Acute brain insults and many chronic brain diseases manifest an innate inflammatory response. The hallmark of this response is glia activation, which promotes repair of damaged tissue, but also induces structural and functional changes that may lead to an increase in neuronal excitability. We have investigated the mechanisms involved in the modulation of neuronal activity by acute inflammation. Initiating inflammatory responses in hippocampal tissue rapidly led to neuronal depolarization and repetitive firing even in absence of active synaptic transmission. This action was mediated by a complex metabotropic purinergic and glutamatergic glia-to-neuron signaling cascade, leading to the blockade of neuronal KV7/M channels by Ca2+ released from internal stores. These channels generate the low voltage-activating, noninactivating M-type K+ current (M-current) that controls intrinsic neuronal excitability, and its inhibition was the predominant cause of the inflammation-induced hyperexcitability. Our discovery that the ubiquitous KV7/M channels are the downstream target of the inflammation-induced cascade, has far reaching implications for the understanding and treatment of many acute and chronic brain disorders.
It is now widely accepted that deciphering the enigma of the brain is the most challenging intellectual endeavor of the 21st century, "The Century of the Brain" - Join our quest and become a friend of ELSC.

study at ELSC

Our Int'l Ph.D. program provides outstanding students with top-notch courses in computational neuroscience.

Building

The Jerusalem Brain Sciences Building will provide a state-of-the-art research and teaching facility for the Edmond and Lily Safra Center for Brain Sciences.
Get into our media channel and investigate ELSC's latest videos: seminars, public lectures, courses and video articles.

Source URL: http://elsc.huji.ac.il/content/article-month-september-2016