

Curriculum Vitae

Tooraj Mirshahi Ph.D.

Weis Center for Research
Geisinger Medical Center
100 North Academy Avenue
Danville, PA 17822
Ph. (570) 271-5967 (office)
(570) 214-3969 (lab)
Fax (570) 271-6701
E-mail: tmirshahi@geisinger.edu

Education

Ph.D. Pharmacology and Toxicology Medical College of Virginia, Virginia Commonwealth University	1997
B.S., Biochemical Pharmacology SUNY at Buffalo	1992

Professional Experience

Staff Scientist Weis Center for Research, Geisinger Medical Center, Danville, PA 17822	2004-present
Instructor Dept. of Physiology and Biophysics Mt. Sinai School of Medicine	2002-2004
Postdoctoral Fellow Dept. of Physiology & Biophysics, Mt. Sinai School of Medicine Supervisor: Dr. Diomedes E. Logothetis	1997-2002

Honors/Awards

Beginning Grant-in-Aid, American Heart Association	2007-2009
Scientist Development Grant -American Heart Association,	2002-2005
Revson Fellowship in Biomedical Sciences,	1999-2001
National Research Service Award, NHLBI, NIH,	2000-2003
Sir James Black Award for outstanding paper by a graduate student. Dept. Pharmacology and Toxicology, MCV/VCU,	1998
Lauren Woods Award for outstanding research by a senior graduate student, Dept. Pharmacology & Toxicology. MCV/VCU	1996
Finalist John C. Forbes Graduate Student Honors Colloquium, MCV/VCU	1995
Student Travel Award, Research Society for Alcoholism,	1995
Travel Award, Central Virginia Chapter of the Society for Neuroscience,	1994
Finalist John C. Forbes Graduate Student Honors Colloquium, MCV/VCU	1994

Grant Support

Active Support

Title: Functional selectivity in MC4R signaling Agency: NIDDK, NIH Grant type: R56	7/5/12-7/4/13
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Role: P.I.

This study aims to determine critical signaling by MC4R and its variant associated with obesity, their interaction with other proteins and their role in metabolic regulation.

Title: A Common Allele in *MC4R* Gene as a Predictor for Weight Loss

Agency: SRC- Geisinger Clinic

7/1/11-6/30/13

Grant Type: Internal

Role: P.I

The goal of this grant is to determine how carrying the I251L allele of MC4R improves metabolic status and whether it can be used a predictor for weight loss outcome after clinical intervention.

Completed research support

Impact of Melanocortin 4 Receptor Mutations on Weight Loss Following Clinical Intervention and Bariatric Bypass Surgery

7/1/09-6/30/10

Agency: SRC- Geisinger Clinic

Grant Type: Internal

Role: P.I

The goals of this grant were to genotype a bariatric cohort for MC4R mutation, and determine whether patients with mutations have different weight loss outcomes.

G Protein Signaling to Cardiac Potassium Channels

7/1/07-6/30/09

Agency: American Heart Association-Pennsylvania/Delaware Affiliate

Grant Type: Beginning Grant-in-Aid

Role: P.I.

This project studied the assembly of G protein and potassium channels in the biosynthetic pathway to show preformed complexes between g proteins and effectors regulate signaling specificity.

Characterization of a Mutant Beta3 Subunit of G proteins: Role in Hypertension. 7/1/02-6/30/05

Agency: American Heart Association-Heritage Affiliate

Grant type: Scientist Development Grant

Role: P.I.

This project studies the whether a common variant of Gbeta3 that purportedly produces a short splice from can assemble with G gamma subunits and signal to effectors.

Interaction sites of K⁺ Channels on G proteins.

7/1/00-6/30/03

Agency: NHLBI, NIH

Grant type: Post- doctoral fellowship

Role: P.I.

This study identified critical interaction sites for GIRK channels on Gβγ.

Identification of interaction sites of K channels on G proteins

7/1/99-6/30/01

Agency: Charles H. Revson Foundation

Grant type: Post- doctoral fellowship

Role: P.I.

These studies looked for specific interaction sites between G proteins and GIRK channels.

Publications

Book chapters:

1. **Mirshahi T.**, Logothetis D.E. and Sassaroli M. (2001) Localization and Quantification of GFP-tagged Ion Channels Expressed in *Xenopus* Oocytes. *Methods in Pharmacology and Toxicology* (Lopatin A. N. and Nichols C.G., eds.), Humana Press, Totowa, NJ, pp. 215-231
2. Rohacs T., Lopes C., **Mirshahi T.**, Jin T., Zhang H. and Logthetis D.E. (2001) Assaying PIP₂ regulation of Potassium Channels. *Methods Enzymol* 2002; 345:71-92 Ed: *Hildebrandt and Iyengar*.

Papers:

1. Zechner JF, Mirshahi UL, Satapati S, Berglund ED, Rossi J, Scott MM, Still CD, Gerhard GS, Burgess SC, **Mirshahi T.**, Aguirre V. (2013) Weight-Independent Effects of Roux-en-Y Gastric Bypass on Glucose Homeostasis via Melanocortin-4 Receptors in Mice and Humans *Gastroenterology* 144(3):580-590
2. Schwindinger WF, Mirshahi UL, Baylor KA, Sheridan KM, Stauffer AM, Usefof S, Stecker MM, **Mirshahi T.**, Robishaw JD.(2012) Synergistic roles for G-protein $\gamma 3$ and $\gamma 7$ subtypes in seizure susceptibility as revealed in double knockout mice. *J Biol Chem.* 287(10):7121-33
3. Mirshahi, U.L., Still C.D., Masker K.K., Gerhard G.S., Carey D.J., **Mirshahi T.** (2011) The *MC4R(I251L)* Allele Is Associated with Better Metabolic Status and More Weight Loss Following Gastric Bypass Surgery. *J. Clin. Endocrinol. Metab.* 96(12):E2088-96
4. Still C.D., Wood G.C., Chu X., Erdman M.S., Manney C.H., Benotti P., Petrick A.T., Strodel W.E., Mirshahi U.L., **Mirshahi T.**, Carey D.J., Gerhard G.S (2011) High allelic burden of four obesity SNPs is associated with poorer weight loss outcomes following gastric bypass surgery. *Obesity* 19(8):1676-83
5. Styer A.M., Mirshahi U.L., Wang C., Girard L., Jin T., Logothetis D.E., **Mirshahi T.** (2010) G Protein $\beta\gamma$ Gating Confers Volatile Anesthetic Inhibition to Kir3 Channels. *J Biol Chem.* 285(53):41290-9
6. Leung T.C., Humbert J., Stuafter, A., Geiger K., Chen H., Tsai H.J., Wang C., **Mirshahi T.** and Robishaw J. (2008) The orphan G protein-coupled receptor 161 is required for left-right patterning. *Dev. Biol.* 323(1):31-40
7. Wheeler A., Wang C., Yang K., Fang K., Davis K., Styer A.M., Moreau C., Revilloud J., Vivaudou M., Liu S., **Mirshahi T.**, and Chan K.W. (2008) Co-assembly of different sulfonylurea receptor subtypes extends the phenotypic diversity of ATP-sensitive potassium (K_{ATP}) channels. *Mol. Pharm.* 74(5):1333-44
8. Wang C., Mirshahi U.L., Liu B., Jia Z., **Mirshahi T.*** and Zhang H. (2008) Arachidonic acid activates Kir2.3 channels by strengthening channel-PIP₂ interactions *Mol. Pharm.* 73(4):1185-94 *Corresponding author
9. Rusinova R, **Mirshahi T.**, Logothetis DE. (2007) Specificity of Gbeta/gamma signaling to Kir3 channels depends on the helical domain of pertussis toxin-sensitive Galpha subunits. *J. Biol Chem.* 282: 34019-30
10. Michailidis IE, Helton TD, Petrou VI, **Mirshahi T.**, Ehlers MD, Logothetis DE. (2007) Phosphatidylinositol-4,5-bisphosphate regulates NMDA receptor activity through alpha-actinin. *J.Neurosci.* 27: 5523-32
11. **Mirshahi T.**, Logothetis D.E. and Rosenhouse-Dantsker A.(2006) Hydrogen bonding dynamics between adjacent blades in G protein β subunit regulates GIRK channel activation. *Biophys. J.* 90, 2776-2785
12. **Mirshahi T.** and Logothetis D.E. (2004)Molecular determinants responsible for differential cellular distribution of GIRK channels. *J Biol. Chem.* 279, 11890-11897
13. Du X., Zhang H., Lopes C., **Mirshahi T.**, Rohacs T. and Logothetis D.E. (2004) Characteristic interactions with PIP₂ determine regulation of Kir channels by diverse modulators. *J Biol. Chem.* 279, 37271-37281
14. Peng L, **Mirshahi T.**, Zhang H., Hirsch J. and Logothetis D.E. (2003) Critical determinants of the G protein γ subunit in the G $\beta\gamma$ stimulation of GIRK channel activity. *J Biol. Chem.* 278, 50203-50211
15. **Mirshahi T.**, Jin T., Logothetis D.E. G $\beta\gamma$ and K_{ACH} : Old story, new insights. *Science STKE* 2003, pe32 (2003)

16. Zhang H., Craciun L.C., **Mirshahi T.**, Rohacs T., Lopes C.M.B. and Logothetis D.E. (2003) PIP₂ activates KCNQ channels and its hydrolysis underlies receptor-mediated inhibition of M currents. *Neuron* 37, 963-975 [Link](#)
17. **Mirshahi T.** and Logothetis D.E. (2002) GIRK Channel Trafficking: Different Paths for Different Family Members. *Mol. Interv.* 2, 289-291 [Link](#)
18. **Mirshahi T.**, Mittal V., Zhang H, Linder M.E., and Logothetis DE. (2002) Distinct sites on G protein $\beta\gamma$ subunits regulate different effector functions. *J Biol Chem.* 277, 36345-36350 [Link](#)
19. **Mirshahi T.**, Robillard L, Zhang H, Hébert TE, and Logothetis DE. (2002) Distinct effects of G $\beta\gamma$ proteins on K⁺ channels involve G β residues that do not interact with G α and underlie agonist-independent channel activity. *J. Biol. Chem.* 277, 7348-7355 [Link](#)
20. Jin T., Peng L., **Mirshahi T.**, Rohacs T., Chan K.W., Sanchez R. and Logothetis D.E. (2002) The $\beta\gamma$ subunit of G proteins gate a K⁺ channel by pivoted bending of a transmembrane segment. *Molecular Cell* 10, 469-481 [Link](#)
21. He C., Yan X., Zhang H., **Mirshahi T.**, Jin T., Huang A. and Logothetis D.E. (2002) Identification of critical residues controlling GIRK channel activity through interactions with the $\beta\gamma$ subunits of G proteins. *J Biol. Chem.* 277, 6088-6096 [Link](#)
22. Ronald KM, **Mirshahi T.**, Woodward JJ. (2001) Ethanol inhibition of N-methyl-D-aspartate receptors is reduced by site-directed mutagenesis of a transmembrane domain phenylalanine residue. *J Biol. Chem.* 276:44729-35.
23. Kobrinsky E, **Mirshahi T.**, Zhang H, Jin T, Logothetis DE. (2000) Receptor-mediated hydrolysis of plasma membrane messenger PIP₂ leads to K⁺-current desensitization. *Nature Cell Biol.* 8:507-514. [Link](#)
24. Zhang H., He C., Yan X., **Mirshahi T.** and Logothetis D. E. (1999) Specific PIP₂ interactions with inwardly rectifying K channels determine distinct activation mechanisms. *Nature Cell Biol.* 1: 183-188 [Link](#)
25. He, C., Zhang, H., **Mirshahi T.** and Logothetis, D.E. (1999) Identification of a potassium channel site that interacts with G protein $\beta\gamma$ subunits to mediate agonist-induced signaling. *J. Biol. Chem.* 274: 12517-12524 [Link](#)
26. **Mirshahi T.**, Anders D.L., Ronald K.M. and Woodward J.J. (1998) Intracellular calcium enhances the ethanol sensitivity of NMDA receptors through an interaction with the C0 domain of the NR1 subunit. *J Neurochem.* 71: 1095-1107
27. Cruz S.L., **Mirshahi T.**, Thomas B., Balster R.L. and Woodward J.J. (1998) Effects of the abused solvent toluene on recombinant N-methyl-D-aspartate and non-N-methyl-D-aspartate receptors expressed in Xenopus oocytes. *J. Pharm. Exper. Ther.* 286:334-340
28. Blevins T.L., **Mirshahi T.**, Chandler L.J. and Woodward J.J. (1997) Effects of acute and chronic ethanol exposure on heteromeric N-methyl-D-aspartate receptors expressed in HEK-293 cells. *J. Neurochem.* 69: 2345-2354.
29. Moore K.A., **Mirshahi T.**, Compton D.R., Poklis A. and Woodward J.J. (1996) In vitro pharmacological characterization of α -benzyl-N-methylphenethylamine, an impurity of illicit methamphetamine synthesis. *Eur. J. Pharm.* 311:133-139
30. **Mirshahi T.** and Woodward J.J. (1995) Ethanol sensitivity of heteromeric NMDA receptors: effects of subunit assembly, glycine and NMDAR1 Mg⁺⁺ insensitive mutants. *Neuropharm.* 34, 347-3556
31. Blevins T., **Mirshahi T.** and Woodward J.J. (1995) Increased agonist and antagonist sensitivity of N-methyl-D-aspartate stimulated calcium flux in cultured neurons following chronic ethanol exposure. *Neurosci. Lett.* 200:214-218