



VA research on **TRAUMATIC BRAIN INJURY**

VA research related to TBI is wide-ranging. Among the goals of VA researchers working in this field are to shed light on brain changes in TBI, improve screening methods and refine tools for diagnosing the condition, and develop ways to treat brain injury or limit its severity when it first occurs.

ABOUT TRAUMATIC BRAIN INJURY

- The CDC defines a TBI as “a disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head, or penetrating head injury.”
- After a TBI, the person may experience a change in consciousness that can range from becoming dazed and confused to loss of consciousness. The person may also have a loss of memory for the time immediately before or after the injury.
- The DOD estimates that 22 percent of all combat casualties from Iraq and Afghanistan are brain injuries. TBI is a significant cause of disability outside of military settings, most often as the result of assaults, falls, automobile accidents, or sports injuries.
- TBI can include a range of comorbidities, from headaches, irritability, and sleep disorders to memory problems, slower thinking, and depression. These symptoms often lead to long-term mental and physical health problems that impair Veterans’ employment and family relationships, and their reintegration into their communities.
- While most people with mild TBI have symptoms that resolve within hours, days, or weeks, a minority may experience persistent symptoms that last for several

months or longer. Treatment typically includes a mix of cognitive, physical, speech, and occupational therapy, along with medication to control specific symptoms such as headaches or anxiety.

VA RESEARCH ON TRAUMATIC BRAIN INJURY: OVERVIEW

- Beyond studying how to better treat TBI, researchers are also designing improved methods to assess the effectiveness of treatments and learning the best ways to help family members cope with the effects of TBI and support their loved ones.
- VA’s [TBI Model System](#) (TBIMS) is a longitudinal multicenter research program that examines the recovery course and outcomes of Veterans and active duty service members with TBI. The goal of the system is to conduct research that contributes to evidence-based rehabilitation interventions and practice guidelines that improve the lives of people with TBI.
- VA’s [Translational Research Center for TBI and Stress Disorders](#) (TRACTS) conducts studies to understand the complex changes in the brain, thinking, and psychological well-being that result from TBI and posttraumatic stress disorder (PTSD). These studies will lead to more understanding and better treatment options for returning Veterans with TBI and PTSD.

- The [Chronic Effects of Neurotrauma Consortium](#) (CENC) serves as a comprehensive research network for DOD and VA that focuses on the long-term effects of combat- and military-related TBI. The CENC is designed to conduct research that provides clinically relevant answers and interventions for service members and Veterans and to develop long-term solutions to the chronic effects of TBI.

SELECTED MILESTONES AND MAJOR EVENTS

- 2008** – Established a [Brain Bank](#) to collect and study post-mortem human brain and spinal cord tissue to better understand the effects of trauma on the human nervous system
- 2012** – [Discovered](#) chronic traumatic encephalopathy, a degenerative disease linked to repeated head trauma such as concussion, in the brains of four Veterans after their deaths
- 2013** - Funded, along with the DOD, two [consortia](#) to improve treatment for PTSD and mild TBI as part of the [National Research Action Plan](#)
- 2015** - [Learned](#) that Veterans who were near to bomb blasts in Iraq and Afghanistan appear to experience faster brain aging

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2016 - Identified the cerebellum as particularly vulnerable to repeated blast exposures

2017 - Found that treatment with the protein UCH-L1 has the potential to improve cognitive function when given weeks or months after a TBI

2018 - Discovered that functional brain networks that actively interfere with pain perception are disrupted by mild TBI in post-9/11 Veterans and service members with and without chronic pain

RECENT STUDIES: SELECTED HIGHLIGHTS

The studies highlighted below appeared in a special issue of the journal Brain Injury that focused on Veterans and service members.

• Neuroimaging showed myelin damage in Veterans with mild TBI, in a study by VA San Diego Healthcare System researchers. Myelin is the substance that insulates nerve fibers. Using a new type of neuroimaging, the researchers found that patients with a history of mTBI had more clusters of lower myelin water fraction (a marker of myelin integrity) than those without. Myelin damage was linked to slower mental processing speed. ([Brain Injury](#), October 2018)

• Patients with a history of mild TBI and chronic pain had less functional

connectivity between certain brain regions, found a Michael E. DeBakey VA Medical Center study. In a study of post-9/11 Veterans and service members, the results showed that patients with more severe chronic pain, which they perceived as interfering with daily life, had less connection between brain regions. Patients with more pain interference had higher cortical thickness in specific regions of the brain. ([Brain Injury](#), October 2018)

• Sensory problems are more common in Veterans with TBI or blast exposure, according to a study of more than 570,000 post-9/11 Veterans. The study of diagnostic codes and administrative data showed that sensory problems affect a substantial number of deployed post-9/11 Veterans. Those diagnosed with a TBI or who had been exposed to a blast were more likely to have all types of sensory dysfunction, with auditory problems being the most common. ([Brain Injury](#), October 2018)

• Traumatic brain injury symptoms predicted opioid prescriptions for chronic pain for Veterans, in a San Francisco VA Health Care System study. Opioids are not recommended for patients with neuropsychological impairment from traumatic brain injury. However, clinical guidelines are not always adhered to in actual practice. In

the study, self-reported severe and very severe postconcussive symptoms predicted starting long-term or short-term opioid use for chronic pain. ([Brain Injury](#), October 2018)

• Mild TBI was not associated with gross brain atrophy, in a Minneapolis VA Health Care System study. Researchers used magnetic resonance imaging to look at ventricle-brain ratio, a measure of brain atrophy, in Veterans at two points five years apart. Veterans with a history of mTBI did not show differences in ventricle-brain ratio compared with patients without mTBI, although they did have larger total brain volume. ([Brain Injury](#), October 2018)

• Repeated mild TBI may lead to balance problems later in life in combat Veterans, according to a study of post-9/11 Veterans and service members. Participants with three or more mTBIs had lower balance scores than those with one or two lifetime mTBIs. Pain interference and sensory conditions affecting the equilibrium may explain some of these balance issues. ([Brain Injury](#), October 2018)

For more information on VA studies on traumatic brain injury and other key topics relating to Veterans' health, please visit www.research.va.gov/topics

TBI can involve symptoms ranging from headaches, irritability, and sleep disorders to memory problems, slower thinking, and depression. These symptoms often lead to long-term mental and physical health problems.

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