Seizure Unconsciousness Similar to Slow Wave Sleep

Embargoed for release until 2:15 pm (EST), December 8th

Washington, D.C., December 8, 2013 - Epilepsy patients with complex partial seizures have impaired consciousness during seizure episodes and typically have no memory of the event. However, the mechanisms of seizure unconsciousness are unclear. Research reported today at the American Epilepsy Society (AES) 67th Annual Meeting suggests that the mechanism underlying loss of awareness during complex partial seizures is likely the same as that involved in slow wave or deep sleep.

In earlier research the team of investigators from Yale Medical School revealed an association between slow wave oscillations in neocortex and loss of consciousness in complex partial seizures. They also developed a rodent model with similar seizure characteristics, including neocortical slow waves similar to those seen in sleep. With the use of this model, the team then sought to find whether the slow waves of seizures were closely related to decreased acetylcholine in a specific sleep-associated brain area, as occurs in slow wave sleep. (Platform C.07 / Abstract 1740199 – Role of Decreased Cholinergic Neurotransmission in Reduced Corticothalamic Arousal during Complex Partial Seizures.)

The synthesis and release of acetylcholine is followed by breakdown into the molecule choline. That molecule was thus used in this study as a proxy for acetylcholine and choline levels at the target site were recorded using an implanted choline-oxidase coated microelectrode.

To determine if there was a reduction in choline levels concordant with decreased neuronal activity, fluctuations in neuronal activity were mapped by functional MRI. When seizures were induced in the animal models, decreases were observed in both fMRI blood oxygen levels and in the microelectrode choline level recordings, demonstrating, for the first time, a drop in cholinergic neurotransmission during limbic seizures in rodents.

“This suggests a possible mechanism to explain the slow oscillations and unconsciousness of complex partial seizures,” says Hal Blumenfeld, M.D., Ph.D., of Yale Medical School, lead investigator on the report. “These seizures propagate from the hippocampus to limbic structures containing inhibitory projection neurons. Neuronal activity in the arousal nuclei of the brainstem and basal forebrain then decreases; and this leads to decreased levels of arousal in the thalamus and cortex, and to impaired consciousness. We hope this research
will help save lives of people with epilepsy who are in danger of accidents or breathing difficulty from the deep unconsciousness accompanying seizures.”

Main investigators on the study:
Wei Li and Joshua Motelow, Dept. of Neurology, Yale School of Medicine
Hal Blumenfeld, Depts. of Neurology, Neurobiology and Neurosurgery, Yale School of Medicine

Editors Note: Authors of this study will be available at a press briefing at 2:15 pm (EST), December 8, in the onsite pressroom, Room 209-A, Level 2 of the Walter E. Washington Convention Center. The call-in number for off-site journalists is 1-605-475-4000, passcode 521653#.

About epilepsy
The epilepsies affect 50 million people worldwide, including three million in the United States. The disorder can have a single specific, well-defined cause, such as a head injury, or manifest as a syndrome with a complex of symptoms. It is the third most common neurological disorder after Alzheimer’s disease and stroke.

About the American Epilepsy Society (AES)
The American Epilepsy Society, based in West Hartford, Conn., seeks to advance and improve the treatment of epilepsy through the promotion of epilepsy research and education for healthcare professionals. The Society’s annual meeting is the largest scientific meeting in epilepsy and each year attracts some 4,000 physicians, scientists and allied healthcare professionals from around the world.

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