CURRICULUM VITAE

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EDUCATION

1986-1987	Undergraduate, University of Akron, Akron, Ohio
1987-1991	Undergraduate, University of Toledo, Toledo, Ohio
1991	B.S., Pharmacy with Honors in Pharmacology, University of Toledo, Toledo, Ohio
1991-1996	Graduate Student, Pharmacology, Vanderbilt University
1996	Ph.D., Pharmacology, Vanderbilt University

PROFESSIONAL TRAINING AND EXPERIENCE

1996-1998	Postdoctoral Fellow, Pharmacology, Vanderbilt University
1998-2003	Senior Fellow, Pharmacology, University of Washington
2003-2004	Acting Instructor, Pharmacology, University of Washington
2004-2009	Research Assistant Professor, Pharmacology, Vanderbilt University Director, Molecular Pharmacology, Vanderbilt Program in Drug Discovery
2009-present	Research Associate Professor, Pharmacology, Vanderbilt University Director, Molecular Pharmacology, Vanderbilt Center for Neuroscience Drug Discovery

AWARDS AND HONORS

1991	Valedictorian, College of Pharmacy
1991	Phi Kappa Phi Graduate Fellowship
1991	AAPS-AFPE Gateway Scholarship
1991	The Merck-Sharp and Dohme Award in Medicinal Chemistry
1991	The Upjohn Award in Pharmacology
1991	The SmithKline Beechem Award in Clinical Pharmacy
1993	First Place, Vanderbilt University Graduate Student Research Day
1994	First Place, Vanderbilt University Graduate Student Research Day
1995	Grass Foundation Fellowship to attend "Neurobiology of Human Neurological Disease: Mechanisms of Neurodegeneration", Cold Spring Harbor Laboratory
2000	Travel award for abstract submitted to "Obesity and the Regulation of Energy Homeostasis", Keystone Symposium, Taos, NM

PROFESSIONAL MEMBERSHIPS

1991-present	Phi Kappa Phi
1991-1998, 2006-present	Society for Neuroscience
2007-present	American Society for Pharmacology and Experimental Therapeutics

RESEARCH SUPPORT-CURRENT

1R01 MH108498-01 (Niswender, CM/Lindsley CW) 12/10/2015-11/30/2018 25% effort
NIMH $1,498,134, Total Project
Development of an $mGlu_{2/4}$ heterodimer-selective allosteric modulator. We propose that heterodimerization may underlie a divergence in *in vivo* pharmacological profiles that we have observed with various $mGlu_4$ positive allosteric modulators that either do or do not potentiate the activity of $mGlu_{2/4}$ heterodimers. We will chemically optimize small molecules with selectivity for $mGlu_{2/4}$ heteromers over $mGlu_2$ or $mGlu_4$ homomeric receptors.

1R01MH110389-01 (Niswender) 07/01/2016-06/30/209 15% effort
NIMH $1,714,670 Total Project
Optimization of a Metabotropic Glutamate Receptor 7 Positive Allosteric Modulator.
We propose to perform a chemical optimization campaign to develop $mGlu_7$ PAMs with enhanced specificity and pharmacokinetic properties and to use deficits in Mecp2-deficient mice to profile native tissue and in vivo activity of optimized compounds, with the goal of developing a highly selective $mGlu_7$ PAM to support continued exploration of the biology and therapeutic potential of this important receptor.

PR160102 (Niswender, CM) 08/01/2017-07/31/2020 15% effort
Department of Defense $1,875,949, Total Project
The role of metabotropic glutamate receptor 7 in the etiology and treatment of Rett syndrome. This grant will examine the role of $mGlu_7$ in Rett syndrome by profiling $mGlu_7$ knockout mice, crossing mice with various $mGlu_7$ expression levels with Mecp2-deficient animals, and developing new $mGlu_7$ positive allosteric modulator probes.

3503 rettsyndrome.org (Niswender, CM) 04/01/2017-03/31/2019 10% effort
Rettsyndrome.org $150,000, Total Project
Exploration of metabotropic glutamate receptor 3 as a target for MeCP2-related disorders.
This grant proposes to determine if $mGlu_3$ is a new target that can be modulated with small molecules for therapeutic benefit in models of MeCP2-related disorders.

8766 Autism Speaks (Niswender, CM) 03/01/2014-08/28/2017 15% effort
Autism Speaks in NCE $449,996, Total Project
Temporal divergence of hypoconnectivity and excitotoxicity in Rett Syndrome.
The goals of these studies are to build upon our preliminary data showing that $mGlu_5$ PAMs reduce symptom severity and phenotypes in RS mice when administered in advanced disease states. We will also assess the liability for PAMs to elicit adverse consequences when administered early in disease due to temporal changes in glutamatergic transmission. Furthermore, we will determine whether $mGlu_5$ NAMs can temper excitotoxicity and prevent synapse loss when administered to young RS mice, thereby reducing the impact of developmental regression on RS phenotypes.

PENDING

rettsyndrome.org (Niswender, CM) 01/01/2018-12/31/2019
Rettsyndrome.org $150,000, Total Project
Tailoring gene replacement therapy for MECP2-related disorders

COMPLETED

Predoctoral/Postdoctoral Awards

1994-1996	Pharmaceutical Research and Manufacturers of America Foundation Predoctoral Award in Pharmacology
1997-1998	Pharmaceutical Research and Manufacturers of America Foundation Postdoctoral Award in Pharmacology
1999-2000	Fellow, Neurobiology and Behavior Training Grant, University of Washington
2000-2003	Fellow, National Service Research Award, NIDDK
03/1/03-02/28/04	University of Washington Diabetes and Endocrinology Research Center Pilot and Feasibility Award

1 R03 MH076398-01 (Niswender, C.M.) 08/1/05-07/31/06
NIH/NIMH $3,000 plus access to screening
Measurement of GPCR-mediated thallium flux through GIRK. Access grant to Molecular Libraries Screening Center Network.

1R21NS053536-01/1R21NS053536-01S1 (Niswender, C.M.) 09/30/05-02/28/08
NIH/NIMH Direct Costs: $125,000 plus $25,000 supplement.
A Direct Assay for HTS of Gi/o-linked GPCRs: mGluR7 as the Prototype.

1 X01 MH077607-01 (Niswender, C.M.) 02/01/06-01/31/07
Discovery of novel allosteric agonists of the M4 muscarinic receptor. Access grant to Molecular Libraries Screening Center Network.

1R01 (Niswender, C.M.) 2/01/04-11/30/09
NIH/NINDS 1,165,000 direct costs current funding period
Metabotropic Glutamate Receptors in Basal Ganglia. Grant transferred from P. Jeffrey Conn in final year of funding.

LEAPS Award (Conn, P.J.) 11/01/07 – 10/30/11
Michael J. Fox Foundation $3,609,000 Direct Costs
Discovery of novel allosteric modulators of mGluR4 for treatment of Parkinson's disease. Biology Project Team Leader

Basic Research Award (Niswender, C.M.) 01/01/12-12/31/13
International Rett Syndrome Foundation. $100,000, Total Project
Metabotropic glutamate receptor 7: a novel therapeutic candidate for Rett Syndrome. This grant examined the regulation of $mGlu_7$ levels in the context of MeCP2 loss and provided the basis for new grants to develop novel allosteric modulators for MeCP2-based disorders.

R21 NS078262 (Niswender, C.M.) 04/01/12-03/13/14
NIH/NINDS $420,809, Total Project
Metabotropic glutamate receptors in the basal ganglia. The goals of this grant were to test the hypothesis that metabotropic glutamate receptor 8 is a novel target in Parkinson's disease. The grant involved a combination of molecular pharmacology, electrophysiology, and in vivo behavioral profiling.

1UH2 NS099066-01 (Niswender, CM) 09/01/2016-09/29/2021
NIH $124,768 Total Project
Development of VU0652957 for the treatment of Parkinson's disease (PD)
We propose to utilize the Blueprint Neurotherapeutics Network (BPN) to advance VU0652957 through Investigational New Drug (IND)-enabling studies in preparation for clinical studies in PD patients. This is a development grant to advance an $mGlu_4$ positive allosteric modulator into clinical development for Parkinson's disease. *Project ended due to lack of exposure required for efficacy in a nonhuman primate model of Parkinson's disease.*

5R21 MH102548-02 (Niswender, CM) 08/01/2014-07/31/2017
NIMH $431,476, Total Project
Metabotropic Glutamate Receptor Regulation in MeCP2-Related Disorders.
Based on dramatic decreases in $mGlu_7$ levels seen in mice that model Rett syndrome, we propose to test the hypothesis that $mGlu_7$ levels are conversely increased in an *MECP2* Duplication mouse model, further substantiating a role for MeCP2 in $mGlu_7$ gene regulation. Additionally, we will test the hypotheses that modulation of $mGlu_7$ activity using pharmacological tools will normalize synaptic plasticity and behavioral deficits in mice under- and overexpressing MeCP2.

INTRAMURAL AND EXTRAMURAL ACTIVITIES

2006

-Grant reviewer, Melanoma Research Foundation
-Manuscript reviewer, Journal of Neurochemistry
-Paper discussion leader for Interdisciplinary Graduate Program Core Course. Kim et al., 2001, JBC. The role of phosphorylation in DI dopamine receptor desensitization.

2007

-Manuscript reviewer, Molecular Pharmacology
-Lecturer in Neuroscience 345 Course. Neuromodulation and metabotropic glutamate receptors.
-Paper discussion leader in Neuroscience 345 Course. Sansig et al., 2001, J. Neuroscience. Increased seizure susceptibility in mice lacking metabotropic glutamate receptor 7.
-Paper discussion leader for Interdisciplinary Graduate Program Core Course. Ross et al., 1978 JBC. Reconstitution of hormone-sensitive adenylate cyclase activity with resolved components of the enzyme.

2008

-Manuscript reviewer, Neuropharmacology
-Paper discussion leader for Interdisciplinary Graduate Program Core Course. Kim et al., 2001, JBC. The role of phosphorylation in DI dopamine receptor desensitization.
-Lecturer in Neuroscience 345 Course. Neuromodulation and metabotropic glutamate receptors.
-Paper discussion leader in Neuroscience 345 Course. Volk et al., 2007, J. Neuroscience. Multiple Gq coupled receptors converge on a common protein synthesis-dependent long term-depression that is affected in fragile X mental retardation.

2009

Grant reviewer, Michael J. Fox Foundation
Manuscript reviewer, Molecular Pharmacology
Manuscript reviewer, ACS Chemical Neuroscience
Manuscript reviewer, Journal of Neuroscience
Manuscript reviewer, J Pharmacol Exp Therapeutics
Manuscript reviewer, British Journal of Pharmacology

2010
Manuscript reviewer, British Journal of Pharmacology
Manuscript reviewer, Molecular Pharmacology
Manuscript reviewer, Neuropharmacology
Manuscript reviewer, Neuroscience

2011
Manuscript reviewer, Journal of Biological Chemistry

Manuscript reviewer, The International Journal of Neuropsychopharmacology
Manuscript reviewer, Nature Protocols
Manuscript reviewer, Proceedings of the National Academy of Sciences

2012
Grant reviewer, Multiple Sclerosis Fast Forward Foundation
Manuscript reviewer, Expert Opinion on Drug Discovery
Manuscript reviewer, Neuropharmacology
Manuscript reviewer, Pharmacology, Biochemistry, and Behavior
Manuscript reviewer, Molecular Pharmacology
Manuscript reviewer, ACS Chemical Neuroscience
Guest lecturer, Drug Discovery Course. "$mGlu_4$ positive allosteric modulators for the treatment of CNS disorders". Vanderbilt University, October 17, 2012.

2013
-Manuscript reviewer, Journal of Neurochemistry
-Manuscript reviewer, Neuropharmacology
-Grant reviewer, Michael J. Fox Foundation
-Grant reviewer, Pilot and Feasibility Awards program, Vanderbilt University for Obesity and Metabolism
-Grant reviewer, NIH EUREKA program
-Special Guest Editor, Neuropharmacology, "The Synaptic Basis of Neurodegeneration"
-Manuscript reviewer, Journal of Neurochemistry
-Guest lecturer, Neuroscience 235 Course. "Drug Discovery in Academia: mGlu4 positive allosteric modulators for the treatment of CNS disorders". Vanderbilt University, March 14, 2013.
-Guest lecturer, Drug Discovery Course. "$mGlu_4$ positive allosteric modulators for the treatment of CNS disorders". Vanderbilt University, November 6, 2013.
-Co-organizer, Academic Drug Discovery Conference, Nashville TN, October 9-11, 2013.

2014
-Manuscript reviewer, Molecular Pharmacology
-Manuscript reviewer, Neuropharmacology
-Manuscript reviewer, Journal of Pharmacology and Experimental Therapeutics
-Grant reviewer, Trailblazer Award, Autism Speaks
-Guest lecturer, Neuroscience 235 Course. "Drug Discovery in Academia: mGlu4 positive allosteric modulators for the treatment of CNS disorders". Vanderbilt University, March 11, 2014.
-Grant reviewer, IWT
-Grant reviews, Meixner Postdoctoral Fellowship Program, Autism Speaks
-Guest lecturer, Drug Discovery Course. "$mGlu_4$ positive allosteric modulators for the treatment of CNS disorders". Vanderbilt University, October, 2014.

2015
-Manuscript reviewer, Neuropharmacology

- Guest lecturer, Neuroscience 235 Course. “Drug Discovery in Academia: mGlu4 positive allosteric modulators for the treatment of CNS disorders”. Vanderbilt University, February 24, 2015.
-Grant reviewer, Meixner Postdoctoral Fellowship Program, Autism Speaks
-Guest lecturer, Drug Discovery Course. “$mGlu_4$ positive allosteric modulators for the treatment of CNS disorders”. Vanderbilt University, October, 2015.

2016
-Manuscript reviewer, Neuropharmacology
-Manuscript reviewer, Frontiers in Neural Circuits
- Guest lecturer, Neuroscience 235 Course. “Drug Discovery in Academia: mGlu4 positive allosteric modulators for the treatment of CNS disorders”. Vanderbilt University, February 24, 2015.
-Guest lecturer, Modern Drug Discovery, “mGlu4 positive allosteric modulators for the
-Grant reviewer, Meixner Postdoctoral Fellowship Program, Autism Speaks
-Member, VICTR “Drug Repurposing Think Tank”

2017
-Manuscript reviewer, Neuropharmacology
-Introduction to the Vanderbilt Center for Neuroscience Drug Discovery: Case Study in Rett Syndrome, MSTP Second Look Day, Vanderbilt University, April 7, 2017.
-Co-chair of Autism Spectrum Disorders Speaking Session, 9^{th} International Meeting on Metabotropic Glutamate Receptors

STUDENTS/POSTDOCS DIRECTLY SUPERVISED/THESIS COMMITTEES

Caroline Kim	VUMC Emphasis Program for Medical Students, 2007-2008. 'Investigation of type III metabotropic glutamate receptor potentiators using a novel HTS assay using thallium flux through GIRK channels". Current position, General Surgeon at Houston Methodist, San Jacinto.
Alexander Kane	Vanderbilt University undergraduate. "The *in vivo* characterization of TBPB, a novel allosteric agonist of M1 muscarinic receptors: Implications for the role of M1 muscarinic receptors in treatment of schizophrenia". Honors thesis, May, 2008.
Shen Yin	Vanderbilt University pharmacology graduate student. Co-mentor, graduated September, 2013. "Allosteric modulation of metabotropic glutamate receptors". Current position, Associate Clinical Scientist, Genentech.
Olivia Veatch	Vanderbilt University genetics graduate student. Thesis committee member, graduated August, 2013. "Identifying biological pathways implicated in defined subgroups of phenotypic expression for autism spectrum disorders." Current position, Research Instructor in Neurology, Vanderbilt Kennedy Center.
Frank Byers	Vanderbilt University Masters in Laboratory Investigation student, thesis committee, graduated May 2014.
Rebecca Klar Senter	Vanderbilt University pharmacology graduate student, Co-mentor. Awarded Weatherstone predoctoral fellowship from Autism Speaks 7/1/2014, graduation 7/14/2015. Current position, Scientist, Flexion Therapeutics.
Rachel Crouch	Vanderbilt University pharmacology graduate student, co-chair of thesis committee. Graduation 11/2016. Current position, Postdoctoral fellow, VCNDD.
Thomas Utley	Vanderbilt University pharmacology postdoc. Current position, Licensing Agent, Vanderbilt Technology Transfer office.
Julie Roper-Field	Vanderbilt University pharmacology postdoc. Current position, Project Manager, VICTR and CTSA Consortium Coordinating Center, Vanderbilt University Medical Center.
Nidhi Jalan-Sakrikar	Vanderbilt University pharmacology postdoc (2012-2014), Current position, postdoctoral fellow at Mayo Clinic.

Rocco Gogliotti	Vanderbilt University pharmacology postdoc, joined lab in 2012, awarded postdoctoral fellowship from International Rett Syndrome Foundation, 2014. Awarded BBRF fellowship in 2016 (current).
Nicole Fisher	Vanderbilt University Interdisciplinary Graduate Student, joined lab Spring of 2015, awarded Pharmacology Training grant slot, 2015 (current).
Branden Stansley	Vanderbilt University Pharmacology Postdoctoral Fellow, joined lab Spring of 2015, awarded T32 postdoctoral training award and an F32 NRSA, June 2016 (current).
Sheryl Vermudez	Vanderbilt University Interdisciplinary Graduate Student, joined lab Spring of 2017 (current).
Annah Moore	Vanderbilt University Interdisciplinary Graduate Student, joined Sweatt Lab in Spring of 2017, co-mentor (current).
Christian Marks	Vanderbilt University Molecular Physiology and Biophysics Graduate Student, thesis committee (current).
Sean Moran	Vanderbilt Neuroscience Graduate Student, thesis committee (current).
Nick Harris	Vanderbilt University Molecular Physiology and Biophysics MD/PhD Student, thesis committee (current).

PRESENTATIONS

1998

-Identification and Functional Characterization of Edited Human Serotonin 2c Receptor Isoforms. 4th IUPHAR Satellite Meeting on Serotonin. October 1998.

2006

-High Throughput Screening and Medicinal Chemistry at Vanderbilt in Support of Drug Discovery for Muscarinic Receptor Ligands. Vanderbilt Institute for Chemical Biology Retreat.

-Allosteric modulation of metabotropic glutamate receptor 5, M1, and M4 muscarinic receptors: potential therapeutic directions for schizophrenia. 27th Annual Meeting of the Southeastern Pharmacology Society. November 2006.

2007

-High Throughput Screening and Medicinal Chemistry at Vanderbilt: The search for Allosteric Ligands of the M1 and M4 Muscarinic Receptors. HTS Users Group Meeting, Vanderbilt University. March, 2007

2008

-Allosteric modulation of mGluR4 as a novel therapeutic direction for the treatment of Parkinson's disease. American Society for Biochemistry and Molecular Biology, Experimental Biology, San Diego, CA. April, 2008.

-Allosteric modulation of GCPRs as a novel therapeutic direction for the treatment of CNS disorders. American Society of Pharmacology and Experimental Therapeutics, Experimental Biology, San Diego, CA, April. 2008.

-Allosteric modulation of mGluR4 as a novel therapeutic direction for the treatment of Parkinson's disease. Keystone Symposia; G Protein Coupled Receptors: New Insights in Functional Regulation and Clinical Application, Killarney, Ireland. May, 2008.

-Allosteric modulation of mGluR4: a novel therapeutic direction for the treatment of Parkinson's disease. 6th International Meeting on Metabotropic Glutamate Receptors, Taormina, Sicily, Italy. September, 2008.

2009

-The development of positive allosteric modulators of mGluR4 for the treatment of Parkinson's disease. WFN World Congress on Parkinson's Disease and Related Disorders. Miami, FL. December, 2009.

2010

-The development of positive allosteric modulators of mGluR4 for the treatment of Parkinson's disease—Parkinson's Disease Case Study. 4th Annual Drug Discovery for Neurodegeneration Conference. Houston, TX. February, 2010.

-HTS results from academia: discovery of allosteric modulators of mGluR4 and 5. Metabotropic Glutamate Receptors: Translation from Discovery to Clinical Trials. The New York Academy of Sciences. New York, NY. February, 2010.

-Functionally selective and context dependent pharmacology of GPCR allosteric modulators. Pharmacology drive assays for GPCRs and ion channels. Ninth Annual World Pharmaceutical Congress. Philadelphia, PA, June, 2010.

-Novel ion channel-based assays: detecting and characterizing 7TM receptor modulators. Pharmacology drive assays for GPCRs and ion channels. Ninth Annual World Pharmaceutical Congress. Philadelphia, PA, June, 2010.

-The Development of Positive Allosteric Modulators of Metabotropic Glutamate Receptor 4. Allosteric Modulator Drug Discovery Congress, San Diego, CA, November, 2010.

2011

-mGlu4 receptor positive allosteric modulator development for the treatment of CNS disorders. 7th International Meeting on Metabotropic Glutamate Receptors, Taormina, Italy. October, 2011.

2012

-mGlu4 positive allosteric modulators for the treatment of CNS disorders. 45th Annual Winter Conference on Brain Research. Snowbird, Utah, January.

2013

-mGlu4 positive allosteric modulators for the treatment of CNS disorders. Guest presentation to Vanderbilt Parkinson's Disease Advisory Board, Vanderbilt University, April 19, 2013.

-Metabotropic glutamate receptor 7: a novel therapeutic target for MeCP2-related disorders. Vanderbilt University Rett Syndrome Symposium, October 16, 2013.

2014

-Metabotropic glutamate receptor potentiation as a therapeutic direction in Rett syndrome. Invited talk, International Rett Syndrome Foundation meeting, June 25, 2014.

-Metabotropic glutamate receptor 7 ($mGlu_7$): a novel target for the treatment of Rett syndrome. Invited talk, 8th International Meeting on Metabotropic Glutamate Receptors, October 2, 2014.

-Metabotropic glutamate receptor 7 ($mGlu_7$): a novel target for the treatment of Rett syndrome. Invited talk, Multimodal Interventions in IDD from Drug Discovery to Clinical Trials, Vanderbilt Kennedy Center, October 22, 2014.

2015

-Metabotropic glutamate receptor 7: a new therapeutic target for both Rett and *MECP2* Duplication syndromes. Invited talk, MECP2 Duplication Conference, Houston TX, Sept 2015.

2016

-Metabotropic Glutamate Receptor 4 Positive Allosteric Modulators for Parkinson's Disease: Impact of Receptor Heterodimerization. CNS Diseases World Summit. Boston, MA, Sept 12, 2016.

2017

-Therapeutic Potential of mGlu7 in Neurodevelopmental Disorders. Invited Speaker, 9th International Meeting on Metabotropic Glutamate receptors. Taormina, Italy, October 2017.

ISSUED PATENTS

1. Benzamide mGluR5 Positive Allosteric Modulators and Methods of Making and Using Same. Patent 8,853,392. Filed 6/3/2008. Issued patent, USA.

2. Benzamide mGluR5 Positive Allosteric Modulators and Methods of Making and Using Same. Patent 5622568. Filed 12/2/2009. Issued patent, Japan.

3. Substituted Dioxopiperidines and Dioxopyrrolidines as mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent 8,759,377. Filed 11/23/2010. Issued patent, USA.

4. Alkyl-3-((2-Amidoethyl)Amino)-8-Azabicyclo[3.2.1]Octane-8-Carboxylate Analogs as M1 Allosteric Agonists and Methods of Making and Using Same. Patent 8,697,691. Filed 12/21/2010. Issued patent, USA.

5. Substituted 1,1,3,1-Tetraoxidobenzo{D} {1,3,2}Dithiazoles as mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent 8,658,650. Filed 1/28/2011. Issued patent, USA.

6. Pyrazolopyridine, Pyrazolopyrazine, Pyrazolopyrimidine, Pyrazolothiophene and Pyrazolothiazole Compounds as mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent zl 201180017221.4. Filed 2/11/2011. Issued patent, China.

7. Pyrazolopyridine, Pyrazolopyrazine, Pyrazolopyrimidine, Pyrazolothiophene and Pyrazolothiazole Compounds as mGluR4 Allosteric Potentiators, Compounds, and Methods of Treating Neurological Dysfunction. Patent 2012/06416. Filed 2/11/2011. Issued patent, South Africa.

8. Pyrazolopyridine, Pyrazolopyrazine, Pyrazolopyrimidine, Pyrazolothiophene and Pyrazolothiazole Compounds as mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent 9,163,015. Filed 2/11/2011. Issued patent, USA.

9. Pyrazolopyridine, Pyrazolopyrazine, Pyrazolopyrimidine, Pyrazolothiophene and Pyrazolothiazole Compounds as mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent 2011215638. Filed 2/11/2011. Issued patent, Australia.

10. Pyrazolopyridine, Pyrazolopyrazine, Pyrazolothiophene and Pyrazolothiazole Compounds as mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent 9,108,963. Filed 8/13/2012. Issued patent, USA.

11. mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Filed 4/23/2012. Patent 9,180,192. Issued patent, USA.

12. mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent 8,779,157. Filed 6/12/2012. Issued patent, USA.

13. Aryl and Heteroaryl Sulfones as mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent 8,912,336. Filed 6/12/2012. Issued patent, USA.

14. Benzisoxazoles and Azabenzisoxazaoles as mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction, Patent 8,916,584, Filed 8/13/2012. Issued patent, USA.

15. Heterocyclic Sulfone mGluR4 Allosteric Potentiators, Compositions, and Methods of Treating Neurological Dysfunction. Patent 9,192,603, Filed 11/13/2012. Issued patent, USA.

ABSTRACTS

1. **Burns, CM**, Obermiller PS, Emeson RB. RNA editing of AMPA receptor subunit (GluR-B) mRNA. , Society for Neuroscience Abstracts, 1993.

2. **Burns CM**, Rueter SM, Emeson RB. Molecular mechanisms mediating the editing of glutamate receptor (GluR-B) RNA transcripts. Albany Conference, RNA Editing, 1994.

3. Rueter, SM, **Burns CM** and Emeson RB. *In vitro* editing of glutamate receptor (GluR-B) RNA transcripts. RNA Processing: Cold Spring Harbor Laboratory, 1995.

4. **Burns CM**, Chu H, Rueter SM, Sanders-Bush E, Emeson RB. Identification and characterization of RNA editing within the serotonin 2C receptor. Society for Neuroscience Abstracts, 1996.

5. Chu H, **Burns C**, Canton H, Emeson RB, Sanders-Bush E. Functional characterization of rat serotonin 5-HT_{2C} receptor editing isoforms. Society for Neuroscience Abstracts, 1996.

6. Rueter SM, **Burns** CM, Emeson RB. Characterization of AMPA receptor subunit (GluR-B) RNA editing in rat brain nuclear extracts. Society for Neuroscience Abstracts, 1996.

7. **Burns CM**, Chu H, Rueter SM, Sanders-Bush E, Emeson RB. RNA editing of transcripts encoding the serotonin 2C receptor. EMBO workshop on RNA Editing, 1996.

8. **Burns CM**, Chu H, Rueter SM, Hutchinson LK, Canton H, Sanders-Bush E, Emeson RB. RNA editing of serotonin 2C receptor transcripts. RNA Society Meeting, 1997.

9. **Niswender CM**, Copeland S, Emeson RB and Sanders-Bush E. Identification and Functional Characterization of Edited Human Serotonin 2c Receptor Isoforms. 4th IUPHAR Satellite Meeting on Serotonin, 1998.

10. **Niswender CM,** Copeland SC, Dilley G., Meltzer HY, Overholser JC, Stockmeier CA, Emeson RB, Sanders-Bush E. RNA editing of human serotonin 2C receptor transcripts. Society for Neuroscience Abstracts, 1998.

11. Berg KA, Cropper JD, **Niswender CM**, Sanders-Bush E, Emeson RB Clarke WP. Activation of PLC and PLA_2 by h5-HT_{2C} receptor RNA-edited isoforms. Society for Neuroscience Abstracts, 1999.

12. **Niswender CM**, McKnight GS. Cre recombinase-mediated expression of a constitutively active form of protein kinase A. Keystone Conference, Obesity and the Regulation of Energy Homeostasis, Taos, NM, 2001.

13. Willis BS, **Niswender CM**, McKnight GS. Cre recombinase-mediated expression of dominant-negative and constitutively active protein kinase A subunits. Society for Neuroscience Abstracts, 2001.

14. **Niswender CM**, Willis BS, Sweet IR, Wallen A, Thompson B, Wu C, Lange AJ, McKnight GS. Expression of a constitutively active PKA holoenzyme in the liver results in glucose intolerance and impaired glucose-stimulated insulin secretion in mice. Keystone Conference, Toward Understanding Islet Biology, Keystone, CO, 2003.

15. **Niswender CM**, Myers KA, Banko JL, Rodriguez AL, Edl J, Zhang Y, Shirey JK, Saleh SA, Weaver CD, Conn PJ. Identification of novel allosteric modulators of group III mGluRs: New tools for the study of synaptic transmission. 5th Meeting on Metabotropic Glutamate Receptors, Taormina, Italy, 2005.

16. Edl J, Rodriguez AL, Tamagnan G, Alagille D, Johnson RL, **Niswender C**, Myers K, Conn PJ. Characterization of structural analogs of a Group III mGluR agonist and mGluR4/5 allosteric modulators. Society for Neuroscience Abstracts, 2005.

17. Myers KA, **Niswender CM,** Williams R, Edl J, Saleh S, Jones CK, Weaver CD, Orton D, Conn PJ. Characterization of novel allosteric antagonists of metabotropic glutamate receptor subtype 7. Society for Neuroscience Abstracts, 2006.

18. Brady AE, Shirey JK, Rodriguez AL, **Niswender CM**, Weaver CD, Conn, PJ. A high throughput functional screen for the identification of selective allosteric ligands of the M1 mAChR. Society for Neuroscience Abstracts, 2006.

19. Edl J, Banko JL, Myers KA, **Niswender CM**, Conn PJ. Developmental differences in group III mGluR regulation of synaptic transmission in area CAI of the rat hippocampus. Society for Neuroscience Abstracts, 2006.

20. **Niswender CM**, Myers KA, Williams R, Ayala J, Luo Q, Saleh S, Jones CK, Weaver CD, Orton D, Conn PJ. Permissive antagonism induced by novel allosteric antagonists of metabotropic glutamate receptor 7. American College of Neuropsychopharmacology Abstracts, 2006.

21. Conn PJ, Weaver CD, **Niswender C**, Brady A, Shirey J, Edl J. Discovery and characterization of novel allosteric modulators of GPCRs. American College of Neuropsychopharmacology Abstracts, 2006.

22. **Niswender CM**, Jones CK, Weaver CD, Rodriguez AL, Chen Y, Shirey JK, Brady AE, Marlo JE, Luo Q, Xianzhang M, Williams L, Hammond AS, Myers KA, Orton D, Williams R, Days EL, Nalywajko NT, Williams, M, Conn PJ. Allosteric modulation of metabotropic glutamate receptor 5, M1 and M4 muscarinic receptors: potential therapeutic directions for schizophrenia. Southeastern Pharmacology Society Abstracts, 2006.

23. **Niswender CM**, Weaver CD, Lindsley CW, Jones CK, Lewis M, Marlo JE, Shirey JK, Xiang Z, Brady AE, Orton D, Williams R, Rodriguez AL, Yin H, Days EL, Farmer C, Luo Q, Xianzhang M, Myers KA, Ayal JE, Nalywajko NT, Lorsen KA, Williams M, Conn PJ. High Throughput Screening, Medicinal Chemistry, Physiology, and Behavioral

Pharmacology at Vanderbilt in Support of Drug Discovery for Targets Involved in CNS Disorders. 8th Annual Rett Syndrome Symposium, 2007.

24. Bridges T, Jones C, Brady A, Marlo J, Rodriguez A, **Niswender C**, Williams R., Kim K., Sheffler D, Grier M, Weaver D, Conn PJ, Lindsley C. Novel allosteric modulation of the M1 muscarinic receptor: agonists and potentiators for the treatment of Alzheimer's disease and schizophrenia. ACS-CNS Medicinal Chemistry Conference, 2007.***

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