

Prevention of Epilepsy After Traumatic Brain Injury

In the current wars in Iraq and Afghanistan the “signature wound” is traumatic brain injury (TBI), of which epilepsy is a common long-term consequence. Those who suffer severe head traumas face up to a 50 percent chance of developing post-traumatic epilepsy, and frequently, this chronic condition does not respond to available treatments, imposing significant ill effects on rehabilitation and quality of life. The civilian population is also at risk; TBI accounts for 5% of epilepsy.

Remarkably little is understood about post-traumatic epilepsy. Although head injury is known to put a patient at high risk for development of chronic seizures in both civilian and non-civilian populations, there is still a lack of research focused on this area. Post-traumatic seizures can develop at anytime after the injury—from within one week to fifteen years later. At this time, there is no way to prevent or cure post traumatic epilepsy.

Now in its third year, CURE’s program, Prevention of Epilepsy after Traumatic Brain Injury, targets funds to basic and applied research on epilepsy related to traumatic brain injury impacting combat, veteran, and civilian populations in order to better understand the causes of epilepsy following TBI and develop interventions and treatments. This program is in partnership with the United States Army Medical Research and Materiel Command (USAMRMC). The program is financed by the USAMRMC, and administered by CURE.

This program supports investigator-initiated research of relevance to the prevention and treatment of post-traumatic epilepsy, including the cellular, molecular, and systems-level understanding of the underlying pathogenic mechanisms; specific approaches to interdict the development of post-traumatic epilepsy; animal models of post-traumatic epilepsy; and investigations of the impact, natural history and epidemiology of post-traumatic epilepsy.

CURE is embarking on its final year of partnership with the USAMRMC for this program. However, CURE is dedicated to continuing support for research in this critical area. With relatively little investment compared to what it deserves, this targeted program has already produced significant results, including a recent exciting breakthrough from Daniela Kaufer, PhD (University of California, Berkeley) and Alon Friedman, MD, PhD (Ben-Gurion University of the Negev, Israel). Drs. Kaufer and Friedman have discovered that drugs known as TGF-beta blockers prevent epilepsy after brain injury in rats. They found that they could prevent the brain changes leading to epilepsy by treating the animals with a drug that blocks transforming growth factor-beta (TGF-beta) receptors. If the findings are confirmed in humans, the TGF-beta blockers may prevent many cases of epilepsy in accident victims and soldiers serving in Iraq and Afghanistan.

Only with increased public and private funding for post-traumatic epilepsy can researchers continue to explore new areas that will one day lead to prevention and cures for epilepsy.

“Prevention of Epilepsy After Traumatic Brain Injury”

A Partnership with the United States Army Medical Research and Materiel Command (USAMRMC)

*** CURE will name five new TBI Awards in September 2009. The organization has previously awarded 12 grants in this area.

2008 TRAUMATIC BRAIN INJURY AWARDS

Prevention of Neocortical Posttraumatic Epileptogenesis

David Prince, MD and Kevin Graber, MD
Stanford University, Stanford, CA

Prevention of Posttraumatic Epilepsy by Transient Modulation of Adenosine Receptors

Detlev Boison, PhD and Theresa Lusardi, PhD
RS Dow Neurobiology Lab, Legacy Research, Portland, OR

Dietary and Activity Treatments for Modulating Post-Traumatic Brain Hyperexcitability

Philip Schwartzkroin, PhD
University of California, Davis, CA

In Vivo Time-Lapse Imaging of an Epileptogenic Focus in Post Traumatic Epilepsy

Adi Mizrahi, PhD
The Hebrew University of Jerusalem, Israel

Roles of Glutamate-Induced Astrocytic Glutamate Release in Post-Traumatic Epilepsy

Jian Kang, MD, PhD
New York Medical College, New York, NY

The Role of Serum Albumin and TGF-Beta in Post-Traumatic Epileptogenesis

Daniela Kaufer, PhD
University of California, Berkeley, CA
Alon Friedman, MD, PhD
Ben-Gurion University of the Negev Beer-Sheva, Israel

2007 TRAUMATIC BRAIN INJURY AWARDS

Prophylaxis of Posttraumatic Epilepsy Following Head Injury in the Rat

Raimondo D'Ambrosio, PhD
University of Washington, Seattle, WA

Mouse Model of Post-Traumatic Epilepsy

James McNamara, MD, Xiao-Ping He, MD, PhD, and Bradley Kolls, MD, PhD
Duke University Medical Center, Durham, NC

Post Traumatic Epilepsy—Targeting Reactive Gliosis

Maiken Nedergaard, MD, PhD
University of Rochester, Rochester, NY

Post-Traumatic Epileptogenesis: Development and Use of Animal Models for Identification of Molecular Mechanisms and Surrogate Markers

Asla Pitkänen, MD, PhD, DSci
University of Kuopio, Finland

Evaluation of Focal Cortical Cooling to Prevent Epileptogenesis and Control Chronic Seizures Induced by Fluid Percussion Injury in the Rat

Matthew Smyth, MD
Washington University, St. Louis, MO
Raimondo D'Ambrosio, PhD
University of Washington, Seattle, WA

Preventing Denervation-Induced Hyperexcitability After Traumatic CNS Injury

Scott Thompson, PhD
University of Maryland School of Medicine, Baltimore, MD