

# Penn gets \$9.7 million grant to study concussion-related brain damage

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Researchers from the University of Pennsylvania will lead an international team in a new project to study relationships between brain injuries and various types of neurodegeneration that lead to dementia

symptoms.

The work will be supported by a five-year, \$9.7 million grant from the National Institute of Neurological Disorders and Stroke and the National Institute on Aging, Penn announced Thursday.

The project, called CONNECT-TBI (traumatic [brain](#) injury), will be co-led by Douglas H. Smith, director of the Center for Brain Injury and Repair and a professor of neurosurgery at Penn, and William Stewart, a neuropathologist who works at the University of Glasgow and is also an adjunct associate professor of neurosurgery at Penn.

In recent years, there has been much publicity about sports figures and military veterans who have developed dementia after suffering concussions earlier in their lives. Researchers who have examined their brains after death have identified a type of neurodegeneration called [chronic traumatic encephalopathy](#) (CTE), which is characterized by a particular pattern of cellular changes at the base of folds in the brain, Smith said.

But CTE is only one type of neurodegeneration associated with brain injury, he said. He thought the field needed a broader term, so he invented one: TReND, for TBI-related neurodegeneration. The NIH suggested a term, too, but, he said, it was "not nearly as catchy." As evidence, he couldn't remember what it was. After some research he reported that it was NATBI, short for Neuropathological Assessment of TBI-related Neurodegeneration and Neurocognitive Decline.

In the study, scientists will analyze information from brain banks and data sets of [brain injury](#) and dementia cases. They will compare the brains of people who have had brain injuries with the brains of peers who have not, to shed light on how injuries affect risks and how patterns of TReND differ. Smith is also interested in learning how to diagnose

people earlier in the disease process. The researchers will study how many concussions are needed to increase risk and how severity of injury affects later brain damage.

There is a popular belief that even one concussion could cause dementia years later. Smith said he even received an email from a young man who had had a concussion and was so worried about his future brain health that he was afraid to get married. Smith thinks there's more to it than that.

"The number one genetic risk factor for having a concussion or head [injury](#) is the Y chromosome," he said. Yet women are more likely to get Alzheimer's than men of the same age. "It simply can't be just one concussion," he said.

Smith said scientists are in the early stages of understanding CTE. Some researchers have reported seeing similar pathological changes in people who did not have a history of [traumatic brain injury](#).

More broadly, people who have had brain injuries may show pathological changes to the proteins tau and amyloid beta in their brains that are similar to those with Alzheimer's disease, Smith said. There also can be brain atrophy, chronic inflammation and damage to the brain's "electric grid." The researchers will be looking for patterns of brain changes.

Symptoms include memory loss, confusion, and depression.

The research will also involve scientists from the University of California San Francisco, Harvard University, Stanford University, Mount Sinai and New York University, Columbia University, University of Toronto, University of Washington, University of Pittsburgh, Uniformed Services University of Health Sciences and the Department

of Defense Medical Research and Materiel Command.

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