

Date of preparation: 1/29/2024

Z. Zack Ma, Ph.D.

Office/Lab Address: MRB III Bio/Sci 7150
Vanderbilt University
465 21st Ave. South
Nashville, TN 37240

Cell Phone: 313-213-0753

Email: zhenzhong.ma@vanderbilt.edu

ORCID ID: orcid.org/0000-0002-1235-3765



EDUCATION & TRAINING:

B.S. Biotechnology, Soochow University, Suzhou Medical College, Suzhou, China 2002

Ph.D. Molecular Biology & Genetics, Wayne State University School of Medicine, Detroit, MI 2011
Advisor: Dr. Jeffrey A. Loeb

Post-doc Neuroscience, University of Texas Southwestern Medical Center, Dallas, TX 2011-2017
Advisors: Dr. Luis F. Parada & Dr. Jane E. Johnson

CURRENT APPOINTMENT:

Assistant Professor (Research), Department of Pharmacology, Vanderbilt University, Nashville, TN

RESEARCH EXPERIENCE & APPOINTMENTS:

Undergraduate Research Assistant, Dr. Ze-Guang Han Laboratory 2001-2002
National Human Genome Center, Division of Functional Genomics, Shanghai, China
Identify and characterize the interacting proteins of hLZP by using a yeast two-hybrid system

Research Assistant, Dr. Jing-de Zhu Laboratory 2002-2003
National Key Laboratory for Oncogenes & Related Genes, Shanghai Cancer Institute, Shanghai, China
Investigate the methylation profiles of promoter CpG island of genes in liver cancer

Graduate Research Assistant, Dr. Jeffrey A. Loeb Laboratory 2004-2011
Center for Molecular Medicine & Genetics, Dept. of Neurology, Wayne State University, Detroit, MI
Identify the critical in vivo roles of neuron-glia communication through soluble neuregulin-1 and BDNF in regulating glial cell development

Postdoctoral Fellow, Dr. Luis F. Parada & Dr. Jane E. Johnson Laboratories 2011-2017
Depts. of Developmental Biology & Neuroscience, UT Southwestern Medical Center, Dallas, TX
Explore the role of adult hippocampal neurogenesis in maintaining antidepressant effects by focusing on BDNF-TrkB signaling; Investigate the transcriptional and epigenetic regulation of neural stem cells

Assistant Instructor, Department of Neurology 2017-2018
University of Texas Southwestern Medical Center, Dallas, TX
Develop a BioID-MS platform to identify the interacting proteins of two autism risk factors (CUL3 and KCTD13) in mouse hippocampus.

Instructor (Research Track), Department of Pharmacology 2018-2022
Vanderbilt Brain Institute, Vanderbilt University, Nashville, TN

Study synaptic and molecular mechanisms underlying sustained antidepressant effects of ketamine

Assistant Professor (Research), Department of Pharmacology 2023-present
Vanderbilt Brain Institute, Vanderbilt University, Nashville, TN

Study synaptic and molecular mechanisms underlying ketamine-induced hippocampal neural plasticity and sustained antidepressant actions.

PROFESSIONAL MEMBERSHIP

Society for Neuroscience 2006-present
Society of Biological Psychiatry 2024-present

PROFESSIONAL ACTIVITIES

Committee Services

Student Committee for the Summer Undergraduate Research Program, WSU Medical School 2007
Planning Committee for Graduate Student Research Day, WSU Medical School 2008-2010
Planning Committee for Postdoc Annual Symposium, UT Southwestern Medical Center 2013
Faculty Review Committee for Vanderbilt Undergraduate Summer Research Program 2023-2024

Ad Hoc Journal Review (www.webofscience.com/wos/author/record/1649587)

Brain Research
CNS & Neurological Disorders - Drug Targets
Current Stem Cell Research & Therapy
Development, Growth and Differentiation
Experimental Brain Research
Hippocampus
International Journal of Neuroscience
Journal of Molecular Neuroscience
Journal of Neuroscience Research
Journal of the Neurological Sciences
Molecular Brain
Molecular Cancer
Neurochemistry International
Neuroscience Letters
Neuropsychopharmacology
Protein and Peptide Letters

Research Grant Review

MRC UKRI, African Research Leaders 2023 Research Grant 2/28/2023

Other Activities

Selected to attend Allen Institute Neuropixels and OpenScope Workshop 6/21-6/23/2023
Invited to nominate candidates for the Nobel Prize in Physiology or Medicine 2024

HONORS & AWARDS

Undergraduate Scholarship Award, Suzhou Medical College / Soochow University 1999-2002
Excellent Thesis Award (*Top 2%*), Dept. of Biotechnology, Soochow University 2002
Thomas C. Rumble University Graduate Fellowship (*Top 1 in the program*), WSU 2005
Graduate Student Professional Travel Award, School of Medicine, WSU 2006&2009
Excellent Oral Presentation Award, Graduate Student Research Day, WSU 2008

MARC Travel Award of FASEB	2017
Short talk speaker, GRC - Neurotrophic Mechanisms in Health and Disease	2023
Scale Success Award, Vanderbilt University	2023

PUBLICATIONS

Peer-Reviewed Journal Articles (total citations: 803, *Google Scholar*, <https://scholar.google.com/citations?user=sfV43nwAAAAJ>):

- Xu ZG, Du JJ, Zhang X, Cheng ZH, **Ma ZZ**, Xiao HS, Yu L, Wang ZQ, Li YY, Huo KK, Han ZG (2003) A novel liver-specific zona pellucida domain containing protein that is expressed rarely in hepatocellular carcinoma. *Hepatology* 38:735-744. PMID: 12939600.
- Yu J, Zhang HY, **Ma ZZ**, Lu W, Wang YF, Zhu JD (2003) Methylation profiling of twenty-four genes and concordant methylation behaviors of nineteen genes that may contribute to hepatocellular carcinogenesis. *Cell Research* 13(5):319-333. PMID: 14672555.
- Ma Z**, Li Q, An H, Pankonin MS, Wang J, Loeb JA (2009) Targeting human epidermal growth factor receptor signaling with the Neuregulin's heparin-binding domain. *Journal of Biological Chemistry* 284(46): 32108-15. PMID: 19717564.
- Calvo M, Zhu N, Tsantoulas C, **Ma Z**, Grist J, Loeb JA, Bennett DL (2010) Neuregulin-ErbB signaling promotes microglial proliferation and chemotaxis contributing to microgliosis and pain after peripheral nerve injury. *Journal of Neuroscience* 30(15): 5437-50. PMID: 20392965.
- Calvo M, Zhu N, Grist J, **Ma Z**, Loeb JA, Bennett DL (2011) Following nerve injury neuregulin-1 drives microglial proliferation and neuropathic pain via the MEK/ERK pathway. *Glia* 59(4): 554-68. PMID: 21319222.
- Ma Z**, Wang J, Song F, Loeb JA (2011) Critical period of axoglial signaling between Neuregulin1 and BDNF required for early Schwann cell survival and differentiation. *Journal of Neuroscience* 31(26):9630-40. PMID: 21715628.
Editorial's pick in "This week in the Journal". J Neurosci. 29 June 2011, 31(26): i. Recommended by Faculty of 1000: 14 Oct. 2011, F1000.com/13340004
- Jeng D, **Ma Z**, Berrett JW, McFadden G, Loeb JA, Essani K (2013) The tanapoxvirus 15L protein is a virus-encoded Neuregulin that promotes viral replication in human endothelial cells. *Journal of Virology* 87(6):3018-26. PMID: 23269801.
- Uruena A, Mona B, Kollipara RK, **Ma Z**, Borromeo MD, Chang JC, Johnson JE (2017) Repression by PRDM13 is critical for generating precise neuronal identity. *eLife* 6:e25787. PMID: 28850031.
- Ma Z***, Zang T, Birnbaum SG, Wang Z, Johnson JE, Zhang CL, Parada LF* (2017) TrkB dependent adult hippocampal progenitor differentiation mediates sustained ketamine antidepressant response. *Nature Communications* 8(1):1668. PMID: 29162814. ***Co-corresponding authors**
- Lin PY#, **Ma ZZ#**, Mahgoub M, Kavalali ET, Monteggia LM (2021) A synaptic locus for TrkB signaling underlying ketamine rapid antidepressant action. *Cell Reports* 36(7):109513. PMID: 34407417. **#Co-first authors**
- Uzay B, Houcek A, **Ma ZZ**, Konradi C, Monteggia LM, Kavalali ET (2023) Neurotransmitter release progressively desynchronizes in induced human neurons during synapse maturation and aging. *Cell Reports* 42 (2): 112042. PMID: 36701235.
- Houcek A, **Ma ZZ**, Trauterman B, Uzay B, Monteggia L, Kavalali ET (2023) CRISPR/Cas9 editing of synaptic genes in human embryonic stem cells for functional analysis in induced human neurons. *STAR Protocols* (Submitted)

Book Chapters:

1. Wang J, **Ma Z**, Loeb JA (2013) Cell-specific targeting of fusion proteins through heparin-binding. In the book "*Fusion Protein Technologies for Biopharmaceuticals: Applications and Challenges*". Schmidt S., editor. John Wiley & Sons, Inc. Hoboken, NJ. doi:10.1002/9781118354599.ch27

Published Meeting Abstracts

1. **Ma Z**, Pankonin MS, An H, Loeb JA. Targeting heparin-binding forms of Neuregulin1 from axons to glia promotes Schwann cell survival. 540.19/N13; 2006 Society for Neuroscience Annual Meeting, Atlanta, GA.
2. **Ma Z**, Loeb JA. Neurotrophin-induced targeting of heparin-binding forms of Neuregulin1 from axons to glia regulates Schwann cell Development. 126.16/A43; 2009 Society for Neuroscience Annual Meeting, Chicago, IL.
3. Calvo M, Zhu N, Tsantoulas C, **Ma Z**, Grist J, Loeb J, Bennett D. 377 Neuregulin-ErbB signaling promotes microglial proliferation and chemotaxis contributing to microgliosis and pain following peripheral nerve injury. 2010 European Journal of Pain Supplements, 4: 107-107.
4. **Ma Z**, Parada LF. SSRI-induced endogenous BDNF from newborn cells regulates adult neurogenesis and the prolonged antidepressant effect. 426.01/AA10; 2014 Society for Neuroscience Annual Meeting, Washington DC. (Nomination for the SfN travel award by Dallas Neuroscience chapter)
5. Lin PY, Mahgoub M, **Ma Z**, Kavalali ET, Monteggia LM. The role of synaptic BDNF-TrkB signaling in ketamine-mediated antidepressant effects. 287.14/G9; 2018 Society for Neuroscience Annual Meeting, San Diego, CA.
6. **Ma ZZ**, Lin PY, Kim JW, Guzikowski NJ, Altamirano RM, Kavalali ET, Monteggia LM. The role of ERK activation in ketamine-induced synaptic plasticity and antidepressant actions. 227.12/JJ5; 2022 Society for Neuroscience Annual Meeting, San Diego, CA.
7. Uzay B, Houcek A., **Ma ZZ**, Konradi CL, Monteggia LM, Kavalali ET. Non-cell autonomous regulation of neurotransmitter release synchrony in human synapses. 112.24/C19; 2022 Society for Neuroscience Annual Meeting, San Diego, CA.
8. Uzay B, **Ma ZZ**, Monteggia LM, Kavalali ET. Phenotypic analysis of mice carrying SNAP25 L50S mutation. NANO42.06; 2023 Society for Neuroscience Annual Meeting, Washington DC.

Grant Support

Vanderbilt University Scale Success Award (9/2023 - 8/2024)

Title: Synaptic and molecular mechanisms of the DUSP6-ERK pathway to sustain antidepressant effects of ketamine.

Role: Principal Investigator

Total Direct Costs: \$50,000

PRESENTATIONS**Meeting Posters**

1. "Targeting heparin-binding forms of Neuregulin1 from axons to glia promotes Schwann cell survival", *Society for Neuroscience Annual Meeting, Atlanta, 10/17/2006*
2. "Neurotrophin-induced targeting of heparin-binding forms of Neuregulin1 from axons to glia regulates Schwann cell Development", *Society for Neuroscience Annual Meeting, Chicago, 10/18/2009*

3. "SSRI-induced endogenous BDNF from newborn cells regulates adult neurogenesis and the prolonged anti-depressant effect", *Society for Neuroscience Annual Meeting, Washington DC, 11/17/2014*
4. "The role of ERK activation in ketamine-induced synaptic plasticity and antidepressant actions." *Society for Neuroscience Annual Meeting, San Diego, CA. 11/13/2022*
5. "Targeting ERK Signaling to Sustain the Antidepressant Effects of Ketamine", Gordon Research Conference (GRC) - Neurotrophic Mechanisms in Health and Disease, 5/29/2023
6. "TrkB-ERK Dependent Hippocampal Neural Plasticity Mediates the Sustained Antidepressant Effects of Ketamine", 62nd Annual Meeting of American College of Neuropsychopharmacology (ACNP), 12/6/2023

Invited Talks

1. "Axon-glia Communication Mediated by Neuregulins and Neurotrophic Factors", *invited by Summer Undergraduate Research Program, Wayne State University School of Medicine, 8/8/2007*
2. "Reciprocal signaling between soluble Neuregulin-1 and BDNF regulates Schwann cell development *in vivo*", *invited by Dr. ES Anton's Laboratory, Neuroscience Center, University of North Carolina at Chapel Hill, 6/20/2011*
3. "Reciprocal signaling between soluble Neuregulin-1 and BDNF regulates Schwann cell development *in vivo*", *invited by Dr. Yingxi Lin's Laboratory, McGovern Institute for Brain Research, MIT, 6/24/2011*
4. "Reciprocal signaling between soluble Neuregulin-1 and BDNF regulates early Schwann cell development", *invited by Dr. Luis Parada's Laboratory, UT Southwestern, 8/11/2011*
5. "BDNF/trkB signaling and Adult Hippocampal Neurogenesis in Antidepressant Response", *invited by Dr. Jane Johnson's Laboratory, Department of Neuroscience, UT Southwestern, 6/11/2015*
6. "Adult Neurogenesis: Sustained Antidepressant Response and Beyond", *invited by Clinical & Translational Science Center, University of New Mexico, 1/25/2018*
7. "Targeting ERK Signaling to Sustain the Antidepressant Effects of Ketamine", *invited short talk at Gordon Research Conference - Neurotrophic Mechanisms in Health and Disease, 5/29/2023*