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VA research on

TRAUMATIC BRAIN INJURY

VA research related to TBI is wide-ranging. Researchers are examining various approaches to detect, monitor, and treat Veterans with TBI.

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." Service members and Veterans are also at risk of brain injury from explosions experienced during combat or training exercises.

• More than 185,000 Veterans who use VA health care have been diagnosed with at least one TBI. The majority of those TBIs were classified as mild. TBI and its associated comorbidities are also a significant cause of disability outside of military settings.

• Conditions stemming from TBI can range from headaches, irritability, and sleep disorders to memory problems, slower thinking, and depression. These ailments can often become long-term health problems that impair Veterans' employment, family relationships, and reintegration into the community.

• Most TBI injuries are considered mild, but even mild cases can involve serious long-term effects on areas such as thinking ability, memory, mood, and focus, along with physical symptoms.

• 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

• Among VA researchers' goals 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 occurs.

• 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 multi-center research program that examines the recovery course and outcomes of Veterans and service members with TBI following inpatient rehabilitation. The goal of the system is to conduct research that contributes to evidence-based rehabilitation and practice guidelines that improve the lives of people with TBI.

• VA's Translational Research Center for TBI and Stress Disorders (TRACTS) aims to better understand the complex problems faced by Iraq and Afghanistan Veterans with TBI and PTSD. The center is focused on innovations to better diagnose TBI and to develop new treatments that target the combined effects of TBI and stress disorders.

• The Brain Rehabilitation Resource Center develops and tests treatments to improve or restore motor, cognitive, and emotional functions impaired by neurologic disease or injury.

• The Long-Term Impact of Military-Relevant Brain Injury Consortium-Chronic Effects of Neurotrauma Consortium (LIMBIC-CENC) is a collaboration between VA, DOD and university partners. It focuses on long-term effects of mild TBI in service members and Veterans. CENC is designed to conduct basic, clinical, and translational research that seeks to discover interventions and treatment for 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

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2013 - Funded two consortia to improve treatment for PTSD and mild TBI

2014 - Developed the Boston Assessment of Traumatic Brain Injury—Lifetime (BAT-L), the first post-combat, semi-structured clinical interview to characterize head injuries and diagnose TBIs

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

2017 – Published results from a long-term study (TRACTS) on the consequences of psychological and brain trauma following 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

2019 – Began the LIMBIC study, a five-year study to better understand the long-term impact of TBI

RECENT STUDIES: SELECTED HIGHLIGHTS

Female Veterans and services members are not well-represented in TBI research, found a Washington DC VA Medical Center review. Many studies on Veterans with TBI do not include women participants. Few TBI studies focused on gender, and most that did had only a small number of female participants. More work is needed on how TBI specifically affects female Veterans and service members. (*PM & R*, March 2020)

VA researchers identified proteins that have potential as biomarkers to identify blast-related TBI through blood tests. Iowa City VA and Louis Stokes VA Medical Center researchers used two different tests to identify six proteins in the blood that may indicate TBI. These proteins and their antibodies are good targets for further study on TBI biomarkers. (*Heliyon*, Feb. 17, 2020)

People with a history of combat-related mild TBI have much higher levels of abnormally fast brain waves than normal, found a study by VA San Diego researchers. The abnormal brain waves were in two of the four lobes of the cerebral cortex: the prefrontal and posterior parietal lobes. These lobes affect functions including reasoning, organization, planning, execution, attention, and problem-solving. (*Cerebral Cortex*, Jan. 10, 2020)

Service members with TBI have higher rates of psychiatric conditions, according to a review by Minneapolis VA researchers. Compared to those without TBI, service members with TBI had higher rates of PTSD, depressive disorder, substance use disorder, and anxiety disorder. Some studies also linked TBI to greater severity of PTSD symptoms and higher rates of suicide attempts. (*Journal of Health Trauma Rehabilitation*, January/February 2020)

TBI is linked to worsening tinnitus, found a study by VA San Diego researchers. Tinnitus involves hearing sound, such as ringing in the ears, when no external sound is present. Researchers assessed hearing in Marines before and after deployment. Both PTSD and TBI, particularly blast-related TBI, were linked to worsening tinnitus. Those who already had tinnitus before being deployed found the progression of the condition also increased with hearing loss. (*Military Medicine*, Dec. 1, 2019)

Veterans with a history of TBI are more than twice as likely to die by suicide, compared to those without TBI. Researchers with the VA Rocky Mountain MIRECC reviewed medical records of more than 1.4 million Veterans. They found those with moderate or severe TBI were 2.45 times more likely to die by suicide than those without a TBI diagnosis. (*Journal of Head Trauma Rehabilitation*, September/October 2019)

Veterans with moderate to severe TBI require rehabilitative services even five years after injury, according to a James A. Haley Veterans' Hospital study. Veterans needed help with engaging in recreation, solving problems, getting around their communities, improving job skills, and accessing psychological support. Both this group and Veterans with mild TBI also may require help in improving memory and controlling physical symptoms. (*Archives of Physical Medicine and Rehabilitation*, Oct. 1, 2019)

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 ailments can often become long-term health problems.

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