

CURRICULUM VITAE

BIOGRAPHICAL

Name:

Matthew Luke MacDonald

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EDUCATION and TRAINING

UNDERGRADUATE:

Sept 1998 – May 2002	Oglethorpe University Atlanta, GA	Bachelor of Science 2002	Major: Biology Minor: Chemistry
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GRADUATE:

Sept 2005 – Jan 2012	University of Pennsylvania Philadelphia, PA	Ph.D. 2012	Pharmacology
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POSTGRADUATE:

Feb 2012 – Nov 2012	University of Pennsylvania Philadelphia, PA	Postdoctoral Fellowship	Psychiatry
Dec 2012 – May 2015	University of Pittsburgh Pittsburgh, PA	Postdoctoral Fellowship	Psychiatry

ACADEMIC POSITIONS

Jun 2015 – Present	Department of Psychiatry University of Pittsburgh School of Medicine Pittsburgh, PA	Assistant Professor
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NON-ACADEMIC POSITIONS

Summer 2001	Atherogenics Inc. Atlanta, GA	Medicinal Chemistry Intern
Summer 2002	Atherogenics Inc. Atlanta, GA	Animal Pharmacology/Molecular Biology Intern
Sept 2002 – Sept 2005	McLean Hospital Boston, MA	Research Technician/Laboratory Manager

MEMBERSHIP in PROFESSIONAL and SCIENTIFIC SOCIETIES

Society for Neuroscience	2005
American Society of Mass Spectrometry	2007
Human Proteome Organization	2012

HONORS

National Merit Scholar Semifinalist (Massachusetts)	1997
Oglethorpe University Presidential Scholarship	1998-2002
Oglethorpe University Student Judicial Board	2000-2002
Ruth L. Kirschstein National Research Service Award (Pre-Doctoral)	2010
CPSA Travel Award	2013
Voice Poster Selection: American College of Neuropsychopharmacology Annual Meeting	2013
Society of Biological Psychiatry Travel Fellowship Award	2014
WPIC 14 th Annual Research Day Outstanding Poster Presentation	2014
NARSAD Young Investigator Award	2015
15 th International Congress on Schizophrenia Research Young Investigator Travel Award	2015
Research Career Development Institute for Psychiatry Fellow (Declined)	2015
Postdoctoral Data & Dine Symposium Poster Award	2015
American College of Neuropsychopharmacology Travel Award	2015
Molecular Psychiatry Travel Fellow	2016

PUBLICATIONS**1. Refereed Articles:**

1. Konradi C, Eaton M, **MacDonald ML**, Walsh J, Benes F, Heckers S. Molecular Evidence for Mitochondrial Dysfunction in Bipolar Disorder. *Archives of General Psychiatry*. 61(3) 300-308, March 2004.
2. Meng CQ, Somers PK, Hoong LK, Zheng XS, Ye Z, Worsencroft KJ, Simpson JE, Hotema MR, Weingarten MD, **MacDonald ML**, Hill RR, Marino EM, Suen KL, Luchoomun J, Kunsch C, Landers LK, Stefanopoulos D, Howard RB, Sundell CL, Saxena U, Wasserman MA, Sikorski JA. Discovery of novel phenolic antioxidants as inhibitors of vascular cell adhesion molecule-1 expression for use in chronic inflammatory diseases. *J Med Chem*. 2;47(25):6420-32. 2004
3. **MacDonald ML**, Eaton M, Dudman T, Konradi K. Antipsychotic drugs elevate mRNA levels of presynaptic proteins in the frontal cortex of the rat. *Biological Psychiatry*. 1;57(9):1041-51.2005.
4. **MacDonald ML**, Naydenov A, Matzilevich D, Konradi C. Decrease in Creatine Kinase Messenger RNA Expression in the Hippocampus and Dorsolateral Prefrontal Cortex in Bipolar Disorder. *Bipolar Disorder*. 8(3):255-64. 2006.

5. Naydenov AV*, **MacDonald ML***. Onger D, Konradi C. Differences in lymphocyte electron transport gene expression levels between bipolar subjects and normal controls in response to glucose deprivation stress. *Archives of General Psychiatry*. 64(5):555-64. 2007
6. Levine JB, Youngs RM, **MacDonald ML**, Chu M, Leeder AD, Konradi C. Isolation Rearing and Hyperlocomotion are Associated with Reduced Immediate Early Gene Expression Levels in the Medial Prefrontal Cortex. *Neuroscience*. 2007 Mar 2;145(1):42-55.
7. **MacDonald ML**, Murray IVJ, Axelsen PH. Mass spectrometric analysis demonstrates that BODIPY 581/591 C11 overestimates and inhibits oxidative lipid damage. *Free Radicals in Biology and Medicine*. 1;42(9):1392-7. 2007
8. Borgmann-Winter KE, Rawson NE, Wang HW, Wang H, **MacDonald ML**, Ozdener MH, Yee KY, Gomez G, Xu J, Bryant B, Adamek G, Mirza N, Pribitkin E, Hahn CG. Human olfactory epithelial cells generated in vitro differentiate to express a diversity of neuronal functions. *Neuroscience*. 2009 Jan 23;158(2):642-53.
9. Chartoff EH, Papadopoulou M, **MacDonald ML**, Parsegian A, Potter D, Konradi C, and Carlezon, WA. Jr. Desipramine reduces stress-activated dynorphin expression and CREB phosphorylation in NAc tissue. 2009 Mar;75(3):704-12. *Mol Pharmacol*. 2009 Mar;75(3):704-12.
10. Hahn CG, Banerjee A*, **MacDonald ML***, Cho DS, Kamins J, Nie J, Borgmann-Winter KE, Grosser T, Pizarro A, Ciccimaro E, Arnold SE, Wang HY, Blair IA. The Post-Synaptic Density of Human Postmortem Brain Tissues: An Experimental Study Paradigm for Neuropsychiatric Illnesses. *PLoS One*. 2009;4(4):e5251.
11. **MacDonald ML**, Ciccimaro E, Prakash A, Banerjee A, Seeholzer SH, Blair IA, Hahn CG. Biochemical Fractionation and Stable Isotope Dilution Liquid Chromatography-mass Spectrometry for Targeted and Microdomain-specific Protein Quantification in Human Postmortem Brain Tissue. *Mol Cell Proteomics*. 2012 Dec;11(12):1670-81.
12. Banerjee A, Wang HY, Borgmann-Winter K, Stucky A, Kvasic J, **MacDonald ML**, Talbot K, Hemby S, Siegel S, Egbujo D, Arnold SE, Sleiman P, Chang X, Hakonarson H, Gur R, Hahn CG. Src kinase hypoactivity as an underlying mechanism for postreceptor NMDA receptor hypofunction in schizophrenia. *Molecular Psychiatry*. 2014 Oct 21
13. D'Aiuto L, Zhi Y, Kumar Das D, Wilcox MR, Johnson JW, McClain L, **MacDonald ML**, Di Maio R, Schurdak ME, Piazza P, Viggiano L, Sweet R, Kinchington PR, Bhattacharjee AG, Yolken R, Nimgaonkar VL. Large-scale generation of human iPSC-derived neural stem cells/early neural progenitor cells and their neuronal differentiation. *Organogenesis*. 2014; 10:365-377.
14. **MacDonald ML**, Ding Y, Newman J, Hemby S, Penzes P, Lewis DA, Yates NA, Sweet RA. Altered glutamate protein co-expression network topology linked to spine loss in the auditory cortex of schizophrenia. *Biol Psychiatry*. 2015; 77:959-968.
15. Shelton MA, Newman JT, Gu H, Sampson AR, Fish KN, **MacDonald ML**, Moyer CE, DiBitetto JV, Dorph-Petersen KA, Penzes P, Lewis DA, Sweet RA. Loss of Microtubule-Associated Protein 2 Immunoreactivity Linked to Dendritic Spine Loss in Schizophrenia. *Biol Psychiatry*. 2015;78:374-385.
16. Wang T, Zhao R, Zhou Fang, Ding Y, **MacDonald ML**, Sweet R, Chen W#. Fast GGM: An efficient algorithm for the inference of Gaussian graphical model. *Plos Computational Biology*. 2016
17. Kirkwood CM, **MacDonald ML**, Schempf TA, Vatsavayi AV, Ikonomic MD, Koppel JL, Ding Y, Sun M, Kofler JK, Lopez OL, Yates NA, Sweet RA. Altered Levels of Visinin-Like Protein 1 Correspond to Regional Neuronal Loss in Alzheimer Disease and Frontotemporal Lobar Degeneration. *J Neuropathol Exp Neurol*. 2016, Jan 14.
18. Sweet RA, **MacDonald ML**, Kirkwood CM, Ding Y, Schempf T, Jones-Laughner J, Kofler J, Ikonomic MD, Lopez OL, Fitz NF, Koldamova R, Yates NA. APOE*4 genotype is associated with altered levels of glutamate signaling proteins and synaptic co-expression networks in the prefrontal cortex in mild to moderate Alzheimer disease. *Mol Cell Proteomics*. 2016.
19. **MacDonald ML**, Alhassa J, Newman JT, Richard M, Hong Gu H, Ryan M. Kelly RM, Alan R, Sampson AR, Kenneth N. Fish KN, Peter Penzes P, Zachary P. Wills ZP, David A. Lewis DA, Robert A. Sweet RA. Selective Loss of Smaller Spines in Schizophrenia. *American Journal of Psychiatry*, 2017.
20. J.M. Krivinko, S.L. Erickson, Y. Ding, Z. Sun, P. Penzes, **M.L. MacDonald**, N.A. Yates, M.D. Ikonomic, O.L. Lopez, R.A. Sweet, J. Kofler, Synaptic Proteome Compensation and Resilience to Psychosis in Alzheimer's Disease, *Am J Psychiatry*, 175 (2018) 999-1009.

21. H.Y. Wang, **M.L. MacDonald**, K.E. Borgmann-Winter, A. Banerjee, P. Sleiman, A. Tom, A. Khan, K.C. Lee, P. Roussos, S.J. Siegel, S.E. Hemby, W.B. Bilker, R.E. Gur, C.G. Hahn, mGluR5 hypofunction is integral to glutamatergic dysregulation in schizophrenia, *Mol Psychiatry*, DOI 10.1038/s41380-018-0234-y(2018).
22. Rajarajan P , Borrman T, Liao W , Schrode N, Flaherty E, Casiño C, Powell S, Yashaswini C, LaMarca E, Kassim B, Javidfar B, Espeso-Gil S, Li A, Won H, Geschwind D, Ho SM, **MacDonald ML**, Hoffman GE, Roussos P, Zhang B, Hahn CG , Weng Z, Brennan KJ, Akbarian S. Neuron-specific Signatures in the Chromosomal Connectome Associated with Schizophrenia Risk, *Science*. 2018 Dec 14;362(6420). PMID: 30545851
23. **MacDonald ML**, Favo D, Garver M, Sun Z, Arion A, Ding Y, Yates N, Sweet RA, Lewis DA. Laser Capture Microdissection – Targeted Mass Spectrometry: A Method for Multiplexed Protein Quantification Within Individual Layers of The Cerebral Cortex. *Neuropsychopharmacology*. 2019 Mar;44(4):743-748. PMID: 30390066
24. McKinney BC, **MacDonald ML**, Newman JT, Shelton MA, DeGiosio RA, Kelly RM, Fish KN, Sampson AR, Lewis DA, Sweet RA. Density of small dendritic spines and microtubule-associated-protein-2 immunoreactivity in the primary auditory cortex of subjects with schizophrenia. *Neuropsychopharmacology*. 2019 May;44(6):1055-1061. doi: 10.1038/s41386-019-0350-7. Epub 2019 Feb 22. PubMed PMID: 30795003; PubMed Central PMCID: PMC6461932.
25. Nucifora LG, **MacDonald ML**, Lee BJ, Peters ME, Norris A, Orsburn B, Yang K, Gleason K, Margolis RL, Pevsner J, Tamminga C, Sweet RA, Ross CA, Sawa A, Nucifora FC. Increased protein insolubility in brains from a subset of patients with schizophrenia. *American Journal of Psychiatry*. 2019 May 6;:appiajp201918070864. doi: 10.1176/appi.ajp.2019.18070864. [Epub ahead of print] PubMed PMID: 31055969.
26. **MacDonald ML**, Garver M, Newman J, Sun Z, Kannarkat J, Salisbury R, Glausier J, Ding Y, Lewis DA, Yates N, Sweet RA. Synaptic Proteome Alterations in the Primary Auditory Cortex of Schizophrenia. *JAMA Psychiatry*, In Press, Oct 23rd 2019.

2. Reviews:

1. Banerjee A, **MacDonald ML**, Borgmann-Winter KE, Hahn CG. Neuregulin 1 - erbB4 pathway in schizophrenia: From genes to an interactome. *Brain Res Bull*. 2010 Sep 30;83(3-4):132-9.
2. Hu W, **MacDonald ML**, Elswick DE, Sweet RA. The glutamate hypothesis of schizophrenia: evidence from human brain tissue studies. *Ann N Y Acad Sci*. 2015; 1338:38-57.

3. Application Notes:

1. **M.L. MacDonald**, E. Ciccimaro, I.A. Blair, C.G. Hahn. Targeted LC-SRM/MS Quantification of Mammalian Synaptic Proteins with MouseExpress® Brain Tissue, a New Isotopically Labeled Proteome Standard. Application Note 27, Cambridge Isotope Laboratories, June 2011.

* Authors contributed equally to manuscript.

4. Selected Conference Posters, Talks, and Invited Talks:

Posters

1. Chronic Antipsychotic Drug Treatment Alters Gene Expression of Presynaptic Proteins in The Frontal Cortex. M.L. MacDonald, M.E. Eaton, J.T. Dudman, C. Konradi. Presented October 24, 2004 at the Society for Neuroscience 2004.
2. Decrease in Creatine Kinase Messenger RNA Expression in the Hippocampus and Dorsolateral Prefrontal Cortex in Bipolar Disorder. MacDonald ML, Naydenov A, Ongur D, Matzilevich D, R.M. Youngs R, Chu M, Konradi C. Presented November 14, 2005 at the Society for Neuroscience, 2005.
3. Selected Reaction Monitoring for Quantification of PSD and NMDAR Complex Proteins and PTMs In Human Postmortem Brain Tissue. M.L. MacDonald, E. Ciccimaro, A. Banerjee, S.E. Arnold, I.A. Blair, C.G. Hahn. Presented June 9, 2011 at the 59st annual meeting of the American Society for Mass Spectrometry.
4. PSD Protein Partitioning is Drastically Altered in the Lateral Prefrontal Cortex of Schizophrenia. M.L. MacDonald, E. Ciccimaro, S. Siegel, S. Hemby, I. Blair, C.G. Hahn. Presented December 4th, 2012 at the 51st annual meeting of the American College of Neuropsychopharmacology.

5. Altered Synaptic Protein Expression and Co-Expression Network Topology Linked to Spine Loss in the Auditory Cortex of Schizophrenia. M.L. MacDonald, Y. Ding, J. Newman, S. Hemby, P. Penzes, D.A. Lewis, N.A. Yates, R.A. Sweet. Presented December 7th, 2013 at the 52nd annual meeting of the American College of Neuropsychopharmacology.
6. Co-expression Network Analysis of Quantitative Proteomics Data: A New Approach for Studying Neuropsychiatric Disease. M.L. MacDonald, Y. Ding, J. Newman, S. Hemby, P. Penzes, D.A. Lewis, N.A. Yates, R.A. Sweet. Presented June 19, 2014 at the 62nd annual meeting of the American Society for Mass Spectrometry.
7. Development and Validation of a Laser Capture Microdissection - Targeted Mass Spectrometry Approach for Cortical Layer Specific Protein Quantification in Postmortem Human Brain Tissue. M.L. MacDonald, D. Arion, D. Favio, D.A. Lewis, N.A. Yates, R.A. Sweet. Presented December 9th, 2015 at the 54th annual meeting of the American College of Neuropsychopharmacology.

Talks

1. *Altered Intracellular Trafficking of PSD Proteins in Postmortem Brains of Schizophrenia*. Presented May 12th 2011 at the 66th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA.
2. *Constellation of Synaptic Molecules at the Postsynaptic-Density Differentiates Schizophrenia from Normal Controls in the Prefrontal Cortex*. Presented June 12, 2012, at the 11th Annual World Congress of the Human Proteome Organization.
3. *Targeted Proteomics and Biochemical Fractionation: New Tools for Deciphering the Synapse in Schizophrenia*. Presented Oct 9th, 2013, at CPSA 2013: Connecting Patients and Subject Numbers Through Analysis, Langhorne, PA.
4. *Selective Loss of Smaller Spines in The Auditory Cortex of Schizophrenia*. Presented December 7th 2015 at the 54th Annual Meeting of the American College of Neuropsychopharmacology.
5. *Selective Loss of Smaller Spines in The Auditory Cortex of Schizophrenia*. Presented January 21st, 2017 at the Winter Conference on Brain Research.
6. *Identification of Phosphoprotein and Phosphoprotein Networks Linked to Spine Loss in Schizophrenia*. Presented June 6th, 2017 at the annual conference of the American Society of Mass Spectrometry.
7. *Identification and Validation of Synapse-Loss Regulating Phosphorylation Events in Schizophrenia*. Presented November 4th at the ASMS Asilomar Conference on Quantitative Analysis of PTMs.
8. *Selective Loss of Smaller Spines in The Auditory Cortex of Schizophrenia*. Presented December 13th 2018 at the 57th Annual Meeting of the American College of Neuropsychopharmacology.
9. *Multi-omics Approach Identifies Pathological Phosphorylation Events Driving Synapse Loss in Schizophrenia*. Presented June 2nd, 2019 at the eighth annual Skyline User Group Meeting.

5. Invited Talks

1. *Exploring Synaptic Protein & Phosphoprotein Networks in Schizophrenia*. Presented June 22, 2017 at the Spectroscopy Society of Pittsburgh Manufactures and Poster Session.
2. *Mapping Synaptic Protein and Phosphoprotein Networks Linked to Dendritic Spine Loss in Schizophrenia*. Presented November 2, 2017 at the University of Pittsburgh Pharmacology & Chemical Biology Seminar.
3. *Mapping Synaptic Protein & Phosphoprotein Networks Linked to Dendritic Spine Loss in Schizophrenia*. Presented March 20, 2018 at the Lieber Speaker Series, Liber Institute/Johns Hopkins University.
4. *Mapping Synaptic Protein & Phosphoprotein Networks Linked to Dendritic Spine Loss in Schizophrenia*. Presented May 1st, 2018 at the University of South Carolina.

PROFESSIONAL ACTIVITIES

MENTORING:

Undergraduate Students

1. Alipi Naydenov, 2005, McLean Hospital, "Gene expression analysis of lymphocytes prepared from bipolar subjects and normal controls"
2. Irene Wang, 2009, University of Pennsylvania "Sequencing of PSD95 by Mass Spectrometry"
3. Cody Barker, 2011, University of Pennsylvania "mGluR5 expression in prefrontal cortex of schizophrenia"
4. Tadhg Schempf, 2014, University of Pittsburgh "SRM Quantification of VSNL1"
5. Joseph Kannarkat, 2016 - 2018, University of Pittsburgh, "Effects of antipsychotic drugs on the synaptic proteome"
6. Aisha Salami, 2017 - 2018, University of Pittsburgh, "Synaptic proteome in schizophrenia"
7. Ryan Salisbury 2017 - 2019, University of Pittsburgh, "Synaptic proteome in ATP1A3 heterozygous mice"

Medical and Graduate Students

1. Kevin Patel, 2010, University of Pennsylvania "Targeted proteomic analysis of PSD enrichments from NRG1 heterozygous mice"
2. Hyunjung Oh, 2013, University of Pittsburgh "Targeted proteomic analysis of GABA signaling proteins in depression"
3. Caitlin Kirkwood, 2014, University of Pittsburgh "Cortical VSNL1 protein expression in Alzheimer's disease"
4. Jamil Alhassan, 2015, University of Pittsburgh "Targeted proteomic analysis of calcium channel complex proteins in the auditory cortex of schizophrenia"
5. Xiyu Zhu, 2017, University of Pittsburgh "Localization of decreased ATP1A3 expression in the auditory cortex of schizophrenia"
6. Emily Parker (Co-mentor with Dr. Sweet), 2016-present, University of Pittsburgh "CACNB4 protein-protein interactions"
7. Michael Ross Dechellis Marks (Co-mentor with Dr. Sweet), 2018-present, University of Pittsburgh (Thesis topic TBD)

Postdoctoral and Resident Fellows

1. Melanie Grubisha, 2013 – 2019, University of Pittsburgh "Investigation of Kalirin Mutations in schizophrenia pathology"

OTHER RESEARCH RELATED ACTIVITIES:

Ad Hoc Reviewer, Wellcome Trust

Ad Hoc Reviewer, *Proteomes*

Ad Hoc Reviewer, *Journal of Proteome Research*

Ad Hoc Reviewer, *Biological Psychiatry*

Ad Hoc Reviewer, *Neurobiology of Disease*

Ad Hoc Reviewer, *Schizophrenia Research Bulletin*

Ad Hoc Reviewer, *Molecular Psychiatry*

CURRENT RESEARCH INTERESTS:

My research focuses on utilizing cutting edge mass spectrometry based proteomic approaches to elucidate the molecular pathology of schizophrenia and other neuropsychiatric diseases, through the study of synaptic protein networks in human postmortem brain tissue. My program is divided into three interrelated tracks: **1.** The development and validation of proteomic approaches to investigate synaptic protein networks in human postmortem brain tissue. New approaches focus on increasing the spatial resolution of proteomics assays (e.g. specific cortical layers, cell types, and synaptic microdomains) and/or increasing the types of post-translational modifications that can be reliably measured in human postmortem brain tissue; **2.** The application of these proteomic approaches, as well as bioinformatics and microscopy, to investigate the link between synaptic protein network alterations and cytoarchitectonic pathology in schizophrenia; **3.** Evaluating the downstream effects of these synaptic protein alterations in animal and cell culture model systems.

RESEARCH:

Current Grant Support:

	Grants Number	Title	Role	Years Inclusive	Source	\$
1	1 R01 MH118497-01A1	Synaptic Protein Networks, Genetic Risk, and Spine Loss in Schizophrenia	PI 40% Effort	2019-2024	NIMH	335,849/yr
2	N/A	Discovering the Protein Signature of Synapse Loss and Cognitive Decline During Aging	PI 40% Effort	2018-2021	ITTC	\$1,226,458/yr
3	1 R01 MH114908-01A1 (Jacobs)	Benzodiazepine Treatment Induced Neuroplasticity	Co-I 5% Effort	2019-2024	NIMH	\$3,874/yr
4	5 P50 AG005133-36	Alzheimer's Disease Research Center (Project 3, Lopez)	Co-I 30% effort	2018-2023	NIA	\$32,487/yr
5	1 R01 MH116046-01A1	Synaptic Resilience to Psychosis in Alzheimer Disease (Sweet)	Co-I 10% effort	2018-2019	NIMH	\$12,994/yr

Past Grant Support:

	Grants Number	Title	Role	Years Inclusive	Source	\$
1	NARSAD YIA FDNFSZ00204-01	Layer 3 Glutamate Signaling Protein Network Abnormalities in Schizophrenia	PI 100% effort	2015-2017	Brain & Behavior Research Foundation	35,000/yr
2	T32 MH016804-31	Training for Transformative Discovery in Psychiatry	Trainee	2014-2015	NIMH	N/A

3	T32 MH016804-31	Training for Transformative Discovery in Psychiatry	Trainee	2013- 2014	NIMH	N/A
4	F31 MH087106-01	NMDA Receptor Complex Dysfunction in Schizophrenia	PI 100% effort	2010- 2012	NIMH	34,000/yr
5	K01 MH 107756	ATP1A3 Induced Alterations to Glutamate Signaling Protein Networks in Schizophrenia	PI 85% effort	2015- 2019	NIMH	\$165,000/yr