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Breathing After Spinal Cord Injury: Emerging Therapeutics Harnessing the Potential of Respiratory Plasticity

Course ID 149

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Title: Breathing after spinal cord injury: Emerging therapeutics harnessing the potential of respiratory plasticity. Number of individuals proposed: 5 Type of Course: Instructional Course Educational Objectives: • The consequence of cervical spinal cord injury (SCI) on ventilation and the adaptive plasticity that facilitates recovery.. • Inform clinicians and researchers on the current clinical and preclinical strategies to alleviate respiratory insuffiency and promote functional recovery. • Novel use for neuromodulation and genetic strategies to promote wholistic ventilatory health after acute and chronic SCI. Summary: Impaired breathing is a leading cause of morbidity and mortality in cervical spinal cord injury (cSCI) cases, with over half of such injuries occurring in the cervical region. This often results in severe respiratory issues, making managing respiratory failure crucial. In incomplete cSCI cases, a promising approach for restoring breathing function involves harnessing plasticity mechanisms to strengthen remaining neural pathways connected to respiratory motor neurons. This course aims to enhance our understanding of plasticity's pivotal role in driving post-spinal cord injury respiratory recovery. It explores findings from preclinical studies investigating innovative interventions to promote ventilatory recovery and critically evaluates their potential for translation from animal models to practical patient treatments. Ultimately, this course offers a thought-provoking discussion on effectively utilizing plasticity in the context of cervical spinal cord injuries, intending to explore emerging treatment options, and shed light on transformative approaches to address respiratory compromise following cSCI. Funding Sources NIH, Craig H. Neilsen Foundation, Kentucky Spinal Cord & Head Injury Research Trust, Pennsylvania Department of Health, Yant Family Spinal Cord Regeneration Fund, VA-ORD Draft Agenda :00 – 0:10 More than just spinal cord repair: Considering the lung, diaphragm, & spinal cord to improve breathing function after injury (Dr, Alilain) :10 – 0:20 Promoting reconnection of damaged respiratory neural circuitry following cervical spinal cord injury (Dr.Lepore) :20 – 0:30 Neurotrophic mechanisms of recovery of respiratory function following cervical SCI (Dr. Mantilla) :30 – 0:40 Neuromodulation to promote respiratory recovery (Dr.Satkunendrarajah). :40 – 0:50 Breathing, the not so simple truth (Dr.Meadow) :50 – 0:60 Discussion Course Chair: Kajana Satkunendrarajah, PhD Associate Professor Department of Neurosurgery Medical College of Wisconsin 5000 W. National Ave. Milwaukee, WI 53295, USA Kajanas@mcw.edu Faculty: Warren Alilain, PhD Associate Professor Department of Neuroscience University of Kentucky College of Medicine, Lexington, KY 40508, USA.Alilain, warren.alilain@uky.edu Angelo Lepore, PhD Professor Department of Neuroscience Thomas Jefferson University Philadelphia, PA Angelo.Lepore@jefferson.edu Carlos Mantilla, MD, PhD Professor Department of Anesthesiology and Perioperative Medicine, Mayo Clinic, Rochester, Minnesota. mantilla.carlos@mayo.edu Joshua Meadow, MD, MSc, PhD Professor of Neurosurgery, Neurology, and Biomedical Engineering (Tenured) Medical College of Wisconsin 5000 W. National Ave Milwaukee, WI jmedow@mcw.edu

Learning Objective 1 Satkunendrarajah, K., Karadimas, S.K., Laliberte, A.M. et al. Cervical excitatory neurons sustain breathing after spinal cord injury. Nature 562, 419–422 (2018). https://doi.org/10.1038/s41586-018-0595-zThe consequence of cervical spinal cord injury (SCI) on ventilation.