OMB No. 0925-0001 and 0925-0002 (Rev. 09/17 Approved Through 03/31/2020)

BIOGRAPHICAL SKETCH

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NAME: Michael Charles Salling

eRA COMMONS USER NAME (credential, e.g., agency login): michael\_salling

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

| INSTITUTION AND LOCATION | DEGREE(if applicable) | Completion DateMM/YYYY | FIELD OF STUDY |
| --- | --- | --- | --- |
| Tulane University, New Orleans, LA | B. S.  | 1997-2001 | Neuroscience and Psychology |
| University of North Carolina at Wilmington Wilmington, NC | M.A. | 2004-2008 | Psychology |
| University of North Carolina at Chapel Hill, Chapel Hill, NC | Ph.D. | 2006-2011 | Neurobiology |
| Columbia University, New York, NY | Postdoc |  2011-2016 | Neuroscience/Anesthesiology |
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**A. Personal Statement**My primary interest during the last 18 years has been on understanding the neuronal networks disrupted in psychiatric illnesses with a focus on alcohol use disorders. This interest was formed through daily interactions with individuals with substance abuse during my time working in psychiatric hospitals and has been cultivated throughout my training in preclinical neuroscience research labs. The majority of my research experience has been in animal models (mouse, rat, baboon) of alcohol exposure and operant self-administration, cognitive tests following alcohol exposure and the molecular and electrophysiological analyses of limbic and frontal cortical brain regions following alcohol exposure. I have recently moved to Louisiana State University Health Sciences Center where I am a tenure track Assistant Professor in the process of starting my independent research program. The goal of my lab is to identify neuroadaptations that occur as the result of stress, drug exposure, viral infection, or pathological brain development and how they play in cognition and excessive alcohol consumption.

**B. Positions and Honors**

**Positions and Employment**

2000-2001 Undergraduate Research Assistant, Tulane University Cognitive Neuroscience Lab

2001-2003 Psychiatric Technician, Depaul-Tulane Behavioral Health Center, Substance Abuse Unit

2003-2004 Psychiatric Technician, Oaks Behavioral Health Center, Dual Diagnosis Unit

2004-2006 Graduate Research Assistant, UNCW Psychology Department

2006-2011 Graduate Research Assistant, UNC Bowles Center for Alcohol Studies

2011-2014 Postdoctoral Fellow, Columbia University Anesthesiology Department

2014-2016 Associate Research Scientist, Columbia University Department of Anesthesiology

2016-2019 Assistant Professor, Columbia University Department of Anesthesiology

2019- Assistant Professor, LSU Health Sciences Center, Department of Anatomy and Cell Biology

# Other Experience and Professional Memberships

2004- Member, Society for Neuroscience

2007- Member, Research Society on Alcoholism

**Honors**

2010 Outstanding Research Award, UNC Neurobiology Curriculum, Pierre Morrel Research Day

2011 Enoch Gordis Graduate Student Award, Research Society on Alcoholism Annual Meeting

2014 Outstanding Poster Award, Gordon Research Conference on Alcohol and the Nervous System

2015 Outstanding Poster Award, European Society Biomedical Research Alcoholism, Valencia, Esp

2016 Travel Award Behavior Biology and Chemistry Conference on Addiction, San Antonio, TX

2016 Enoch Gordis Postdoc Award Finalist, Research Society on Alcoholism Annual Meeting

2017 Ziskind-Somerfield Research Award Paper Finalist, *Biological Psychiatry*

**C. Contributions to Science**

Glutamate signaling pathways and alcohol reinforcement. As a graduate student under the mentorship of Clyde Hodge, I performed preclinical work that supported targeting of metabotropic glutamate receptors (mGluRs), specifically mGluR5 with the antagonist MPEP (Schroeder et al. 2008, Besheer et al. 2009) and mGluR7 with the positive allosteric modulator AMN082 (Salling et al. 2009) as strategies to decrease alcohol self-administration and reinstatement. I then became interested in identifying novel targets that play a role in the transition to alcohol dependence and using an unbiased proteomics approach, I identified calcium-calmodulin protein kinase II alpha (CaMKIIα) and several proteins involved in its local translation and interactions with glutamate receptor trafficking as being up regulated following chronic alcohol consumption. I next used several agents to demonstrate that CaMKIIα and AMPAR inhibition selectively decrease alcohol self-administration (Salling et al. 2014) and extend this work to reinstatement of alcohol seeking (Salling 2017). From this work, I synthesized a pathway of genes involved in glutamate neuroplasticity called the mGluR-Eef2-AMPAR pathway and we performed a GWAS study on an alcohol drinking population where this pathway came out significantly associated with drinking behavior (Meyers, Salling et al. 2017).

1. Salling, MC, Faccidomo, S, Hodge, CW (2008) Nonselective suppression of operant ethanol and sucrose self-administration by the mGluR7 positive allosteric modulator AMN082. *Pharmacology, Biochemistry, and Behavior*, 91(1).
2. Schroeder JP, Spanos M, Stevenson JR, Besheer J, Salling MC, Hodge CW (2008) Cue-induced reinstatement of alcohol-seeking behavior is associated with increased ERK1/2 phosphorylation in specific limbic brain regions: blockade by the mGluR5 antagonist MPEP. *Neuropharmacology*, 55(4).
3. Besheer, J, Grondin, J, Salling, MC, Stevenson, R, Spanos, M, Hodge, CW (2009) Interoceptive effects of alcohol require mGlu5 receptor activity in the nucleus accumbens. *J. Neuroscience*, 29(30).
4. Salling, MC, Li, C, Faccidomo, S, Galunas, C, Psilos, K, Spanos, M, Kash, T, Hodge, CW (2015). Moderate alcohol drinking and the amygdala proteome: Identification and validation of CaMKII and AMPAR activity as novel molecular mechanisms of the positive reinforcing effects of alcohol. *Biological Psychiatry*.
5. Meyers, JL, Salling, MC (co-first author), Almi, LM, Ratanatharathorn A, [Uddin](http://www.ncbi.nlm.nih.gov/pubmed/?term=Uddin%20M%5Bauth%5D) M, [Galea](http://www.ncbi.nlm.nih.gov/pubmed/?term=Galea%20S%5Bauth%5D) S,[Wildman](http://www.ncbi.nlm.nih.gov/pubmed/?term=Wildman%20DE%5Bauth%5D) DE, [Aiello](http://www.ncbi.nlm.nih.gov/pubmed/?term=Aiello%20AE%5Bauth%5D)AE, Bekh Bradley B, Ressler K, Koenen KC ( ). Frequency of Alcohol Consumption in Humans; the Role of Metabotropic Glutamate Receptors and Downstream Signaling Pathways. *Translational Psychiatry.*
6. Salling, MC, Hodge CJ, Psilos, KE, Eastman, VR, Faccidomo, SP, Hodge, CW (2017) Cue-induced reinstatement of alcohol-seeking behavior is associated with increased CaMKII T286 phosphorylation in the reward pathway of mice. *Pharmacology, Biochemistry, and Behavior.*

Inhibition in the CNS

Under the mentorship of Neil Harrison, I initially focused on the acute effects of alcohol and inhibition in the prefrontal cortex (Harrison et al. 2017). From this work, we identified a tonic inhibitory current mediated by glycine and not GABA receptors in layer II/III of the prefrontal cortex (PFC) (Salling et al. 2014) which led to a larger collaboration investigating the specific glycine subunit involved in tonic inhibition. We found that the alpha 3 subunit of the glycine receptor plays an important role in tonic inhibition (McCracken, et al. 2017) and are currently targeting mutations to the address the acute effects of alcohol interaction sites on these receptors.

1. Harrison, NL, Skelly, MJ, Grosserode, EP, Lowes, DC, Zeric, T, Phister, S, Salling, MC (2017). Effects of acute alcohol on excitability in the CNS (review). *Neuropharmacology*, 122(36-45)
2. Salling, MC, Harrison, NL. (2014) Strychnine-sensitive glycine receptors on pyramidal neurons in layers II/III of the mouse prefrontal cortex are tonically activated**.** *Journal of Neurophysiology*, 112(5).
3. McCracken, LM, Salling, MC, Carreau-Vollmer, C, Odean, NN, Blednov, YA, Betz, H, Harris, RA, Harrison, NL (2017) Glycine Receptor α3 and α2 Subunits Mediate Tonic and Exogenous Agonist-Induced Currents in Forebrain. *PNAS*, 114(34).

Neuroadaptations following Binge Alcohol Drinking

A major interest of mine is characterizing the effects of binge drinking during adolescence on reward circuitry and cognitive function. Here, we employed intermittent alcohol consumption in adolescence and using cell-attached electrophysiology found that VTA neurons increase their sensitivity to acute alcohol after adolescent binge drinking (Avegno 2016). However, we did not find that altering dopamine receptor expression in the ventral striatum altered binge-like or compulsive alcohol consumption (Gallo 2015) and believe inputs onto VTA neurons are involved. I also looked the effect of adolescent binge alcohol consumption on PFC function and found that adolescent binge drinkers show deficits in working memory consistent with PFC dysfunction. Whole cell recordings from PFC neurons in binge drinkers demonstrate that they have altered intrinsic excitability that prevents them from entering muscarinic induced intrinsic persistent firing, a neurobiological correlate of working memory (Salling 2018). We think that this imbalance of reward circuitry and cognitive function underlies addictive behavior and may be corrected using brain stimulation therapy (Salling and Martinez 2016).

1. Avegno, E, Salling MC, Borgkvist, A, Marjeru, A, Barnet, A, Margolis, E, Sulzer D, Harrison NL (2016) Voluntary adolescent drinking enhances excitation by low levels of alcohol in a subset of dopaminergic neurons in the ventral tegmental area. *Neuropharmacology.* 110(Pt A):386-95)
2. Gallo, EF, Salling, MC, Feng, B, Morón, JA, Harrison, NL, Javitch, JA, Kellendonk, C (2015) Upregulation of dopamine D2 receptors in the nucleus accumbens indirect pathway increases locomotion but does not reduce alcohol consumption. *Neuropsychopharmacology* 40:1609-18
3. Salling, MC, Skelly, MJ, Avegno, E, Regan, S, Zeric, and Harrison NL (2018)Alcohol consumption during adolescence in a mouse model of binge drinking alters the intrinsic excitability and function of prefrontal cortex pyramidal neurons through a reduction in the hyperpolarized activated cation current. *Journal of Neuroscience 38(27).*
4. Salling, MC, Martinez, D (2016). Brain Stimulation in Addiction (Review). *Neuropsychopharmacology.* 41(12):2798-2809.

**Full publication list at:** <https://www.ncbi.nlm.nih.gov/pubmed?term=((salling%20m)%20NOT%20Ovarian%5BTitle%5D)%20NOT%20National%5BTitle%5D>

**D. Additional Information: Research Support and/or Scholastic Performance**

**Ongoing Research Support**

- K99AA024507-01A1 Salling (PI) 03/1/2018 – 03/1/2023

Prefrontal pathways engaged in excessive alcohol consumption

**Pending Research Support**

**Completed Research Support**

F31AA018938 Salling (PI) 09/17/2009 – 08/12/2011

Role of CaMKII in ethanol self-administration

Role: PI

5T32DA016224-07 Sulzer (PD) 08/10/2011 - 08/09/2012

Substance abuse training grant at Columbia University Neurology Department

F32AA022028-02 Salling (PI) 09/30/2012 – 09/30/2014

Alcohol and inhibition in the prefrontal cortex

Role: PI

1R21AA023879-01 (MPI) Salling (Multi-PI) 02/28/2016 – 02/28/2018

A pilot study of deep brain stimulation for alcohol dependence in nonhuman primates

Role: co-PI

Smithers Pilot Proposals for Alcohol Research 07/15/17 - 11/15/18

“A pilot study of focused ultrasound stimulation in alcohol dependence in nonhuman primates

Role: PI