Prithvi Shah Lab Online Profile

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TRAINING

Prithvi Shah received a B.S Degree in Physical Therapy from India. She obtained her Ph.D. in Muscle Physiology and Rehabilitation Science from the University of Florida. Dr. Shah obtained her post-doctoral training at the University of California in Los Angeles. In 2014, she joined the faculty of the State University of New York at Stony Brook as Assistant Professor in the School of Health Technology and Management. She is also an affiliate faculty in the Department of Neurobiology and Behavior at Stony Brook University. Dr. Shah is a recipient of the Craig Neilsen Post-Doctoral Fellowship Award and is an active Consortium Associate of the Christopher and Dana Reeve Foundation.

RESEARCH INTERESTS/EXPERTISE

In her laboratory, she pursues the idea that the spinal cord is a system with a dense network of neurons that is capable of controlling, modulating and executing specific and discrete motor tasks in the absence of supraspinal input. Specifically, the dense connections of interneuronal connections in the spinal cord can be effectively modulated through a combination of pharmacological, electrical and rehabilitation training regimens to facilitate neuronal activity and modulate the functional state of the spinal cord in order to evoke a range of motor tasks.

Dr. Shah uses a variety of experimental rodent models to address questions such as "what is the contribution of the spinal cord – either partially or completely independent of input from the brain - in the performance of sensory-motor tasks such as walking, reaching, grasping, or maintaining posture"?

Viewing the spinal cord as an independent system allows us to identify the anatomy, function and the interaction of spinal neuronal populations. Dr. Shah utilizes the basic principles of neuroplasticity in strategizing new neurorehabilitation techniques in the spinal cord injury rodent model. **One of the main objectives of our research is to develop optimal rehabilitative strategies that effectively enhance motor and sensory function after spinal cord injury. In turn, our research aims to yield critical information in identifying neuronal mechanisms that control a range of motor behaviors.**

Our work has direct implications in the development of novel motor rehabilitation strategies after motor dysfunction in persons with neurological disorders. For example: Should rehabilitation therapy be limited to task specific training? Or should training involve more variables to it? In addition, what is the impact of forelimb rehabilitation on lower extremity function after an incomplete spinal cord injury? If effective, can we introduce this training as a new interventional paradigm for individuals with lower limb dysfunction?

To achieve our research objectives, we use a variety of scientific methodologies including behavioral assessment, electrophysiological evaluation and immunohistological measures in the rodent model of spinal cord injury.

SELECT PUBLICATIONS

1. **Shah P, et al;** In-vivo bioenergetics of skeletal muscle after spinal cord contusion in rats [*European Journal of Applied Physiology*, 2014 Apr;114(4):847-58 January 2014]
2. **Shah PK** et al; Quadrupedal Step-training Enhances Locomotor Function after Spinal Cord Injury Via Re-engagement of Spinal Interneuronal Networks, *Brain*. 2013 Nov;136(Pt 11):3362-77.
3. Gad P, Choe J, **Shah P,** Alias GG, Rath M, Gerasimenko Y, Zhong H, Roy RR, Edgerton VR. Sub-threshold spinal cord stimulation facilitates spontaneous motor activity in spinal rats. *J Neuroeng Rehabil.* 2013 Oct 24;10(1):108
4. Gad P, Lavrov I, **Shah PK**, Zhong H, Roy RR, **Edgerton** VR, Gerasimenko Y. J; Neuromodulation of motor- evoked potentials during stepping in spinal rats*. J. Neurophysiol*. 2013 Sep;110(6):1311-22
5. Gerasimenko Y, Gorodnichev R, **Shah PK,** Zhong H Roy RR, and Edgerton VR. Multisite spinal cord stimulation to facilitate posture and locomotion. *Proceedings in the International Functional Electrical Stimulation Society*. September 2012 (10-13)
6. **Shah PK**, Gerasimenko Y, Edgerton, V.R; Variability in Step Training Enhances Locomotor Recovery after a Spinal Cord Injury, *Eur J Neurosci*. 2012 Jul;36(1):2054-2062
7. **Shah PK,** Song J, Kim S, Zhong H, Roy RR, Edgerton VR. Rodent Estrous Cycle Response to Surgical Interventions, *Behavioral Neuroscience*, 2011 Dec;125(6):996-1002
8. **Shah PK,** Gregory CM, Stevens JE, Pathare NC, Jayaraman A, Behrman AL, Walter GA, Vandenborne K. Non-invasive assessment of lower extremity muscle composition after incomplete spinal cord injury, *Spinal Cord,* 2008 August; 46(8):565-70
9. **Shah PK**, Stevens JE, Gregory CM, Pathare NC, Jayaraman A, Bickel CS, Bowden M, Behrman AL, Walter GA, Dudley GA, Vandenborne K. Lower-extremity muscle cross-sectional area after incomplete spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, 2006 June; 87(6): 772-8

VIDEOS RELEVANT TO OUR RESEARCH (Coming Soon)

Video 1: Quadrupedal stepping before and after a partial injury to the thoracic spinal cord (hemisection injury, Hx) is shown from three animals: quadrupedal step trained, bipedal step trained and not trained. Note that the uninjured rat steps quadrupedally on the treadmill without any support. After quadrupedal training (that involves forced use of the forelimbs), stepping mimicks the stepping pattern of an uninjured rat and without external support to the trunk or tail. The rats in the bipedal trained group (hindlimbs only) and non-trained group, in contrast, step poorly; and partial trunk and tail support is necessary to enable effective weight bearing and coordination during stepping.

Video 2: The ability of a spinal animal to step on a treadmill in different directions in the presence of spinal epidural stimulation after two weeks of forward step training.