

Ja Wook Koo

Curriculum Vitae

Personal Data:

Date of Birth January 16, 1975 (Male)
Nationality South Korea (Permanent resident in US)
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Department of Neuroscience
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Education:

May 2008 PhD, Department of Psychology, Yale University, New Haven, Connecticut
Dec. 2005 MS, Department of Psychology, Yale University, New Haven, Connecticut
Area of specialization: Behavioral Neuroscience
Feb. 2002 MS, School of Biological Sciences, Seoul National University, Seoul, Korea
Feb. 2000 BS, School of Biological Sciences, Seoul National University, Seoul, Korea

Professional Societies:

2000-Present Society for Neuroscience
2002-Present Association of Korean neuroscientists
2008-2009 Association for Psychological Science

Honors:

2011 Young Investigators Travel Award, NIDA
2006 University Dissertation Fellowship, Graduate School of Arts and Sciences, Yale University
2001 Research Assistantship, National Creative Research Initiative Centre for AD, Seoul National University
2000 Graduate Fellowship, College of Natural Sciences, Seoul National University
1998 Student Scholarship, College of Natural Sciences, Seoul National University
1993-1995 Student Scholarship, College of Natural Sciences, Seoul National University

Research Experiences:

- **Role of Neurotrophic Factors in Drug Addiction/Defeat stress**
2008 – current, Department of Neuroscience, Icahn School of Medicine at Mount Sinai
 - Advisor: Eric J. Nestler, MD, PhD
 - Effects of morphine/cocaine and stress on epigenetics/behaviors and the optogenetic modulation
 - Role of BDNF in NAc and VTA in drug addiction and defeat stress
- **Role of Pro-inflammatory Cytokines in Anti-Neurogenic and Depressive-Like Effects of Stress**
2003 – 2008, PhD thesis research, Division of Molecular Psychiatry, Yale University
 - Advisor: Ronald S. Duman, PhD
 - Effects of stress on depressive-like behaviors in rats, IL-1RI null mice, and NF-κB reporter mice
 - Anti-neurogenic effects of stress, IL-1β, and NF-κB *in vitro* and *in vivo*
 - Investigation of IL-1β and NF-κB signaling pathways
- **Differential Effects of Selective Neurotoxic Lesions of the Amygdala Sub-nuclei on Fear Conditioning in Rats**
2002 – 2003, Department of Psychology, Yale University
 - Advisor: Jeansok J. Kim, PhD
 - Selective neurotoxic lesions in the central and basolateral amygdalar sub-nuclei
 - Ultrasonic vocalization and freezing behavior in tone-cued and contextual fear conditioning

- **Pre- and Postnatal Effects of Stress and Enriched Environment on Hippocampal Neurogenesis and Cognitive Function in Rats**
2000 – 2002, MS thesis research, Department of Pharmacology, College of Medicine, Seoul National University
 - Advisor: Yoo-Hun Suh, MD, PhD
 - Cross-housing study with pre- and/or post-natal stress and enriched environment
 - Investigation of hippocampal neurogenesis, expression of synaptic proteins and BDNF, and experience-dependent learning and memory tasks
- **Oviposition Preference and Offspring Performance in *Mechoris ursulus* Roelofs**
1998 – 2000, Senior thesis research, School of Biological sciences, Seoul National University
 - Advisor: Jae Chun Choe, PhD
 - Observation of unique egg-laying behaviors and consequences of female Oak nut weevils
 - Evolutionary implication and interpretation of the behaviors

Publications:

1. **Koo JW**, Mazei-Robison MS, LaPlant Q, Egervari G, Anderson SA, Ferguson D, Feng J, Sun H, Scobie KN, Damez-Werno D, Riberio E, Peña CJ, Walker D, Bagot RC, Hodes GE, Adlman H, Chadwick B, Robison AJ, Vialou VF, Dias C, Lorsch Z, Mouzon E, Lobo MK, Dietz DM, Russo SJ, Neve RL, Hurd YL, Nestler EJ. Epigenetic basis of opiate suppression of *Bdnf* gene expression in the ventral tegmental area. *Nat Neurosci* (under revision)
2. Sun H, Damez-Werno D, Scobie KN, Shao N, Dias C, **Koo JW**, Rabkin J, Maze I, Peña CJ, Korb E, Bagot RC, Cahill ME, Mouzon E, Heller EA, Cates H, Neve RL, Kennedy PJ, Dietz DM, Allis CD, Varga-Weisz P, Tamminga CA, Shen L, Nestler EJ. ISWI chromatin remodeler ACF is necessary and sufficient for stress-induced depressive-like behavior through nucleosome repositioning and transcription regulation. *Nature* (under revision)
3. Feng J, Shen L, Szulwach K, Vialou VF, Le T, Ferguson D, **Koo JW**, Zhong C, Kennedy PJ, Dias C, Liu X, Shao N, Laitman B, Song H, Fan G, Jin P, Nestler EJ. Cocaine induced 5hmC dynamics in mouse nucleus accumbens. *Nat Neurosci* (under revision)
4. **Koo JW***, Lobo MK*, Chaudhury D, Labonte B, Friedman AK, Heller EA, Peña CJ, Han MH, Nestler EJ (2014) Loss of D1-specific NAc BDNF signaling enhances morphine reward by reduction of GABA inhibition. *Neuropsychopharmacol* (in press) *contributed equally.
5. Feng J, Wilkinson M, Ferguson D, Liu X, Purushothaman I, Ferguson D, Vialou VF, Maze I, Shao N, Kennedy PJ, **Koo JW**, Dias C, Laitman B, Stockman V, Laplant Q, Cahill M, Nestler EJ, Shen L (2014) Chronic cocaine-regulated epigenomic changes in mouse nucleus accumbens. *Genome Biology* (in press)
6. Papachatzaki M, Gaspari S, **Koo JW**, Tsimpanouli ME, Stergiou E, Bagot RC, Ferguson D, Mouzon E, Chacravarty S, Deisseroth K, Lobo MK, Zachariou V (2014) Nucleus Accumbens specific interventions in RGS9-2 activity modulate responses to morphine. *Neuropsychopharmacol* 39:1968-1977
7. Scobie KN, Damez-Werno D, Sun H, Shao N, Gancarz A, Panganiban CH, Dias C, **Koo JW**, Caiafa P, Kaufman L, Neve RL, Dietz DM, Shen L, Nestler EJ (2014) Essential Role of Poly(ADP-Ribosyl)ation in Cocaine Action. *PNAS* 111:2005-2010
8. Dietz DM, Kennedy PJ, Sun H, Maze I, Gancarz AM, Vialou VF, **Koo JW**, Mouzon E, Ghose S, Tamminga CA, Nestler EJ (2014) Δ FosB induction in prefrontal cortex by antipsychotic drugs is associated with negative behavioral outcomes. *Neuropsychopharmacol* 39:538-544
9. Walsh JJ, Friedman AK, Sun H, Heller EA, Ku S, Juarez B, Burnham VL, Mazei-Robison MS, Ferguson D, Golden SA, **Koo JW**, Chaudhury D, Christoffel DJ, Pomeranz L, Friedman JM, Russo SJ, Nestler EJ, Han MH (2014) Stress and CRF gate neural activation of BDNF in the mesolimbic reward pathway. *Nat Neurosci* 17:27-29
10. Lobo MK, Zaman S, Damez-Werno D, **Koo JW**, Bagot RC, DiNieri J, Nugent A, Finkel E, Chaudhury D, Chandra R, Riberio E, Rabkin J, Mouzon E, Cachepe R, Cheer JF, Han MH, Dietz DM, Self DW, Hurd YL, Vialou VF, Nestler EJ (2013) Δ FosB Induction in Striatal Medium Spiny Neuron Subtypes in Response to Chronic Pharmacological, Emotional, and Optogenetic Stimuli. *J Neurosci* 33:18381-18395
11. Ferguson D, **Koo JW**, Feng J, Heller EA, Rabkin J, Heshmati M, Renthal W, Neve RL, Li X, Shao N, Sartorelli V, Shen L, Nestler EJ (2013) Essential Role of SIRT1 Signaling in the Nucleus Accumbens in Cocaine and Morphine Action. *J Neurosci* 33:16088-16098
12. Chaudhury D, Walsh JJ, Friedman AK, Juarez B, Ku S, **Koo JW**, Ferguson D, Tsai H-C, Pomeranz L, Christoffel DJ, Nectow A, Ekstrand M, Domingos A, Mazei-Robison MS, Mouzon E, Lobo MK, Neve RL, Friedman JM, Russo SJ, Deisseroth K, Nestler EJ, Han MH (2013) Rapid regulation of depression-related

behaviours by control of midbrain dopamine neurons. *Nature* 493:532-536

13. **Koo JW**, Mazei-Robison MS, Chaudhury D, Juarez B, LaPlant Q, Ferguson D, Feng J, Sun H, Scobie KN, Damez-Werno D, Crumiller M, Ohnishi YN, Ohnishi YH, Mouzon E, Hodes GE, Dietz DM, Lobo MK, Neve RL, Russo SJ, Han MH, Nestler EJ (2012) BDNF is a Negative Modulator of Morphine Action. *Science* 338: 124-128
14. Damez-Werno D, LaPlant Q, Dietz DM, Sun H, Scobie KN, Walker IM, **Koo JW**, Vialou V, Mouzon E, Russo SJ, Nestler EJ (2012) Drug experience epigenetically primes *fosB* gene inducibility in rat nucleus accumbens. *J Neurosci* 32:10267-10272
15. Dietz DM, Sun H, Lobo MK, Cahill ME, Chadwick B, Gao V, **Koo JW**, Mazei-Robison MS, Dias C, Maze I, Damez-Werno D, Dietz KC, Scobie KN, Ferguson D, Christoffel D, Ohnishi YH, Hodes GE, Zheng Y, Neve RL, Hahn KM, Russo SJ, Nestler EJ (2012) Essential Role for Rac1 in Cocaine-Induced Structural Plasticity of Nucleus Accumbens Neurons. *Nat Neurosci*. 15:891–896
16. Mazei-Robison MS, **Koo JW**, Friedman AK, Lansink CS, Robison AJ, Vinish M, Krishnan V, Kim S, Siuta MA, Galli A, Niswender KD, Appasani R, Horvath MC, Neve RL, Worley PF, Snyder SH, Hurd YL, Cheer JF, Han MH, Russo SJ, Nestler EJ (2011) Role for mTOR signaling and neuronal activity in morphine-induced adaptations in ventral tegmental area dopamine neurons. *Neuron* 72(6):977-90
17. LaPlant Q, Vialou V, Covington HE 3rd, Dumitriu D, Feng J, Warren BL, Maze I, Dietz DM, Watts EL, Iñiguez SD, **Koo JW**, Mouzon E, Renthal W, Hollis F, Wang H, Noonan MA, Ren Y, Eisch AJ, Bolaños CA, Kabbaj M, Xiao G, Neve RL, Hurd YL, Oosting RS, Fan G, Morrison JH, Nestler EJ (2010) Dnmt3a regulates emotional behavior and spine plasticity in the nucleus accumbens. *Nat Neurosci*. 13:1137-1143
18. Lobo MK, Covington HE 3rd, Chaudhury D, Friedman AK, Sun H, Damez-Werno D, Dietz DM, Zaman S, **Koo JW**, Kennedy PJ, Mouzon E, Mogri M, Neve RL, Deisseroth K, Han MH, Nestler EJ (2010) Cell Type Specific Loss of BDNF Signaling Mimics Optogenetic Control of Cocaine Reward. *Science* 330:385-390
19. **Koo JW**, Russo SJ, Ferguson D, Nestler EJ, Duman RS (2010) NF- κ B is an essential mediator of the IL-1 β induced anti-neurogenic effects of stress. *PNAS* 107:2669-2674
20. Su XW, Li XY, Banasr M, **Koo JW**, Shahid M, Henry B, Duman RS (2009) Chronic treatment with AMPA receptor potentiator Org 26576 increases neuronal cell proliferation and survival in adult rodent hippocampus. *Psychopharmacology (Berl)* 206:215-222
21. **Koo JW** and Duman RS (2009) Evidence for IL-1 receptor blockade as a therapeutic strategy for the treatment of depression. *Curr Opin Investig Drugs* 10:664-671
22. LaPlant Q, Chakravarty S, Vialou V, Mukherjee S, **Koo JW**, Kalahasti G, Bradbury KR, Taylor SV, Maze I, Kumar A, Graham A, Birnbaum S, Krishnan V, Truong H-T, Neve RL, Nestler EJ, and Russo SJ (2009) Role of NF- κ B in ovarian hormone-mediated stress hypersensitivity in females. *Biol Psychiatry* 65:874-880
23. **Koo JW** and Duman RS (2009) IL-1 receptor null mutant mice show decreased anxiety-like behavior and enhanced fear memory. *Neurosci Lett* 456:39-43
24. **Koo JW** and Duman RS (2008) IL-1 β is an Essential Mediator of the Anti-Neurogenic and Anhedonic Effects of Stress. *PNAS* 105:751-756
25. Kim JJ, **Koo JW**, Lee HJ, and Han J-S (2005) Amygdalar Inactivation Blocks Stress-Induced Impairments in Hippocampal LTP and Spatial Memory. *J Neurosci* 25:1532-1539
26. **Koo JW**, Han J-S, and Kim JJ (2004) Selective Neurotoxic Lesions of Basolateral and Central Nuclei of the Amygdala Produce Differential Effects on Fear Conditioning. *J Neurosci* 24:7654-7662
27. **Koo JW**, Park CH, Choi SH, Kim NJ, Choe JC, and Suh Y-H (2003) Postnatal environments can counteract prenatal effects on cognitive ability, cell proliferation, and synaptic protein expression. *FASEB J* 17:1556-1558
28. Park CH, Choi SH, Kim CH, Seo JH, **Koo JW**, Rah JC, Kim HS, Jeong SJ, Joo WS, Lee YJ, Kim YS, Kim MS, and Suh Y-H (2003) General pharmacology of indole [2',3':3,4] pyrido [2,1-b] quinazolinium- 5,7,8,13-tetrahydro-14-methyl-5-oxo-chloride, a new anti-dementia agent. *Arzneimittelforschung* 53:393-401
29. **Koo JW**, Roh HC, and Choe JC (2003) Oviposition preference for acorn size and offspring performance in *Mechoris ursulus* Roelofs (Coleoptera: Attelabidae). *J Ethol* 21:37-43
30. Park CH, Choi SH, **Koo JW**, Kim H-S, Suh Y-H (2002) Novel cognitive improving and neuroprotective activities of Polygala tenuifolia Willdenow extract, BT-11. *J Neurosci Res* 70:484-492
31. Choi SH, Park CH, **Koo JW**, Seo JH, Kim HS, Jeong SJ, Lee JH, Kim SS, and Suh Y-H (2001) Memory impairment and cholinergic dysfunction by centrally administered A β and carboxyl-terminal fragment of Alzheimer's APP in mice. *FASEB J* 15:1816-1818
32. Seo JH, Kim SS, Kim HS, Park CH, Jeong SJ, Lee JH, Choi SH, Chang KA, Rah JC, **Koo JW**, Kim EM, and Suh Y-H (2001) Effects of nicotine on APP secretion and A β - or CT(105)-induced toxicity. *Biol. Psychiatry* 49:240-247

Publications in preparation:

1. Ferguson D, Shao N, **Koo JW**, Feng J, Vialou VF, Dietz DM, Maze I, Liu X, Kennedy PJ, Renthal W, Neve RL, Shen L, Sartorelli V, Nestler EJ (2014) Next Generation Sequencing using ChIP-Seq Highlights an Essential Role for SIRT1 in Emotional Plasticity. (in preparation)

Professional activities:

- Reviewer for scientific journals:
 - *Biological Psychiatry*
 - *Journal of Neuroscience*
 - *International Journal of Neuropsychopharmacology*
 - *Plos One*