Rapamycin Might Have a Therapeutic Role in Tuberous Sclerosis and Other Disorders

Boston, Mass., December 5 -- How the brain becomes susceptible to seizures is under intense investigation by scientists seeking to cure and prevent epilepsy. The search is increasingly dependent on advanced technologies that provide an unprecedented window into the actions and structures of brain cells, and new insight into how seizures affect the brain.

Researchers at the AES 63rd Annual Meeting here report using a technique called fast, multicellular imaging, to focus on small groups of neurons to observe the action of single cells during experimental seizures. Other investigators, using a related technique, report on observing the neuronal response to seizures of different duration, in order to find out of seizures of a much shorter duration produce brain injury.

In what is the first report of fast, multicellular imaging of dentate granule cells (DGC) in hippocampal slices from animals exposed to a single experimentally induced prolonged seizure, researchers at Children's Hospital of Philadelphia found that 64.8 of DGC showed calcium transients, an indicator of cell excitation or seizure susceptibility; whereas, calcium transients were seen in only six of DGC in slices from control animals.

Chang-Hoon Cho, Ph.D., lead author of the study, says his team's ongoing research is pointing toward identifying the abnormally behaving—seizure-inducing—small subset of neurons to control the whole neuronal population in epilepsy.

Using time-lapse multiphoton imaging of neocortical brain cells in an animal model, researchers at Washington University, St. Louis, have monitored the effect of experimentally induced seizures on the dendritic structure of neocortical neurons on live animal models. The researchers looked for injury to the cells in ascending time intervals from 5-10 minutes up to 30-40 minutes of cumulative seizure duration. The team, led by Michael Wong, M.D., Ph.D., found that seizure-induced injury worsens with longer seizures, but even relatively brief seizures of 5-10 minutes may also cause some injury.

"While the long-term evolution and functional consequences of this seizure-induced dendritic injury need to be investigated," Wong says, "our findings raise concerns about the potentially damaging effect of relatively brief seizures."

These and other studies of seizure-induced neuronal damage, and the subsequent potential for negative effects on cognition and memory, are directly relevant to clinical practice and the treatment of seizures. Many clinicians now advocate aggressive intervention when seizures reach 5 minutes instead of longer durations before initiating emergency medical intervention.

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