Regional and Cell Type-Specific Connectivity of Corticospinal Circuits

February 6

Tuesday, 12:30 pm

Billings Building—Rosedale Room

SPEAKER:

Anders Nelson, Ph.D.

Assistant Professor

Center for Neural Science

New York University

Host: Yutaka Yoshida, Ph.D.

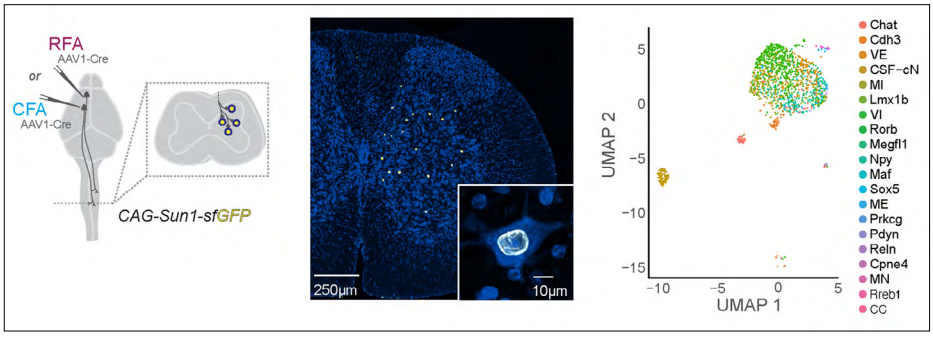
For more information contact

Darlene White

daw9085@med.cornell.edu

Abstract

Corticospinal neurons (CSNs) synapse directly on spinal neurons, a diverse group of neurons with unique structural and functional properties necessary for body movements. CSNs modulating forelimb behavior fractionate into caudal forelimb area (CFA) and rostral forelimb area (RFA) motor cortical populations. Despite their prominence, no studies have mapped the diversity of spinal cell types targeted by CSNs, let alone compare CFA and RFA populations. Here we use anatomical and RNA-sequencing methods to show that CSNs synapse onto a remarkably selective group of spinal cell types, favoring inhibitory populations that regulate motoneuron activity and gate sensory feedback. CFA and RFA CSNs target similar spinal cell types, with notable exceptions that suggest these populations differ in how they influence behavior. Finally, axon collaterals of CFA and RFA CSNs target similar brain regions yet receive surprisingly divergent inputs. These results detail the rules of CSN connectivity throughout the brain and spinal cord for two regions critical for forelimb behavior.



Publications

1. Topographical and cell type-specific connectivity of rostral and caudal forelimb corticospinal neuron populations, LM Carmona, ET Thomas, K Smith, B Tasic, RM Costa, A Nelson, bioRxiv, 2023.11. 17.567623

2. Corticospinal populations broadcast complex motor signals to coordinated spinal and striatal circuits, A Nelson, B Abdelmesih, RM Costa, Nature Neuroscience, 24 (12), 1721-1732

3. The basal forebrain and motor cortex provide convergent yet distinct movement-related inputs to the auditory cortex, A Nelson, R Mooney, Neuron 90 (3), 635-648