# Could standard treatment for traumatic brain injury be wrong?

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Traumatic brain injury — not heart disease, stroke or cancer — is the number one cause of death and disability in people under 45. Each year, some 1.5 million Americans, including soldiers, athletes, the elderly and children, sustain head injuries, and nearly half of them will be hospitalized and treated in an emergency room or intensive care unit.

But what if they are treated incorrectly?

The Brain Injury Research Center (BIRC) in the UCLA Department of Neurosurgery has been awarded a $4.2 million grant from the National Institutes of Health to research new ways to heal the brain after a traumatic brain injury, or TBI. Specifically, researchers will be looking at how to best feed the brain the nutrients it needs to optimize recovery.

The standard thinking for many years has been that after a TBI, the brain lies in a docile state or coma and thus requires very little energy. But research from the BIRC now shows that the brain's response to trauma requires enormous amounts of energy.

"Many patients with a traumatic brain injury exhibit hyperglycemia — high blood sugar — by the time they arrive in the ER," said David Hovda, professor of neurosurgery and director of the BIRC. "So the standard protocol was to give the patient insulin to tightly control the levels of glucose that would take them to normal. For many regions of the injured brain, this may be the wrong thing to do."

In fact, the brain needs fuel to initiate the healing process — and not just glucose, Hovda suspects. Because they have found that the way glucose is used by the brain changes after a TBI, researchers believe other naturally used compounds, including pyruvate, beta-hydroxybutyrate, lactate and ketones, should be considered in treatment. Hovda and his colleagues think that each of these fuels may serve a different purpose, depending on the severity of the injury and whether the injured individual is an adult or adolescent. The goal, therefore, is to identify the optimal brain fuels for different age groups that will improve recovery.

"Our work is challenging because we're questioning a standard protocol," said Dr. Christopher Giza, UCLA associate professor of neurosurgery and a co-investigator on the NIH grant. "If the brain is actually asking for fuel (glucose), that means that after trauma, Mother Nature is shifting gears and changing the chemistry of the brain. These concepts and constructs are what we're going to be examining closely."

"The majority of head injuries are called mild traumatic brain injuries," Hovda said. "But what we've discovered is the path of physiological consequences measured in severe head injuries also occurs in mild traumatic head injuries as well. So this research might just change what's put in the IV bag at the onset of treatment."

Over the past 20 years, there have been more than 75 clinical trials for traumatic brain injury, but none have resulted in a standard treatment for TBI. The current grant will have both a research and a clinical component: The research will look at the use of alternative fuels and how these fuels enter the brain and contribute to the healing process, while the clinical aspect will test alternative fuels and examine the possible threat to recovery after TBI when hyperglycemia is stopped.

Interest in continuing research on head trauma recovery is widespread and is supported by, among others, Major League Baseball, the National

Football League, the World Boxing Council and the U.S. Department of Defense.

"We wish there was a cure for TBI," Hovda said. "But for now all that's available is rehabilitation therapy. Patients diagnosed with epilepsy or depression have medications that may help. But as of now there is no cocktail remedy for TBI. Our hope is to change that."

Source: University of California - Los Angeles