

# Mayur J Patil

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Email: patil5@usf.edu, Date of birth: May 5<sup>th</sup>, 1979, Sex: Male

## Education and qualifications

**1997-2000** Bachelor of Science, Microbiology, Department of Microbiology, VES College, Mumbai University, Mumbai, India

**2000-2002** Masters in Life Sciences, Neuroscience Major, Sophia College, Mumbai University, Mumbai, India

**2004-2007** Masters in Cell and Molecular Biology, Tulane University, New Orleans, LA

**2010-2016** PhD. in Pharmacology, "Prolactin-A target for female-specific management of postoperative pain". Mentor: Armen Akopian, UTHSCSA, San Antonio, TX

**2016-2017** Postdoctoral fellow, Mentor: Armen Akopian, UTHSCSA, San Antonio, TX

**2017-2019** Postdoctoral fellow, Mentor: Brad Udem, Johns Hopkins University, Baltimore, MD

**2019-2020** Postdoctoral fellow, Mentor: Marian Kollarik, USF, Tampa, FL

**2020-present** Postdoctoral fellow, Mentor: Tom Taylor-Clark, USF, Tampa, FL

## Awards and Honors

**2013:** American Heart Association Pre-doctoral fellowship award

**2012:** Maria Yeung Student Research Award from the Dental school, University of Texas Health Science Centre at San Antonio

**2012:** Travel Award for the 2012 International Association for Study of Pain (IASP) meeting held in Milan

**2014:** Travel Award for the 2014 IASP meeting held in Buenos Aires, Argentina.

**2016:** First place in oral presentation, Dental Science Symposium, University of Texas Health Science Centre at San Antonio

**2017:** Second place in oral presentation, Dental Science Symposium, University of Texas Health Science Centre at San Antonio

**2018:** Inaugural Marsh Research Postdoctoral Fellowship Award winner, Asthma and Allergy Division of Department of Medicine, Johns Hopkins University, Baltimore

**2022:** Warren Alpert Distinguished Postdoctoral Scholar Fellowship Award

## Support

**2022-2024** Warren Alpert Foundation Fellowship Grant (07/22-06/24) \$400,000

## **Oral Presentations**

1. "Regulation of inflammation-induced TRPA1-TRPV1 activity via their interaction" Pharmacology Department Summer Research Practicum, University of Texas Health Science Centre at San Antonio, San Antonio, Texas, 2011.
2. "Evaluation of Nociception in Prolactin and Prolactin Receptor null-mutant female and male mice in models of Inflammatory Pain" Dental Science Symposium, University of Texas Health Science Centre at San Antonio, San Antonio, Texas, 2012.
3. "Der p 3 Allergen Activated Ano-1 Channel On Afferent Airway Nerves Regulates Th2 Cell Responses" AAAAI meeting 2014.
4. "Type I and II Interferons cause airway symptoms by acutely evoking action potential discharge from vagal C-fibers in mouse lungs" Asthma and Allergy Division of Department of Medicine, Johns Hopkins University, Baltimore 2018
5. "Activation of Airway Afferent Vagal C-fibers by Sphingosine-1-Phosphate and Interferons" Department of Molecular Pharmacology & Physiology, University of South Florida, Tampa, 2019
6. "Role of Airway Vagal Sensory neurons in House Dust Mite mediated Asthma" Department of Molecular Pharmacology & Physiology retreat, University of South Florida, Tampa, 2021.
7. "Role of Sensory Neurons in Sensing Inflammatory Mediators" Department of Molecular Pharmacology & Physiology, Special Seminar, University of South Florida, Tampa, 2022.

## **Research Interests and Projects**

- Neuroendocrinology - Sex hormonal regulation of the pain pathway.
- Neuroimmunology - Regulation of immune system by neurons, particularly sensory nerves in the airways.
- Activation of Airway nerves by inflammatory mediators

## **Teaching**

- Biochemistry 101 - Tulane University
- Genetics lab 101 - Tulane University
- Molecular biology 201 - Tulane University
- Molecular biology lab 301 - Tulane University
- Microbiology lab 301 - Tulane University
- Biology lab 101 - Tulane University
- Airway Physiology – Johns Hopkins University

## **Society Memberships**

Society for Neuroscience 2010-present

American Pain Society

International Association for the Study of Pain

American Academy of Allergy Asthma and Immunology

## Publications

1. Linley JE, Rose K, **Patil MJ**, Robertson B, Akopian AN, Gamper N (2008) Inhibition of M current in sensory neurons by exogenous proteases: a signaling pathway mediating inflammatory nociception. *The Journal of Neuroscience*: 28:11240-11249.
  2. **Patil MJ**, Jeske NA, Akopian AN (2010) Transient receptor potential V1 regulates activation and 3. modulation of transient receptor potential A1 by Ca<sup>2+</sup>. *Neuroscience* 171:1109-1119.
  3. Lautner MA, Ruparel SB, **Patil MJ**, Hargreaves KM (2011) In vitro sarcoma cells release a lipophilic substance that activates the pain transduction system via TRPV1. *Annals of Surgical Oncology* 18:866-871.
  4. **Patil MJ**, Patwardhan A, Salas MM, Hargreaves KM, Akopian AN (2011) Cannabinoid receptor antagonists AM251 and AM630 activate TRPA1 in sensory neurons. *Neuropharmacology* 61:778- 788.
  5. Scotland PE, **Patil MJ**, Belugin S, Henry MA, Goffin V, Hargreaves KM, Akopian AN (2011) Endogenous prolactin generated during peripheral inflammation contributes to thermal hyperalgesia. *The European Journal of Neuroscience* 34:745-754.
  6. **Patil MJ**, Belugin S, Akopian AN (2011) Chronic alteration in phosphatidylinositol 4,5-biphosphate levels regulates capsaicin and mustard oil responses. *Journal of Neuroscience Research* 89:945- 954.
  7. Ruparel S, Henry MA, Akopian A, **Patil MJ**, Zeldin DC, Roman L, Hargreaves KM (2012) Plasticity of cytochrome P450 isozyme expression in rat trigeminal ganglia neurons during inflammation. *Pain* 153:2031-2039.
  8. **Patil MJ**, Green DP, Henry MA, Akopian AN (2013) Sex-dependent roles of prolactin and prolactin receptor in postoperative pain and hyperalgesia in mice. *Neuroscience*. Dec 3; 253:132-41
  9. **Patil MJ**, Ruparel SB, Henry MA, Akopian AN (2013) Prolactin Regulates TRPV1, TRPA1 and TRPM8 in Sensory Neurons in Sex-dependent Manner: Contribution of Prolactin Receptor to Inflammatory Pain. *American Journal of Physiology Endocrinology and Metabolism*. Nov 1;305(9): E1154-64
  10. **Patil MJ**\*, Belugin S, AR Diogenes, E. Ginsburg, M. A. Henry and A. N. Akopian (2013). "Mechanisms of Transient Signaling via Short and Long Prolactin Receptor Isoforms in Female and Male Sensory Neurons." *J Biol Chem* 288(48): 34943-34955.
- \*Contributed equally to the study
11. **Patil MJ**, Henry MA, Akopian AN (2014) Prolactin receptor in regulation of neuronal excitability and channels. *Channels (Austin)* 8(3):193-202.
  12. Henry MA, Fairchild DD, **Patil MJ**, Hanania T, Hain HS, Davis SF, Malekiani SA, Hu A, Sucholeiki R, Nix D, Sucholeiki I (2015). "Effect of a Novel, Orally Active Matrix Metalloproteinase-2 and -9 Inhibitor in Spinal and Trigeminal Rat Models of Neuropathic Pain". *J Oral Facial Pain Headache*. Summer;29(3):286-96. doi: 10.11607/ofph.1350
  13. Green DP, Ruparel SB, Gao X, Ruparel NB, **Patil MJ**, Akopian AN, Hargreaves KM (2016). "Central activation of TRPV1 and TRPA1 by novel endogenous agonists contributes to mechanical and thermal allodynia after burn injury". *Molecular Pain*, Vol 12, July 2016
  14. Green DP, **Patil MJ**, Akopian AN (2016). "Influence of hypophysectomy, ovariectomy and gonadectomy on postoperative hypersensitivity in rats". *Glob Anesth Perioper Med*, 2016 doi: 10.15761/GAPM.1000145.
  15. Mecklenburg J, **Patil MJ**, Koek W, Akopian AN (2017). "Effects of local and spinal administrations of mu-opioids on postoperative pain in aged versus adult mice". *Pain Rep*. 2017 Jan;2(1). pii: e584. doi: 10.1097/PR9.0000000000000584.
  16. Yu X, **Patil MJ**, Yu M, Liu Y, Wang J, Udem BJ, Yu S." Sphingosine 1 Phosphate selectively activates vagal afferent C-fiber subtype in guinea pig esophagus". *Neurogastroenterology Motil*, 2018 Apr 19: e13359. Doi: 10.1111/nmo.13359.
  17. **Patil MJ**, Hovhannisyian AH, Akopian AN. "Characteristics of sensory neuronal groups in CGRP- cre-ER reporter mice: Comparison to Nav 1.8-cre, TRPV1-cre and TRPV1-GFP mouse lines". *PLOS One*. 2018 Jun 4; 13(6): e0198601. doi: 10. 1371/journal.pone.0198601
  18. **Patil MJ**, Sonya Meeker, Diana Bautista, Dong X, Udem B. "Sphingosine-1-phosphate activates mouse vagal airway afferent C-fibers via S1PR3 receptors". *Journal of Physiology*. 2019. 10.1113/JP277521.
  19. Sun H, Lin A, Ru F, **Patil MJ**, Meeker S, Lee L, Udem B. "KCNQ/M-channels Regulate Mouse Vagal Bronchopulmonary C-fiber Excitability and Cough Sensitivity". *JCI Insight*. 2019;4(5):e124467

20. **Patil MJ\***, Yongming Huang, Mingwei Yu, Peter Liptak, Bradley J. Udem, Xinzhong Dong, Guobin Wang, Shaoyong Yu. (2019) "Effects of ginger constituent 6-shogaol on gastroesophageal vagal afferent C-fibers". *Neurogastroenterology and Motility*  
\*Contributed equally to the study
21. **Patil MJ**, Hui Sun, Fei Ru, Sonya Meeker, Bradley J. Udem. Targeting C-fibers for Peripheral acting antitussive drugs. *Pulmonary Pharmacology and Therapeutics*. 56 (2019) 15-19.
22. **Patil MJ**, Hovhannisyah AH, Wangzhou A, Mecklenburg J, Koek W, Goffin V, Grattan D, Boehm U, Dussor G, Price TJ, Akopian AN. (2019) Prolactin receptor expression in mouse dorsal root ganglia neuronal subtypes is sex-dependent. *J Neuroendocrinol*. Aug;31(8):e12759. doi: 10.1111/jne.12759.
23. **Patil MJ**, Belugin S, Mecklenburg, Wangzhou A, Mecklenburg J, Koek W, Goffin V, Grattan D, Boehm U, Dussor G, Price TJ, Akopian AN. (2019). Prolactin Regulates Pain responses Via a Female-selective Nociceptor-specific mechanism. Oct 25th, 2019, *iScience*, 20, 449-465.
24. **Patil MJ**, Salas M, Belugin S, Boyd JT, Jeske NA, Akopian AN. (2020). Sensitization of Small-Diameter Sensory Neurons Is Controlled by TRPV1 and TRPA1 Association. Jan 2020, *FASEB J*, 34 (1), 287-302.
25. Kim S, Hadley S, Maddison M, **Patil MJ**, Cha B, Kollarik M, Taylor-Clark T. (2020) Mapping of Sensory Nerve Subsets Within the Vagal Ganglia and the Brainstem Using Reporter Mice for Pirt, TRPV1, 5-HT3, and Tac1 Expression. Apr 9th, 2020, *eNeuro*, 7 (2).
26. Kim S, Bahia P, **Patil MJ**, Sutton S, Sowell I, Hadley S, Kollarik M, Taylor-Clark T. (2020) Development of a mouse reporter strain for the purinergic P2X2 receptor. 2020, *eNeuro*
27. Paige C, Barba-Escobedo P, Mecklenburg J, **Patil MJ**, Goffin V, Grattan D, Dussor G, Akopian A, Price T. (2020). Neuroendocrine mechanisms governing sex-differences in hyperalgesic priming involve prolactin receptor sensory neuron signalling. 2020 *Journal of Neuroscience*
28. **Patil MJ**, Ru F, Sun H, Wang J, Kolbeck R, Dong X, Kollarik M, Canning B, Udem B. (2020). Acute Activation of Bronchopulmonary Vagal Nociceptors by Type I Interferons. 2020 *Journal of Physiology*
29. Pavelkova N, Brozmanova M, **Patil MJ**, Kollarik M. (2021). Voltage-Gated Sodium Channels Mediating Conduction in Vagal Motor Fibers Innervating the Esophageal Striated Muscle. 2020 *Physiological Research*
30. Hadley S, **Patil MJ**, Pavelkova N, Kollarik M, Taylor-Clark T. (2021) Contribution of tetrodotoxin-sensitive, voltage-gated sodium channels (Na V 1) to action potential discharge from mouse esophageal tension mechanoreceptors. *Am J Physiol Regul Integr Comp Physiol*. 2021 Nov 1;321(5):R672-R686.
31. Kim S, **Patil MJ**, Hadley S, Bahia P, Butler S, Madaram M, Taylor-Clark T. (2022) Mapping of the Sensory Innervation of the Mouse Lung by Specific Vagal and Dorsal Root Ganglion Neuronal Subsets. *eNeuro*. 2022 Apr 13;9(2): ENEURO.0026-22.2022. doi: 10.1523/ENEURO.0026-22.2022.
32. Sun H, **Patil MJ**, Ru F, Meeker S, Udem B. (2022) Kv1/D-type potassium channels inhibit the excitability of bronchopulmonary vagal afferent nerves. *Journal of Physiology*. 2022 Apr 17. doi: 10.1113/JP282803.

## Conference Abstracts

1. **Mayur J. Patil**, Kenneth M. Hargreaves and Armen N. Akopian. Regulation of TRPV1 and TRPA1 activities by PIP2 in TRPA1/TRPV1 expressing cells. **2008 Society for Neuroscience meeting**. Poster Presentation.
2. **Mayur J. Patil**, Sergei Belugin, Michael A. Henry, Kenneth M. Hargreaves, and Armen N. Akopian. Regulation of Prolactin System in Sensory Neurons by Estrogen and Testosterone. **2010 Society for Neuroscience meeting**. Poster Presentation.
3. **Mayur J. Patil**, Jie Li, Armen Akopian. Regulation of inflammation-induced TRPA1-TRPV1 activity via their interaction. **2011 UTHSCSA Graduate Sciences Symposium**. Poster Presentation.
4. **Mayur J. Patil**, Jie Li, Michael A. Henry and Armen Akopian. Nociception in Prolactin and Prolactin Receptor Null-Mutant female and male mice. **2011 Society for Neuroscience meeting**. Poster Presentation.
5. **Mayur J. Patil**, Michael A. Henry and Armen N. Akopian. Asthma-inducing Mold and House Dust Mite Allergens Activate and Sensitize Sensory Neurons Innervating Airways. **2012 AAAAI meeting**. Poster

Presentation.

6. **Mayur J.Patil**, Jie Li, Armen Akopian. Regulation of inflammation-induced TRPA1-TRPV1 activity via their interaction. **2012 American Pain Society meeting**. Poster Presentation.
7. **Mayur J.Patil**, Michael A. Henry and Armen N. Akopian. Evaluation of Nociception in Prolactin and Prolactin Receptor null-mutant female and male mice in models of Inflammatory Pain. **IASP 2012**, Poster presentation.
8. **Mayur J.Patil**, Henry MA and Akopian AN. Roles of prolactin and prolactin receptor in hyperalgesia for postoperative pain model in male and female mice. **2013 Society for Neuroscience meeting**. Poster Presentation.
9. **Mayur J.Patil**, Edward G Brooks, Michael Henry, Armen Akopian. Der p 3 Allergen Activated Ano-1 Channel on Afferent Airway Nerves Regulates Th2 Cell Responses. **2013 AAAAI meeting**. **Poster Presentation**.
10. **Mayur J.Patil**, Edward G Brooks, Michael Henry, Armen Akopian. Airway Sensory Neuronal TRPA1 Does Not Mediate OVA Induced Allergic Asthma. **2014 AAAAI meeting**. **Poster Presentation**.
11. **Mayur J.Patil**, Vincent Goffin, Henry MA, and Akopian AN. Female-specific Regulation of Postoperative Pain by Sensory Neuronal Prolactin Receptor and Extra-pituitary Prolactin. **2016 Society for Neuroscience meeting**. Poster Presentation.
12. **Mayur J. Patil**, Sonya Meeker, and Bradley Udem. Activation of Airway Afferent Vagal C-fibers by Sphingosine-1-Phosphate. Experimental Biology meeting 2018.
13. **Mayur J. Patil**, and Bradley Udem. Regulation of Airway Vagal Afferent C-fibers by Type I and Type II Interferons. Experimental Biology meeting 2019.
14. **Mayur J. Patil**, Kim S, Kollarik M, Taylor-Clark T. SPARC: The Structure and Location of Vagal Nociceptive Nerve Fibers in the Mouse Trachea. Experimental Biology meeting 2022.

#### **Service: AD HOC Reviewer of Scientific Journals**

- American Journal of Physiology-Lung Cellular and Molecular Physiology Pharmacology
- Journal of Asthma and Allergy
- Neurogastroenterology and Motility
- Frontiers in Physiology
- Journal of Physiology and Pharmacology
- Pulmonary Pharmacology and Therapeutics

#### **Technical experience**

- Various pain behavior techniques -surgeries, implantations, nociception, thermal, cold, and mechanical allodynia
- Various molecular biology techniques – Cloning, WB, RT-PCR, Co-IP, ELISA
- Tissue culture: cell lines, primary neuronal culture, primary acute lung cell culture (i.e. epithelial, fibroblasts and so on)
- Immunohistochemistry (IHC) and in situ hybridization (ISH)
- Calcium imaging
- Mouse breeding (knockout, transgenic and conditional)
- Lung function – Flexivent and Buxco (performed on EMKA machine)
- Generation of allergy models (OVA and other natural allergens)
- Cough measurement using Buxco
- Various rodent surgeries
- Radioimmune and Luminex assays
- DNA transfection into sensory neurons and other non-neuronal cells
- FACS

- Extracellular lung-vagal nerve-ganglia electrophysiology
- Ex vivo 2-Photon microscopy
- Single cell RT-PCR

### **Referees**

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