Functional analysis of neuronal circuits in health and disease

https://www.neurodegenerationresearch.eu/survey/functional-analysis-of-neuronal-circuits-in-health-and-disease/

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Research Abstract
Neuronal wiring patterns are specific connections within the nervous system necessary for cognitive processes and behavior, and are critical to react to external stimuli and control the body. Specific insight into circuit functionality is required to provide further knowledge into neuronal processing and their malfunctions in disease. Conditions in which defective neuronal circuitry may be the underlying cause are represented by psychiatric disorders, including schizophrenia, depression, eating disorders and autism. In neurodegenerative disease, the death of certain neuronal populations is a common explanation, such as in the devastating disease ALS. Spinal cord injury often disables supra-spinal input, thus, a detailed understanding of spinal cord locomotor network organization is required for therapeutic targeting of spinal

neurons and circuits and the possible recovery of motor function. It has proven efficient to selectively interfere with or kill the functionality of aberrant axonal projections or certain neuronal populations to better understand these systems. Our vision is to investigate neuronal circuitry and identify genetic determinants of specific interneuron populations and their function. Combined with other powerful methods, including electrophysiology, pharmacology, optogenetics and imaging including the new moving x-ray gait analysis, we strive to be a state-of-the art laboratory for interrogation of neuronal microcircuitry. This proposal will analyze contributions from defined populations of interneurons in functions including motor control and memory. It will provide insights into how spinal cord interneurons coordinate locomotion and the integration with descending signals from motor centers in the brain. It will also provide novel insight into the functionality of local interneurons in the hippocampus that control memory formation and address the role of modulatory input in an entirely novel fashion, the transporter VAAT. Thus, the analysis proposed here will interrogate functionality of circuits that is compromised in motor disorders such as Parkinson’s Disease and in disorders of memory, such as Alzheimer’s Disease and dementia.

Further information available at:

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