marmosets (Callithrix geoffroyi): Ontogeny, stability, and lack of concordance among co-twins. Hormones and Behavior, 61(2), 196-20.

PUBLICATIONS "IN PREP"

*indicates mentored student author

Mustoe A, Arroyo J.P., Lopez M., Alverez L., Alverez A., Hickmott A., Cervantes L., Reveles K., Phillips K., Ross C. Age-related changes in gait performance in captive marmosets (Callithrix jacchus)

Mustoe A, Almeida NR, *Douchey M, *Loya-Perez, V, Schulte. N, French JA, Toews, M. Design and characterization of oxytocin and dopamine receptor bivalent ligands to target receptor heterodimers produce increased oxytocin receptor agonism but not vasopressin 1a receptor agonism.

*Briardy M, *Manca C, *Wulf M, *Hudson JJ, **Mustoe A**. Validation of multiple steroid hormones using a single low-cost extraction procedure in hair

*Manca C, *Wulf M, **Mustoe A**. Social buffering with mates and strangers: the effects of oxytocin and dopamine treatments during social separation and reunion

TEACHING AND MENTORING EXPERIENCE

Texas A&M University-San Antonio

2023 General Biology I (BIOL-1306)
2023 First-Year Seminar (2 Sections) (UNIV-1301)

University of Nebraska at Omaha *evidence of teaching effectiveness available upon request

2022—2020 Introduction to Biology II Laboratory: (BIO-1750) (equivalent to organismal biology)
2022—2021 Molecular and Biomedical Biology Internship: (BIO 4550)
2021 Behavioral Ecology (BIO-4260)
2021 Vertebrate Endocrinology (BIO-4730 *co-instructor)
2021 Primatology (ANTH-4920, BIO-4030, PSYC-4920) (I developed as a new special topic course)
2019 Personalized Genomics (NEURO4900 *co-instructor)
2018 Social Neuroscience (PSYC-8336, NEUR-4330)
2016 Advanced Neuroscience Laboratory (NEUR-4200)
2015 Advanced Neuroscience Laboratory (NEUR-4200)
2015 Advanced Neuroscience Laboratory (NEUR-4200)
2013 Advanced Neuroscience Laboratory (NEUR-4200)
2013 Statistics for the Behavioral Sciences (PSYC-3130)
2012 Statistics for the Behavioral Sciences (PSYC-3130)

Creighton University

2016 Physiological Psychology (PSY 437)

Teaching Assistant

2009—2013 Various courses in UNO Dept of Psychology/Neuroscience
2006—2009 Supplemental Instruction Leader at UW-Oshkosh (Intro to Psychology; 7 semesters)

Teaching Pedagogy and Professional Development

2020 BootcampR: An Introduction to R
2015 Society for Behavioral Neuroendocrinology Teaching Workshop, "Teaching Behavioral Endocrinology to the Masses"

2014 Pedagogical Theory and Practice: The Sociology of Teaching and Learning (UNO)
2014—2010 Hormone "Assay Bootcamp"
I ran workshops to train faculty, graduate, and undergraduate students in principles and techniques in endocrine assays (primarily EIAs)

Undergraduate and Graduate Student Mentoring *(details/outcomes available upon request)*
2023 Summer Intern; Southwest National Primate Research Center
2009—Present Callitrichid Research Center (UNO) and UNO Department of Biology
1 MS UNO dept. of biology graduate students
1 PhD. Student Supervisory Committee Member, University of Nebraska Medical Center, Department of Pediatrics
10 undergraduate student manuscript co-authors
9 supervised undergraduate intramural research grants (FUSE)
1 undergraduate student senior thesis
1 undergraduate student honors thesis

GRANT FUNDING

2023—2027 ***Multiple Methods Approach to Study the Impact of Stress among Latino Immigrant Cattle Feedyard Workers in the Central States Region***
CDC National Institute for Occupational Safety & Health (NIOSH) (subcontract: $15,341)
Co-Investigator
Synopsis: multi-method observational study will identify chronic and severe types of stress and their associations with occupational injuries, physical and psychosocial health, and social well-being outcomes across time and industry-specific seasons. My role is involved in the hormone analyses.

2021—2023***** ***Age-Specific Impacts in Neurocognitive Outcomes Following Prolonged Social Isolation*** *UNMC CoNDA Center Pilot Grant Award, NIGMS COBRE ($145,724)*
Principal Investigator (5P20GM130447 subaward PI)
Synopsis: The goal of this study is to examine short- and long-term changes neuroendocrine, behavioral, and awake fMRI brain imaging outcomes associated with stress due to social isolation in adolescent, adult, and old-age marmoset monkeys.
**Grant was awarded but later declined by myself due to change in institution to Texas*

2019—2021 ***Signaling in Marmoset Oxytocin Receptors: From Cells, Brain Imaging, to Behavior***
University of Nebraska Collaboration Initiative Seed Grant ($148,910)
Principal Investigator
Synopsis: The goal of this study is to gather preliminary data of receptor- and circuit-level mechanisms underlying oxytocin behavioral function and effects in the presence and absence of dopamine receptor dimerization using pharmacological (BRET), cell membrane (TIRF) and brain imaging (fMRI), and behavioral studies.

2019—2020 ***The Marmoset as a Model for Social Stress and Reward: Cells, Brains, and Behavior***
University of Nebraska at Omaha Faculty Research Grant ($5,000)
Principal Investigator
Synopsis: Develop behavioral and neuroimaging models to expand research capacity for responses and neuropeptide interventions related to social stressors in marmosets.

GRANTS CURRENTLY UNDER REVIEW

2023—2024 ***The Interface of Lipidomics and the Gut Microbiome in Aging Individuals***
Pilot Grant Program, San Antonio Nathan Shock Center and the Barshop Institute, UTHSA ($25,000)
Principal Investigator
Synopsis: Evaluate the effects of aging and fecal microbiome transplants on gut microbiome changes and lipid metabolite signaling in feces and plasma.

SELECTED CONFERENCE AND SYMPOSIUM TALKS

*indicates mentored **student presenting author**

2023 Age-related Changes in Gait Performance in Captive Marmosets (Callithrix jacchus): American Society of Primatology meeting, Reno, NV

2023 The Interaction Between Digestive Efficiency and Cortisol on Metabolic Outcomes*. SNPRC Research Days. *J Tregidgo SNPRC summer intern

2022 Insights into marmoset social motivation through oxytocin evolution and signaling: Department of Anthropology Seminar Series, University of Zurich, [invited talk]

2020 Social buffering with mates and strangers: the effects of oxytocin and dopamine treatments during social separation and reunion*. Marmoset Bioscience Symposium. *C Manca's abstract was selected as a "Trainee Talk"

2019 Neuropeptide signaling in marmosets from pharmacology to behavior: Department of Biology Seminar Series, University of Nebraska, [invited talk].

2018 Oxytocin Signaling in New World monkeys from pharmacology to behavior: Department of Genetics, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil [invited talk]

2017 Oxytocin regulation of social motivation in primates: Cells to behavior. Symposium: Neurobiology of motivated behaviors. International Symposium of Integrative Zoology, Xining, China [invited talk]

2016 Juvenile affiliative behavior shapes later-life responses to stressors in marmosets. Symposium: The social juvenile – the ontogeny of primate social skills and relationships. American Society of Primatology/International Primatological Society. Chicago, USA [invited talk]

2014 Marmoset responses to inequity following manipulation of the oxytocin system. American Society of Primatologists. Decatur, GA USA [submitted talk]

2013 Do marmosets care to share? Other-regarding preferences following manipulation of the oxytocin system. American Society of Primatologists. San Juan, Puerto Rico. Student competition finalist. [submitted talk]

SELECTED CONFERENCES ABSTRACTS/POSTERS

*indicates mentored **student presenting author**

2023 Validation of Multiple Steroid Hormones Using a Single, Simplified, and Low-Cost Hair Extraction Procedure. American Society of Primatology meeting, Reno, NV

2020 Coactivation of dopamine receptors enhances oxytocin signaling responses at marmoset and human oxytocin receptors but not at vasopressin 1a receptors. Marmoset Bioscience Symposium. *M Douchey

2018 Dopamine receptor coactivation enhances oxytocin potency and efficacy at marmoset and human oxytocin receptors. Society for Social Neuroscience, San Diego, CA.

2017 Pharmacologic signatures of Leu8- and Pro8-oxytocin at human and marmoset oxytocin receptors. Society for Behavioral Neuroendocrinology, Long Beach, CA.

2016 Prosocial profiles: Oxytocin and cortisol influence marmoset sociality in a variety of food-sharing tasks. American Society of Primatology/International Primatological Society. Chicago, IL.
2015 Opposite-sex strangers display more social attention to marmosets treated with oxytocin. Society for Social Neuroscience, Chicago, IL.
2014 Responses to inequity following oxytocin manipulation in marmoset monkeys. Society for Neuroscience, Washington D.C.
2014 Prosocial behavior is related to girls' psychological and boys' physiological measures of negative reactivity in adolescent children. Society for Research on Adolescence, Austin, TX.
2012 Multiple species of marmosets possess novel oxytocin sequence. American Society of Primatologists, Sacramento, CA.

PROFESSIONAL SERVICE

Manuscript Peer-Review (list of journals) https://publons.com/wos-op/researcher/1364920/aaryn-mustoe

American Journal of Primatology, Animal Behaviour, Animal Behavior and Cognition, Animal Welfare, Annals of the New York Academy of Sciences, Behavioural Brain Research, Comparative Medicine, Current Biology, Frontiers in Neuroscience, Functional Ecology, Hormones and Behavior, Integrative Zoology, International Journal of Primatology, iScience, Neurobiology of Stress, NeuroImage, New Directions for Child and Adolescent Development, Physiology & Behavior, Psychoneuroendocrinology, Primates, Reproduction, Fertility and Development, Royal Society Open Science, Scientific Reports

Other Selected Service

2023—Pres **Guest Associate Editor**, Frontiers in Endocrinology; Special topic: "*Recent Advances in Endocrinology of Non-Traditional Mammalian Models"*
2023—Pres **Education Committee**, American Society of Primatology
2022—Pres **Editorial Board Member**, *American Journal of Primatology*
2022—Pres **NSF-Graduate Research Fellowship Program (GRFP) Panel Reviewer**
2020—Pres Member, Marmoset Working Group
2020—2022 **Marmoset Bioscience Symposium Scientific Committee**
2020—2021 **The Leakey Foundation**, Ad-hoc Grant Reviewer
2020 Marmoset Principle Investigator Meeting: Behavior Panelist
2020 International Primatological Society/Latin American Society of Primatologists, Scientific Review Committee
2018 National Science Foundation (NSF) Research Grant: BCS, Ad-hoc Grant Reviewer
2015—2016 University Safety Committee, UNO
2012—2014 American Society of Primatologists, Scientific Program Committee

DEI Service and Science Outreach

2023—Pres **DEI Committee**, American Society of Primatology
2023—Pres **Diversity Council Member**, Texas Biomedical Research Institute
2023 **Undergraduate Summer Internship** Application Evaluation Committee, Texas Biomedical Research Institute
2021—2016 **Omaha Metropolitan Science and Engineering Fair Judge** (senior division) Omaha's Henry Doorly Zoo (@MSEFOmaha)
2019—2015 **STEM Outreach: UNO Department of Chemistry**, "Magic of Chemistry: Chemistry of Color" and "Fun with Polymers" workshops, volunteer 'lab director' for junior Girl Scouts (4th-8th Grade)
2018—2017 Volunteer, Nebraska Science Festival (@NESciFest)
2015—2014 Science Fair Judge (7th and 8th grade)—Our Lady of Lourdes, Omaha, NE

AWARDS AND FELLOWSHIPS

2023 1st Place Oral Presentation, SNPRC Research Days
2015 UNO Graduate Research and Creativity Activity Award ($5000).
'Exploring the presence of the catechol-o-methyltransferase (COMT) polymorphism in marmosets and its potential influence on prosocial behavior'
2014 University of Nebraska Presidential Doctoral Fellowship
2014 UNO Graduate Research and Creativity Activity Award ($5000).
'Marmoset responses to inequity following manipulation of the oxytocin system'
2013 American Society of Primatologists Student Competition Oral Presentation Finalist
2013 UNO Outstanding Graduate Student Oral Presentation Award
2008 Ronald E. McNair Post-Baccalaureate Achievement Fellowship (UWO-TRIO Program)

SUMMARY OF RESEARCH SKILLS AND EXPERTISE

Endocrinology: Quantifying biomarkers through enzyme and radioactive immunoassays for steroid hormones (cortisol, testosterone, estrogen, progesterone, and corresponding metabolites), peptide hormones (oxytocin, vasopressin), immune (interleukins, cytokines, c-reactive protein), metabolic biomarkers (ghrelin, insulin, leptin) and kinetic enzyme (alpha-amylase). Experienced measuring biomarkers in biosamples including of saliva, urine, blood, feces, and hair.

Primate Behavior: Intranasal peptide administrations, stress paradigms, novel primate prosocial/cooperation tasks, cognitive/learning assessments, behavioral assays/analyses, social/cognitive developmental analyses, ambulatory testing, bioacoustics acquisition/analyses, 12+ years' experience with captive marmoset research design, primate colony management, and primate welfare management.

Pharmacology: GPCR biology and G-protein signaling assays including fluorescence-based calcium signaling assays, fluorescence-based membrane potential assays, fluorescence-based receptor internalization assays, radiolabeled based cAMP signaling assays, radiolabeled-based whole cell receptor binding assays; cell culturing techniques ('in vitro' cell lines, primary tissue cultures: neuronal and fibroblasts, plasmid transfections); some minor experience with confocal imaging, BRET/FRET, and bivalent ligand design

Microbiome: fecal microbiome transplants (oral gavage), fecal extractions, common microbiome analyses (QIIME2, R-Studio), metabolomic/lipidomics processing

Genomic: DNA/RNA extractions from blood, hair, saliva, PCR purification and sequencing, phylogenetic analyses and alignment (gene and genomic), differential gene expression (Tuxedo Suite pipeline), SNP analyses

Neuroimaging: Minor experience with resting-state and event-related functional connectivity fMRI acquisition with independent component analyses using FSL MELODIC to identify default mode networks in marmosets.