

Rajesh Khanna, PhD, MSc

General Information

Title: Professor (with tenure), Department of Molecular Pathobiology,
Director, NYU Pain Research Center



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LinkedIn: 



CHRONOLOGY OF EDUCATION

BSc, Toxicology, The University of Toronto, Toronto, Ontario, Canada
1990-1994

MSc, Pharmacology, The University of Toronto, Toronto, Ontario, Canada
1994-1996

Advisor: Patricia Harper, Ph.D.

Dissertation Title: Constitutive embryonic and fetal expression of xenobiotic-metabolizing cytochrome P450s: CYP1A1, CYP1A2, and CYP1B1

PhD, Physiology, The University of Toronto, Toronto, Ontario, Canada
1997-2000

Advisor: Lyanne C. Schlichter, Ph.D.

Dissertation Title: Expression, roles and regulation of potassium channels in neuroimmune cells

Post-doctoral fellowship, Physiology and Cellular and Molecular Neuroscience, University of California at Los Angeles, Los Angeles, California

2000-2003

Advisor: Diane M. Papazian, Ph.D.

CHRONOLOGY OF EMPLOYMENT

Toronto Western Research Institute, Toronto, Ontario, Canada (2003 – 2007)

Indiana University School of Medicine, Indianapolis, Indiana (2007 – 2013)

The University of Arizona College of Medicine, Tucson, AZ (2014 – 2021)

New York University, College of Dentistry, New York, NY (2022 –

HONORS AND AWARDS

Awards

1990-1994	Metropolitan Life Merit Undergraduate Scholarship
Sep. 1999	American Physiological Society Travel Award
Feb. 2000	Biophysical Society Travel Award
Mar. 2000	Keystone Conference Scholarship
2001	Governor General's Gold Medal nominee (for outstanding doctoral dissertation)
2000-2002	Natural Sciences and Engineering Research Council of Canada Postdoctoral Fellowship
2001-2003	American Heart Association Postdoctoral Fellowship
2003-2004	American Heart Association Postdoctoral Fellowship (competitive renewal)
2010	Elwert Award in Medicine, Indiana University

Scientific Review Panels

2017	Reviewer, National Cancer Institute - ZCA1 SRB-A (J1) NCI Provocative Questions Special Emphasis Panel-2
2018	Reviewer, Academic Program Review of the Physiological Sciences Graduate Interdisciplinary Program, University of Arizona
2018	Reviewer, Special Emphasis Panel/Scientific Review Group 2018/08 ZRG1 ETTN-U (81) S; Uniformed Services University (USU) – Pain Research and Management program
2018	Reviewer, Neurotransmitters, Receptors, and Calcium (NTRC) Signaling Study Section
2018	Reviewer, R13 Review Panel ZNS1 SRB K13
2018, '20, '21	Reviewer, Czech Science Foundation
2018	Reviewer, Special Emphasis Panel/Scientific Review Group ZRG1 ETTN-U 84; Uniformed Services University (USU) – Transforming Technology for the Warfighter (TTW) Program
2018	Reviewer, ZDA1 SXM-M (09) S; Cutting-Edge Basic Research Awards (CEBRA) (R21-Clinical Trial Optional)
2018	Reviewer, ZNS1 SRB-M (07); Review of R35 Research Program Award
2019	Reviewer, Special Emphasis Panel/Scientific Review Group 2019/05 ZDA1 SXM-M (22) S
2019	Reviewer, PAR Panel: Fogarty Global Brain Disorders 2019/05 ZRG1 BDCN-N (55) R
2019	Reviewer, NINDS R13 review (ZNS1 SRB K17) 2019/03
2019	Reviewer, ZDA1 SXM-M 22 S, Cutting-Edge Basic Research Awards (CEBRA) (R21)
2019	Reviewer, National Science Center, Poland
2019	Reviewer, 2019/08 ZRD1 Neurobiology – B (NURB)-H (01) 1 Merit Review Subcommittee (VA)
2019	Reviewer, Special Emphasis Panel/Scientific Review Group 2019/08 ZRG1 IFCN-N (55)
2019	Reviewer, 2019/08 ZRG1 IFCN-B (07) S - Discovery & Validation of Novel Safe and Effective Pain Treatment
2019	Reviewer, Special Emphasis Panel/Scientific Review Group 2019/08 ZRG1-IDM-C-50
2019	Reviewer, 2020 NIH Director's New Innovator Award Program
2020	Reviewer, Somatosensory and Pain Systems Study Section (SPS) 2020/05
2020	Reviewer, 2020 CTF's Drug Discovery Initiative Registered Reports (DDIRR) Program
2020	Reviewer, National Council of Science and Technology, Mexico
2020	Member, Abstract Review Committee for 2020 Annual NF Conference, Children's Tumor Foundation

- 2020 Reviewer and Acting Chair, 2020/08 ZDA1 TXT-V (01) R – Step Up for Substance Use Disorders (SUD): A Drug Target Initiative for Scientists Engaged in Fundamental Research – U18 Research Demonstration – Cooperative Agreement Study Section (2020/06)
- 2020 Reviewer and Acting Chair, 2020/08 ZDA1 TXT-V (05) R SEP II: Step Up for Substance Use Disorders (SUD): A Drug Target Initiative for Scientists Engaged in Fundamental Research
- 2020 Reviewer and Acting Chair, 2020/08 ZDA1 SKM-D (06) R SEP III: Step Up for Substance Use Disorders (SUD): A Drug Target Initiative for Scientists Engaged in Fundamental Research
- 2020 Ad hoc Reviewer for The University of Rochester Del Monte Institute for Neuroscience
- 2020 Ad hoc Reviewer for the Department of Pharmaceutical Sciences, College of Pharmacy and Allied Health Professions, South Dakota State University
- 2020 Reviewer, 2021/01 ZDA1 SKM-D (02) S; NIDA SEP for Career Development and Education (K99/R00 and K12)
- 2020, 2021 Reviewer, NIH Director’s New Innovator Award Program (DP2), 2021/05 ZRG1 CVRS-A (70) S
- 2021 Reviewer, Gilbert Family Foundation Gene Therapy Initiative – Peer Review Panel
- 2021 Reviewer, Special Emphasis Panel/Scientific Review Group 2021/05 ZRG1 MDCN-C (04) M (Molecular, Cellular and Developmental Neurosciences panel)
- 2021 Member, Scientific Program Committee for the 2022 Annual Society meeting of the Canadian Pain Society
- 2021 Reviewer, NIH Director New Innovator Award Program (DP2) 2022/05 ZRG1 CVRS-B (70) S
- 2021-2025 Member, Neurobiology of Pain and Itch (NPI) Study Section
- 2022 Chair, Mechanism and Transition review panel for the FY21 Chronic Pain Management Research Program (CPMRP)
- 2022 Chair, 2022/05 ZDA1 IXR-Q (09) R - HEAL Initiative: Novel Targets for Opioid Use Disorders and Opioid Overdose
- 2022 ZRG1 MOSS-R (70) R RFA-RM-21-025: NIH Faculty Institutional Recruitment for Sustainable Transformation (FIRST) Program – FIRST Cohort
- 2022 Reviewer, Mitacs Accelerate (Canada’s premiere research internship program)
- 2022 Mentor and Reviewer, The Interstellar Initiative (Japan Agency for Medical Research and Development and the New York Academy of Sciences)

Editorial/Society Memberships

- 2011-2014 Editor, *Translational Neuroscience*
- 2012- Editorial Board Member, *Journal of Pathobiology and Toxicology*
- 2012- Editorial Board Member, *the International Scholarly Research Network (ISRN)*
- 2015- Review Editor, *Frontiers in Cellular Biochemistry*
- 2015- Review Editor, *Frontiers in Cellular Neuroscience*
- 2017- Associate Editor, *BMC Neuroscience*, ‘Cell and molecular mechanisms’ section
- 2017- Associate Editor, *Neuronal Signaling* (Biochemical Society, Portland Press)
- 2018- Editorial Board, *ASN Neuro*
- 2020- Review Editor, *Frontiers in Pain Research*, Cancer Pain
- 2020- Review Editor, *Frontiers in Pharmacology*, Pharmacology of Ion Channels and Channelopathies
- 2021- Associate Editor for *Frontiers in Cellular Neuroscience (Cellular Neurophysiology section)*
- 2021-2023 Editorial Board Member, *Cells*

2021- US Association for the Study of Pain (USASP), Basic Science - Preclinical Special Interest Group (SIG) Chair

2022- 2026 Associate Editor, Journal of Pain

Teaching/Mentoring

2017 Outstanding Undergraduate Biology Research Program (UBRP) Faculty Mentor 2016

2017 Honors College, UA Excellence in Mentoring Award

2018 College of Medicine Faculty Mentoring Award, University of Arizona

2018 Achievement Award 2018, Outstanding Faculty for Graduate and Professional Students, University of Arizona

2021 College of Medicine Faculty Mentoring Award, University of Arizona

Startups/Leadership

2011- Scientific co-founder, Sophia Therapeutics, LLC

2013 Scientific co-founder, Gabriel Therapeutics, LLC

2015- Scientific co-founder and Chief Scientific Officer, Regulonix, LLC (www.regulonix.com)

2017 UA Academic Leadership Institute Fellow (<http://ali.arizona.edu/fellows/2018>)

2020 Senior Member of the National Academy of Inventors

<https://uanews.arizona.edu/story/four-uarizona-researchers-named-senior-members-national-academy-inventors>

<https://www.wildcat.arizona.edu/article/2020/02/n-professor-inventors>

2020 Scientific co-founder and Chief Scientific Officer, EleutheriaTx (www.eleutheriatx.com)

SERVICE/OUTREACH

NATIONAL/INTERNATIONAL

2009- Reviewer for 95+ *journals*:

ACS Chemical Neuroscience; ACS Nano; ACS Pharmacology & Translational Science; Acta Pharmaceutica Sinica B; Acta Physiologica; Addiction Biology; Advanced Science; Aging; Annals of Neurology, Artificial Cells; Archiv der Pharmazie; Blood Substitutes, and Biotechnology; ASN Neuro, BBA Molecular Cell Research, Behavioral Brain Research; Biomedicine & Pharmacotherapy; Bioorganic & Medicinal Chemistry; BMC Neuroscience; Brain Research; FASEB Journal; Cancer Research; Cell Reports; Cellular and Molecular Neurobiology; Cellular and Molecular Neuroscience; Cellular Physiology and Biochemistry; Channels, ChemMedChem; Clinical and Translational Medicine; Computational and Structural Biotechnology Journal; Current Molecular Pharmacology; eLife; European Journal of Neurology; European Journal of Pain; European Journal of Pharmacology; European Neuropsychopharmacology; Experimental Biology and Medicine; Experimental Brain Research, Frontiers in Cellular Biochemistry, Frontiers in Cellular Neuroscience; Frontiers in Cellular Neuroscience; Future Medicinal Chemistry; Future Virology; Heliyon; IBRO Neuroscience Reports; iScience; International Journal of Molecular Sciences; J Clinical Investigation; Journal of Basic and Clinical Physiology and Pharmacology; Journal of Cell Science; Journal of Investigative Dermatology; Journal of International Medical Research; Journal of Medicinal Chemistry; Journal of Molecular Liquids; Journal of Molecular Neuroscience; Journal of Neuroscience; Journal of Pain Research; Journal of Pain; Journal of Physiology; Journal of the American Chemical Society; Life Sciences; Marine Drugs; Molecular Medicine; Molecular Neurobiology; Molecular Pain; Molecular Therapy; Nature Communications; Neural Plasticity; Neural Regeneration Research; Neurochemistry International; Neuroscience; Neuroscience Letters; Neurotherapeutics; Neurotoxicity Research; Oncogene; Pain; Peptides; Pharmaceutical Nanotechnology; Pharmacological Reports; Phytomedicine; Planta Medica; PloS One; Psychoneuroendocrinology; Research in Veterinary Science; Reviews in the Neurosciences

Science Advances; Seminars in Cell and Developmental Biology; Science Signaling; The International Journal of Biochemistry & Cell Biology; Theranostics; Tissue and Cell; Translational Research, Trends in Pharmacological Sciences.

- 2009 Reviewer, Indiana State Department of Health Spinal Cord and Brain Injury Research Fund competition
- 2011- Member, National Scientific Advisory Council, American Federation of Aging Research
- 2011 Scientist Reviewer, 2011 Neurofibromatosis Research Program (NFRP), Congressionally Directed Medical Research Programs (CDMRP)
- 2012 Reviewer, Medical Research Council, United Kingdom, “Neurosciences and Mental Health” study section
- 2013 Reviewer, Biotechnology and Biological Sciences Research Council, United Kingdom
- 2013 Reviewer, National Institute of Academic Anesthesia (NIAA) e-grants, British Journal of Anesthesia, Great Britain, and Ireland
- 2013 Reviewer, Research Support Funds Grant, IUPUI Office of the Vice Chancellor for Research
- 2013 External reviewer, Promotion and Tenure Committees at Simon Fraser University, Burnaby, British Columbia, Canada; University of California, San Diego, CA; Medical College of Wisconsin, Madison, WI
- 2014 Reviewer, National Research Foundation of Korea - Global Research Network Program
- 2014 Reviewer, Natural Sciences and Engineering Research Council of Canada (NSERC)
- 2016 Reviewer, Neurological Foundation of New Zealand
- 2016 Reviewer, Italian Ministry of Health, Brain Disorders and Clinical Neuroscience Study Section
- 2017 Reviewer, Fondazione Cariplo – private philanthropic organization funding Biomedical Research
- 2017 Reviewer, Italian Medicines Agency (AIFA), Italian Ministry of Health
- 2018 Reviewer, Netherlands Organization for Scientific Research (NWO), Earth and Life sciences division
- 2020 Reviewer, 2020 CTF's Drug Discovery Initiative Registered Reports program
- 2020 Reviewer, Italian Multiple Sclerosis Society
- 2020 Reviewer, Italian Ministry of Health (MOH) Applied Clinical and Biomedical Research Study Section
- 2021 Reviewer, Medical Research Council, United Kingdom
- 2021- External Assessor/Reviewer, Promotion and Tenure Committees for:
 - Department of Molecular Biomedical Sciences, NC State Veterinary Medicine;
 - Department of Anesthesiology at the University of California, San Diego;
 - Pharmacology & Therapeutics, School of Medicine National University of Ireland Galway
 - Department of Pharmacy Practice and Pharmaceutical Sciences, University of Minnesota
- 2022 Reviewer, Medical Research Council, United Kingdom
- 2022 Reviewer, Peer Reviewed Medical Research Program (PRMRP) Pain Management panel (DIS-PM) for the Department of Defense (DOD) Congressionally Directed Medical Research Programs (CDMRP)

DEPARTMENTAL

- 2007-2009 Co-chair, Stark Neurosciences Research Institute Seminar Series Committee, Indiana University School of Medicine
- 2009- 2013 Chair, Stark Neurosciences Research Institute Seminar Series Committee, Indiana University School of Medicine
- 2009-2013 Member, Stark Neurosciences Research Institute Confocal Users Instruction and Oversight Committee, Indiana University School of Medicine
- 2014- Graduate Student Committees: Razaz Felemban, Yue Wang, Alex Sandweiss, Karissa E. Cottier, Ashley Symons, Erik Dustrude, Sarah Wilson, Joel Brittain, Aubin Moutal, Omotore Eruvwetere, Andrew Piekarz, Weihua Song, Jason Robarge, Melissa Walker, Polina Feldman, Lingxiao Deng,

Zifan Pei, Yohance M. Allette, Rania Sulaiman, Kathryn Ibbotson, Rakesh Kumar, Jessica J Pellman, Wazir Ezedine Abdullahi

- 2015 Chair, Department of Pharmacology Search Committee for Tenure-track Professor, College of Medicine, University of Arizona
- 2017-2020 Promotions and Tenure Committee, Department of Pharmacology
- 2018 - Space Committee, Department of Pharmacology
- 2019 Faculty Annual Review Committee, Department of Pharmacology
- 2020 - 2021 Chair, Promotions and Tenure Committee, Department of Pharmacology
- 2021 Member, Pharmacology Graduate Program Committee

COLLEGE

- 2014-2019 MD Admissions committee (Chair, Sub-committee E since 2015 and Chair of full committee 2018)
- 2014-2016 University of Arizona College of Medicine Innovative Research Committee for Creating Drug Discovery Team for Neurological Disease
- 2015-2017 Chair, MD/PhD Admissions Committee
- 2015-2017 Chair, Medical Student Research Program (MSRP); Students hosted: Marissa Posada, Edwin Telemi
- 2017 Distinguished Faculty Mentor, New Faculty Mentoring Program (<https://uaatwork.arizona.edu/lqp/new-mentoring-program-supports-junior-faculty>)
- 2018 COM Scholarship Committee - Class of 2023 Recruitment Scholarship Committee
- 2018-2023 Dean's Research Council
- 2019 Advisory Team for UAHS Strategic Plan initiative 2.3 "*Substance Misuse and Addiction*"
- 2020 Member, EMSR (Experimental mouse shared resources) Oversight Committee
- 2020 Member, British Postgraduate Scholarship (Marshall Scholarship, Mitchell Scholarship, and Rhodes Scholarship) Interview Committee
- 2020 Reviewer, Cancer Center Shared Resource renewal grant, University of Arizona Cancer Center
- 2021 Reviewer, Accelerating Innovations into CarE (AICE) - Concepts Program (Alberta, Canada)
- 2021 Reviewer, Arizona Biomedical Research Centre Research Grants
- 2021 Voted Member, 5-Year Administrative Review Member of Chair of Department of Cellular and Molecular Medicine, College of Medicine, Tucson

UNIVERSITY

- 2014- Interviewer, Neuroscience GIDP Admissions Committee
- 2014- Interviewer, Arizona Biological and Biomedical Sciences Program (ABBS) program
- 2015- Graduate Student Committees: Kathryn Ibbotson, Wazir Ezedine Abdullahi
- 2014- Mentor, Undergraduate Biology Research Program
- 2014- Undergraduate Biology Research Program (UBRP) Admissions Committee
- 2015 Grant Reviewer, Arizona Cancer Center review Committee for The Director's Challenge for Therapeutic Development Award
- 2016 Panelist, Idea-to-Asset Seminar, Tech Launch Arizona
- 2016- Member, Molecular and Nanotechnology Imaging Theranostics Committee
- 2016 Reviewer, Brain Research Foundation Scientific Innovation Award Program, Office for Research & Discovery
- 2016 Panel Member, Search Committee for Research Development Associate, Office of Research and Discovery
- 2017 Neuroscience GIDP Seminar Committee

- 2018 UA Global Health Competition Team Mentor
 2018 Mentoring Facilitator for Mentoring Societies, University of Arizona, College of Medicine

TEACHING

- 2014-2022 PHCL 553; Course Director from 2015-
 2014-2022 PHCL 601A; Lecturer
 2014-2019 NRSC 588; Lecturer
 2014-2018 CBI, Neuro System Block, AZMed Facilitator

Individual Student Contact

Advising (High School)

- 2014- Nicole Robles, Michelle Murrieta, Denise Salas Villa, Nicholas Borrea, Paige Nye, Sabrina Hirshorn

Advising/Mentoring (Undergraduate)

- 2014-2015 Anshula Prasad, Yaqi Ran, Hyeonu Oh
 2014-2015 Isabel Nicole Angeles, Daniel Carlson (Undergraduate Biology Research Program)
 2014-2016 Denise Salas Villa (Undergraduate Biology Research Program)
 2015-2016 Seeneen Meroueh, Morgan Postal, Jake Lund Bantlin, Molly Mercedes Ryan, Deziree Coleman
 2016 Shaely Ann Jackson
 2014-2018 Lindsey Anne Chew (Undergraduate Biology Research Program)
 2015-2019 Shreya Bellampalli (Undergraduate Biology Research Program), Ahmed F. Al-Shamari (Summer Institute for Medical Ignorance)
 2016-2019 Angie Dorame (Summer Institute for Medical Ignorance), Meagan Kai-May Yu
 2017-2019 Ann Mary Thomas, Grace Ann Montfort, Iori Kanazawa, CJ Shekhinah Ryan, Nancy Yen Ngan Pham, Pooja Gunnala, Yezan Hassan, Maria Fernanda Cruz, Aspen Johnston, Rohan Mittal, Jinette Sun Park, Angie Dorame, Misha Raheel Chaudhary, Tori Danielle Gammel, Bianca Faye Vianson, Alyssa Esther Cordova (TRiO Arizona's Science, Engineering, and Math Scholars program (ASEMS)), Ceci Kimball, Kari Joy Thomas, Sarah Melissa Bedor, Elizabeth Anne Dolbeck
 2018-2020 Tissiana Gabriela menna Vallecillo (Flinn Scholar), Laasya Vallabhaeni (Flinn Scholar), Rahul Jayaraman (Flinn Scholar), Diana Meijers (BLAISER), Joseph Baca (BLAISER), Haley Alexander Kenner (UBRP)
 2020-2022 Kyleigh Ann Masterson, Kyle Andrew Goveia, Roberto Avila-Valenzuela (BLAISER), Auditi Bhowmick, Veronica Neria Bausher (BLAISER), Jared Fischer (NIH High School and Undergraduate Student Research Program), Omar Alsbiei
 2022 Margarita Joa (NYU Biology CAS)

Mentoring (Medical School)

- 2014 Marissa Posada
 2015 Edwin Telemi
 2017 Alex Urzua

Mentoring (Junior Faculty)

- 2014-2020 May Khanna (Pharmacology, University of Arizona)
 2015-present Amol Patwardhan (Anesthesiology, University of Arizona)
 2015-2021 Mohab Ibrahim (Anesthesiology, University of Arizona)
 2018-2022 Asmaa Abu-Maziad (Assistant Professor of Pediatrics, University of Arizona)

2018-2022	Andreia Zago Chignalia (Anesthesiology, University of Arizona)
2018-2020	Rebecca Vanderpool (Assistant Professor of Medicine, University of Arizona)
2018-2020	Joao Luis Carvalho De Souza (Anesthesiology, University of Arizona)
2019-2021	Arturo Andrade (University of New Hampshire)
2020-2021	Salma Imran Patel (Assistant Professor of Medicine, Associate Program Director, Sleep Medicine Fellowship, Division of Pulmonary, Allergy, Critical Care & Sleep Medicine, University of Arizona)

Independent Studies

2014-2015	Isabel Nicole Angeles, Yaqi Ran, Daniel Carlson, Hyeonu Oh
2015-present	Ahmed F. Al-Shamari, Lindsey Anne Chew
2015	Deziree Coleman
2016-present	Angie Dorame, Meagan Kai-May Yu, Jinette Sun Park
2017-present	Yezan Hassan, Rohan Mittal, Nancy Yen Ngan Pham

Rotations Directed

2014	Yue Wang, Karissa Cottier, Lusine Gomtsian
2015	Wazir Ezedine Abdullahi, Yuanzhang Yang, Samer Masri
2018	Sarakai Vi

Dissertations Directed

2012	Joel M. Brittain (PhD graduate)
2014	Sarah Wilson (PhD graduate)
2015	Erik Dustrude (PhD Graduate)
2015	Yue Wang (MSc Graduate)
2018-2022	Lisa Boinon (PhD graduate)
2019-2022	Harrison Stratton (PhD graduate)

Postdoctoral Fellows

2012-2013	Andrew Piekarz, Michael R. Due
2014	Ohannes K. Melemedjian
2014-2016	Yuying Wang
2015	Lian Wang
2016-2017	Wennan Li
2014-2016	Liberty-Francois Moutal
2014-2018	Aubin Moutal
2016-2020	Song Cai
2017-2019	Jie Yu
2018- 2019	Aude Chefdeville
2018-2020	Yuan Zhou
2019-2021	Dongzhi Ran
2020-present	Kimberly Gomez
2020-2021	Qiuyan Wang
2021-2022	Olukiran Olaoluwa Sesan
2021-present	Paz Duran
2021-present	Santiago Loya
2021-present	Aida Calderón-Rivera
2021-present	Cheng Tang

Research Assistant Professors

2018-2021 Aubin Moutal

Thesis Committees

2014-2020 Oscar Mendez, Justin LaVigne, Yanxia Chen, Alex Sandweiss, Kathryn Ibbotson, Melissa Walker (IUSM), Zifan Pei (IUSM)

Dissertation Committees

2014-2020 Ashley Michele Liguori
Melissa Walker
Zifan Pei
Alex Sandweiss
Kelsey Nation
Justin LaVigne
Oscar Mendez
Yanxia Chen
Lisa Boinon
Harrison J Stratton

Doctoral Dissertations examined (outside of United States)

- 2012 Rakesh Kumar, A comparative study of the effect of Loperamide and Morphine on nociception and expression of μ -opioid receptor and calcium channels in spinal cord of the rat following surgery (All India Institute of Medical Sciences)
- 2019 Arun Kumar Verma, Structural insight of r(CGG) motif and small molecule-based therapeutics development for the expanded CGG repeats RNA associated neurological disorders (Biosciences & Biomedical Engineering Indian Institute of Technology Indore, India)
- 2019 Evaluation of the activity of hydrogen sulfide in a rodent model of chemotherapy-induced neuropathic pain (Department of Pharmacology and Therapeutics, Faculty of Pharmacy, Kuwait University)
- 2020 Gabriella MacDougall, Investigations into the Neuroprotective Mechanisms of Poly-Arginine Peptides (School of Health Sciences University of Notre Dame, Australia)
- 2021 Zakaria El-Hashim Ahmed, The role of central adenosine A1 receptors in modulating enhanced cough (Department of Pharmacology and Therapeutics, Faculty of Pharmacy, Kuwait University)

PUBLICATIONS (ORCID #: 0000-0002-9066-2969)



Symbols: ^a, based on work as a graduate student; * or #, corresponding author; @, co-first author

1. ^a**Khanna R.**, Chang M.C., Joiner W.J., Kaczmarek L.K., Schlichter L.C. hSK4/hIK1, a calmodulin-binding KCa channel in human T lymphocytes. Roles in proliferation and volume regulation. *J. Biol. Chem.* 1999; 274:14838-14849. PMID: 10329683.
2. ^aJugloff D.G., **Khanna R.**, Schlichter L.C, Jones O.T. Internalization of the Kv1.4 potassium channel is suppressed by clustering interactions with PSD-95. *J. Biol. Chem.* 2000; 275:1357-1364. PMID: 10625685.
3. ^aCayabyab F.S. @, **Khanna R.** @, Jones O.T., Schlichter L.C. Suppression of the rat microglia Kv1.3 current by src-family tyrosine kinases and oxygen/glucose deprivation. *Eur. J. Neurosci.* 2000; 12:1949-1960. PMID: 10886336.
4. ^a**Khanna R.**, Roy L., Zhu X., Schlichter L.C. K⁺ channels and the microglial respiratory burst. *Am J Physiol Cell Physiol.* 2001; 280:C796-C806. PMID: 11245596.

5. ^aChang M.C., **Khanna R.**, Schlichter L.C. Regulation of Kv1.3 channels in activated human T lymphocytes by Ca²⁺-dependent pathways. *Cell Physiol. Biochem.* 2001; 11:123-134. PMID: 11410708.
6. ^aJoiner W.J.[@], **Khanna R.**[@], Schlichter L.C., Kaczmarek L.K. Calmodulin regulates assembly and trafficking of SK4/IK1 Ca²⁺-activated K⁺ channels. *J. Biol. Chem.* 2001; 276:37980-37985. PMID: 11495911.
7. ^a**Khanna R.**, Myers M.P., Laine M., Papazian D.M. Glycosylation increases potassium channel stability and surface expression in mammalian cells. *J Biol Chem.* 2001; 276:34028-34034. PMID: 11427541.
8. ^aKoni P.A., Khanna R., Chang M.C., Tang M.D., Kaczmarek L.K., Schlichter L.C., Flavell R.A. Compensatory anion currents in Kv1.3 channel-deficient thymocytes. *J. Biol. Chem.* 2003; 278:39443-39451. PMID: 12878608.
9. **Khanna R.**, Lee E.J., Papazian D.M. Transient calnexin interaction confers long-term stability on folded K⁺ channel protein in the ER. *J Cell Sci.* 2004; 117:2897-2908. PMID: 15161937.
10. Myers M.P. [@], **Khanna R**[@], Lee E.J., Papazian D.M. Voltage sensor mutations differentially target misfolded K⁺ channel subunits to proteasomal and non-proteasomal disposal pathways. *FEBS Lett.* 2004; 568:110-116. PMID: 15196930.
11. Wan J., **Khanna R.**, Sandusky M., Oh F., Baloh R.W., Papazian D.M., Jen J.C. CACNA1A mutations causing episodic and progressive ataxia alter channel trafficking and kinetics. *Neurology* 2005; 64 (12): 2090-2097. PMID: 15196930.
12. **Khanna R.**, Li Q. Stanley E.F. Fractional recovery analysis of a synaptotagmin-associated complex at the presynaptic transmitter release site. *PLoS One* 2006; 1: e67 1-9. PMID: 17183698
13. **Khanna R.**, Li Q., Sun L., Collins T. J., Stanley E.F. N type Ca²⁺ channels and RIM scaffold protein covary at the presynaptic transmitter release face but are components of independent protein complexes. *Neuroscience* 2006; 140: 1201-1208. PMID: 16757118.

a. **Selected for cover image of issue**

14. **Khanna R.**, Sun L., Li Q., Luo L., Stanley E.F. Long splice variant N type Ca²⁺ channels are clustered at presynaptic transmitter release sites without modular adaptor proteins. *Neuroscience* 2006; 138: 1115-1125. PMID: 16473471.
15. Sun L., Li Q., **Khanna R.**, Chan A.W., Wong F., Stanley E.F. Transmitter release site Ca²⁺ channel clusters persist at isolated presynaptic terminals. *Eur. J. Neurosci.* 2006; 23: 1391-1396. PMID: 16553800.
16. Chan A.W.[@], **Khanna R.**[@], Li Q., Stanley E.F. Munc18: a presynaptic transmitter release site N type (CaV2.2) Ca²⁺ channel interacting protein. *Channels* 2007; 1: 1-10. PMID: 19170253.

b. **Selected for cover image of issue**

17. **Khanna R.**[#], Zougman A., Stanley E.F.[#]. A proteomic screen for presynaptic terminal N-type Ca²⁺ channel (CaV2.2) binding partners. *J. Biochem. Mol. Biol.* 2007; 40: 302-314. PMID: 17562281.
18. **Khanna R.**, Li Q, Bewersdorf, J, Stanley E.F. The presynaptic CaV2.2 channel-transmitter release site core complex. *Eur J Neurosci.* 2007 Aug;26(3):547-59. PMID: 17686036.
19. **Khanna R.**, Li Q, Schlichter, L.C., Stanley E.F. The transmitter release-site CaV2.2 channel cluster is linked to an endocytosis coat protein complex. *Eur J Neurosci.* 2007 Aug;26(3):560-74. PMID: 17686037.

Start of Independent Faculty position:

20. Brittain, JM, Piekarz, AD, Wang Y, Kondo T, Cummins TR, and **Khanna, R**[#]. An atypical role for collapsin response mediator protein 2 (CRMP-2) in neurotransmitter release via interaction with presynaptic voltage-gated Ca²⁺ channels. *J. Biol. Chem.* 2009; 284:31375-31390. PMID: 19755421
21. Chi, XX, Schmutzler, BS, Wang, Y, Brittain, JM, Hingtgen, CM, Nicol, GD, and **Khanna, R**[#]. Regulation of N-type voltage-gated calcium channels (Cav2.2) and transmitter release by collapsin response mediator protein-2 (CRMP-2) in sensory neurons. *J Cell Sci.* 2009 Dec 1;122(Pt 23):4351-62. PMID: 19903690.

**Featured in journal issue with commentary "Creating currents with CRMP-2",
<http://jcs.biologists.org/content/122/23/e2301>**

22. Wang, Y, Brittain, JM, Wilson, SM, and **Khanna, R**[#]. Emerging roles of collapsin response mediator proteins (CRMPs) as regulators of voltage-gated calcium channels and synaptic transmission. *Commun Integr Biol.* 2010 Mar;3(2):172-5. PMID: 20585514.

23. Wang Y, Brittain JM, Jarecki BW, Park KD, Wilson SM, Wang B, Hale R, Meroueh SO, Cummins TR, **Khanna, R#**. In silico docking and electrophysiological characterization of lacosamide binding sites on collapsin response mediator protein-2 identifies a pocket important in modulating sodium channel slow inactivation. *J Biol Chem*. 2010 Aug 13;285(33):25296-307. PMID: 20538611.
24. Wang, Y, Brittain, JM, Wilson, SM, Hingtgen, CM, and **Khanna, R#**. Altered calcium currents and axonal growth in Nf1 haploinsufficient mice. *Translational Neuroscience* 2010 Jun;1(2):106-114. PMID: 21949590.
25. Yuying Wang, Ki Duk Park, Christophe Salomé, Sarah M. Wilson, James P. Stables, Rihe Liu, **Rajesh Khanna#**, and Harold Kohn#. Development and Characterization of Novel Derivatives of the Antiepileptic Drug Lacosamide That Exhibit Far Greater Enhancement in Slow Inactivation of Voltage-Gated Sodium Channels. *ACS Chemical Neuroscience* 2011 Feb 16;2(2):90-106. PMID: 21532923.
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This article was evaluated by the Faculty of 1000:

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- 2020 Coronavirus may suppress pain in initial stages of COVID-19 hijacking pain pathway*
[International Business Times, 10/3/20](#)
[Pain News Network, 10/3/20](#)
[Scitechdaily, 10/3/20](#)
[The Health Site, 10/3/20](#)
[Business Today, 10/2/20](#)
[The Hindu Business Lines, 10/4/20](#)
Pain relief caused by coronavirus may help explain virus spread, say scientists [Times Of India, 10/2/20](#)
[Punjab News Network, 10/3/20](#)
[News Today, 10/4/20](#)
[Science X, 10/4/20](#)
KNAU Arizona Public Radio: <https://www.knau.org/post/arizona-study-coronavirus-infection-relieves-pain-rodents>
<https://www.telemundoarizona.com/noticias/local/uarizona-y-su-combate-al-covid-19/2101856/>
The novel coronavirus may inadvertently function as a pain reliever, study suggests: [FOX NEWS, 10/8/20](#)
[KOLD-TV, 10/8/20](#)
[Daily Mail \(Uk\), 10/9/20](#)
[International Business Times \(Uk\), 10/12/20](#)
[The Times Of India, 10/10/20](#)
[Al Khaleej Today, 10/10/20](#)
[Biospace, 10/9/20](#)
[Corn Nation \(Nebraska Football Blog\), 10/12/20](#)

Quirks and Quarks, CBC Podcast [cbc.ca/1.5763913](https://www.cbc.ca/1.5763913).

<https://m.mid-day.com/articles/indian-doctor-at-the-university-of-arizona-makes-a-link-between-covid-19-and-pain-relief/23046285>

<https://briancrombie.com/podcasts-the-brian-crombie-hour/> @sauga960am on the Brian Crombie radio hour from Toronto, Ontario, Canada

<https://www.rediff.com/news/interview/what-you-must-know-about-covid-19/20201201.htm>

[HTTPS://WWW.REDIFF.COM/NEWS/INTERVIEW/CORONAVIRUS-HOW-WE-CAN-DEFEAT-COVID-19/20201203.HTM](https://www.rediff.com/news/interview/coronavirus-how-we-can-defeat-covid-19/20201203.htm)

- 2020 FLEXcast podcast with host Dr. Allie Min - Mentorship and Faculty Development
<https://facultyaffairs.medicine.arizona.edu/faculty-resources/career-development/flexcast>
<https://podcasts.apple.com/us/podcast/flexcast-the-faculty-learning-exchange/id1512737003>
- 2020 This Week in Virology, episode #674 (podcast): Spike protein induces [analgesia](#) (Pain) 1:05:51
https://hwcdn.libsyn.com/p/2/6/8/2684fcdda32cedc1/TWiV674.mp3?c_id=86574722&cs_id=86574722&expiration=1604601177&hwt=48d4669807230af77a5201b13676570b
- 2020 AZPM National Public Radio: Science Fridays with Leslie Tolbert (How COVID-19 spreads by affecting our sensitivity to pain) <https://radio.azpm.org/p/radio-azscience/2020/11/6/183567-episode-257-how-covid-19-spreads-by-affecting-our-sensitivity-to-pain/>
- 2021 Interviewed by Kathy Ritchie, KJZZ-FM for a Nature article (<https://www.nature.com/articles/s41586-021-03553-9>) regarding physicians prescribing opioids to COVID-19 long haulers
- 2022 Interviewed by Shaun Sim, Crain's New York (business publication) for launch of the NYU Pain Research Center https://www.craigslist.com/health-pulse/providers-say-healthfirst-left-claims-unpaid-then-dropped-them-network?utm_source=health-pulse-tuesday&utm_medium=email&utm_campaign=20220114&utm_content=hero-headline
- 2022 Pain Research Forum (PRF) podcast interview with Joe Lesnak, PRF correspondent
- 2022 Pain Research Forum highlighted - The Last of the "Unplucked" Gems: Targeting Nav1.7 for Chronic Pain <https://www.painresearchforum.org/news/204620-last-%e2%80%9cunplucked%e2%80%9d-gems-targeting-nav17-chronic-pain>

PATENTS AWARDED

United States Patent 9,018,173/2003

US9018173B2 CA 2802207 EP2580233B1 <https://patents.google.com/patent/us9018173> Materials and methods for suppressing inflammatory and neuropathic pain. Granted 2013-08-15

US9782491B2 <https://patents.google.com/patent/us9782491> Peptide conjugates for treating pain. Granted 2017-10-10

US10287334 <https://patents.google.com/patent/us10287334b2> Non-narcotic CRMP2 peptides targeting sodium channels for chronic pain. Granted 2019-05-23

US10441586 <https://patents.google.com/patent/us10441586b2> CRMP2 SUMOylation inhibitors and uses thereof. Granted 2019-10-15

US10857382B2 Composition and Methods for treating and preventing Chronic Pain. Granted 2020-12-06

DISCLOSURES/PATENTS SUBMITTED

2006 Disclosure of invention: "Fractional recovery analysis of protein complexes" a method to derive the sequence of proteins in a solubilized multiprotein complex to the technology development and commercialization office, university health network, the University of Toronto, Toronto, Ontario, Canada.

2009 Disclosure of invention: "Transmission Regulatory Peptides (TRAPs) that interfere with CRMP-2:Cav2.2 interactions: tools for studies of synaptic function and potential targets for synaptopathies" (10033) to the office of technology transfer, Indiana University. 61/353,373;61/454,436; PCT/US2011/040100;

- 9,018,173; 2011279703;2,802,207; 201180038945.7; 2580233; 10895/DELNP/2012; 14/680,880; 2580233; 2580233;2580233
- 2011 PCT/US11/40100 materials and methods for suppressing inflammation and neuropathic pain.
- 2012 UA provisional patent application No. 61/588,831. Compounds, composition, and methods for treating neuropathic pain.
- 2012 US provisional patent application 29920-220647: compounds and methods for the prophylactic treatment of epilepsy.
- 2012 Disclosure of invention: Neurological aryl unit (NAU): a structural entity or pharmacophore unit for the control of neuronal hyperexcitability disorders (filed by Rajesh Khanna, IUSM and Harold Kohn, University of North Carolina)
- 2012 Disclosure of invention: functional recovery following traumatic brain injury by sparing motoneuron dendrites from atrophy with a novel peptide therapeutic (12174 IURTC)
- 2012 Peptides conjugates for treating CRMP2-calcium channel mediated pain, U.S. provisional patent application no. 61/655,380
- 2014 Disclosure of invention: CRMP2 SUMOylation motif (CSM) peptide: a novel non-narcotic peptide affecting sodium channel trafficking for chronic pain (Rajesh Khanna and co-inventors May Khanna, Todd W. Vanderah, and Erik T. Dustrude) UA-100; US provisional patent application no. 61/949,456
http://inventions.arizona.edu/technologies/ua14-100_a-non-narcotic-analgesic-peptide-for-chronic-pain
- 2015 US Provisional Patent Application no. 62/238,182. SUMOylation inhibitors of Nav1.7 and their uses
- 2016 Disclosure of invention: inhibitors of voltage-gated calcium channel alpha-beta interactions: novel anti-allodynic compounds (Rajesh Khanna, Vijay Gokhale, and May Khanna) UA16-139
- 2016 Disclosure of invention: Small molecule allosteric antagonists of Cav2.2 calcium channels and uses thereof (Rajesh Khanna and Vijay Gokhale) UA16-145/US provisional patent application No. 62/314,055
- 2016 Disclosure of invention: Using light to create an animal migraine and pain model (Mohab M. Ibrahim and Rajesh) UA16-212
- 2016 U.S. Provisional Patent Application No. 62/506,303; CRMP2 SUMOylation: a novel biomarker for pain (Rajesh Khanna, May Khanna, and Aubin Moutal) UA17-019
- 2017 Methods and compositions for inhibiting SUMOylation of proteins (Rajesh Khanna, May Khanna, and Vijay Gokhale) UA17-182
- 2017 U.S. Provisional Patent Application No. 62/506,298; Small Molecule Antagonists of SUMO Related Modification of CRMP2 And Uses Thereof (May Khanna, Ph.D.; Rajesh Khanna, Ph.D.; Vijay Gokhale, Ph.D.; and Reena Chawla, Ph.D.) UA17-089
[Top Stories in 2017 at the UA Health Sciences: https://arizona.us2.list-manage.com/track/click?u=b102b4587403905186d245edb&id=5f1c97b30b&e=edc6bfd5ed](https://arizona.us2.list-manage.com/track/click?u=b102b4587403905186d245edb&id=5f1c97b30b&e=edc6bfd5ed)
- 2017 Allosteric antagonism of calcium channels with small molecules for relief of neuropathic pain (Rajesh Khanna and Vijay Gokhale) UA17-249
- 2017 Discovery of T-type Calcium Channel Antagonists from Multicomponent Reactions and Their Application in Paclitaxel-induced Peripheral Neuropathy (Jun Wang and Rajesh Khanna) UA18-028
- 2017 Peptides that modulate the effect of the CRMP2: neurofibromin complex on synaptic transmission; PCT/US2016/024266 (WO 2016/154559 A1)
- 2017 Patent US 9,782,491 B2 issued Oct 10, 2017 – Peptide conjugates for treating pain (PCT/US2013/043977 filed Jun 4, 2013)
- 2017 U.S. Patent Application No.: 16/306,797; U.S. Nat'l Entry of PCT/US2017/035577 COMPOSITIONS AND METHODS FOR TREATING AND PREVENTING CHRONIC PAIN (Int'l Filing Date: 02-Jun-2017) UA16-154

- 2018 Patent 2015226911 Australia (issued June 14, 2018; expires March 6, 2035)
- 2018 16/306,797 (UA16-154): COMPOSITIONS AND METHODS FOR TREATING AND PREVENTING CHRONIC PAIN (Filing date 03-Dec-2018)
- 2019 New Zealand Patent No. 742038; NZ National Entry of PCT/US2016/056051 (Int'l Filing Date: 07-Oct-2016)
- 2020 UA Ref. No: UA20-171, UNIA 20.10 Provisional Patent Application: THE T-TYPE CALCIUM CHANNEL ENHANCER SAK3 IMPROVES BEHAVIORAL AND MOTOR DEFECTS ASSOCIATED WITH TAF1 GENE EDITING (filed by Mark Nelson, Rajesh Khanna, Janakiraman Udaiyappan, and Dhanalakshmi Chinnasamy)
- 2020 UAZ-38427.101 Provisional Patent Application: SMALL MOLECULE INHIBITORS OF CaV3.2 ACTIVITY AND USES THEREOF (Jun Wang and Rajesh Khanna)
- 2020 UA21-038: Method of blocking NRP-1 for pain cancer and viral entry (Rajesh Khanna, Aubin Moutal, and Samantha Perez-Miller)
- 2020 UA21-096: Zinc finger protein transcription factors for repression of pain genes (Rajesh Khanna, Aubin Moutal, Casey Case and Manal Mehta) Provisional application 63/134,274 filed January 6, 2021
- 2021 UA-21-165: Inhibitors of CRMP2 phosphorylation for pain relief (Rajesh Khanna, Aubin Moutal, and Samantha Perez-Miller)
- 2021 UA21-167: Treatment of craniofacial pain disorders (Frank Porreca, Edita Navratilova, Aubin Moutal, and Rajesh Khanna) UNIA 21.08 PROV
- 2021 UA18-028 Application Filed - International Patent Application No. PCT/US2021/031964; CJ Ref. No: UAZ-38427.601 SMALL MOLECULE INHIBITORS OF CaV3.2 ACTIVITY AND USES THEREOF (Jun Wang and Rajesh Khanna)
- 2022 A Novel Pan-T-Type Calcium Channel Modulator that alleviates Tonic, Neuropathic and Inflammatory Pain; Disclosure UA22-113 (Jun Wang and Rajesh Khanna)
- 2022 Japanese Patent No. 7092776 SMALL MOLECULE ANTAGONISTS OF SUMO RELATED MODIFICATION OF CRMP2 AND USES THEREOF (May Khanna, Ph.D.; Rajesh Khanna, Ph.D.; Vijay Gokhale, Ph.D.; and Reena Chawla, Ph.D.)

SCHOLARLY PRESENTATIONS

Seminars

- 2002 Trafficking of voltage-gated K⁺ channels, Universidad de Metropolitana, San Juan, Puerto Rico (Invited)
- 2003 Quality control of potassium channel biogenesis, Institut de Pharmacologie et de Toxicologie, Universite de Lausanne, Lausanne, Switzerland (Invited ; host Dr. Olivier Staub)
- 2007 Ion channel trafficking: from molecule to malady, Brock University, St. Catharines, Ontario, Canada (Invited)
- 2007 Ion channel trafficking: from molecule to malady, Medical College of Wisconsin, Wisconsin, Madison (Invited)
- 2008 The calcium channel interactome: a new tree emerges in the woods, Neuroscience Retreat at Bradford Woods — Martinsville, Indiana, IUPUI/IUB (Invited)
- 2009 The calcium channel acquires a new synaptic partner in the transmitter release chronicles, Institute of Psychiatric Research, Department of Psychiatry, Indiana University School of Medicine, Indianapolis, Indiana (Invited)
- 2009 The presynaptic calcium channel interactome, Indiana University Purdue University Fort Wayne (IPFW), Department of Chemistry Fort Wayne, Indiana (Invited)

- 2009 Exploiting Ca²⁺ channel protein-protein interactions for development of therapeutics for pain and neuroprotection, Department of Biochemistry and Molecular Biology, Indiana University School of Medicine, Indianapolis, Indiana (Invited)
- 2009 An Atypical Role for CRMP-2 in Trafficking and Transmitter Release Via Interaction with Presynaptic Voltage-gated Calcium Channels, Loyola University College Stritch School of Medicine, Department of Pharmacology, Loyola University, Chicago, IL (Invited)
- 2009 Nervous System Ion channels: a glimpse of functions, trafficking, targeting and diseases, Goshen College, Department of Chemistry and Mathematics, Goshen, IN (Invited)
- 2010 Roles of ion channels in physiology and pathophysiology, Department of Pharmaceutical Sciences, College of Pharmacy and Health Sciences, Butler University, Indianapolis, IN (Invited)
- 2011 CRMP2, a novel target for pain, Departments of Neurology and Neurosurgery, McGill University and the Montreal Neurological Institute, Montréal, Québec, Canada (Invited)
- 2011 CRMP2, a novel biological target for pain, AstraZeneca R&D Montreal, Ville Saint-Laurent (Montréal), Québec, Canada (Invited)
- 2011 CRMPs curb calcium channels: implications for pain relief, Brain Research Institute, Department of Neurology, University of California at Los Angeles, Los Angeles, CA (Invited)
- 2011 CRMPs Curb Calcium Channels: Implications for Relief of Chronic Neuropathic Pain, Department of Neurosciences and Pathology, University of Toledo Medical Center, Toledo, Ohio (Invited)
- 2011 CRMP2, a novel target for pain, Department of Anatomy and Cell Biology, University of Kansas Medical Center, Kansas City, Kansas (Invited)
- 2012 CRMPs curb calcium channels: implications for pain relief, Department of Biological Sciences, Simon Fraser University, Vancouver, British Columbia, Canada (Invited)
- 2012 CRMP2, a novel target for nociception and neuroprotection, Department of Pharmaceutical Sciences, University of British Columbia, Vancouver, British Columbia, Canada (Invited)
- 2012 CRMP2, a novel target for pain, Departments of Neuro-Oncologie and Neuro-Inflammation, Faculty of Medicine Laennec, Lyon, France (Invited)
- 2012 CRMP2 and Lacosamide: Strange Bedfellows or Complete Strangers?, CNS Research, UCB Pharma, Chemin du Foriest, R9 1420-Braine l'Alleud, Belgium (Invited)
- 2012 Targeting calcium channel interactions for the development of therapeutics for chronic pain, Department of Pharmacology, University of Arizona (Invited)
- 2013 CRMPing chronic pain with peptide aptamers, 2013 Indy SfN, Indianapolis Chapter of the Society for Neuroscience (Invited)
- 2013 Targeting calcium channel interactions for the development of therapeutics for chronic pain, Center for Pain Research, and Department of Neurobiology, Pittsburgh, PA (Invited)
- 2013 CRMP2 peptides for pain management: preclinical studies, Phi-Zeta research Day, Purdue University, Purdue, IN (Invited)
- 2014 CRMPing Pain, Children's Health Research Center at Sanford Research, Sioux Falls SD Sanford Research (Invited)
- 2016 'Painful' ménage à trois: CRMP2 wrestles with SUMO to curb Nav1.7, Neuroscience Data Blitz, Neuroscience Department, University of Arizona (Invited)
- 2016 CRMPing Pain, Department of Anesthesiology Bioengineering; Cell Biology and Anatomy; Biopharmaceutical Science, University of Illinois College of Medicine, Chicago, Illinois (Invited)
- 2017 ChIRPMAP – a novel method for identifying regulators channels inhibitor, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada (Invited)
- 2017 Crosstalk between CRMP2 SUMOylation and phosphorylation modulates NaV1.7 channel trafficking and neuropathic pain, Centre for Biomedical Research, University of Victoria, British Columbia, Canada (Invited)
- 2017 ChIRPMAP – a novel method for identification of channel regulators, Department of Pharmacology & Pathology, Columbia University, New York (Invited)

- 2017 New Therapeutic Horizons in Chronic Pain, Department of Anesthesiology & Critical Care Medicine, University of New Mexico (Invited)
- 2018 Research Funding and Visibility, New Faculty Mentoring Program, Office of Diversity and Inclusion, University of Arizona Health Sciences (Invited)
- 2018 SUMO on CRMPs - wrestling for pain?, Chemistry and Biochemistry and Biological Chemistry Program Journal Club, University of Arizona (Invited)
- 2018 Conquering Pain, Science Café at the 2018 - Tucson Festival of Books (Invited)
- 2018 Made It Happen: From Research to Invention to Impact (<https://techlaunch.arizona.edu/event/regulonix-commercializing-non-opioid-drugs-chronic-pain>)
- 2019 CRMP2, NaV1.7 channels, Chronic Pain – a novel method for identification of channel regulators, Department of Pharmacology & Toxicology, Indiana University Purdue University Indianapolis (Invited)
- 2019 Unlocking NaV1.7's pain potential, University of Pittsburgh, Department of Neurobiology, Pittsburgh, PA, USA (June 28, 2019, Pittsburgh, Invited)
- 2019 Unlocking NaV1.7's pain potential, Università Degli Studi di Milano, Department of Bioscience, Milano, Italy (Invited)
- 2019 Biologics, Small Molecules, and Natural Products Targeting Voltage-gated Calcium Channels for Pain Relief, Pharmacology and Toxicology, Institute of Pharmacy, University of Innsbruck, Innsbruck, Austria (Invited; host Joerg Striessnig)
- 2019 Unlocking NaV1.7's pain potential, University College London, London, United Kingdom (Invited; hosts Drs. Annette Dolphin and John Wood)
- 2019 Unlocking NaV1.7's pain potential, Grünenthal GmbH, Aachen, Germany (Invited; host Drs. Stefan Schunck, Paul Ratcliffe, and Torsten Rodolf Dunkern)
- 2020 Unlocking NaV1.7's pain potential, Cognition and Neuroscience, School of Behavioral and Brain Sciences, The University of Texas at Dallas, Texas (Invited)
- 2020 Unlocking NaV1.7's pain potential, Henry and Amelia Nasrallah Center for Neuroscience, Saint Louis University School of Medicine, St. Louis, Missouri (Invited, Dr. Daniela Salvemini)
- 2020 Two Scientists – a conversation on the scientific journey, work-life balance, COVID-19 and analgesia; University of Arizona (Invited)
- 2021 SARS-CoV-2 Spike protein highlights a role for VEGF-A/Neuropilin-1 receptor signaling in nociceptive processing, Dept. of Molecular Pathobiology, New York University College of Dentistry (Invited; host Dr. Nigel W. Bunnett)
- 2021 From the COVID-19 fog a new pain target emerges in “Academic Innovation in the Drug Discovery Ecosystem” – Arizona Center for Drug Discovery Spring Summit (Invited; host Dr. Wei Wang)
- 2021 Opportunities for Therapeutics for Chronic Pain -Targeting Ion channels and their Regulators, MD Anderson Pain Research Consortium; Dept. of Symptom Research and Anesthesiology, Critical Care and Pain Medicine, Houston, Texas, USA (Invited; hosts Drs. Cobi Heijnen and Carin Hagberg)
- 2021 Opportunities for Therapeutics for Chronic Pain -Targeting Ion channels and their Regulators, Department of Pharmacology and Physiology and the Henry and Amelia Nasrallah Center for Neuroscience, Saint Louis University School of Medicine, St. Louis, MO USA (Invited; host Dr. Daniela Salvemini)
- 2021 Opportunities for Therapeutics for Chronic Pain -Targeting Ion channels and their Regulators, MD Anderson Pain Research Consortium; The Division of Anesthesiology, Critical Care and Pain Medicine, Houston, Texas, USA (Invited; host Dr. Patrick Dougherty)
- 2021 Selective targeting of NaV1.7 via inhibition of the CRMP2-Ubc9 interaction reduces pain in rodents, Department of Neuroscience and Pharmacology, Carver College of Medicine, The University of Iowa (Invited; Host Dr. Kathleen Sluka)
- 2022 Navigating a new path to NaV1.7 for pain; NYU Neuroscience Institute (Invited; Host Dr. Richard Tsien)
- 2022 Can SARS-CoV2 blunt pain?; Interdisciplinary Pain Research Program's (IPRP) Seminar NYU Langone Health (Invited; Host Dr. Jing Wang)

- 2022 Navigating a new path to NaV1.7 for pain; Department of Pharmacology, Northwestern Medicine, Feinberg School of Medicine (Invited; Host Dr. Al George)
- 2022 Navigating a new path to NaV1.7 for pain; Trans Cure Lecture Series, Institute of Biochemistry and Molecular Medicine, University of Bern, Switzerland (Invited; Host Dr. Hugues Abriel)
- 2022 Can SARS-CoV2 blunt pain?; Department of Immunobiology, University of Arizona (Invited; Host Dr. Felicia Goodrum)
- 2022 Opportunities for Therapeutics for Chronic Pain -Targeting Ion channels and their Regulators; Kansas University Medical Center (Hosts: Drs. Talal Khan and Doug Wright)
- 2022 The last of the unplucked gems: targeting NaV1.7 for chronic pain, Department of Pharmacology and Toxicology, University at Buffalo (Invited; host Dr. Arindam Bhattacharjee)
- 2022 A unique binding domain in NaV1.7 accounts for its selective regulation by CRMP2; University of Texas Health Science Center at San Antonio (Invited; host Dr. Shivani Ruparel)
- 2022 Opportunities for Therapeutics for Chronic Pain -Targeting Ion channels and their Regulators; Institute of Neurological Sciences and Psychiatry, Ankara, Turkey (Host: Dr. Bengisu Solgun)
- 2023 A Renaissance in Targeting NaV1.7; Alan Edwards Centre for Research on Pain (Invited, Dr. Arkady Khoutorsky, McGill Pain Center)
- 2023 A Path Not Taken for Targeting NaV1.7 for Chronic Pain; Keynote Speaker for Department of Physiology and Biophysics Research Day, Dalhousie University, Halifax, Nova Scotia, Canada (Invited; Dr. Yassine El Hiani)

Symposia/Conferences

- 2009 Drug Discovery in Academia: CRMP2, a novel target for pain suppression, Indiana University and Lilly Labs Joint Pain Forum, Indianapolis, Indiana (Invited)
- 2009 Regulation of neurite outgrowth and synaptic efficacy by calcium channel-CRMP-2 interactions, 2009 Gill Symposium, Indiana University Bloomington, Bloomington, IN (Invited)
- 2009 Regulation of Synaptic Efficacy by Calcium channel-CRMP-2 Interactions, FASEB Summer Research Conference on Ion Channel Regulation June 7-12, 2009, Snowmass Village, Colorado (Invited)
- 2011 Suppression of inflammatory and neuropathic pain by uncoupling CRMP-2 from the presynaptic Ca²⁺ channel complex, Ion Channel Symposium 2011 (Danish Arrhythmia Research Centre) May 26-27, 2011 Copenhagen, Denmark (Invited)
- 2011 Suppression of inflammatory and neuropathic pain by uncoupling CRMP-2 from the presynaptic Ca²⁺ channel complex, FASEB Summer Research Conference on Ion Channel Regulation, June 12-17, 2011, Steamboat Springs, Colorado (Invited)
- 2011 CRMP2, a novel biological target in pain research, Pain Interest Group Annual Meeting, Chicago, IL (Invited)
- 2011 CRMP2: A Novel Biological Target in Pain Research, 5th Annual Pain Therapeutic Summit: New Drug Discovery Targets, Clinical Development and Commercialization Strategies, September 20-21, 2011, San Francisco, CA (Invited)
- 2012 Suppression of inflammatory and neuropathic pain by uncoupling CRMP-2 from the presynaptic Ca²⁺ channel complex, 43rd Annual Meeting of the American Society of Neurochemistry, Baltimore, MD Colloquium on Collapsin Response Mediator Proteins (CRMPs) in Neurological Disease (Session Chairs, Invited)
- 2012 Pain Sensitization in the Periphery: Should We Mine New Pain-Transducing Ion Channels or Focus on Specific Properties of Known Ion Channel Targets, APS 31st Annual Scientific Meeting, Honolulu, HI (Invited)
- 2012 Neuroprotective effects of CRMP2 following TBI, 2012 Mini-symposium: CNS Injury and Repair, Joint symposia between Indiana University School of Medicine, Indianapolis, Indiana and Center for Translational Neuroscience, University of Missouri-Columbia School of Medicine (Invited)

- 2013 Curbing calcium channels for relief of chronic pain, 4th International Congress on Neuropathic Pain: the path to relief starts with understanding, Toronto, Ontario, Canada (Session Chair; Invited)
- 2013 Voltage-gated calcium channels: novel roles, International Union of Physiological Sciences (IUPS) Congress, The Physiological Society, Birmingham, United Kingdom (Invited)
- 2015 Voltage-gated channels in Pain, Spring Pain meeting, May 11-13, 2015, Palm Springs, CA (Session Chair; Invited)
- 2016 Teaching an old dog new tricks: constellation pharmacology unravels nociceptive targets and mechanisms, Spring Brain meeting, Topic: Pain Mechanisms (April 7-11, 2016, Sedona, AZ) (Invited)
- 2017 Going in circles with opioids for treatment of pain, Spring Brain meeting, Topic: Pain Mechanisms (March 16-19, 2017, Sedona, AZ) (Invited)
- 2017 Regulonix: Non-opioid compounds for chronic pain (April 18, 2017, University of Arizona, I²A Expo and Awards: Invention to Impact)
- 2017 Regulonix: Non-opioid drugs for chronic pain (May 3, 2017, TechCode, Mountain View, CA)
- 2017 Regulonix: Non-opioid drugs for chronic pain (Oct 25, 2017, First San Diego Annual Regional Innovation Showcase, Torrey Pines, CA)
- 2017 First Annual NF1 Synodos meeting, Oct 2 – 4, 2017, Palm Beach, FL (Invited)
- 2018 Targeting Sodium Channels for Non-Opioid-Based Pain Relief, Drug Discovery and Development Symposium, College of Pharmacy, University of Arizona
- 2018 “CRMPing Pain”, Brain to Nanodomain Symposium honoring Dr. Elise F. Stanley (October 17, 2018, Toronto, Ontario, Canada)
- 2019 Neurobiology and Chemistry of Pain and Addiction in honor of Dr. Rao Rapaka (April 29, 2019, Tucson, AZ; Chair Session 3)
- 2019 FASEB Science Research Conference (July, 2019; co-chairs Rajesh Khanna and Henry Colecraft, Lisbon, Portugal)
- 2019 Unlocking NaV1.7's Pain Potential: Preclinical Studies on a First-in-Class, Non-Opioid, Selective NaV1.7 Regulator, 4th Annual Chemistry and Drug Abuse Conference, Boston, MA (Invited)
- 2019 New Approaches for Pain Assessment and Treatment Nanosymposium (Chair, Session number 543, Society for Neuroscience, McCormick Place, Chicago, IL)
- 2019 Dissecting pain in NF1 (Session #5: Pain and Itch) 2019 NF Conference, San Francisco, CA
- 2019 Sex-dependent differences in pain and sleep in a porcine model of neurofibromatosis 1 (Session #8: Targeted Gene Editing and Gene Therapy for Neurofibromatosis, co-chair) 2019 NF Conference, San Francisco, CA Session #5: Pain and Itch
- 2019 Unlocking NaV1.7's pain potential: Discovery and initial characterization of a novel class of compounds selectively targeting NaV1.7 through inhibition of a protein-protein interaction (Session number 543, Society for Neuroscience, McCormick Place, Chicago, IL)
- 2019 Unlocking NaV1.7's pain potential (Translational Research Initiative for Pain and Neuropathy Annual Symposium at Virginia Commonwealth University; Richmond, VA, November 5, 2019)
- 2020 Discovery of T-type Calcium Channel Antagonists from Multicomponent Reactions and Their Application in Paclitaxel-induced Peripheral Neuropathy (Inaugural NIH HEAL InitiativeSM Investigator Meeting, Bethesda, Maryland)
- 2020 Defining the CaV2.2-CRMP2 molecular interaction identifies a first-in-class small molecule anti-nociceptive (Session C-03: CRMPs in the CNS: Novel Roles in Health and Disease, Co-chair) American Society of Neurochemistry 2020 Annual Meeting, St. Charles, MO [postponed due to the Covid-19 pandemic]
- 2020 Unlocking NaV1.7's pain potential (Session S6: Novel Non-narcotic Strategies for Pain Management) American Society of Neurochemistry 2020 Annual Meeting, St. Charles, MO [postponed due to the Covid-19 pandemic]
- 2020 Biochemistry Focus webinar series: Neurobiology of chronic pain – mechanisms, management, and in-between (Biochemical Society and Portland Press, chaired by Dr Eilís Dowd); podcast attendees were

- from UK, USA, India, Nigeria, Iran, Canada, Philippines, Ireland, Mexico, Ghana, Scotland, Iraq, Indonesia, Germany, and Belgium
- 2021 SARS-CoV-2 Spike protein co-opts VEGF-A/Neuropilin-1 receptor signaling to induce analgesia (Symposium: COVID-19, human nociceptors, and pain (Chair of session)) Canadian Pain Society Annual Meeting April 27-31 [virtual meeting]
- 2021 Second NIH Helping to End Addiction Long-term (HEAL) Initiative Investigators Meeting; HEAL Innovation Research – Panelist and Speaker (Nav1.7 revisited)
- 2021 Novel COVID-19 Pain Syndromes - Evidence from Translational Basic and Clinical Research (International Association for the Study of Pain’s “COVID-19: Elevating Healthcare Professionals and Available Resources - The Latest on COVID-19 and Pain” Virtual Education series) May 20, 2021
- 2022 Navigating a new path to Nav1.7 for pain (New York Academy of Sciences – Advances in Pain) May 3-4 New York City
- 2022 Allosteric Modulation of CaV2.2 (4th European Calcium Channel Conference, Alpbach, Austria (May 24-28, 2022))
- 2022 Unlocking CaV2.2’s pain potential (Calcium Channels Session) May 29- June 4; Pain Mechanisms and Therapeutics meeting, Verona, Italy)
- 2022 Visiting Faculty, North American Pain School - "Controversies in Pain Research" - The last of the unplucked gems: targeting NaV1.7 for chronic pain (June 19-24, 2022 at the Fairmont Le Chateau Montebello, in Montebello, Quebec)
- 2022 NYU Center for Skeletal & Craniofacial Biology annual Symposium, Keynote speaker: ‘Answers to NaV1.7 Analgesic Failures: Posttranslational Targeting for Pain Reduction’
- 2022 Navigating a New Path to NaV1.7 for Pain (FASEB Ion Channel Regulation Conference, Halifax, Nova Scotia, Canada)

Peer reviewed abstracts

- 2011 Brittain JM, Chen L, Brustovetsky T, Gao X, Wilson SM, Ashpole NM, Molosh AI, You H, Hudmon A, Brustovetsky N, Chen J, **Khanna R**. Neuroprotection against Traumatic Brain Injury by a Peptide Derived from the Collapsin Response Mediator Protein 2 (CRMP2). Session 426. Nov 14, 2011. Society for Neuroscience Meeting, Washington D.C.
- 2011 Wilson SM, Xiong W, Head J, Brittain JM, Gagare P, Ramachandran P, Jin X, **Khanna R**. The anticonvulsant Lacosamide inhibits CRMP2-mediated neurite outgrowth in vitro and prevents enhanced excitatory connectivity in an animal model of posttraumatic epileptogenesis. Session 250. Nov 13, 2011. Society for Neuroscience Meeting, Washington D.C.
- 2011 Brittain JM, Duarte DB, Wilson SM, Ballard C, Johnson PL, Liu N, Xiong W, Ripsch MS, Wang Y, Fehrenbacher JC, Fitz JD, Khanna M, Park CK, Ashpole NM, Hudmon A, Meroueh SO, Ji RR, Hurley JH, Jin X, Shekhar A, Xu XM, Oxford GS, Vasko MR, White FA, **Khanna R**. Session 275. Nov 13, 2011. Society for Neuroscience Meeting, Washington D.C
- 2012 White FA, Due MR, Piekarz AD, Feldman P, Chavez S, Yin H, **Khanna R**. Neuroexcitatory effects of morphine-3-glucuronide are dependent on Toll-like receptor 4 signaling. Society for Neuroscience 2012 New Orleans.
- 2012 T. Verhovshek, J. Brennia, S.M. Wilson, J. Gao, X. Jin, **R. Khanna** and X-M. Xu. A novel peptide targeting the collapsin response mediator protein 3 (CRMP3) is neuroprotective in multiple models of dendritic atrophy. Society for Neuroscience 2012 New Orleans.
- 2013 Wilson NM, **Khanna R**, and Wright DE. A peptide uncoupling Collapsin Response Mediator Protein-2 (CRMP2) from the Voltage-gated Ca²⁺ channel attenuates mechanical allodynia in a rodent model of diabetic neuropathy. Annual Meeting of the Diabetic Neuropathy Study Group, September 27-30 in Dresden, Germany.

- 2013 Shimomura A, Patel D, Wilson SM, **Khanna R**, Hashino E. Essential role for CBP in Tlx3-mediated neuronal differentiation from embryonic stem cells. Feb 16-20, 2013 Baltimore, MD. American Research in Otolaryngology MidWinter Conference.
- 2014 Melissa Walker, Lingxiao Deng, Chandler L. Walker, Wenjie Wu, Xiangbing Wu, Qingbo Lu, Sarah M. Wilson, **Rajesh Khanna**, Naikui Liu, Xuejun Wen, Ning Zhang, and Xiao-Ming Xu. Novel Bioengineered Hydrogel Combinational Therapy for Traumatic Spinal Cord Injury. 6th Annual Wings for Life Annual Meeting, Salzburg, Austria, May 21-22, 2014.
- 2014 **Khanna R**. Challenging the catechism of therapeutics for chronic neuropathic pain: targeting CaV2.2 interactions with CRMP2 peptides. June 15, 2014 - June 20, 2014 - Keystone Resort - Keystone, Colorado, USA. The Brain: Adaptation and Maladaptation in Chronic Pain.
- 2014 **Khanna R**. CRMP2 protein SUMOylation modulates NaV1.7 channel trafficking. July 6, 2014 – July 11, 2014, Mount Holyoke College in South Hadley MA, USA. Gordon Research Conference on Ion Channels.
- 2015 Wang Y, Francois-Moutal L, Moutal A, Cotter KE, Melemedjian OK, Khanna M, Vanderah TW, and **Khanna R**. A membrane-delimited N-myristoylated CRMP2 peptide aptamer inhibits CaV2.2 trafficking and reverses post-operative pain behaviors. American Pain Society, May 13-16, 2015 at the Palm Springs Convention Center, Palm Springs, CA.
- 2015 Moutal A, Dustrude E, Yang XF, Wang Y, Khanna M, **Khanna R**. Interplay between CRMP2 phosphorylation and SUMOylation determines NaV1.7 trafficking Session 35. Oct. 17, 2015. Society for Neuroscience Meeting, Chicago, IL (abstract #17492).
- 2016 Chung-Yang Yeh, Ashlyn M. Bulas, Karen A. Hartnett, **Rajesh Khanna**, Dandan Sun, Elias Aizenman. Ameliorating Kv2.1-mediated Neurodegeneration in Ischemic Stroke. Keystone Symposium on Neurodegenerative Mechanisms. June, 2016.
- 2016 Alexander J. Sandweiss, Mary I. McIntosh, Aubin Moutal, Aswini K. Giri, Victor J. Hrubby, **Rajesh Khanna**, Tally M. Largent-Milnes and Todd W. Vanderah. Pulling the brakes on midbrain dopamine cells: inhibiting substance p prevents opiate reward. International Narcotics Research Conference 2016, July 10-14, 2016 Bath, England.
- 2016 Aubin Moutal, Nathan Eyde, Edwin Telemi, Jennifer Y. Xie, Frank Porreca, and **Rajesh Khanna**. Relief of cephalic pain by (S)-Lacosamide in an experimental model of headache. 2016 NF Conference, June 18-21, 2016 Austin, Texas.
- 2016 Xiaofang Yang, Aubin Moutal, and **Rajesh Khanna**. CRISPR/Cas9-based gene editing of *Nf1*: a new rat model of Neurofibromatosis type 1 (NF1)? 2016 NF Conference, June 18-21, 2016 Austin, Texas.
- 2016 Chung-Yang Yeh, Ashlyn M. Bulas, Karen A. Hartnett, Charles T. Anderson, Roberto Di Maio, Thanos Tzounopoulos, Dandan Sun, **Rajesh Khanna**, Elias Aizenman. A peptide disrupting Kv2.1/syntaxin interaction is neuroprotective in cerebral ischemia. Society for Neuroscience Meeting, San Diego, CA.
- 2016 Priyadarshan Goswamee, Jeffrey Parrilla-Carrero, William Buchta, Peter W Kalivas, Aubin Moutal, **Rajesh Khanna** and Arthur C Riegel. Chronic Cocaine Self-Administration Impairs the Ability of Dopamine to Enhance Neuronal Excitability by Inhibition of Kv7/KCNQ Channels. Medical University of South Carolina Research Day, SC.
- 2017 David Meyerholz, Georgina K Ofori-Amanfo, Mariah R. Leidinger, Dawn Quelle, Benjamin Darbro, Karin Panzer, Jessica C. Sieren, **Rajesh Khanna**, Chris Rogers, Katherine White, Jill Weimer. Evaluation of Immunohistochemical Markers for Application in a Novel Neurofibromatosis-1 Porcine Model. Experimental Biology Meeting, April 2017, Chicago, IL.
- 2017 Mohab M. Ibrahim, Amol Patwardhan, Kerry Gilbraith1, Jessica Hanson, Aubin Moutal, Wennan Li, Song Cai, Lindsey A. Chew, Xiaofang Yang, T. Philip Malan, Todd W. Vanderah, Frank Porreca, and **Rajesh Khanna**. Long-lasting antinociceptive effects of green light in rats and humans. Society for Neuroscience Meeting, Washington, DC.
- 2017 **Rajesh Khanna**, Amol Patwardhan, Kerry Gilbraith1, Jessica Hanson, Aubin Moutal, Wennan Li, Lindsey A. Chew, Shreya S. Bellampalli, Angie Dorame, Xiaofang Yang, T. Philip Malan, Todd W. Vanderah, Frank Porreca, and Mohab M. Ibrahim. Development and characterization of an injury-free rodent model of hyperalgesia relevant to fibromyalgia syndrome. Society for Neuroscience Meeting, Washington, DC.

- 2017 Angie Dorame, Zunaira Shuja, Vijay Gokhale, Xiaofang Yang, Yingshi Ji, Yue Wang, Aubin Moutal, Lindsey A. Chew, Shreya S. Bellampalli, Todd W. Vanderah, May Khanna, Henry M. Colecraft, and **Rajesh Khanna**. High-throughput chemical screening identifies SGM-45 as a selective inhibitor of N-type voltage-gated (Cav2.2) channel. Society for Neuroscience Meeting, Washington, DC.
- 2017 Erin Romero, Brian Hallmark, Amanda Willis, Saurabh Sharma, Christopher Le, Aubin Moutal, **Rajesh Khanna**, Cassandra Deering-Rice, Christopher Reilly, Eugene Chang. Loss of function TRPV1 SNP (rs8065080) is associated with chronic rhinosinusitis. American Rhinologic Society meeting Chicago, IL.
- 2018 Hongwei Yu, Hongfei Xiang, Seung Min Shin, Hao Xu, Brandon Itson-Zoske, **Rajesh Khanna**, and Quinn H. Hogan. Enhanced analgesic effect of AAV-encoded mutant CBD3 peptide (CBD3A6K) for primary sensory neuron-targeted treatment of neuropathic pain in rat. American Society of Gene & Cell Therapy, 21st annual meeting in Chicago, IL, May 16-19, 2018.
- 2018 Katherine A. White, Vicki J. Swierl, Jordan L. Kohlmeyer, David K. Meyerholz, Munir R. Tanas, Johanna Uthoff, Emily Hammond, Frank A. Rohret, J. Adam Goeken, Chun-Hung Chan1, Mariah R. Leidinger, Shaikamjad Umesalma, Margaret R. Wallace, Rebecca D. Dodd, Karin Panzer, Benjamin W. Darbro, Aubin Moutal, Song Cai, Wennan Li, Shreya S. Bellampalli, **Rajesh Khanna**, Christopher S. Rogers, Jessica C. Sieren, Dawn E. Quelle, and Jill M. Weimer. A novel porcine model of Neurofibromatosis Type 1 (NF1) that mimics the human disease. 8th Annual Rare Disease Symposium, Sanford, Sioux Falls, South Dakota, Feb. 23, 2018.
- 2018 Lindsey A. Chew and **Rajesh Khanna**. A novel therapeutic strategy for chronic pain. 22nd annual Posters on the Hill, Washington, D.C. April 18, 2018
- Featured in the Daily Wildcat: UA Research travels to Capitol Hill**
<http://www.wildcat.arizona.edu/article/2018/03/n-posters-on-the-hill>
- 2018 Chung-Yang Yeh, Zhaofeng Ye, Shivani Gaur, Aubin Moutal, Amanda M Henton, Stylianos Kouvaros, Jami L Saloman, Karen A Hartnett-Scott, Kai He, Thanos Tzounopoulos, **Rajesh Khanna**, Carlos J Camacho and Elias Aizenman. Small molecule inhibition of Kv2.1-syntaxin interaction protects against neuronal cell death. Society for Neuroscience Meeting, San Diego, CA.
- 2018 Laura Alberio, Andrea Saponaro, Alessandro Porro, Matteo Pisoni, Shizhen Luo, Aubin Moutal, Yingshi Ji, **Rajesh Khanna**, Gerhard Thiel and Anna Moroni. Engineering synthetic tools for the inhibition of cell excitability. Janelia Farms - Conference on genetic manipulation of neuronal activity. Sep. 2018

GRANTS AND CONTRACTS

Funded

Federal

- 2011-2014 CRMP-2, a novel target for excitotoxicity, American Heart Association, 15% effort, \$308,000, PI
- 2011-2015 Neurofibromin-CRMP2-Ca²⁺ channels: a new network for therapeutic intervention in neurofibromatosis, Department of Defense Congressionally Directed Military Medical Research and Development Program – Neurofibromatosis New Investigator Award FY2010, \$616,000, 10% effort, PI
- 2012-2013 Characterization and elucidation of the cellular pharmacological pathways of Extended NeuroAmides (ENAs) for the treatment of epileptic disorders, NIH R41, \$80,000, sub-contractor
- 2012-2016 Liberation of Intracellular Zinc and Neuronal Cell Death, NIH R01, 5% effort, \$27,985, Sub-contractor
- 2014-2015 The role of DAMPS in painful bladder syndrome, NIH R01, 5% effort, \$390,000, multi-PI
- 2016-2019 Targeting the CRMP2/Ca²⁺ channel complex for abortive treatment of migraine and post-traumatic headache, CDMRP, 20% effort, \$2,281,087, PI
- 2017-2018 Regulators of NaV1.7 channels: Novel Anti-allodynic Drug candidates, NIH R41, 10% effort, \$299,999, PI

2017-2022 CRMP2, mitochondria, and Huntington disease, NIH R01, 10% effort, \$2,818,710, multi-PI

2017-2022 CRMP2, Nav1.7 sodium channel, and chronic pain, NIH R01, 15% effort, \$1,918,584, PI

2018-2022 Mechanism of intrathecal Contulakin-G induced analgesia without motor block, NIH K08 K08NS104272, \$196,560; Co-mentor (PI: Patwardhan)
<http://memo.ahsc.arizona.edu/index.cfm/memos/view/33649/0494a059b98295f6>

2018-2023 Green Light Therapy for Chronic Pain, NIH R01, 12.5% effort, \$1,716,875, co-I
<http://anesth.medicine.arizona.edu/news/2018/university-anesthesiology-faculty-garner-nih-funding>

2019-2020 Optimization of Betulinic Acid analogs for T-type calcium channel inhibition for nonaddictive relief of chronic pain, NIDA 1R41DA050364, 10% effort, \$224,696, PI

2019-2020 Discovery of T-type Calcium Channel Antagonists from Multicomponent Reactions and Their Application in Paclitaxel-induced Peripheral Neuropathy, NINDS 1R41NS116784, 10% effort, \$341,527, PI

2019-2020 FASEB SRC on Ion Channel Regulation, NINDS 1R13NS111788-01 (conference grant), Henry Colecraft and Rajesh Khanna (Multi-PIs)

2019-2020 Evaluation of Drug Efficacy in a Rat Model of Neuropathic Pain, NINDS, 3% effort, \$275,676, PI of subcontract (Prime: Lovelace Biomedical & Environmental Research Institute)

2019-2020 Disease Model Characterization and Development of Assays to Evaluate and Measure Pain in a Porcine Model for Sick Cell Disease (SCD), NIDA, 3% effort, \$139,298, PI of subcontract (Prime: Lovelace Biomedical & Environmental Research Institute)

2020-2024 Genetic and Pharmacological Validation of CRMP2 Phosphorylation as a Novel therapeutic Target for Neuropathic Pain, NINDS R01NS120663, 10% effort, \$2,060,449, PI

2020-2022 Green Light Therapy for Improving Dementia in Mice Models of Alzheimer's Disease, Administrative Supplement for NIHR01 AT009716, 4% effort, Co-Investigator (PI: Ibrahim)

2020-2024 Validation of Spinal Neurotensin Receptor 2 as an Analgesic Target NINDS R01, 7.5% effort, Co-Investigator (PI: Patwardhan)

2021-2026 Anti-CV2 autoantibodies unmask a CRMP5/GluN2B pain signaling hub, NINDS R01NS119263, 5% effort, \$368,934, Co-Investigator (PI: Moutal, UA)

2021 Sentrin proteases, CRMP2 deSUMOylation, and Chronic Pain; 3R01NS120663-01A1S1 NINDS Diversity Supplement, 1% effort, PI (Trainee – Kimberly Gomez)

2021 Inhibition of CaV α - β interaction with orally available small organic molecules for chronic pain, NIH R41, 10% effort, PI (Wei Wang, Pharmacy, PI of UA subcontract); \$400,000

2021 CRMP2 phosphorylation: a novel target for Alzheimer's disease; 3R01NS120663-01A1S2 NINDS, 10% effort, PI

2021 Targeting the neuropilin-1 receptor (NRP-1)/VEGF-A axis for neuropathic pain, NINDS 1R41NS122545, 10% effort, \$419,470, PI

State

2012-2014 CRMP2, a novel therapeutic target of neuroprotection and neuroinflammation in an open-head concussive model of traumatic brain injury, Indiana Spinal Cord and Brain Injury Research Board, Indiana State Department of Health Indiana – Individual Research Grant, \$120,000, PI

2013-2014 Preclinical evaluation of CRMP2-directed peptides for neuroprotection, Indiana Spinal Cord and Brain Injury Research Board, Indiana State Department of Health Indiana – Individual Research Grant, \$120,000, PI

2013-2014 Functional recovery following traumatic brain injury by sparing motoneuron dendrites from atrophy with a novel peptide therapeutic, Indiana State Department of Health Indiana – Individual Research Grant, \$120,000, co-PI

Industry

2012 ENA (Extendend NeuroAmides), cellular and whole animal pharmacological evaluation, Neurogate LLC, KickStart grant, \$22,000, sub-contractor (PI: Kohn)

2016-2017 TEV-48125 in brain injury and bladder, TEVA Pharmaceutical Industries, LTD, 5% effort, \$176,390, Sub-contractor (PI: Porreca)

2018-2019 Development of NaV1.7 allosteric modulators (Seed investment of \$2,000,000 from UA Venture Capital Fund; CEO of Regulonix Holding Inc., CSO: Khanna)

https://tucson.com/business/tucsonan-launches-venture-capital-fund-to-support-ua-tech-start/article_cb5b442a-488e-5dd2-95e4-fadb40818a05.html

https://tucson.com/business/tucson-tech-ua-cites-impact-of-tech-startups-as-numbers/article_d699d94a-53ae-542b-a045-0b4f8904eeec.html

<https://www.azbio.org/non-opioid-pain-therapeutics-company-regulonix-raises-2-million-in-seed-funding-led-by-uaventure-capital-fund>

<http://memo.ahsc.arizona.edu/index.cfm/memos/view/33548/3e537a409c18e92d>

<https://www.facebook.com/UACOM.Tucson/videos/1464773500320168/>

Private Foundations

2010-2011 Preclinical studies of a small peptide-based disruptor of calcium channel complexes as a novel therapeutic for chronic pain and migraine, Ralph W. and Grace M. Showalter Research Trust Fund, \$60,000, PI

2010-2011 Screening and validation of peptide-based disruptors of the neurofibromin and CRMP-2 interaction as novel therapeutic tools for NF1, Children's Tumor Foundation, \$15,000, PI

2012-2013 Assessment of peptide-based disruptors of the neurofibromin and CRMP-2 interaction as novel analgesics for neurofibromatosis type 1 (NF1), Drug Discovery Award Initiative, Children's Tumor Foundation, \$50,000, PI

2012-2013 A Cure for Epilepsy: Prevention of Post-traumatic Epilepsy by Targeting CRMP2-mediated Axon Sprouting, Ralph W. and Grace M. Showalter Research Trust Fund, \$60,000, PI

2015-2017 Molecular Targeting of Migraine in the NF1 Population, Children's Tumor Foundation, 1% effort, \$90,000, Sponsoring PI

2016-2018 Synodos - NF1 Porcine Model Collaborative Research Program, Children's Tumor Foundation, 10% effort, \$287,601, PI

2021 TAF1, T-Type channels, and X-linked Dystonia Parkinsonism, Collaborative Center for X-linked Dystonia Parkinsonism (CCXDP), 10% effort, \$549,916, PI

University

2012 Development of analgesic peptide therapeutics for AIDS-related neuropathic pain, Funding Opportunities for Research Commercialization and Economic Success (FORCES) grant, Indiana University Research Technology and Commercialization, \$25,000, PI

2012 Treatment of neuropathic pain by a small-molecule inhibitor of beta subunits of voltage-gated calcium channel complexes, Program Project Planning (P3) grant from Indiana University, \$100,000, multi-PI

2013 CBD3, a novel peptide therapeutic for chronic pain, Research Invention and Scientific Commercialization Program, Indiana Clinical and Translational Sciences Institute, \$25,000, PI

2015 Inducible CRISPR-Cas9 Knock-in Mice for Genome Editing and Neuropathic Pain Modeling, University of Arizona Genetically Engineered Mouse Modeling Core Grant, \$10,000, PI

- 2016 Evaluating novel pain therapeutics targeting sodium channels in human nociceptors for improved success of clinical translatability, Arizona Area Health Education Centers (AHEC) Program Research Grants, \$10,000, PI
- 2016 Regulators of NaV1.7 Channels: Novel Anti-Nociceptive Drug Candidates, Tech Launch Arizona Asset Demonstration Award, \$50,000, multi-PI
- 2016 Drug metabolism and pharmacokinetic (DMPK) and Safety Profiling of Regulators of Sodium Channels (ReNs) 155 and 194, Tech Launch Arizona Asset Demonstration Award, \$65,000, multi-PI
- 2017 From Pathophysiology to Therapeutics in Childhood Epilepsy: A translational approach using an SCN8A mouse model and human induced pluripotent stem cells, Improving Health/BIO5 Institute Accelerate for Success Program, \$99,164 (PI: Michael Hammer; Co-Is: Thomas Cowen, Tom Doetschman, Rajesh Khanna, Tally Largent-Milnes, Lalitha Madhavan, Helena Morrison, Todd Vanderah)
- 2019 Green Light Therapy for Chronic Pain (Administrative Supplement) NIH, 10% effort, coPI: Ibrahim, UA (PI) 09/01/2019 - 08/31/2020
- 2021 Blocking NRP-1 for the Treatment of Pain, Cancer and Prevention of Viral Entry; Tech Launch Arizona Asset Demonstration Award, \$59,910, PI
- 2021 A NaV1.7 mouse lacking the CRMP2-binding domain: examining specificity of NaV1.7-CRMP2 coupling and testing if pain resolution requires endogenous opioid signaling; 2021 Core Facilities Pilot Program, \$10,000, PI
- 2022 TAF1, T-Type channel activators, and X-Linked Dystonia Parkinsonism, Collaborative Center for X-Linked Dystonia-Parkinsonism (CCXDP) Investigator Award, 10% effort, PI (2 year award totaling \$500,000)
- 2022 Antagonists of CRMP2 phosphorylation for chemotherapy-induced peripheral neuropathy, 1R61NS126026-01A1, 20% effort, PI (co-Is: Dr. Andrea Hohmann, IU Bloomington; and Dr. Gerald Zamponi, Univ. of Calgary, Canada) \$1,394,887

Submitted

- 2019 Modulation of EAE disease by Collapsin Response Mediator Protein 2, NIH R01, 10% effort, Co-Investigator (PI: Feinstein, UIC)
- 2019 CRMP2, Mitochondria, and Huntington's Disease (Administrative Supplement) NIH, 10% effort, multi-PI (multi-PI: Brustovetsky, UA) 09/01/2019 - 08/31/2020
- 2019 The University of Arizona Health Sciences Older Americans Independence Center, NIH P30, 10% (co-investigator; Co-Leader of Biological Mediators Measurement Core)
- 2020 Age-dependent recovery after mild traumatic brain injury through remote ischemic conditioning NIH R21 A1, 3% effort, Co-I (Multi-PIs: Kaveh Laksari and Elizabeth Hutchinson)
- 2020 Evaluation of Contulakin-G a novel, non-opioid, neurotensin analogue for the treatment of cancer pain NIH R01, 5% effort, Co-Investigator (PI: Patwardhan, UA)
- 2021 SARS-CoV-2 Spike protein highlights a role for VEGF-A/Neuropilin-1 receptor signaling in nociceptive processing, NIHR01, 20% effort, PI (Co- Investigator – Aubin Moutal) Impact 30, percentile 20
- 2021 Zinc Finger Protein based repression of VEGF-A for Neuropathic Pain, NIH R41, 10% effort, PI (Aubin Moutal, Pharmacology, PI of UA subcontract)
- 2021 Targeting the neuropilin-1 receptor (NRP-1)/VEGF-A axis for neuropathic pain, NIH R41, 10% effort, PI (Aubin Moutal, Pharmacology, PI of UA subcontract)
- 2021 Novel Drug Candidates for Rare Extreme Pain Disorder, NIH R41, 10% effort, PI (Aubin Moutal, Pharmacology, PI of UA subcontract)
- 2021 Inhibitors of CRMP2 phosphorylation for pain relief, NIH R41, 10% effort, PI (Aubin Moutal, Pharmacology, PI of UA subcontract) 36% percentile
- 2022 Slc7a5 (Lat1) Inhibitors for Chronic Pain, NIH R34, 5% effort, co-I (Aubin Moutal, Pharmacology, multi-PI with Dr. Sascha Alles, Univ. New Mexico)

- 2022 Dissection of NTSR2/calcium channel signaling as a non-opioid spinal analgesic mechanism for the treatment of high impact chronic pain, NIHR01 1R01NS129487-01A1 10% effort, (Multi-PIs: Rajesh Khanna and Amol Patwardhan (contact PI)) **33% percentile**
- 2022 Studies on RGS4 regulated pathways in models of neuropathic pain, NIHR01 5% effort, co-I (PI: Venetia Zachariou)
- 2022 CRMP2 and mitochondrial dynamics in Alzheimer's disease, NIHR01 10% effort, MPI (Multi-PIs: Rajesh Khanna and Nickolay Brustovetsky (contact PI))
- 2022 Validation of Neuropilin-1 receptor signaling in nociceptive processing NIHR01 5% effort, MPI (Multi-PIs: Rajesh Khanna (contact PI) and Aubin Moutal)

LIST OF COLLABORATORS

New York University

Brian Schmidt, PhD, MD, DDS; Nigel Bunnett, PhD; Paramjit Arora, PhD; Dane Jensen, PhD; Rodrigo Lacruz, PhD; Kara Margolis, MD PhD; Yi Ye, PhD.

External

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This is a true and accurate statement of my activities and accomplishments. I understand that misrepresentation in securing promotion and tenure may lead to dismissal or suspension.



Signed: _____ Date: __09/12/2022