Sabhya Rana, Ph.D.

NINDS K99 Fellow
Department of Physical Therapy
Breathing Research and Therapeutics Center
University of Florida

Email: Sabhya.rana@phhp.ufl.edu | **Phone**: (949) 338-4655 | **Research Profile:** ResearchGate , Google Scholar

RESEARCH INTERESTS

I am a systems neuroscientist and my research explores how glutamatergic neurotransmission modulates motor neuron activity in the context of respiratory motor control. Further, I am investigating how pharmacological and non-invasive neuromodulatory therapies can be leveraged as therapeutic modalities in preclinical models of spinal cord injury models. I use approaches including neuromodulation, microsurgery, electrophysiology, behavioral tests, retrograde viral tracing, anatomical and histopathological analysis, advanced imaging techniques, molecular and cellular assays, and advanced EMG signal analysis to develop and test hypotheses.

EDUCATION

Doctor of Philosophy, Biomedical Science
Track: Neuroscience
Mayo Clinic Graduate School of Biomedical Sciences, 7/2014 – 1/2019

Bachelor of Science in Biological Sciences
University of California, Irvine, 9/2008 – 9/2011

RESEARCH BACKGROUND

Research Assistant Scientist
8/2024 – Present

Fuller Lab | Breathing Research and Therapeutics Center | University of Florida
• Development of non-invasive spinal stimulation strategies to enhance respiratory output in disease and injury conditions

Postdoctoral Research Associate
12/2019 – Present

Fuller Lab | Breathing Research and Therapeutics Center | University of Florida
Mentor: Dr. David D. Fuller

• Development of pharmacological therapies (ampakines) to restore breathing after traumatic spinal cord injury
• Study neural control of breathing in awake rodents
• Study the impact of Pompe Disease on breathing
• Development of AAV therapies to target neural dysfunction in Pompe Disease

Postdoctoral Research Fellow
1/2019 – 11/2019

Cell and Regenerative Physiology Laboratory | Department of Physiology and Biomedical Engineering | Mayo Clinic
Mentors: Dr. Gary C. Sieck and Dr. Carlos B. Mantilla

• Investigate mitochondrial function across motor neuron types
• Study the impact of aging on mitochondrial function in motor neurons

Doctoral Student
7/2014 – 1/2019

Regenerative Physiology Laboratory | Department of Physiology and Biomedical Engineering | Mayo Clinic
Thesis: Neuroplasticity of Respiratory Motor Control Following Spinal Cord Injury
Co-Mentors: Dr. Carlos B. Mantilla and Dr. Gary C. Sieck

• Study glutamatergic neurotransmission at phrenic motor neurons
• Impact of mid-cervical spinal cord injuries on diaphragm muscle function
• Elucidate mechanisms of neuroplasticity at the motor neuron level

Junior Specialist
9/2013 - 6/2014

Department of Anesthesiology and Perioperative Care | University of California, Irvine
Mentor: Dr. Leif Havton

• Characterize bladder recovery following transplantation of human embryonic stem cell-derived motor neurons in a conus medullaris injury model

Lab Assistant II
9/2011 – 9/2013

Reeve Irvine Research Center | University of California, Irvine
Mentor: Dr. Oswald Steward

• Participated in three spinal cord injury replication studies conducted under the Facilities of Research Excellence in Spinal Cord Injury (FORE-SCI) project funded by NINDS
• Assess functional recovery and axonal regeneration after PTEN gene deletion in mice with acute and chronic spinal cord injury

Lab Assistant IV
8/2010 – 9/2011

Reeve Irvine Research Center | University of California, Irvine
Mentors: Dr. Hans Keirstead and Dr. Magdalene Seiler

• Evaluate visual recovery and tissue integration of retinal progenitor sheet transplants into corneas of rats with rod degeneration

RESEARCH GRANTS AND SCHOLARSHIPS

4/2024 – 4/2029

Career transition award (K99/R00), National Institutes of Health National Institute of Neurological Disease and Stroke
Title: Spinal Direct Current Stimulation to Enhance Breathing Following Cervical Spinal Cord Injury
Role: Principal Investigator

7/2023 – 4/2024

Parker B Francis Foundation Fellowship (About)
Title: Trans-spinal Direct Current Stimulation and Ampakine Therapy to Enhance Breathing
Role: Principal Investigator
$225k for 3 yrs (salary, fringe, travel)
**Relinquished in 2024 to accept K99*

7/2021 – 7/2023

Spinal Cord Injury Research on the Translational Spectrum: Craig H. Neilsen Foundation (About)
Title: Ampakine mediated respiratory recovery following cervical spinal cord injury
Role: Principal Investigator
$150,000 for 2 yrs (salary, fringe, travel, science materials)

7/2014 – 1/2019

Mayo Clinic Graduate School of Biomedical Sciences Fellowship
100% Support for tuition and stipend for 5 yrs

7/2014 – 7/2016

Dean's Fellowship - Mayo Clinic Graduate School of Biomedical Sciences
$6,000 for 2 yrs

PUBLICATIONS

1. Benevides ES, **Rana S**, Fuller DD. Chemogenetic activation of the diaphragm after spinal cord injury in rats. Respiratory Physiology & Neurobiology, 2025, 104421, ISSN 1569-9048, doi.org/10.1016/j.resp.2025.104421

2. Radin DP, Lippa A, **Rana S**, Fuller DD, Smith JL, Cerne R, Witkin JM. Amplification of the Therapeutic Potential of AMPAkines from the Nootropic Era to Today. Pharmacol Biochem Behav. 2025 Jan 31:173967. doi: 10.1016/j.pbb.2025.173967. Epub ahead of print. PMID: 39894310.

3. Kondiles BR, **Rana, S.,** Weiner, D, Blesch A, St. John J, Haag-Molkenteller C, Freund P, Guest J, Mikol D, Harkema S, Trumbower R, Fehlings M, Weidner N, Hogge GS, Field-Fote E, Hsieh J*, Jones L*. Lessons Learned and Recommendations from the SCOPE 2023 Spinal Cord Injury Clinical Trials Update. *Accepted at Neurotrauma Reports on 12/27/24*

4. Fusco A, **Rana S**, Jorgenson M, Bindi V, Sunshine MD, Shaw G, Fuller DD. Immunohistochemical labeling of ongoing axonal degeneration 10 days following cervical contusion spinal cord injury in the rat. Spinal Cord (2025). https://doi.org/10.1038/s41393-024-01053-x

5. **Rana S*,** Fusco AF, Witkin JM, Radin DP, Cerne R, Lippa A, Fuller DD. Pharmacological modulation of respiratory control: Ampakines as a therapeutic strategy. Pharmacol Ther. 2024 Nov 7:108744. doi: 10.1016/j.pharmthera.2024.108744. Epub ahead of print. PMID: 39521442.
***corresponding author*

6. Witkin JM, Radin DP, **Rana S**, Fuller DD, Fusco AF, Demers JC, Pradeep Thakre P, Smith JL, Lippa A, Cerne R. AMPA receptors play an important role in the biological consequences of spinal cord injury: Implications for AMPA receptor modulators for therapeutic benefit. Biochem Pharmacol. 2024 May 17:116302. doi: 10.1016/j.bcp.2024.116302. PMID: 38763261.

7. **Rana *S***, Thakre PP, Fuller DD. Ampakines increase diaphragm activation following mid-cervical contusion injury in rats. Exp Neurol. 2024 Apr 4;376:114769. doi: 10.1016/j.expneurol.2024.114769. PMID: 38582278.

8. **Rana S***, Alom F*, Martinez RC, Fuller DD, Mickle AD. Acute ampakines increase voiding function and coordination in a rat model of SCI. Elife. 2024 Mar 7;12:RP89767. doi: 10.7554/eLife.89767. PMID: 38451184. **Authors contributed equally*

9. Fogarty MJ, **Rana S**, Mantilla CB, Sieck GC. Size-dependent differences in mitochondrial volume density in phrenic motor neurons. J Appl Physiol (1985). 2023 Jun 1;134(6):1332-1340. doi: 10.1152/japplphysiol.00021.2023. Epub 2023 Apr 6. PMID: 37022966; PMCID: PMC10190832.

10. Shaw G, Madorsky I, Li Y, Wang Y, Jorgensen M, **Rana S**, Fuller DD. Uman-type neurofilament light antibodies are effective reagents for the imaging of neurodegeneration. Brain Commun. 2023 Mar 16;5(2):fcad067. doi: 10.1093/braincomms/fcad067. PMID: 37091583; PMCID: PMC10120172.

11. Thakre PP, **Rana S**, Benevides ES, Fuller DD. Targeted drug or gene delivery to the phrenic motoneuron pool. J Neurophysiol. 2022 Nov 23;. doi: 10.1152/jn.00432.2022. Review. PubMed PMID: 36416447.

12. Singer M, Benevides E, **Rana S**, Martinez R, Barral B, Byrne BJ, Fuller DD. Optogenetic activation of the tongue in spontaneously breathing mice. Respir Physiol Neurobiol. 2022 Nov 21; 103998. doi: 10.1016/j.resp.2022.103998. [Epub ahead of print] PubMed PMID: 36423822.

13. **Rana S,** Sunshine MD, Gaire J, Simmons CS, Fuller DD. Breathing patterns and CO_2 production in adult spiny mice (Acomys cahirinus). Respir Physiol Neurobiol. 2023 Jan;307:103975. doi: 10.1016/j.resp.2022.103975. Epub 2022 Oct 4. PubMed PMID: 36206972.

14. Fuller DD, **Rana S**, Smuder AJ, Dale EA. The phrenic neuromuscular system. Handb Clin Neurol. 2022;188:393-408. doi: 10.1016/B978-0-323-91534-2.00012-6. PMID: 35965035.

15. Singer ML, **Rana S**, Benevides ES, Barral BE, Byrne BJ, Fuller DD. Chemogenetic activation of hypoglossal motoneurons in a mouse model of Pompe disease. J Neurophysiol. 2022 Aug 17. doi: 10.1152/jn.00026.2022. PMID: 35976060.

16. Benevides ES, Sunshine MD, **Rana S**, Fuller DD. Optogenetic activation of the diaphragm. Sci Rep. 2022 Apr 20;12(1):6503. doi: 10.1038/s41598-022-10240-w. PMID: 35444167; PMCID: PMC9021282.

17. **Rana S**, Zhan WZ, Sieck GC, Mantilla CB. Cervical spinal hemisection alters phrenic motor neuron glutamatergic mRNA receptor expression. Exp Neurol. 2022 Jul;353:114030. doi: 10.1016/j.expneurol.2022.114030. Epub 2022 Mar 2. PMID: 35247372; PMCID: PMC9090312.

18. **Rana S**, Sunshine MD, Greer JJ, Fuller DD. Ampakines Stimulate Diaphragm Activity after Spinal Cord Injury. J Neurotrauma. 2021 Dec;38(24):3467-3482. doi: 10.1089/neu.2021.0301. PMID: 34806433; PMCID: PMC8713281.

19. Fuller DD, Trejo-Lopez JA, Yachnis AT, Sunshine MD, **Rana S,** Bindi VE, Byrne BJ, Smith BK. Case Studies in Neuroscience: Neuropathology and diaphragm dysfunction in ventilatory failure from late-onset Pompe disease. J Neurophysiol. 2021 Aug 1;126(2):351-360. doi: 10.1152/jn.00190.2021. Epub 2021 Jun 30. PubMed PMID: 34191636; PubMed Central PMCID: PMC8409957.

20. Doyle BM, Singer ML, Fleury-Curado T, **Rana S,** Benevides ES, Byrne BJ, Polotsky VY, Fuller DD. Gene delivery to the hypoglossal motor system: preclinical studies and translational potential. Gene Ther. 2021 Aug;28(7-8):402-412. doi: 10.1038/s41434-021-00225-1. Epub 2021 Feb 11. Review. PubMed PMID: 33574581; PubMed Central PMCID: PMC8355248.

21. **Rana S***, Fogarty MJ*, Mantilla CB, Sieck GC. Quantifying mitochondrial volume density in phrenic motor neurons. J Neurosci Methods. 2021 Apr 1;353:109093. doi: 10.1016/j.jneumeth.2021.109093. Epub 2021 Feb 4. PubMed PMID: 33549636; PubMed Central PMCID: PMC7990712. **Authors contributed equally*

22. Gaire J, Varholick JA, **Rana S**, Sunshine MD, Doré S, Barbazuk WB, Fuller DD, Maden M, Simmons CS. Spiny mouse (Acomys): an emerging research organism for regenerative medicine with applications beyond the skin. NPJ Regen Med. 2021 Jan 4;6(1):1. doi: 10.1038/s41536-020-00111-1. PMID: 33397999; PMCID: PMC7782534.

23. Pareja-Cajiao M, Gransee HM, Stowe JM, **Rana S,** Sieck GC, Mantilla CB. Age-related impairment of autophagy in cervical motor neurons. Exp Gerontol. 2021 Feb;144:111193. doi: 10.1016/j.exger.2020.111193. Epub 2020 Dec 5. PubMed PMID: 33290859; PubMed Central PMCID: PMC7968728.

24. **Rana S,** Zhan WZ, Mantilla CB, Sieck GC. Disproportionate loss of excitatory inputs to smaller phrenic motor neurons following cervical spinal hemisection. J Physiol. 2020 Oct;598(20):4693-4711. doi: 10.1113/JP280130. Epub 2020 Aug 19. PubMed PMID: 32735344; PubMed Central PMCID: PMC7869015.

* *Featured as Journal Cover: Volume 598, Issue 20, 15 October 2020*
** *Highlighted in a perspective article by Bolser. DOI: 10.1113/JP280588.*
*** *Selected as editor's choice article for issue*

25. **Rana S,** Sieck GC, Mantilla CB. Heterogeneous glutamatergic receptor mRNA expression across phrenic motor neurons in rats. J Neurochem. 2020 Jun;153(5):586-598. doi: 10.1111/jnc.14881. Epub 2019 Oct 17. PubMed PMID: 31563147; PubMed Central PMCID: PMC7101263.

* *Featured as Journal Issue Cover (June 2020). J. Neurochem., 153:. doi:10.1111/jnc.14747*

26. **Rana S,** Mantilla CB, Sieck GC. Glutamatergic input varies with phrenic motor neuron size. J Neurophysiol. 2019 Oct 1;122(4):1518-1529. doi: 10.1152/jn.00430.2019. Epub 2019 Aug 7. PubMed PMID: 31389739; PubMed Central PMCID: PMC6843086.

27. Khurram OU, Fogarty MJ, **Rana S,** Vang P, Sieck GC, Mantilla CB. Diaphragm muscle function following midcervical contusion injury in rats. J Appl Physiol (1985). 2019 Jan 1;126(1):221-230. doi: 10.1152/japplphysiol.00481.2018. Epub 2018 Sep 20. PubMed PMID: 30236045; PubMed Central PMCID: PMC6383644.

28. **Rana S,** Sieck GC, Mantilla CB. Diaphragm electromyographic activity following unilateral midcervical contusion injury in rats. J Neurophysiol. 2017 Feb 1;117(2):545-555. doi: 10.1152/jn.00727.2016. Epub 2016 Nov 9. PubMed PMID: 27832610; PubMed Central PMCID: PMC5288488.

29. **Rana S**, Gonzalez Porras MA, Mantilla CB, Sieck GC. The Burden of Proof of Nanotechnology. J Neuroscience. EPub Apr 17, 2016; *Letter to the Editor*

A full list of publications can be found at:
https://www.ncbi.nlm.nih.gov/myncbi/sabhya.rana.1/bibliography/public/

PRE-PRINT CONTRIBUTIONS *(pending acceptance of final publication)*

1. Benevides ES, Thakre PP, **Rana S**, Sunshine MD, Jensen VN, Oweiss K, Fuller DD. Chemogenetic stimulation of phrenic motor output and diaphragm activity. bioRxiv 2024.04.12.589188; doi: https://doi.org/10.1101/2024.04.12.589188

2. Fuller DD, **Rana S**, Thakre PP, Benevides ES, Pope M, Todd AG, Jensen VJ, Vaught L, Cloutier D, Ribas RA, Larson RC, Gentry MS, Sun RC, Chandran V, Corti M, Falk DJ, Byrne BJ. Neonatal systemic gene therapy restores cardiorespiratory function in a rat model of Pompe disease. bioRxiv 2024.12.10.627800; doi: https://doi.org/10.1101/2024.12.10.627800

MANUSCRIPTS UNDER REVIEW

1. Fuller DD, **Rana S**, Thakre PP, Benevides ES, Pope M, Todd AG, Jensen VJ, Vaught L, Cloutier D, Ribas RA, Larson RC, Gentry MS, Sun RC, Chandran V, Corti M, Falk DJ, Byrne BJ. Neonatal systemic gene therapy restores cardiorespiratory function in a rat model of Pompe disease. *Under review at Molecular Therapy (1st Revision submitted)*
2. Mickle A, **Rana S,** Benevides ES, Byrne B, Fuller DD, Dale E. A respiratory signature of disease progression in the Pompe rat. *Under review at Journal of Physiology*
3. Benevides ES, Thakre PP, **Rana S**, Sunshine MD, Jensen VN, Oweiss K, Fuller DD. Chemogenetic stimulation of phrenic motor output and diaphragm activity. *Under review at eLife (1st revision)*
4. Fusco A, **Rana S**, Mcintyre M, Gonzalez IA, Ribas R, Sun RC, Fuller DD. Safety and Efficacy of CX1739 as a Neuroprotective Intervention in the Acute and Subacute Period After Spinal Cord Injury. *Under review at Experimental Neurology*

MANUSCRIPTS IN PREPARATION

1. **Rana S,** Fuller DD. Detailed Evaluation of Diaphragm EMG and Ventilation in Unanesthetized Freely Behaving Rats Following High and Mid-Cervical Spinal Cord Injury. (Research Article)
2. **Rana S,** Sefiani A, Gonzalez I, Cabral K, Fuller DD, Geoffroy C. A novel Trk-B antagonist restores diaphragm activity following high cervical spinal cord injury in rats. (Research Article)
3. Diller A, **Rana S**, Thakre PP, Deegan K, Sunshine MD, Bindi VE, Chandran V, Nguyen B, Smuder AJ, Fuller DD. Going With the Flow: Assessing the Vasculature in the Diaphragm after Spinal Cord Injury. (Research Article)

4. Deegan K, **Rana S**, Martinez RC, Gonzalez IA, Thakre PP. Fuller DD. Normobaric Hyperoxia Treatment after Mid-cervical Contusion Injury in Rats. (Research Article)

PRESENTATIONS

1. George Washington University, Department of Pharmacology and Physiology*. Re-learning to breathe: Therapeutic strategies to alleviate respiratory depression following spinal cord injury. Washington DC.* 19th Sept, 2024.

2. SCI-SHARP Science Seminar*. Transcutaneous spinal cord stimulation to enhance hand function following SCI.* Hosted online. 30th July, 2024.

3. Neuroplasticity NeuroNines Seminar. Gainesville, FL. *Pharmacological Restoration of Motor Function after Spinal Cord Injury,* 8th June, 2023.

4. International Symposium on Neural Regeneration. Stevenson, WA. *Ampakine therapy improves respiratory muscle activation following cervical spinal cord injury*, 26th April, 2023.

5. Therapeutic Intermittent Hypoxia Virtual Workshop. *Ampakines Amplify Phrenic LTF.* Jan 7th 2022.

6. Unite 2 Fight Paralysis 2021 Symposium. **Rana S,** Alilain WJ. *Facilitating Meaningful Connections between SCI Researchers and the Community.* Oct 21st 2021. Hosted online due to COVID-19.

7. Brains and Brews Seminar. University of California, Irvine. *Drug Therapies to Restore Breathing after Spinal Cord Injury*. 4th Oct, 2021

8. Neuromedicine Seminar. Gainesville, FL. *Re-learning to Breathe after a Spinal Cord Injury.* Jun 28th, 2021.

9. Neuroplasticity NeuroNines Seminar. *Ampakine therapy to restore breathing after cervical spinal cord injury*. Jun 3rd, 2021. Hosted online due to COVID-19.

10. Motor Unit Group Seminar Series (MUGSS). Online. *Ampakines Enhance Diaphragm Motor Unit Activity and Ventilation in Awake Rats following Cervical Spinal Cord Injury*. Feb 22nd, 2021.

11. 2020 ACD Neuro Summit. *Motor Neuron Size Dependent Mechanisms of Neuroplasticity Following Spinal Cord Injury*. Nov 20, 2020. https://acdbio.com/2020-nov-12-acd-neuro-summit

12. Department of Physiology and Biomedical Engineering Seminar. Rochester MN. *Mechanisms of Neuroplasticity Following Spinal Cord Injury in the Respiratory System*. June 21, 2019.

13. Nature Webcast. *Motor Neuron Size Dependent Mechanisms of Neuroplasticity Following Spinal Cord Injury*. May 14, 2019. https://www.nature.com/webcasts/event/motor-neuron-size-dependent-mechanisms-of-neuroplasticity-following-spinal-cord-injury/

14. Experimental Biology Meeting, Orlando, FL. Hot Topics in Respiratory Control. *Cervical Spinal Hemisection Induced Changes in Glutamatergic Receptor Expression that Depend on Phrenic Motor Neuron Size*. Organizer: Peter MacFarlane. Apr 6, 2019.

SESSIONS

1. **Session Moderator:** Intermittent Hypoxia Workshop 2024, Basic Science Session; Shirley Ryan Ability Lab, 5th October 2024, Chicago, IL

2. **Co-Host:** Spinal Cord Outcomes Partnership Endeavors (SCOPE) clinical trials update (CTU) pre-course at the 2023 International Spinal Research Trust Meeting, 14th September 2023, London, UK

3. **Co-Chair:** DEIJA workshop: Promoting Diversity in SCI Research; 25th April, 2023, Stevenson, WA

4. **Chair:** APS Workshop: How to Develop Your Research Program and Lead Your Lab Team to Success!; 23rd April, 2023. Long Beach, CA

MEETING ABSTRACTS (SELECT)

1. **Rana S**, Benevides EB, Gonzalez I, Martin JH, Fuller DD. Non-invasive transcutaneous spinal direct current stimulation enhances diaphragm activity following high-cervical spinal cord injury. Society for Neuroscience Meeting; 2024 Oct 4-9, Chicago, IL.
2. **Rana S**, Fuller DD. Ampakine therapy improves respiratory muscle activation following cervical spinal cord injury. International Spinal Research Trust Meeting; 2023 Sept 14-16, London, UK.
3. **Rana S**, Pope MK, Corti M, Byrne BJ, Fuller DD. Neonatal AAV gene therapy prevents ventilatory decline in a rat model of Pompe disease. Congenital Central Hypoventilation Syndrome Annual Network Meeting, 2023 Sept 6-9, Orlando, FL.
4. **Rana S**, Fuller DD. Ampakine therapy improves respiratory muscle activation following cervical spinal cord injury. International Symposium on Neural Regeneration; 2023 Apr 23-27, Stevenson, WA.
5. **Rana S**, Byrne BJ, Fuller DD. Low-dose ampakine CX717 increases ventilation in a rat model of Pompe Disease. Physiology Meeting; 2023 Apr 19-23, Long Beach, CA. https://journals.physiology.org/doi/abs/10.1152/physiol.2023.38.S1.5732994
6. **Rana S**, Fuller DD. Daily low-dose ampakine treatment causes a sustained increase in diaphragm activation following chronic cervical spinal cord injury. Physiology Meeting; 2023 Apr 19-23, Long Beach, CA. https://journals.physiology.org/doi/abs/10.1152/physiol.2023.38.S1.5732568
7. Shaw G, Madorsky I, Li Y, Wang YS, **Rana S,** Fuller DD. Novel, interesting, surprising and useful properties of a panel of NF-L monoclonal antibodies. International Neurotrauma Symposium; 17–20 July 2022 • Berlin, Germany
8. **Rana S,** Thakre PT Barral BB, Fuller DD. Ampakine CX717 Stimulates Diaphragm Activity following Mid-cervical Spinal Contusion Injury. Experimental Biology Meeting; 2022 Apr 2-5, Philadelphia, PA.
9. **Rana S,** Sunshine MD, Fuller DD. Low Dose Ampakine Stimulates Diaphragm Activity and Increases Tidal Volume following Cervical Spinal Cord Injury in Non-Anesthetized Freely Behaving Rats. Experimental Biology Meeting; 2021 Apr 27-30, virtual.
10. **Rana S,** Sunshine MD, Fuller DD. Ipsilateral Diaphragm EMG Recorded from Unanesthetized Freely Behaving Rats is Persistently Reduced following High Cervical Spinal Hemilesion. Experimental Biology Meeting; 2021 Apr 27-30, virtual.
11. **Rana S,** Sunshine MD, Fuller DD. Impact of Ampakine CX-717 on Diaphragm EMG Activity and Breathing in Non-anesthetized Freely Behaving Rats. Experimental Biology Meeting; 2020 Apr 04-07; *Meeting cancelled due to COVID-19.*
12. **Rana S,** Zhan WZ, Sieck GC, Mantilla CB. Disruption of BDNF/TrkB Signaling Alters Glutamatergic mRNA Expression at Phrenic Motor Neurons. Experimental Biology Meeting; 2020 Apr 04-07; *Meeting cancelled due to COVID-19.*
13. **Rana S,** Zhan WZ, Sieck GC, Mantilla CB. Distribution of Ipsilateral and Contralateral Glutamatergic Synaptic Inputs to Phrenic Motor Neurons. Experimental Biology Meeting; 2019 Apr 06-09; Orlando, FL.
14. CE Fain, **S Rana,** MA Huggins, GC Sieck, AJ Johnson. Upregulation of Neuronal VEGF in Experimental Cerebral Malaria Coincides with Disease Severity Biomarkers in Humans: A Novel Mechanism of Pathophysiology. Immunology Meeting; 2019 May 09-13; San Diego, CA.
15. **Rana S,** Zhan WZ, Sieck GC, Mantilla CB. Distribution of Ipsilateral and Contralateral Glutamatergic Synaptic Inputs to Phrenic Motor Neurons. Experimental Biology Meeting; 2019 Apr 06-09; Orlando, FL.
16. **Rana S,** Fogarty MJ Mantilla CB, Sieck GC. Mitochondrial density and morphology in phrenic motor neurons is size-dependent. Society For Neuroscience Annual Meeting; 2018 Nov 03-07; San Diego, CA.
17. Mantilla CB, **Rana S,** Zhan WZ, Sieck GC. Cervical spinal hemisection induced changes in phrenic motor neuron TrkB mRNA expression depend on motor neuron size. Society for Neuroscience Annual Meeting; 2018 Nov 03-07; San Diego, CA.

18. Sieck GC, **Rana S,** Zhan WZ, Mantilla CB. Glutamatergic synaptic input to phrenic motor neurons depends on motor neuron size. Society For Neuroscience Annual Meeting; 2018 Nov 03-07; San Diego, CA.
19. **Rana S,** Mantilla CB, Sieck GC. Phrenic Motor Neuron Size Dependent Neuroplasticity of Glutamatergic Neurotransmission Following Cervical Spinal Cord Injury. Motoneuron Meeting; 2018 June 11-14; Boulder, CO.
20. **Rana S**, Mantilla CB, Gransee HM, Zhan WZ, Sieck GC. Neuroplasticity of Glutamatergic Neurotransmission at Phrenic Motor Neurons following Cervical Spinal Cord Injury. Dynamic Poster. Society For Neuroscience Annual Meeting; 2017 Nov 11- 15; Washington, D.C.
21. **Rana S**, Sieck GC, Mantilla, CB. Phrenic Motoneuron Loss and Compensatory Increase in Diaphragm Muscle Activity Following a Unilateral Mid-Cervical Contusion Injury in Rats. Young Investigator Research Symposium; 2016 March 19; Rochester, MN
22. **Rana S**, Sieck GC, Mantilla, CB. Assessment of Diaphragm EMG Activity and Neural Drive Following a Mid-Cervical Contusion Injury in Rats. International Symposium on Neural Regeneration; 2015 Nov 30-Dec 1; Pacific Grove, CA
23. **Rana S**, Gransee HM, Correa S, Cajiao MP, Zhan WZ, Sieck GC, Mantilla, CB. Histological and Functional Characterization of a Mid-Cervical Contusion Injury in Rats. Society for Neuroscience Annual Meeting; 2015 Oct 17-Oct 21; Chicago, IL
24. **Rana S**, Seiler MJ, Keirstead HS. Optimization of Stem Cell Differentiation into Retina. Undergraduate Research Symposium, University of California, Irvine; 2011 May 14; Irvine, CA

AWARDS AND HONORS

2024	AJP-Lung Cellular and Molecular Physiology Editorial Board Fellow
2023	International Spinal Research Trust Meeting Travel Award, London, UK Spinal Research Trust, United Kingdom
2023	Congenital Central Hypoventilation Syndrome Postdoctoral Scholarship, Orlando, FL, CCHS Annual Network Meeting
2023	Respiration Section Outstanding Trainee Award ($1000) Annual Experimental Biology Meeting 2023, American Physiological Society, Long Beach, CA
2023	Respiration Section Abstract of Distinction (two abstracts selected) Annual Experimental Biology Meeting 2023, American Physiological Society, Long Beach, CA
2023	Women in Physiology Committee travel award ($500) Annual Experimental Biology Meeting 2023, American Physiological Society, Long Beach, CA
2023	Physiologists in Industry Committee Postdoctoral Translational Research Award (*relinquished*) Annual Experimental Biology Meeting 2023, American Physiological Society, Long Beach, CA
2023	Postdoctoral Poster Award ($150) 13th Annual NCF SfN Regional Conference, University of Florida, Gainesville, FL
2021	McKnight Brain Institute Rising Star University of Florida, Gainesville, FL
2021	Outstanding Scholars in Neuroscience Award Program (OSNAP) awardee National Institute of Health (NIH), Bethesda, MD
2021	Respiration Section Trainee Poster Presentation Award ($100) Annual Experimental Biology Meeting 2021, American Physiological Society
2021	Research Recognition Award ($750) Annual Experimental Biology Meeting 2021, American Physiological Society
2021	Inaugural Physiological Reports Award ($200) Annual Experimental Biology Meeting 2021, American Physiological Society

2021, 2022	Postdoctoral Poster Award ($400) 16th Annual Neuromuscular Plasticity Symposium, University of Florida, Gainesville FL
2019	Mayo Clinic Graduate School of Biomedical Sciences Commencement Speaker
2019	Respiration Section Trainee Poster Presentation Award ($100) Annual Experimental Biology Meeting 2019, American Physiological Society, Orlando, FL
2019	Neuromuscular Plasticity Scholar ($500) 14th Annual Neuromuscular Plasticity Symposium, University of Florida, Gainesville, FL
2017	Duane K. Rorie, MD, PhD Excellence in Research Award Department of Anesthesiology, Mayo School of Graduate Medical Education
2016	Young Investigator Poster Award Mayo Clinic Research Fellows Symposium, Rochester, MN
2015-2017	MCGSBS-sponsored Annual Meeting travel award ($1000) Society for Neuroscience, Chicago, IL, Washington, DC, San Diego, CA
2013	Backbone Research Award Reeve Irvine Research Center, Irvine, CA
2013	Travel Award ($500), Working 2 Walk Symposium, Boston MA ($500) Unite to Fight Paralysis (U2FP)
2011	Excellence in Research – University of California Irvine Title: Optimization of Stem Cell Differentiation into Retina

TRAINING WORKSHOPS

2025	COMPASS Scholar, Washington University in St. Louis (About)
2015	OSU Spinal Cord Injury Training Program, Columbus OH Funded by Craig H. Neilsen Foundation and Ohio State University
2014	Write Winning Grant Proposals Workshop, Rochester MN Conducted by Dr. David C. Morrison
2011	2011 CDRF/RIRC BMS Training, Irvine CA

SERVICE – Editorial service and peer review

AJP-Lung Cellular and Molecular Physiology Editorial Board Fellow (2024 – present)

Adhoc Reviewer for Scientific Journals

- PLOS One
- Aging Cell
- Brain Research Bulletin
- Neural Regeneration Research
- Journal of Neurophysiology
- Brain Research
- Journal of Neurotrauma
- FASEB Bioadvances
- eLife
- IBRO Neuroscience Reports
- Experimental Neurology
- JOVE

Assisted Reviews for Journals (mentored):

- Journal of Physiology
- Neurobiology of Disease

- Experimental Neurology
- Journal of Neurochemistry
- Acta Physiologica

TEACHING EXPERIENCE

Fall Qtr 2024	**Guest Lecture:** Neuroplasticity: A Foundation for Rehabilitation (RSD 6718) University of Florida, Rehabilitation Sciences Graduate Program Lectures: DCS and neuroplasticity
Fall Qtr 2024	**Guest Lecture:** Neurophysiology (GMS 6022) University of Florida, Neuroscience PhD Program Lectures: Neurophysiology of Breathing
Fall Qtr 2022	**Guest Lecture:** Neuroplasticity: A Foundation for Rehabilitation (RSD 6718) University of Florida, Rehabilitation Sciences Graduate Program (class of 22 students) Lectures: Neuroinflammation, Neuromodulation Techniques
Spr Qtr 2022	**Guest Lecture:** Control of Breathing and Airway Defense: Implications for Rehabilitation (RSD6930), University of Florida, Rehabilitation Sciences Graduate Program (class of 20 students), Lectures: Neural Control of Breathing: In-lab Demonstrations of EMG Data Acquisition and Plethysmography
Spr Qtr 2021	**Guest Lecture:** Neuroscience for physical therapists (PHT6168C) University of Florida, Physical Therapy Program (class of +70 students) Spinal Cord (Part I, II), Cranial Nerves (Part I, II) *Student evaluations available on request
Fall Qtr 2020	**Guest Lecture:** Neuroplasticity: A Foundation for Rehabilitation (RSD 6718) University of Florida, Rehabilitation Sciences Graduate Program (class of 12 students) Lectures: Homeostatic Plasticity, Crossed Phrenic Phenomenon
Spr Qtr 2016-18	**Teaching Assistant:** Grant Writing and Critical Thinking (CORE 6050) Mayo Clinic Graduate School of Biomedical Sciences (class of +35 students) Lead discussion sessions for 1st and 2nd year pre-doctoral students Assist students with the structure and content of F31 grant writing assignment
Fall Qtr 2015	**Teaching Assistant:** Practical Neuroanatomy (NBD 6410) Mayo Clinic Graduate School of Biomedical Sciences (class of 8 students) Lead lecture and lab sections for 1st year pre-doctoral students

MENTORING

BioSci Mentor Program – University of California, Irvine

- Zachary Sloan (2022 – 2023)
  Junior, Major: Neurobiology

Undergraduate Students:

- Jane Yap (2017-2019)
  Current position: Research technician, Mayo Clinic, Rochester MN
  “Methods to quantify mitochondrial function in phrenic motor neurons using TOMM20 IHC”
- LiAna Patterson B.S. (2021-2022)
  Current position: MS2 at Florida State University College of Medicine
  Honors Thesis : “Daily Ampakine Treatment after Thoracic Spinal Cord Injury”
- Katelyn H. Cabral (2022 – present)
  Current position: Sophomore, Major: Applied Physiology and Kinesiology, University of Florida
  “Targetting trkB signaling to enhance respiratory recovery following cervical SCI”

Postbaccalaureate Students:

- Victoria Bindi B.S. (2020-2022)

Current position: MS3 at University of Florida College of Medicine

- Brian Barral B.S. (2021-2022)
  Current position: MS2 at Northeast Ohio Medical University (NEOMED)
- Robert Martinez B.S. (2021-2023)
  Current position: Post-baccalaureate Research Education Program (PREP) at Mayo Clinic

Graduate Students

- Alyssa Brown, M.D., Ph.D. (2017-2019)
  Mayo Clinic Graduate School of Biomedical Sciences, Biomedical Engineering track. Currently a PGY3 at Northwestern University (general surgery)
  "Mitochondrial dynamics in the diaphragm muscle"
- Michele Singer, Ph.D. (2020 - 2022)
  Rehabilitation Science PhD program Alum – University of Florida. Currently a postdoctoral fellow at Johns Hopkins University
  "The Hypoglossal Motor System: Studies of Neuropathology and Adeno-Associated Virus Mediated Therapy"
- Ethan Benevides B.S. (2020 – 2024)
  PhD Candidate, Rehabilitation Science PhD program – University of Florida.
  "Genetic manipulation of diaphragm afferents"
- Kyle Deegan B.S. (2022 – 2024)
  MS student, Department of Neuroscience – University of Florida.
  "Normobaric hyperoxia to treat spinal cord injuries"
- Anna M. Fusco B.S. (2022 – 2025)
  MD/PhD student, Department of Neuroscience – University of Florida.
  "Axonal degeneration following cervical spinal cord injury".

RELEVANT LEADERSHIP AND VOLUNTEER EXPERIENCE (Graduate career onwards)

2024 – Present **SHARP – SCI Health and Research Partnership Steering Leadership Team**
The goal of SHARP is to create an opportunity for more engagement within and between researchers, clinicans, individuals with SCI and their caregivers. Ultimately our goal is to foster a sense of community where: 1) individuals with SCI can integrate and engage with basic/clinical science researchers to learn about what is on the horizon, and 2) clinicians and researchers can learn from individuals with SCI and their caregivers/families/etc to better serve them as we go about our work/research, and 3) to begin to consider ways to better involve individuals affected by SCI in the research process.

2023 – Present **NeuroPD^2 – Leadership team**
Helped in the creation and launch of the first neuroscience postdoctoral group at the McKnight Brain Institute at the University of Florida.

2023 – Present **International Online SCI Seminar (I-OSCIRS) – Co-Chair**
I-OSCIRS hosts experts in the field of spinal cord injury. With seminars broadcast monthly on YouTube, we have developed a robust seminar series that touches on issues of interest to the broader spinal cord research injury community, including neurotrauma, neuroscience, repair, regeneration, walking, and paralysis. We have also collaborated with key foundations like ASIA, ISRT, ISNR and U2FP to deliver relevant content directly to the SCI community.

2022 – 2025 **American Physiological Society, COC Trainee Representative**
Trainee representative on the society-wide committee on committees. The Committee on Committees (CoC) recommends nominees for standing committee chairs and members, following consultation with sections.

2022 – 2025 **American Physiological Society, Trainee Advisory Committee – GSA Subcommittee**

The Graduate Student Ambassador (GSA) fellowship program was launched in 2015 by the Trainee Advisory Committee (TAC) and APS Council to encourage graduate students to serve as liaisons between local undergraduate/graduate students and the Society.

2021 – 2025 **American Physiological Society– Trainee Advisory Committee Chair**
Represent section trainees and organize trainee-focused events at the APS annual meeting. *Voting member of the section steering committee.

2021 – Present **Summer Neuroscience Internship Program (SNIP) – Admissions Committee**
University of Florida, Department of Neuroscience.

2020 – 2021 **American Physiological Society, Respiration Section – Newsletter Co-Editor**

2020 – Present **Diversity & Inclusion Committee - Member**
Breathing REsearch And THErapeutics Center (BREATHE), University of Florida

2019 – Present **American Physiological Society, Respiration Section – Training Sub-Committee**
Serve on the training committee for the respiration section. Assist in the organization of Trainee Highlights Symposium and mentoring club at the annual meeting.

2019 – 2025 **American Physiological Society, Respiration Section – Awards Sub-Committee**

2016 – 2017 **Graduate Student Association Co-President**
Oversee the workings of the MCGSBS graduate student council and act as a liaison between the leadership of Mayo Clinic College of Medicine, Mayo Clinic Graduate School of Biomedical Sciences, program directors, the GSA and the student body. Some major projects undertaken during this role were efforts to conserve student benefits, request for stipend increase, provision of good healthcare and mediate delivery of climate survey to the student body to assess student morale and address these concerns with the administration.

2015 – 2016 **Graduate Student Association Executive Education Committee Representative**
Liaison between MCGSBS students and the MCGSBS Leadership and Deans. I served as the student body advocate on the Education Committee to voice comments and concerns brought forth by the graduate student body through the GSA. Responsibilities include reviewing applications for new courses and extensions, and approving MCGSBS policies.

2015 – 2016 **Brainwaves Director**
Overlook all activities for Brainwaves organization that is supported by the Department of Neurosurgery and Neurology at the Mayo Clinic. Brainwaves is an outreach organization that targets school and college students. Hosted seven events that were aimed to educate students about neuroscience and provide guidance on pursuing careers in STEM.

2014 – 2015 **Graduate Student Association First-Year Representative**
Served as a conduit for communication between the Graduate Student Association and the incoming first-year graduate student class

2014 – 2015 **Brainwaves Outreach Coordinator**