

Jason Aoto
Curriculum Vitae

Department of Pharmacology
University of Colorado, Denver
Anschutz Medical Campus
12800 E. 19th Ave, Rm P18-6101
Aurora, CO 80045

Lab phone: (303) 724-9302
Cell: (949) 677-2492
Email: jason.aoto@cuanschutz.edu

Education

Bachelor of Science, Biochemistry University of California, Los Angeles	1998-2002
Doctor of Philosophy, Molecular and Cell Biology <i>University of California, Berkeley</i> <i>Dissertation: "Molecular Mechanisms Underlying Excitatory Shaft-Synapse Formation and Homeostatic Synaptic Scaling"</i>	2004-2009
Post-Doctoral Training Postdoctoral Fellow in the laboratory of Dr. Thomas Südhof, <i>Dept. of Molecular and Cellular Physiology</i> <i>Stanford University, Stanford, CA</i>	2009-2015

Academic Appointment

Associate Professor Department of Pharmacology <i>University of Colorado, Anschutz School of Medicine</i>	2022-present
Assistant Professor Department of Pharmacology <i>University of Colorado, Anschutz School of Medicine</i>	2016-2022

Membership in professional organizations

Alpha Chi Sigma	1999-present
Society for Neuroscience	2005-present
SACNAS	2018-present
Japan Neuroscience Society	2020-present

Major Committee and Service Responsibilities

University/School of Medicine

Chair, Nancy Zahniser Memorial Lecture	2016-present
Faculty grant reviewer for Postdoctoral Association Travel Awards	2016-present
CU Anschutz SOM Faculty Senate	2017-present
Faculty member for SACNAS career panel	2017-present

Departmental

Chair, Dept. of Pharmacology Seminar Committee	2018-present
Chair, Neuroscience Program Seminar Committee	2018-present
Neuroscience Graduate Program Steering Committee	2018-present
Pharmacology Graduate Program Admissions Committee	2020-present
Pharmacology Graduate Program Diversity, Equity and Inclusion Committee	2021-present
Co-Director, Pharmacology Graduate Program	2022-present

Review and Referee Work

Journal Review:

Review Editor, Frontiers in Synaptic Neuroscience
BMC Biology
Cell Reports
Cellular and Molecular Life Science
DNA and Cell Biology
EmboJ
Frontiers in Molecular Neuroscience
Journal of Neuroscience
Molecular Neurobiology
Molecular Psychiatry
Nature Communications
PLOS Biology
Synapse

Grant Review:

Ad hoc reviewer for NIH study section Synapses, Cytoskeleton and Trafficking Study section (SYN, 2019)
Ad hoc reviewer for NIH special emphasis panel (SEP) Molecular and Cellular Substrates of Complex Brain Disorders (2020)
Reviewer Phase I, HHMI/Gilliam (2018 - 2020)
Reviewer Phase II, HHMI/Gilliam (2021-)
Ad hoc reviewer for local NIH CCTSI funding - Novel Methods Small Grants Program (2017-2019)

Invited extramural lectures and presentations

Stanford Institute for Neuro-Innovation and Translational Neuroscience - "Neuroligins, Neurexins and ASDs" and guest panelist discussing modern approaches to studying ASDs.	2010
First Annual Molecular Psychiatry Meeting – "Neurexin-3 alternative splicing: insights into synaptic function"	2013
International Neuroscience Winter Conference invited speaker - "functional and mechanistic interrogation of neurexin-3 alpha ectodomains"	2018
Society for Neuroscience Minisymposium invited speaker - "functional and mechanistic interrogation of neurexin-3 alpha ectodomains"	2018
Colorado State University invited speaker - "functional and mechanistic interrogation of the neurexin-3 alpha ectodomains"	2019
University of Colorado Denver invited speaker - "Functional and molecular interrogation of the sexually dimorphic ventral subiculum"	2019
Front Range Neuroscience Group invited speaker	2019
Neuronal Surfaceome Meeting. Anzola D'Ossola, Italy.	2020
	2023
Japan Neuroscience Society Meeting – Symposium co-Chair	2023

Teaching Record

Course Administration

<u>Director</u> Frontiers in Pharmacology (PHCL 7600)	2020-2022
<u>Co-director</u> . Grant Proposals in Pharmacology (PHCL 7615)	2019-present

Other Participation in Formal Courses

Frontiers in Pharmacology (PHCL 7600) - 1hr lecture time per year highlighting cutting-edge approaches in neuroscience. ~9 graduate students per year.	2017-present
Principles of Pharmacology (PHCL 7620) - 2hrs lecture time per year that chronicles advances in addiction biology and how drugs of abuse impact brain function. ~9 graduate students per year.	2017-present
Ethics in Research (PHCL 7605) - Group Discussion Leader - 7 lectures (2hrs per lecture, 14 hrs total). Present modern (e.g. stem cell) and classical (e.g. authorship) ethical dilemmas in research. ~15-20 students per year.	2017-2021
Grant Proposals in Pharmacology (PHCL 7615) - 4 lectures (2hrs per lecture, 8 hrs total) Co-director with plans to become sole director of the course. This course highlights how to write a competitive grant. ~5-8 students per year.	2019-present
Cellular and Molecular Neurobiology (NRSC7600) - 1 2hr lecture per year that highlights cutting edge approaches in neuroscience.	2021-present
Introduction to Research in Pharmacology (PHCL 7650)	2016-present
Thesis laboratory (PHCL 8990), currently 6 students	2016-present
Pharmacology Retreat. Research Lecture. ~20 graduate students	2016, 2017
Pharmacology Seminar. Research Lecture. ~20 graduate students	2016

Student Mentorship

Ad hoc faculty mentor for Dept. of Pharmacology Journal Club	2016-present
Dept. of Pharmacology Major Seminar series - faculty "expert"	2016-present
Member of 10 total thesis committees (chair of 2)	2017-present
Member of 9 comprehensive examination committees (chair of 2)	2017-present
Dr. Maigen Bethea's Postdoctoral mentorship committee	2019-present

Awards

Dean's Doctoral Mentoring Award	2022
--	------

Grant Support

Active Grants

NIMH R21 MH129620	PI: Aoto	7/01/22-6/30/24
The major goals of this project are to use cutting-edge 3D dSTORM to assess how neurexin-3 functions to organize nanodomain architecture. To accomplish this, we will use previously generated neurexin-3 conditional KO mice as well as a novel epitope tag neurexin-3 knockin mouse line that we recently generated.		
NIMH R01 MH116901	PI: Aoto	6/01/18-4/30/23
The major goals of this project are to utilize a point mutation in neurexin-3 α to test the role of extracellular sequences of neurexin-3 α at excitatory and inhibitory synapses <i>in vitro</i> and <i>in vivo</i> . Direct costs: \$250,000/year for 5 years.		
HHMI Gilliam Fellowship GT15852	PI: Aoto	7/1/2022-6/30/2025
The HHMI Gilliam Fellowship identifies and funds mentor-mentee pairs to promote diversity in STEM and to support the research of Mr. Eric Stokes. Through HHMI, Dr. Aoto has received extensive mentorship training to effectively communicate and mentor students from diverse cultural and ethnic backgrounds.		

Direct costs: \$50,000/year for 3 years.

Completed Grants

R00 MH103531-03 <i>Title: Synaptic Dissection of Cell Adhesion Molecule Function within Subicular Circuits</i>	(NCE to 12/31/19)	2016-2019
National Institute of Mental Health Pathway to Independence Award (K99) (1K99MH103531) <i>Title: Synaptic Dissection of Cell Adhesion Molecule Function within Subicular Circuits</i>		2014-2016
Private Foundations: NARSAD 24847 <i>Title: Interrogation of Neurexin-3 in Subicular microcircuit</i>		2017-2020
HHMI Gilliam Mentor		2018-2021

Bibliography

Peer-reviewed publications:

Sainson, R.C.A., **Aoto, J.**, Nakatsu, M.N., Holderfield, M., Conn, E., Koller, E., and Hughes, C.C.W. (2005). Cell-autonomous notch signaling regulates endothelial cell branching and proliferation during vascular tubulogenesis. *FASEB J.* *19*, 1027–1029.

Nakatsu, M.N., Sainson, R.C.A., Pérez-del-Pulgar, S., **Aoto, J.N.**, Aitkenhead, M., Taylor, K.L., Carpenter, P.M., and Hughes, C.C.W. (2003). VEGF(121) and VEGF(165) regulate blood vessel diameter through vascular endothelial growth factor receptor 2 in an in vitro angiogenesis model. *Lab. Invest.* *83*, 1873–1885.

Nakatsu, M.N., Sainson, R.C.A., **Aoto, J.N.**, Taylor, K.L., Aitkenhead, M., Pérez-del-Pulgar, S., Carpenter, P.M., and Hughes, C.C.W. (2003). Angiogenic sprouting and capillary lumen formation modeled by human umbilical vein endothelial cells (HUVEC) in fibrin gels: the role of fibroblasts and Angiopoietin-1. *Microvasc. Res.* *66*, 102–112.

Aoto, J., Ting, P., Maghsoodi, B., Xu, N., Henkemeyer, M., and Chen, L. (2007). Postsynaptic ephrinB3 promotes shaft glutamatergic synapse formation. *J. Neurosci.* *27*, 7508–7519.

Aoto, J., Nam, C.I., Poon, M.M., Ting, P., and Chen, L. (2008). Synaptic signaling by all-trans retinoic acid in homeostatic synaptic plasticity. *Neuron* *60*, 308–320.

Maghsoodi, B., Poon, M.M., Nam, C.I., **Aoto, J.**, Ting, P., and Chen, L. (2008). Retinoic acid regulates RAR α -mediated control of translation in dendritic RNA granules during homeostatic synaptic plasticity. *Proc. Natl. Acad. Sci. U.S.A.* *105*, 16015–16020.

Sarti, F., Schroeder, J., **Aoto, J.**, and Chen, L. (2012). Conditional RAR α knockout mice reveal acute requirement for retinoic acid and RAR α in homeostatic plasticity. *Front Mol Neurosci* *5*, 16.

Anderson, G.R., Galfin, T., Xu, W., **Aoto, J.**, Malenka, R.C., and Südhof, T.C. (2012). Candidate autism gene screen identifies critical role for cell-adhesion molecule CASPR2 in dendritic arborization and spine development. *Proc. Natl. Acad. Sci. U.S.A.* *109*, 18120–18125.

Aoto, J., Martinelli, D.C., Malenka, R.C., Tabuchi, K., and Südhof, T.C. (2013). Presynaptic neurexin-3 alternative splicing trans-synaptically controls postsynaptic AMPA receptor trafficking. *Cell* *154*, 75–88.

Anderson, G.R., **Aoto, J.**, Tabuchi, K., Földy, C., Covy, J., Yee, A.X., Wu, D., Lee, S.-J., Chen, L., Malenka, R.C., et al. (2015). β -Neurexins Control Neural Circuits by Regulating Synaptic Endocannabinoid Signaling. *Cell* *162*, 593–606.

Aoto, J., Földy, C., Ilcus, S.M.C., Tabuchi, K., and Südhof, T.C. (2015). Distinct circuit-dependent functions of presynaptic neurexin-3 at GABAergic and glutamatergic synapses. *Nat. Neurosci.* *18*, 997–1007.

Pak, C., Danko, T., Zhang, Y., **Aoto, J.**, Anderson, G., Maxeiner, S., Yi, F., Wernig, M., and Südhof, T.C. (2015). Human Neuropsychiatric Disease Modeling using Conditional Deletion Reveals Synaptic Transmission Defects Caused by Heterozygous Mutations in NRXN1. *Cell Stem Cell* *17*, 316–328.

Földy, C., Darmanis, S., **Aoto, J.**, Malenka, R.C., Quake, S.R., and Südhof, T.C. (2016). Single-cell RNAseq reveals cell adhesion molecule profiles in electrophysiologically defined neurons. *Proc. Natl. Acad. Sci. U.S.A.* *113*, E5222-5231.

Chanda, S., **Aoto, J.**, Lee, S.-J., Wernig, M., and Südhof, T.C. (2016). Pathogenic mechanism of an autism-associated neuroligin mutation involves altered AMPA-receptor trafficking. *Mol. Psychiatry* *21*, 169–177.

Purkey, A.M., Woolfrey, K.M., Crosby, K.C., Stich, D.G., Chick, W.S., **Aoto, J.**, and Dell'Acqua, M.L. (2018). AKAP150 Palmitoylation Regulates Synaptic Incorporation of Ca²⁺-Permeable AMPA Receptors to Control LTP. *Cell Rep* *25*, 974-987.e4.

Meador, K., Wysoczynski, C.L., Norris, A.J., **Aoto, J.**, Bruchas, M.R., and Tucker, C.L. (2019). Achieving tight control of a photoactivatable Cre recombinase gene switch: new design strategies and functional characterization in mammalian cells and rodent. *Nucleic Acids Res.* *47*, e97.

Liu, Q., Sinnen, B.L., Boxer, E.E., Schneider, M.W., Grybko, M.J., Buchta, W.C., Gibson, E.S., Wysoczynski, C.L., Ford, C.P., Gottschalk, A., **Aoto, J.**, et al. (2019). A Photoactivatable Botulinum Neurotoxin for Inducible Control of Neurotransmission. *Neuron* *101*, 863-875.e6.

Dai, J., **Aoto, J.**, and Südhof, T.C. (2019). Alternative Splicing of Presynaptic Neurexins Differentially Controls Postsynaptic NMDA and AMPA Receptor Responses. *Neuron* *102*, 993-1008.e5.

Restrepo, S., Langer, N.J., Nelson, K.A., and **Aoto, J.** (2019). Modeling a Neurexin-3 α Human Mutation in Mouse Neurons Identifies a Novel Role in the Regulation of Transsynaptic Signaling and Neurotransmitter Release at Excitatory Synapses. *J. Neurosci.* *39*, 9065–9082.

Restrepo, S., Schwartz, S.L., Kennedy, M.J., and **Aoto, J.** (2020). Measuring Transcellular Interactions through Protein Aggregation in a Heterologous Cell System. *J Vis Exp*.

Cai, Y., Nielsen, B.E., Boxer, E.E., **Aoto, J.**, and Ford, C.P. (2021). Loss of nigral excitation of cholinergic interneurons contributes to parkinsonian motor impairments. *Neuron* *109*, 1137-1149.e5.

Mermer, F., Poliquin, S., Rigsby, K., Rastogi, A., Shen, W., Romero-Morales, A., Nwosu, G., McGrath, P., Demerast, S., **Aoto, J.**, et al. (2021). Common molecular mechanisms of SLC6A1 variant-mediated neurodevelopmental disorders in astrocytes and neurons. *Brain* *144*, 2499–2512.

Boxer, E.E., Seng, C., Lukacsovich, D., Kim, J., Schwartz, S., Kennedy, M.J., Földy, C., and **Aoto, J.** (2021). Neurexin-3 defines synapse- and sex-dependent diversity of GABAergic inhibition in ventral subiculum. *Cell Rep* *37*, 110098. PMID: 34879268

Boxer, E.E., Kim, J., Dunn, B., and **Aoto, J.** (2023). Ventral subiculum inputs to nucleus accumbens medial shell preferentially innervate D2R medium spiny neurons and contain calcium permeable AMPARs. *J Neurosci*, JN-RM-1907-22. PMID: 36609456

Review:

Aoto J., Chen L. (2007) Bidirectional ephrin/Eph signaling in synaptic functions. *Brain Res*, 1184:72-80. PMID: 1766489

Boxer, E.E., and **Aoto, J.** (2022). Neurexins and their ligands at inhibitory synapses. *Front Synaptic Neurosci* *14*, 1087238. 10.3389/fnsyn.2022.1087238. PMID: 36618530

Scientific Abstracts presented:

Poster

As First Author:

2006 Society for Neuroscience Poster Presentation

2006 Berkeley MCB Retreat Poster Presentation

2007 Society for Neuroscience Poster Presentation

2008 Keystone Symposium on Translational Regulatory Mechanisms

2008 UC Berkeley MCB Retreat Poster Presentation

2010 Annual Howard Hughes Medical Institute Investigator Meeting

2014 Society for Neuroscience Poster Presentation

As Senior Author:

2018 Society for Neuroscience

Boxer, E., Wang, J., Dunn, B., **Aoto, J.** Characterization of ventral subiculum-nucleus accumbens projection circuitry

Restrepo, S., Langer, N., Nelson; K., **Aoto, J.** Evolutionarily conserved site on Neurexin3- α modulates balance between excitation and inhibition

2019 Winter Conference on Brain Research

Restrepo, S., Langer, N., Nelson; K., **Aoto, J.** Evolutionarily conserved site on Neurexin3- α modulates balance between excitation and inhibition

2019 AAAS Annual Meeting

Restrepo, S., Langer, N., Nelson; K., **Aoto, J.** Evolutionarily conserved site on Neurexin3- α modulates balance between excitation and inhibition

2019 Gordon Research Conference

Boxer, E., Restrepo, S., **Aoto, J.** Sex-dependent inhibition and utilization of neurexin-3 in ventral subiculum.

2021 Society for Neuroscience

Boxer, E.E., Seng, C., Lukacsovich, D., Kim, J., Schwartz, S., Kennedy, M.J., Földy, C., and **Aoto, J.** Neurexin-3 defines synapse- and sex-dependent diversity of GABAergic inhibition in ventral subiculum.

2022 Society for Neuroscience

Lloyd, B.A., Roth, R., **Aoto, J.** Neurexin-3 controls excitatory synapse nano-organization in hippocampus.

Stokes, E.G., **Aoto, J.** Neurexin-3a mutations distinctly modulate synaptic organization and function.

Kim, J., Boxer, E. E., **Aoto, J.** Cocaine induces cell-type specific plasticity in ventral subiculum to nucleus accumbens circuit.