CURRICULUM VITAE
Jing Wang, M.D., Ph.D.

1. EDUCATION

1996	B.A. Harvard College
2004	M.D. Columbia University College of Physicians and Surgeons
2004	Ph.D. Integrated Program in Cellular, Molecular and Biochemical Studies, Columbia University College of Physicians and Surgeons

2. POSTDOCTORAL TRAINING

2004-2005	Intern in Medicine, Columbia University Medical Center
2005-2008	Resident in Anesthesiology, Columbia University Medical Center
2007-2008	Research Fellow, Department of Neuroscience, Columbia University College of Physicians and Surgeons
2008-2009	Fellow in Pain Medicine, Johns Hopkins University School of Medicine
2008-2009	Alpharma Research Fellow in Pain Medicine, Johns Hopkins University School of Medicine

3. LICENSURE AND CERTIFICATION

2006	New York State License Registration #239358
2009	American Board of Anesthesiology #44346
2009	Subspecialty in Pain Medicine by the American Board of Anesthesiology #44346

4. ACADEMIC POSITIONS

Academic appointments

2009-2015	Assistant Professor, Department of Anesthesiology, Perioperative Care and Pain Medicine, New York University School of Medicine
2010-	Director of Research, Center for the Study and Treatment of Pain, New York University School of Medicine
2014-2015	Assistant Professor, Department of Neuroscience and Physiology, New York University School of Medicine
2015-	Associate Professor, Department of Anesthesiology, Perioperative Care and Pain Medicine, New York University School of Medicine
2015-	Associate Professor, Department of Neuroscience and Physiology, New York University School of Medicine
2017-	Vice Chairman for Clinical and Translational Research, Department of Anesthesiology, Perioperative Care and Pain Medicine, New York University School of Medicine

2018- Associate professor with Tenure, Department of Anesthesiology, Perioperative Care and Pain Medicine, Department of Neuroscience and Physiology, New York University School of Medicine

Hospital Appointments

2009- Attending Physician of Anesthesiology, New York University Medical Center
2009- Attending Physician in Pain Medicine, New York University Medical Center
2009- Attending Physician of Anesthesiology, Bellevue Hospital
2009- Attending Physician in Pain Medicine, Bellevue Hospital

5. RESEARCH GRANTS

Ongoing Research Support

NIH-R01GM115384
Central glutamate signaling in postoperative pain regulation
08/01/2015 – 07/31/2020
Goal: The goal of this project is to understand how excitatory glutamatergic transmission from the prefrontal cortex and associated areas to the nucleus accumbens regulates postoperative pain. We will focus on both sensory and affective aspects of pain. We will also examine the analgesic effects of glutamatergic acting agents in the treatment of postoperative pain in rodent models.
Role: PI (30% effort)
Total cost: $2,196,365

NIH-R01NS100065
Dissecting neural circuits for acute pain
07/15/2016 – 05/31/2020
Goal: The goal of this project is to develop objective biomarkers for pain based on neural signals in the cortex. We will develop advanced statistical and machine learning methods to analyze spiking rates in the somatosensory cortex and anterior cingulate cortex, two crucial regions for sensory and affective components of pain, before, during and after an acute thermal or mechanical noxious stimulus. We will derive algorithms based on such analyses to detect the onset and intensity of acute pain.
Role: Multi-PI (15% effort)
Total cost: $1,695,000

NIH-U24NS113844
Early Phase Pain Investigation Clinical Network (EPPIC-Net) Data Coordinating Center (DCC)
Anticipated 09/2019 – 08/2024
Goal: The goal of this project is to develop data science, data storage and management for studies from phase 2 clinical trials associated with EPPIC-Net. The DCC will work with the Clinical Coordinating Center and individual Clinical Centers for clinical trials to support clinical trials for novel analgesics and devices. It will provide data science and statistical support for these phase 2 studies. It will also serve as center to safe-keep and store data for future use.
Role: Co-I (10% effort)

Total cost: $20,600,000

NSF-1835000
Closed-loop neuromodulation for chronic pain
02/1/2019 – 05/31/2022
Goal: The goal of this project is to develop a closed-loop neuromodulatory system that can be used to treat chronic pain in rodent models.
Role: Multi-PI (10% effort)
Total cost: $877,220

Pending Research Support
NIH-R01NS111472
A dynamic predictive coding framework for cortical pain processing (RFA NS-18-030, BRAIN Initiative)
08/01/2019 – 07/31/2024
Goal: The goal of this project is to provide a novel predictive coding framework for pain, combining nociceptive information with predictions drawn from prior aversive experiences and modulatory signals, based on multi-scale neural activities in the primary somatosensory cortex, anterior cingulate cortex, and the prefrontal cortex. Our new conceptual model indicates that dynamic converging cortical circuits encode the perception of pain and has translational implications for pain diagnosis and treatment.
Role: PI (10% effort)
Total cost: $4,174,855

NIH-U18EB029328
Noninvasive cortical ultrasonic stimulator for chronic pain relief
10/01/2019 – 09/30/2022
Goal: The goal of this project is to develop and experimentally validate the use of ultrasound (US) for non-invasive cortical stimulation and pain management, breaking new ground in our ability to use treat chronic pain in large mammalian brains, and potentially lead to new clinical tools.
Role: Multi-PI (10% effort)
Total cost: $2,395,379

NIH-UG3NS114076
Ketamine and web-based CBT to reduce chronic postsurgical pain (RFA NS-19-021, HEAL Initiative)
09/01/2019 – 08/31/2024
Goal: In a two-stage randomized control trial, we aim to study the effectiveness of adding postoperative ketamine and post-discharge cognitive behavioral therapy (CBT) to routine postoperative care, for the prevention of post-mastectomy pain syndrome (PMPS), one of the most common CPSP conditions. As ketamine and CBT are low risk treatment options that are easy to implement in a wide range of clinical settings, our proposal can substantially impact postoperative pain management, and in doing so can contribute significantly to our combat against the opioid epidemic.
Role: PI (25% effort)
Total cost: $11,345,174

Research Support Completed During the Last Three Years

K08 GM1026911-03
09/01/2012 – 8/31/2016
Postoperative pain increases synaptic GluA1 expression in the nucleus accumbens to regulate depression-like behavior
Goal: The goal of this project is to understand the role for synaptic trafficking of GluA1 subunits of the AMPA receptors in the regulation of postoperative pain. We will focus specifically on the role of these receptors in the nucleus accumbens in pain-induced depression.
Role: PI

6. TEACHING

Medical Students

2009- present	Lectures on pain medicine at New York University School of Medicine
2009- present	Monthly Journal Clubs on pain medicine at NYU School of Medicine
2009- present	Annual lectures on neuroscience at NYU School of Medicine
2013-2015	Mentored Alexander Le for research clerkship in anesthesiology
2015-2016	Mentored Duo Xu for Medical School Honors Program in Research
2016-2017	Mentored Conan Huang for research clerkship in anesthesiology
2018	Mentored Leor Shalot for research clerkship in anesthesiology
2018-2019	Mentored Divya Patel for research clerkship in anesthesiology

Graduate Students

2013-2015	Chen Su, Dr. Phil Thesis
2016-2018	Haocheng Zhou, Dr. Phil Thesis
2016-2018	Zhengdong Xiao, Phil Thesis

Residents, Fellows, and Postdocs

2009-present	Trained residents in anesthesiology
2009-present	Trained fellows in pain medicine
2015-present	Trained postdoctoral fellow Qiaosheng Zang, PhD
2015-2017	Trained postdoctoral fellow Louise Urien, PhD

7. ADMINISTRATIVE RESPONSIBILITIES

Professional Positions and Appointments

2010-	Associate Director, Pain Medicine Fellowship, New York University School of Medicine
2010-	Director of Research, Center for the Study and Treatment of Pain, New York University School of Medicine
2017-	Vice Chair for Clinical and Translational Research

Major Committee Assignments

2010- Institutional Review Board, New York University School of Medicine
2012-2014 Chair, Quality Improvement Committee on Pain Medicine, Department of Anesthesiology, New York University School of Medicine
2014- Quality Improvement Committee on Pain Medicine, Department of Anesthesiology, New York University School of Medicine
2012-2015 Search Committee for Vice Chair of Research for Department of Anesthesiology, New York University School of Medicine

Major Administrative Responsibilities

2010- Associate Director, Pain Medicine Fellowship, Department of Anesthesiology, New York University School of Medicine
2011- Director of Research, Center for the Study and Treatment of Pain, New York University School of Medicine
2012-2014 Chair, Quality Improvement Committee on Pain Medicine, Department of Anesthesiology, New York University School of Medicine
2017- Vice Chair for Clinical and Translational Research

8. ACADEMIC SERVICES AND PROFESSIONAL MEMBERSHIPS

Reviews

2009- *Ad hoc* reviewer for **scientific journals** including *Nature, Nature Neuroscience, Neuron, Cell Reports*, *Anesthesiology, Scientific Reports, J. Neuroscience, J Neurosci. Methods, eNeuro, Frontiers in Cellular Neuroscience, Molecular Pain, Behavioral Brain Research, Neuroscience, Molecular Brain, Neuroscience Letters, Brain Research Bulletin*

2009- Reviewer for **clinical journals** including *BMJ*, *BJA*, *Anesthesia and Analgesia, Regional Anesthesia and Pain Medicine*

2018 *Ad hoc* reviewer for NIH Study Section "Somatosensory and Pain Systems"
2019 *Ad hoc* reviewer for NIH Study Section "Somatosensory and Pain Systems"
2019 *Ad hoc* reviewer for NIH Study Section "Special Emphasis Panel for the HEAL Initiative."
2019 *Ad hoc* reviewer for NIH Study Section "Special Emphasis Panel for the Target Brain Circuits, BRAIN Initiative."

Professional organizations

2010-present American Society of Anesthesiologists
2011-present Society for Neuroscience
2012-present American Pain Society
2014-present International Association for the Study of Pain
2014-present New York State Society of Anesthesiologists

2014-2016	American Society of Anesthesiologists, Abstract Review Subcommittee on Regional Anesthesia and Acute Pain
2015-present	Association of University Anesthesiologists
2017-present	International Anesthesia Research Society

Conference chairs

2017	Organizer and speaker, Symposium on "Defining New Cortical Mechanisms for the Regulation of Acute and Chronic Pain." Annual Meeting for the American Pain Society
2017	Session chair and speaker, Annual Pain and Cortex Summer Meeting, Toronto, CA

Invited lectureship

2009	Invited Speaker, Department of Anesthesiology and Critical Care Medicine, Johns Hopkins School of Medicine
2009	Invited Speaker, Department of Anesthesiology and Critical Care, University of Pennsylvania
2009	Invited Speaker, Department of Anesthesiology, Weill Cornell Medical College
2009	Invited Speaker, Department of Anesthesiology, New York University School of Medicine
2011	Invited Speaker, Annual Neuroscience Retreat, New York University School of Medicine
2011	Invited Speaker, Anesthesia Research Seminar Series, New York University School of Medicine
2012	Invited Speaker, Grand Rounds, Division of Pain Medicine, New York University School of Medicine
2013	Invited Speaker, Department of Anesthesiology and Critical Care Medicine, Johns Hopkins School of Medicine
2014	Invited Speaker, Grand Rounds, Department of Anesthesiology, New York University School of Medicine
2014	Invited Speaker, Grand Rounds, Department of Anesthesiology, Weill Cornell Medical College
2014	Invited Speaker, Keystone Symposium, "The Brain: Adaptation and Maladaptation in Chronic Pain"
2014	Invited Speaker, South Central China Symposium on Pain
2015	Invited Speaker, Early Career Forum, Annual Meeting for the American Pain Society
2015	Invited Speaker, Chronic Pain Rounds Lecture Series, Massachusetts General Hospital
2015	Invited Speaker, Neuroscience Series, University of Colorado at Boulder
2015	Invited Speaker, Frontiers in Neuroscience and Technology, Zhejiang University, Hangzhou, China
2016	Invited Speaker, Symposium on Innovations in Postsurgical Pain Research: Basic, Experimental and Clinical Studies of Pain Mechanisms and Impact, Annual Meeting for the American Pain Society

2016 Invited Speaker, Pain Mechanisms and Therapeutics Conference, Italy
2016 Invited Speaker, Eastern Pain Association Annual Meeting
2016 Invited Speaker, American Psychosomatic Society Mid-year Meeting, Neuroscience of Pain
2017 Invited Speaker, Anesthesia Research Rounds, Columbia University College of Physicians and Surgeons
2017 Invited Speaker, Annual Meeting for the Association of University Anesthesiologists
2017 Invited Speaker, Grand Rounds, Department of Neurosurgery, Brown University Medical School
2017 Invited Speaker, Annual Meeting for Collaborative Research in Computational Neuroscience (CRCNS)
2017 Invited Speaker, Pain and Cortex Meeting, Toronto, CA
2017 Invited Speaker, Grand Rounds, Department of Anesthesiology and Critical Care, Perelman School of Medicine at the University of Pennsylvania
2017 Speaker and Mentor, Eastern Pain Association Annual Meeting
2017 Invited Speaker, Nanosymposium on "Advances on Pain Neuroimaging," Annual Meeting for the Society for Neuroscience
2018 Invited Speaker, Special Seminar, Cold Spring Harbor Laboratory
2018 Invited Speaker, Pain Mechanisms and Therapeutics Conference, Sicily, Italy
2018 Invited Speaker, Annual Conference on Pain and Emotion, Toronto, CA
2018 Invited Speaker, Department of Pharmacology and Toxicology, Indiana University
2018 Invited Speaker, Department of Physiology, Northwestern University, Feinberg School of Medicine
2018 Invited Speaker, Nanosymposium on "Somatosensation: cortical mechanisms," Annual Meeting for the Society for Neuroscience
2018 Invited Speaker, "NIH workshop: discover and validation of biomarkers to develop non-addictive therapeutics for pain." NIH.
2019 Invited Speaker, Research Group Lectures, UCSF
2019 Invited Speaker, Department of Anesthesiology, Northwestern University, Feinberg School of Medicine
2019 Invited Speaker, Neuroscience Faculty Lunch Seminar Series, New York University
2019 Invited Speaker, Spring Pain Conference, Annual Meeting for the American Pain Society

9. PATENTS

Wang J and Ziff EB. Methods of treating depression and pain. Filed, January 28th, 2013. WO2013177484A1.

Wang J. and Jahrane Dale. Mechanical pain detection device. OIL ID WAN02-06.

Wang J., Prathamesh Kulkarni, and Eric Robinson. System and method for tumor characterization. OIL ID WAN02-05PRO.

10. COMPLETE BIBIOGRAPHY

Original Research

1. Zarrinkar, PP, **Wang J**, and Williamson JR. Slow folding kinetics of RNase P RNA. *RNA* 1996; 2 (6): 564-573.

2. Chen S, **Wang J**, and Siegelbaum, SA. Properties of hyperpolarization-activated pacemaker current defined by coassembly of HCN1 and HCN2 subunits and basal modulation by cyclic nucleotide. *J Gen Physiol* 2001; 117 (5): 491-504.

3. **Wang J**, Chen S, and Siegelbaum, SA. Regulation of hyperpolarization-activated HCN channel gating and cAMP modulation due to interactions of COOH terminus and core transmembrane regions. *J Gen Physiol* 2001; 118 (3): 237-250.

4. **Wang J**, Chen S, Nolan MF, and Siegelbaum, SA. Activity-dependent regulation of HCN pacemaker channels by cyclic AMP: signaling through dynamic allosteric coupling. *Neuron* 2002; 36 (3): 451-461.

5. Chen S, **Wang J**, Zhou L, George MS, and Siegelbaum, SA. Voltage sensor movement and cAMP binding allosterically regulate an inherently voltage-independent closed-open transition in HCN channels. *J Gen Physiol* 2007; 129 (2): 175-188.

6. **Wang J**, Christo PJ. The influence of prescription monitoring programs on chronic pain management. *Pain Physician* 2009; 12(3): 507-515.

7. Stojanovic MP, Sethee J, Mohuiddin M, Cheng J, Barker A, **Wang J**, Palmer W, Huang A, Cohen SP. MRI analysis of the lumbar spine: can it predict response to diagnostic and therapeutic facet procedures? *Clin J Pain 2010*; 26(2): 110-115

8. **Wang J**, Goffer Y, Xu D, Tukey DS, Shamir DB, Zou AH, Eberle SE, Blanck TJJ, Ziff EB. A Single sub-anesthetic dose of ketamine relieves depression-like behaviors induced by neuropathic pain in rats. *Anesthesiology* 2011; 115(4): 812-821.

9. Tukey DS, Ferreira JM, Antoine SO, D'amour JA, Ninan I, Cabeza de Vaca S, Incontro S, Wincott C, Horwitz J, Hartner DT, Guarini CB, Khatri L, Goffer Y, Xu D, Titcombe RF, Khatri M, Marzan DS, Mahajan SS, **Wang J**, Froemke RC, Carr KD, Aoki C, Ziff EB. Sucrose ingestion induces rapid AMPA receptor trafficking. *Journal of Neurosci.* 2013; 33(14): 6123-6132.

10. Tukey DS, Lee M, Xu D, Eberle SE, Goffer Y, Manders TR, Ziff EB, **Wang J**. Differential effects of natural rewards and pain on vesicular glutamate transporter expression in the nucleus accumbens. *Molecular Brain.* 2013; 6(1):32.

11. Goffer Y, Xu D, Eberle SE, D'amour J, Lee M, Tukey DS, Froemke RC, Ziff EB, **Wang J**. Calcium permeable AMPA receptors in the nucleus accumbens regulate depression-like behaviors in the chronic neuropathic pain state. *Journal of Neurosci.,* 2013; 33(48):19034-44.

12. Le A, Lee M, Su C, Zou A, and **Wang, J**. AMPAkines have novel analgesic properties in rat models of persistent neuropathic and inflammatory pain. *Anesthesiology*, 2014; 121(5): 1080-90.

13. Lee M, Manders TR, Eberle SE, Su C, D'amour J, Yang R, Lin HY, Deisseroth K, Froemke RC, and **Wang J**. Activation of corticostriatal circuitry relieves chronic neuropathic pain. *Journal of Neurosci.* 2015; 35(13):5247–5259.

14. Su C, D'amour J, Lee M, Lin HY, Manders T, Xu D, Eberle SE, Goffer Y, Zou AH, Rahman M, Ziff E, Froemke RC, Huang D, and **Wang J**. Persistent pain alters AMPA receptor subunit levels in the nucleus accumbens. *Molecular Brain*. 2015; 8(1):46.

15. Xu D, Su C, Lin HY, Manders T, and **Wang J**. Persistent neuropathic pain increases synaptic GluA1 subunit levels in core and shell subregions of the nucleus accumbens. *Neuroscience Letters*, 2015; 609: 176-181.

16. Chen Z and **Wang J**. Statistical analysis of neuronal population codes for encoding acute pain. *IEEE Conference Paper*, 2016.

17. Su C, Lin HY, Yang R, Xu D, Lee M, Pawlak N, Norcini M, Sideris A, Esperanza R-P, Huang D, and **Wang J**. AMPAkines target the nucleus accumbens to relieve postoperative pain. *Anesthesiology*, 2016; 125: 1030-43.

18. Chen Z, Zhang Q, Tong APS, Manders TR, and **Wang J**. Deciphering neuronal population codes for acute thermal pain in a rodent model. *J Neural Eng*, 2017; 14(3): 036023.

19. Chen Z, Hu S, Zhang Q, and **Wang J**. Quickest detection for abrupt changes in neuronal ensemble spiking activity using model-based and model-free approaches. *8th International IEEE/EMBS Conf on Neural Eng (NER),* 2017, p.481-484.

20. Zhang Q, Manders, Tong AP, Yang R, Garg A, Goyal A, T, Dale J, Urien L, Martinez E, Yang G, Chen Z, and **Wang J**. Chronic pain induces generalized enhancement of pain aversion. eLife, 2017, doi: 10.7554/eLife.25302.

21. Martinez E, Lin HY, Zhou H, Dale J, Liu K, Huang D, and **Wang J**. Corticostriatal regulation of acute pain. *Frontiers in Cellular Neuroscience*, 2017; 11:146.

22. Sun Y, Liu K, Martinez E, Dale J, Huang D, and **Wang J**. AMPAkine and morphine provide complementary analgesia. *Behavioral Brain Research*. 2017; S0166-4328 (17) 30985-3.

23. Modrek AS, Golub D, Khan T, Prado J, Bowman C, Deng J, Zhang G, Rocha PP, Raviram R, Lazaris HC, Stafford J, LeRoy G, Kader M, Dhaliwal J, Bayin NS, Frenster J, Serrano J,

Chiriboga L, Baitalmal R, Nanjangud G, Chi AS, Gofinos JG, **Wang J**, Karajannis M, Bonneau RA, Reinberg D, Tsirigos A, Zagzag D, Snuderl M, Skok JA, Neubert T and Placantonakis, DG. Low-grade astrocytoma core mutations in IDH1, P53 and ARTX cooperate to block differentiation of human neural stem cells via epigenetic repression of SOX2. *Cell Reports*, 2017 21(5):1267-1280.

24. Urien L, Zhang Q, Martinez E, Zhou H, Desrosier N, Dale J, and **Wang J**. Conditioned Place Aversion (CPA): how to assess the aversion of acute pain stimulus. *Bio-protocol*, 2017, 7(21): e2595.

25. Hu S, Zhang Q, **Wang J** and Chen Z. Real-time particle filtering and smoothing algorithms for detecting abrupt changes in neural ensemble spike activity. *J Neurophys*, 2017, 119 (4): 1394-1410.

26. Dale J, Zhou H, Zhang Q, Martinez E, Hu S, Liu K, Urien L, Chen Z, and **Wang J**. Scaling up cortical control inhibits pain. *Cell Reports*, 2018, 23 (5): 1301-1313.

27. Urien L, Xiao Z, Dale J, Chen Z, and **Wang J**. Rate and temporal coding mechanisms in the anterior cingulate cortex for pain anticipation. *Scientific Reports,* 2018, 8 (1):8298.

28. Zhang Q, Xiao Z, Huang C, Hu S, Kulkarni P, Martinez E, Tong AP, Garg A, Zhou H, Chen Z, and **Wang J**. Local field potential decoding of the onset and intensity of acute pain in rats. *Scientific Reports,* 2018, 8 (1):8299.

29. Zhao R, Zhou H, Huang L, Xie Z, **Wang J**, Gan W-B, and Yang G. Neuropathic pain causes pyramidal neuronal hyperactivity in the anterior cingulate cortex. *Frontiers in Cellular Neuroscience*, 2018, 12:107.

30. Kendale SM, **Wang J**, Blitz J, Calvino S, Cuff G, Barone N, Rosenberg AD, and Doan L. A retrospective study of opioid prescribing patterns at hospital discharge in surgical patients with obstructive sleep apnea. *Canadian J Anesth*, 2018, 65 (8): 914-22.

31. Kendale SM, Kulkami P, Rosenberg AR, and **Wang J**. Supervised machine learning predictive analytics for prediction of post induction hypotension. *Anesthesiology*, 2018, 129 (4): 675-688.

32. Zhou H, Martinez E, Lin HY, Yang R, Dale J, Liu K, Huang D, and **Wang J**. Inhibition of the prefrontal projection to the nucleus accumbens enhances pain sensitivity and affect. *Frontiers in Cellular Neuroscience*, 2018, 12 (240).

33. Xiao Z, Hu S, Zhang Q, Tian X, Chen Y, **Wang J** and Chen Z. Ensembles of change-point detectors: Implications for real-time BMI applications. *J Comp Neurosci.*, 2018. doi: 10.1007/s10827-018-0694-8.

34. Zhou H, Zhang Q, Martinez E, Dale J, Hu S, Zhang E, Liu K, Huang D, Yang G, and **Wang J**. Ketamine reduces aversion in rodent pain models by suppressing hyperactivity of the anterior cingulate cortex. *Nature Comm,*, 2018; 9 (1): 3751.

35. Dale J, Zhou H, Zhang Q, Martinez E, and **Wang J**. A new automated method for quantifying nociceptive responses in rodents. *J Neurosci. Methods*, 2018; 312: 148-153.

36. Boenigk K, Echevarria GC, Nisimov E, von Bergen Granell, AE, Cuff GE, **Wang J**, and Atchabahian A. Low-dose ketamine infusion reduces postoperative hydromorphone requirements in opioid-tolerant patients following spine fusion: A randomized controlled trial. *Euro J Anaesth*, 2019, 36 (1): 8-15.

37. **Wang J**, Echevarria GC, Doan L, Ekasumara N, Calvino S, Chae F, Martinez E, Robinson E, Cuff G, Franco L, Muntyan I, Kurian M, Schwack BF, Bedrosian AS, Fielding GA, Ren-Fielding CJ. Effects of a single subanesthetic dose of ketamine on pain and mood after laprascopic gastric bypass and gastrectomy surgery: A randomized double-blind placebo controlled study. *Euro J Anaesth*, 2019, 36 (1): 16-24.

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40. Martinez E, Zhou H, and **Wang J**. Intracranial pharmacotherapy and pain assays in rodents. J Vis Exp. 2019 Apr 9;(146). doi: 10.3791/58473.

41. Zhou H, Zhang Q, Martinez E, Dale J, Robinson E, Huang D, and **Wang J**. A novel neuromodulation strategy to enhance the prefrontal control to treat pain. *Mol. Pain*, 2019. Epub. doi: 10.1177/1744806919845739.

42. Xiao Z, Martinez E, Kulkarni PM, Zhang Q, Hou Q, Rosenberg D, Talay R, Shalot L, Zhou H, **Wang J** and Chen Z. Cortical pain processing in the rat anterior cingulate cortex and primary somatosensory cortex. *Frontiers in Cellular Neuroscience*, 24 April 2019. https://doi.org/10.3389/fncel.2019.00165.

43. Kulkarni P, Robinson E, Pradhan JS, Gartrell-Corrado R, Rohr B, Kluger H, Wong PF, Acs B, Rizk EM, Yang C, Mondal M, Moore M, Phelps R, Horst B, Ferringer T, Chen Z, Rimm D, **Wang J**, Saenger Y. Deep learning based on standard H&E images of primary melanoma tumors identifies patients at risk for visceral recurrence and death. *Clin. Cancer Res.,* accepted.

44. Huang, L, Sideris A, Norcini M, Recio-Pinto E, Blanck T, **Wang J**, Gan W, and Yang G. Microglial BDNF in the somatosensory cortex is important for nerve injury-induced neuronal plasticity and mechanical allodynia. *Brain*, under review.

Invited Reviews

1. **Wang J** and Goffer, Y. AMPA receptors – A future therapeutic target for analgesia? *Techniques in Regional Anesthesia and Pain Management* 2010;14(2):59-64.

2. Doan L, Manders T, and **Wang J**. Neuroplasticity Underlying the Comorbidity of Pain and Depression. *Neural Plasticity*. 2015; 2015:504691.

3. Doan L and **Wang J**. An Update on the Basic and Clinical Science of Ketamine analgesia. *Clinical Journal of Pain*, 2018; 34 (11): 1077-88.

4. Urien L and **Wang J**. Top-down cortical control of acute and chronic pain. *Psychosomatic Medicine*, in press.

5. Davis K, Aghaeepour N, Ahn A, Angst M, Borsook D, Brenton A, Burczynski M, Crean C, Edwards R, Gaudillierre B, Hergenroeder G, Ladarola M, Iyengar S, Jiang Y, Kong J-T, Mackey S, Saab C, Sang CN, Scholz J, Segerdahl M, Tracey I, **Wang J**, Wager TD, Wasan AD, Pelleymounter MA. Discovery and Validation of Biomarkers to Develop Non-Addictive Therapeutics for Pain: Challenges and Opportunities. *Nature Reviews Neurology*, in revision.

Abstracts

1. Chen S, **Wang J**, and Siegelbaum SA. Domains important for gating and cAMP regulation of HCN channels. *Soc. Neurosci* 2000.

2. **Wang J**, Goffer Y, Blanck TJJ, and Ziff, EB. Chronic Neuropathic Pain Leads to Depressive Behaviors in Rats. *American Society for Anesth* 2010.

3. **Wang J**, Goffer Y, Xu D, Tukey DS, Shamir DB, Zou AH, Eberle SE, Blanck TJJ, Ziff EB. Low dose ketamine relieves depression like behaviors induced by neuropathic pain in rats. *Soc. Neurosci* 2011.

4. Lee M, Goffer Y, Xu D, Eberle S, D'Amour J, Manders T, Froemke R, Ziff E, **Wang J**. AMPA receptor signaling in the nucleus accumbens regulates depression-like behaviors in the chronic neuropathic pain state. *Satellite Symposium, Neural Circuits Underlying Nociception and Pain and Their Plasticity,* 2013.

5. **Wang J**, Goffer Y, Xu D, Eberle S, Lee M, D'Amour J, Froemke R, Ziff E. AMPA receptor signaling in the nucleus accumbens regulates depression-like behaviors in the chronic neuropathic pain state. *Soc. Neurosci.,* 2013.

6. Eberle S, Lee M, Xu D, Rahman M, Zou A, **Wang J**. A behavioral characterization of acute postoperative pain in rats. *Soc. Neurosci.,* 2013.

7. Lee M, Tukey D, Xu D, Eberle S, Goffer Y, Ziff E, **Wang J**. Differential effects of natural rewards and pain on vesicular glutamate transporter (VGLUT) expression in the nucleus accumbens (NAc). *Soc. Neurosci.,* 2013.

8. Lee M, Manders T, Chen S, D'Amour J, Eberle S, Froemke R, and **Wang J**. Optogenetic activation of a corticostriatal circuit inhibits both sensory and depressive symptoms of pain. *NIH Pain Consortium Symposium,* 2014.

9. Manders T, Eberle S, Lee M, D'Amour J, Froemke R, Chen S, and **Wang J**. Optogenetic activation of the corticostriatal circuit inhibits chronic pain. *Keystone Symposium, The Brain: Adaptation and Maladaptation in Chronic Pain*, 2014.

10. Manders T, Lee M, Eberle S, D'amour J, Su C, Froemke R, and **Wang J**. Corticostriatal circuit inhibits chronic pain. *IASP,* 2014.

11. Le A, Lee M, Su C, Zou A, and **Wang, J**. AMPA potentiators as novel pharmacotherapy for relieving symptoms of persistent neuropathic and inflammatory pain. *American Society of Anesth*, 2014.

12. Su C, Le A, Lee M, Zou A, and **Wang, J**. AMPA potentiators as novel pharmacotherapy for relieving sensory and affective symptoms of persistent neuropathic and inflammatory pain. *Soc. Neurosci.,* 2014.

13. Manders T, Lee M, Eberle S, D'amour J, Su C, Froemke R, and **Wang J**. Optogenetic activation of the corticostriatal circuit inhibits chronic pain. *Soc. Neurosci.,* 2014.

14. Chen S, D'amour J, Lee M, Lin H-Y, Yang R, Manders T, Xu D, Eberle SE, Goffer Y, Zou AH, Rahman M, Ziff E, Froemke RC, Huang D, and **Wang J**. Persistent pain alters AMPA receptor subunit levels in the nucleus accumbens. *American Society for Anesth* 2015

15. Chen S, Yang R, Lin H-Y, Pawlak N and **Wang J**. AMPAKines relieve postoperative pain by potentiating AMPA receptors in the nucleus accumbens. *American Society for Anesth* 2015

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11. AWARDS AND HONORS

2002 Dean's Day Award for Research, Columbia University College of Physicians and Surgeons

2008 Alpharma Award in Pain Medicine, Johns Hopkins University School of Medicine