Treatments for Epilepsy and Other CNS Disorders

Published date: Aug. 18, 2016

Technology description

Pharmacological Modulation of Gap-Junction Signaling and Neuronal Synchrony

Technology Overview

The mammalian brain contains two types of synapses: chemical and electrical. The overwhelming majority of research on neuronal communication has focused on chemical synaptic transmission, particularly in mammalian systems. By contrast, only recently has the importance of electrical synapses, or gap junctions, been appreciated. It is now known that electrical synapses can be found all over the mammalian brain, and they primarily provide the means of communication amongst inhibitory neurons of similar biochemical profile. Although a large percentage of neurological and neuropsychiatric diseases involve imbalances of excitation and inhibition, treatments of these diseases have completely neglected gap junctional synapses. As a source of synchronization of inhibitory neurons, neuronal gap junctions are crucial to disorders of inhibition, including epilepsy. And despite their prevalence, electrical synapses have yet to be considered as pharmacological targets for the treatment of neurological and neuropsychiatric diseases.
Drs. Carole Landisman and Philippe Coulon are studying the modulation and plasticity of gap junctions, which may provide powerful insights into how regulation — and dysregulation —can change the function of inhibitory neuronal circuitry. Combining paired whole-cell recordings and calcium imaging, Drs. Coulon and Landisman are investigating the effects of pharmacological agents on the extent and strength of gap junction-regulated inhibitory synchrony. By starting with agents commonly used for the treatment of epilepsy, they hope to provide a foundation for the strategic development of new treatments—not just for epilepsy, but for a wide array of diseases that involve disorders of inhibition.

Institution

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