Sabhya Rana, Ph.D.

Assistant Professor
Department of Neuroscience
Belford Center for Spinal Cord Injury
Ohio State University

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RESEARCH INTERESTS

My research group investigates the neural control of breathing in disease and injury states. We study how glutamatergic neurotransmission regulates motor neuron activity within respiratory motor circuits. We are also examining how pharmacological agents and non-invasive neuromodulatory interventions can be used as therapeutic strategies in preclinical models of spinal cord injury. Our lab uses 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

POSITIONS

Assistant Professor (tenure track) 8/2025 – Present	**Department of Neuroscience** The Ohio State University Neural control of breathing in disease and injury, with an emphasis on neuromodulation and neuropharmacology to strengthen respiratory motor function.
Principal Investigator 08/2025 – Present	**Belford Center for Spinal Cord Injury Research** Ohio State University Wexner Medical Center
Research Assistant Scientist 8/2024 – 7/2025	**Department of Physical Therapy** University of Florida
Postdoctoral Research Associate 12/2019 – 7/2024	**Fuller Lab | Breathing Research and Therapeutics Center |** University of Florida Mentor: Dr. David D. Fuller
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
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
Junior Specialist	**Department of Anesthesiology and Perioperative Care** | University

9/2013 - 6/2014 | of California, Irvine
Mentor: Dr. Leif Havton

Lab Assistant II | **Reeve Irvine Research Center** | University of California, Irvine
9/2011 – 9/2013 | Mentor: Dr. Oswald Steward

Lab Assistant IV | **Reeve Irvine Research Center** | University of California, Irvine
8/2010 – 9/2011 | Mentors: Dr. Hans Keirstead and Dr. Magdalene Seiler

CURRENT 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

PENDING REVIEW RESEARCH GRANTS

7/2026 – 7/2028 | **Translational Spectrum Grants: Craig H. Neilsen Foundation (About)**
Title: A dual TrkB-targeted pharmacologic and neuro-stimulation strategy for respiratory recovery after SCI
Role: Principal Investigator
$400,000 for 2 years
**Approved for funding, pending Notice of Award*

12/2026 – 11/2031 | **R01: National Institutes of Health**
Title: Mechanisms underlying postoperative cognitive dysfunction in aging
Role: Co-I (5% effort year 4 and 5)
Anticipated Proposal Amount: $3,452,642
Submitted March 2026, pending study section review

COMPLETED RESEARCH GRANTS AND SCHOLARSHIPS

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 Postdoctoral Fellowship: 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

FACULTY MENTORING STATUS

02/2026 – Present	**Molecular, Cellular and Developmental Biology Program** The Ohio State University Status: P
01/2026 – Present	**Biomedical Sciences Graduate Program** The Ohio State University Status: P
09/2025 – Present	**Neuroscience Graduate Program** The Ohio State University Status: P

INSTITUTE MEMBERSHIPS

12/2025 – Present	**Gene Therapy Institute – Ohio State University** Faculty
10/2025 – Present	**Institute of Brain, Behavior, and Immunology – Ohio State University** Faculty
08/2025 – Present	**Chronic Brain Injury Program – Ohio State University** Faculty Affiliate

PUBLICATIONS

1. **Rana S*,** Martinez R*, Sieck GC, Mantilla CB. Motor Neuron Size-Dependent Differences in mRNA Expression of Tropomyosin-Related Kinase Receptor B in Adult Rats. J Neurochem. *Accepted for publication Jan 2026. *Authors contributed equally*

2. Mickle AR, **Rana S**, Benevides ES, Byrne BJ, Fuller DD, Dale EA. A respiratory signature of disease progression in the Pompe rat. J Neurophysiol. 2025 Dec 5;. doi: 10.1152/jn.00305.2025. [Epub ahead of print] PubMed PMID: 41348648.

3. Fusco AF, **Rana S**, Macintyre MM, Gonzalez IA, Ribas RA, Sun RC, Fuller DD. Acute Administration of Ampakine CX1739 after Cervical Spinal Cord Injury. J Neurotrauma. 2025 Oct 6;. doi: 10.1177/08977151251382939. [Epub ahead of print] PubMed PMID: 41051937.

4. Fusco AF, **Rana S,** Rayaprolu S, MacIntyre MM, Jorgensen M, Shaw G, Fuller DD. Serum evaluation of NFL correlates with histological identification of degenerating axons. Exp Neurol. 2025 Oct;392:115360. doi: 10.1016/j.expneurol.2025.115360. Epub 2025 Jun 23. PubMed PMID: 40562346.

5. Benevides ES, **Rana S,** Fuller DD. Chemogenetic activation of the diaphragm after spinal cord injury in rats. Respir Physiol Neurobiol. 2025 Aug-Sep;336:104421. doi: 10.1016/j.resp.2025.104421. Epub 2025 Mar 26. PubMed PMID: 40154905.

6. Fuller DD, **Rana S,** Thakre PP, Benevides ES, Pope MK, Todd AG, Jensen VN, Vaught L, Cloutier DA, 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. Mol Ther. 2025 Jun 14;. doi: 10.1016/j.ymthe.2025.06.022. [Epub ahead of print] PubMed PMID: 40518673.

7. Benevides ES, Thakre PP, **Rana S,** Sunshine MD, Jensen VN, Oweiss K, Fuller DD. Chemogenetic stimulation of phrenic motor output and diaphragm activity. Elife. 2025 Jun 2;13. doi: 10.7554/eLife.97846. PubMed PMID: 40454577; PubMed Central PMCID: PMC12129449.

8. 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.

9. 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*

10. 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

11. **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. 2025 Jan;265:108744. doi: 10.1016/j.pharmthera.2024.108744. PMID: 39521442; PMCID: PMC11849399. **corresponding author*

12. 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.

13. **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.

14. **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*

15. 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.

16. 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.

17. 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.

18. 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.

19. **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.

20. 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.

21. 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.

22. 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.

23. **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.

24. **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.

25. 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.

26. 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.

27. **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*

28. 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.

29. 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.

30. **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*

31. **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*

32. **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.

33. 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.

34. **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.

35. **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/

PUBLICATIONS UNDER REVIEW

1. Thakre PT, **Rana S**, Mitchell GS, Fuller DD. Pairing ampakine with brief hypoxia evokes phrenic neuroplasticity via a spinal NMDA receptor mediated mechanisms. Function *Accepted for publication June 2026*

INVITED PRESENTATIONS

National:

1. International Spinal Research Trust meeting. London, UK. *Non-invasive spinal stimulation approaches to improve respiratory outcomes after SCI.* 17th September, 2026.
2. International Symposium on Neural Regeneration. Cambridge, MD. *Fixing the pump: respiratory recovery following spinal cord injury*, 22nd July, 2026.
3. American Physiological Society Summit. Session: Animal Models in Respiratory Science: Past, Present and Future. *Modeling to medicine: Leveraging preclinical animal models to advance respiratory recovery after spinal cord injury.* Minneapolis, MN. 25th April, 2026
4. National Neurotrauma Society Meeting. Session: Spinal Cord Injury Beyond Locomotor and Sensory Dysfunction: The Whole Body Problem. *Non-invasive spinal stimulation improves respiratory function following SCI.* Philadelphia, PA. 17th June, 2025.
5. American Physiological Society Summit. Session: Hot Topics in Respiratory Control. *Powering Up the Breath: A Non-invasive Approach to Mitigate Respiratory Insufficiency Following Spinal Cord Injury*. Baltimore, MD. 24th April, 2025.
6. 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.
7. International Symposium on Neural Regeneration. Stevenson, WA. *Ampakine therapy improves respiratory muscle activation following cervical spinal cord injury*, 26th April, 2023.
8. Therapeutic Intermittent Hypoxia Virtual Workshop. *Ampakines Amplify Phrenic LTF.* Jan 7th 2022.
9. Unite 2 Fight Paralysis 2021 Symposium. *Facilitating Meaningful Connections between SCI Researchers and the Community.* Oct 21st 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. 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/
13. 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.

Local:

1. Pulmonary Research Conference. The Ohio State University. Columbus, OH. *Powering up the breath: Therapeutic strategies to improve respiratory function following cervical spinal cord injuries.* 17th March, 2026.

2. Chronic Brain Injury Program. The Ohio State University. Columbus, OH. *Powering up the breath: Therapeutic strategies to improve respiratory function following cervical spinal cord injuries.* 13th February, 2026.

3. DHLRI Research in Progress Seminar. The Ohio State University. Columbus, OH. *Powering up the breath: Therapeutic strategies to improve respiratory function following cervical spinal cord injuries.* 6th February, 2026.

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

5. Neuroplasticity NeuroNines Seminar. Gainesville, FL. *Pharmacological Restoration of Motor Function after Spinal Cord Injury,* 8th June, 2023.
6. Brains and Brews Seminar. University of California, Irvine. *Drug Therapies to Restore Breathing after Spinal Cord Injury*. 4th Oct, 2021
7. Neuromedicine Seminar. Gainesville, FL. *Re-learning to Breathe after a Spinal Cord Injury.* Jun 28th, 2021.
8. Neuroplasticity NeuroNines Seminar. *Ampakine therapy to restore breathing after cervical spinal cord injury*. Jun 3rd, 2021. Hosted online due to COVID-19.
9. Department of Physiology and Biomedical Engineering Seminar. Rochester MN. *Mechanisms of Neuroplasticity Following Spinal Cord Injury in the Respiratory System*. June 21, 2019.

SESSIONS

1. **Co-Host:** APS Physiolo-GIST Competition, APS Summit, Baltimore, MD 25th April 2025

2. **Session Moderator:** Intermittent Hypoxia Workshop 2024, Basic Science Session; Shirley Ryan Ability Lab, 5th October 2024, Chicago, IL
3. **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
4. **Co-Chair:** DEIJA workshop: Promoting Diversity in SCI Research; 25th April, 2023, Stevenson, WA

5. **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. Sastry K, **Rana S**. An automated deep learning framework for objective segmentation and quantification of diaphragm EMG across physiological states. APS Physiology Summit. 23-26th April 2026, Minneapolis MN.
2. Rease M, Maldonado G, Sastry K, Freitas C, Benevides E, Fuller DD, **Rana S**.Polarity and dose-dependent effects of spinal direct current stimulation on diaphragm activity after cervical spinal cord injury in rats. APS Physiology Summit. 23-26th April 2026, Minneapolis MN.
3. **Rana S**, Benevides E, Maldonado G, Fuller DD. Non-invasive transcutaneous spinal direct current stimulation enhances diaphragm activation during acute hypoxia in rats with high-cervical spinal cord injury (SCI). APS Physiology Summit. 24-27th April 2025, Baltimore MD.

4. **Rana S**, Pope M, Sun R, Gentry M, Corti M, Byrne B, Fuller DD. Comparing two adeno-associated virus (AAV) strategies for preventing respiratory decline in Pompe disease. APS Physiology Summit. 24-27th April 2025, Baltimore MD. APS Physiology Summit. 24-27th April 2025, Baltimore MD.
5. **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.
6. **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.
7. **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.
8. **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.
9. **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
10. **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
11. 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
12. **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.
13. **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.
14. **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.
15. **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.*
16. **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.*
17. **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.
18. 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.
19. **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.
20. **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.
21. 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.

22. 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.
23. **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.
24. **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.
25. **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
26. **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
27. **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
28. **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 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 award 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 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 Annual Experimental Biology Meeting 2021, American Physiological Society
2021	Research Recognition Award Annual Experimental Biology Meeting 2021, American Physiological Society
2021	Inaugural Physiological Reports Award Annual Experimental Biology Meeting 2021, American Physiological Society
2021, 2022	Postdoctoral Poster Award

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
Annual Experimental Biology Meeting 2019, American Physiological Society, Orlando, FL

2019 Neuromuscular Plasticity Scholar
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
Society for Neuroscience, Chicago, IL, Washington, DC, San Diego, CA

2013 Backbone Research Award
Reeve Irvine Research Center, Irvine, CA

2011 Excellence in Research – University of California Irvine
Title: Optimization of Stem Cell Differentiation into Retina

TRAINING WORKSHOPS

2026 Master Mentorship Certificate Program (in progress)
Center for Faculty Advancement, Mentoring and Engagement, Ohio State University

2025 New Faculty Boot Camp, American Thoracic Society, San Francisco, May 2025

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

2026 – Present Associate Editor: Journal of Neurophysiology

2026 – Present Editorial board: ODC-SCI

AJP-Lung Cellular and Molecular Physiology Editorial Board Fellow (2024 – 2025)

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

- Journal of Physiology
- Neurobiology of Disease
- Experimental Neurology
- Journal of Neurochemistry
- Acta Physiologica
- Expert Opinion On Investigational Drugs

RELEVANT LEADERSHIP AND SERVICE

National:

2025 – Present	American Physiological Society, Respiration section Mixer programming committee
2026	American Physiological Society, Porter Fellowship Reviewer
2025 – Present	National Neurotrauma Society, Membership Committee
2025	American Physiological Society, Porter Fellowship Program Speaker
2019 – Present	American Physiological Society, Respiration Section – Awards Sub-Committee
2025 – Present	Respiration Section Programming Committee, American Physiological Society
2024 – 2025	SHARP – SCI Health and Research Partnership Steering Leadership Team
2022 – Present	International Online SCI Seminar (I-OSCIRS) – Co-Chair
2022 – 2025	American Physiological Society, Committee on Committees member
2022 – 2025	American Physiological Society, Trainee Advisory Committee – GSA Subcommittee
2021 – 2025	American Physiological Society, Trainee Advisory Committee Chair (Respiration Section)
2020 – 2021	American Physiological Society, Respiration Section – Newsletter Co-Editor
2019 – 2025	American Physiological Society, Respiration Section – Training Sub-Committee

Local:

2026 -	Host lab: Explorations in Neuroscience High school camp
2026 -	*Poster Judge:* 19th Annual IGP Symposium, Ohio State University
2026 –	*Poster Judge:* Department of Neuroscience Research Day
2026 -	Reviewer, Department of Neuroscience, Internal Grant Review Program (IGRP)
2026 –	*Poster Judge:* Center for Brain Injury Recovery & Discovery (CBIRD) Research Day
2026 –	OSU MSTP Roundtable chat host, February 26, 2026
2026 –	*Reviewer*: Application Reviewer for the 2026 Explorations in Neuroscience Internship
2026 –	Programming and Engagement in Neuroscience Committee, OSU
2025 –	*Poster Judge:* Neuroscience Research Day Retreat
2025 –	Awards Committee, Widening Impact in Medicine & Science (WIMS), OSU
2025 –	Search Committee, Department of Neuroscience, OSU
2025 –	*Ad hoc* reviewer: Neuroscience Graduate Program (NGP) PhD program applications
2023 – 2025	NeuroPD^2 – Leadership team, McKnight Brain Institute, University of Florida
2021 – 2025	Summer Neuroscience Internship Program (SNIP) – Admissions Committee University of Florida, Department of Neuroscience.

2020 – 2025	Diversity & Inclusion Committee BREATHE Center - Member
2016 – 2017	Graduate Student Association Co-President
2015 – 2016	Graduate Student Association Executive Education Committee Representative
2015 – 2016	Brainwaves Director, Mayo Clinic
2014 – 2015	Graduate Student Association First-Year Representative, Mayo Clinic
2014 – 2015	Brainwaves Outreach Coordinator, Mayo Clinic

TEACHING EXPERIENCE

Spring 2026 — **Course Director:** Seminar Topics in Neuroscience (NEUROGS 7887)
Ohio State University (79 enrolled students)

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

Mentoring since faculty appointment (Ohio State University)

Graduate Mentoring

Mentee	Years	Outcomes	Project
Natalie Stover (Neuroscience Graduate Program)	2026 -		Targetting Trk-mediated respiratory motor plasticity in neural disease and injury

Undergraduate Mentoring

Mentee	Level	Years	Outcome	Project
Kailash Shastry	Senior	2025 -	2026 Barbara A. Horwitz and John M. Horowitz Undergraduate award and APS Excellence in undergraduate research award (national); CBIRD Research Day Poster award	Machine learning approaches for processing of respiratory biosignals
Dhruva Venakari	Senior	2025 -	CBIRD Research Day Poster award, DNS research Day award	Non-invasive spinal stimulation to enhance hypoxia induced respiratory facilitation following SCI
Isabel Oliveira	Freshman	2026 -		
Shritha Velaga	Freshman	2026 -		

Postbaccalaureate Mentoring

Mentee	Level	Years	Outcome	Project
Matthew Rease	Research Technician	2025 -	Abstract submission 2026 APS meeting, trainee talk at CBIRD research day, APS Merilyn Merker Trainee talk (2026)	Non-invasive spinal stimulation to enhance respiratory output following SCI

Thesis committees

OSU student committees:

Sarayu Ali – Jacy Wagnon Lab (NGP, Year 2)

Mentoring prior to faculty appointment

Graduate and Professional Student Mentoring

Mentee	Program	Institution	Years	Current Position	Thesis or Project
Alyssa Brown	MD PhD, Biomedical Engineering	Mayo Clinic GSBS	2017–2019	PGY3 Surgery, Northwestern University	Mitochondrial dynamics in diaphragm
Michele Singer	PhD, Rehabilitation Science	University of Florida	2020–2022	Postdoctoral Fellow, Johns Hopkins University	Hypoglossal motor system, AAV therapy
Ethan Benevides	PhD Candidate	University of Florida	2020–2024	PhD Candidate	Genetic manipulation of diaphragm afferents
Kyle Deegan	MS, Neuroscience	University of Florida	2022–2024	MS Student	Normobaric hyperoxia for SCI
Anna M. Fusco	MD PhD, Neuroscience	University of Florida	2022–2025	MD PhD Student	Axonal degeneration after cervical SCI

Undergraduate Mentoring

Mentee	Level	Institution	Years	Current position	Project
Zachary Sloan	Junior	UCI BioSci Mentor Program	2022–2023	Undergraduate	N/A
Jane Yap	Undergraduate	Mayo Clinic	2017–2019	Research Technician, Mayo Clinic	Mitochondrial assays in phrenic MNs
LiAna Patterson	BS	University of Florida	2021–2022	MS3, FSU College of Medicine	Daily ampakine after thoracic SCI
Katelyn H. Cabral	Sophomore	University of Florida	2022–2025	Undergraduate	TrkB signaling and respiratory recovery

Postbaccalaureate Mentoring

Mentee	Degree	Program	Years	Current Position
Victoria Bindi	BS	Postbaccalaureate Research Training	2020–2022	MS4, University of Florida COM
Brian Barral	BS	Postbaccalaureate Research Training	2021–2022	MS3, Northeast Ohio Medical University
Robert Martinez	BS	Mayo Clinic PREP	2021–2023	PREP Scholar, Mayo Clinic