

**Congress of the United States**  
**House of Representatives**  
Washington, D.C. 20515

**MEMORANDUM**

**October 11, 2017**

**To: Democratic Members of the House Committee on Energy and Commerce and Committee on the Judiciary**

**Fr: Democratic Staff of the Committee on Energy and Commerce and Committee on the Judiciary**

**Re: Forum on “Addressing the Long-Term Effects of Sports-Related Brain Injury”**

On Friday, October 13, 2017 at 10:00 a.m. in room 2226 of the Rayburn House Office Building, Democratic Leadership of the Committee on Energy and Commerce and Committee on the Judiciary will hold a roundtable discussion on the long-term impact of subconcussive trauma, in particular as associated with contact sports such as football. The roundtable will bring together experts from the medical research and athletic communities to review the causes, effects, and treatments of concussions and other head trauma. It will discuss what is known about brain injuries, what gaps exist in the scientific literature, and what is being done to address those gaps. It will also feature first-hand accounts from individuals who have been exposed to subconcussive trauma and have witnessed its long-term effects.

**I. BACKGROUND**

Many Americans—including children, youth, and adults at the amateur and professional levels—participate in contact sports such as football. With the many benefits of sports participation, however, comes an inherent risk of injury, including risks of head and brain trauma. Experts are only now beginning to understand the long-term consequences of repeated brain trauma. A series of highly publicized incidents involving professional and college football players have provoked widespread discussion of the consequences of sports-related head injuries, and about ways to mitigate the risks associated with contact sports.<sup>1</sup>

The underlying causes of neurological conditions remain a major challenge for scientists. Despite recent advances in diagnostic brain imaging and our understanding of the physics of concussion, both the short-term and long-term consequences of traumatic brain injury are poorly

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<sup>1</sup> See, e.g., Jake Griffin et al., *Friday night flight: High school football in Chicago area takes a hit*, CHICAGO SUN TIMES (Oct. 6, 2017), <https://chicago.suntimes.com/chicago-politics/friday-night-flight-high-school-football-in-chicago-area-takes-a-hit-participation-down-amid-concussion-cte-fears/>.

understood.<sup>2</sup> However, there is emerging evidence that brain injuries, even those once considered minor, are linked to long-term, sometimes debilitating consequences, such as psychological and sleep disorders, amyotrophic lateral sclerosis (ALS), chronic traumatic encephalopathy (CTE), and Alzheimer's disease.<sup>3</sup>

## II. THE SCIENCE OF SPORTS-RELATED BRAIN INJURY

The leading cause of death from sports-related injuries is traumatic brain injury (TBI), which includes concussions, as well as more severe brain injuries.<sup>4</sup> More than 70 percent of emergency room (ER) visits for sports and recreation-related TBI were youths from 10 to 19 years of age. Emergency room visits for children and teens increased nearly 60 percent over the last decade.<sup>5</sup>

Concussions, or mild traumatic brain injuries (mTBI), occur when a blow to the head or body causes the head to move rapidly back and forth, resulting in temporary neurological impairment, such as disorientation, loss of memory for events immediately before or after the injury, or brief loss of consciousness.<sup>6</sup> Based on available data, the Centers for Disease Control and Prevention (CDC) estimates that between 1.6 million to 3.8 million sports- and recreation-related concussions occur each year.<sup>7</sup>

There continues to be uncertainty in how TBI is diagnosed. Concussion has multiple, non-harmonized definitions across the medical literature. Furthermore, in the absence of objective diagnostic measures, concussion remains a clinical diagnosis subject to great variability

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<sup>2</sup> Aaron J. Carman et al., *Expert Consensus Document: Mind The Gaps—Advancing Research Into Short-Term and Long-Term Neuropsychological Outcomes of Youth Sports-Related Concussions*, NATURE (Apr. 2015), <https://www.nature.com/nrneurol/journal/v11/n4/pdf/nrneurol.2015.30.pdf>.

<sup>3</sup> See, e.g., *Link Found Between Concussions and Lou Gehrig's Disease*, L.A. TIMES (Aug. 17, 2010); Christine M. Baugh et al., *Chronic Traumatic Encephalopathy: Neurodegeneration Following Repetitive Concussive and Subconcussive Brain Trauma*, BRAIN IMAGING & BEHAVIOR: MTBI SPECIAL ISSUE (2012); *Concussion Could Be Linked to Alzheimer's Risk, Study Says*, US NEWS (Dec. 27, 2013), <https://www.usnews.com/news/articles/2013/12/27/concussions-could-be-linked-to-alzheimers-risk-study-says>.

<sup>4</sup> AMERICAN ASSOCIATION OF NEUROLOGICAL SURGEONS, *Sports-Related Head Injury*, <http://www.aans.org/Patients/Neurosurgical-Conditions-and-Treatments/Sports-related-Head-Injury> (last visited on Oct. 6, 2017).

<sup>5</sup> CENTERS FOR DISEASE CONTROL AND PREVENTION, *Nonfatal Traumatic Brain Injuries Related to Sports and Recreation Activities Among Persons Aged ≤19 Years—United States, 2001—2009* (Oct. 7, 2011), <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6039a1.htm>.

<sup>6</sup> CENTERS FOR DISEASE CONTROL AND PREVENTION, *Heads Up: What is a Concussion?* [https://www.cdc.gov/headsup/basics/concussion\\_what.html](https://www.cdc.gov/headsup/basics/concussion_what.html) (last visited on Oct. 6, 2017).

<sup>7</sup> Data showing the occurrence of TBI, especially in youth sports, is limited due to the absence of a comprehensive reporting and collection system. Thomas R. Frieden et al., *Report to Congress: Traumatic Brain Injury In the United States: Epidemiology and Rehabilitation*, CENTERS FOR DISEASE CONTROL AND PREVENTION (2015), [https://www.cdc.gov/traumaticbraininjury/pdf/tbi\\_report\\_to\\_congress\\_epi\\_and\\_rehab-a.pdf](https://www.cdc.gov/traumaticbraininjury/pdf/tbi_report_to_congress_epi_and_rehab-a.pdf); SPORTS CONCUSSION INSTITUTE, *Concussion Facts*, [www.concussiontreatment.com/concussionfacts.html#sfaq9](http://www.concussiontreatment.com/concussionfacts.html#sfaq9) (last visited on Oct. 6, 2017).

across specialties and is likely underreported.<sup>8</sup> One major initiative currently funded by the National Institutes of Health (NIH) and the Department of Defense (DoD), the TRACK-TBI study, seeks to refine and improve diagnosis and treatment of TBI.<sup>9</sup>

While TBI and concussions both may result in devastating consequences, recent research suggests that athletes can sustain significant brain damage caused solely by repeated head impacts, even if those collisions do not result in concussions.<sup>10</sup> These “sub-concussive” events occupy an increasingly large role in the discourse surrounding sports-related brain injuries.

Repetitive brain trauma, including concussive and sub-concussive injuries, may increase an individual’s risk of developing CTE, a neurodegenerative disease associated with serious mental impairments and psychological effects, such as memory loss, confusion, impulse control, aggression, depression, suicidal ideation, and eventually progressive dementia.<sup>11</sup> Studies have found that athletes who had no observable symptoms of concussion but who nevertheless sustained repeated impacts to the head, performed worse than their non-athlete peers on tasks involving memory and displayed altered brain function on fMRI scans.<sup>12</sup> This research provides additional evidence that repetitive hits to the head—even in the absence of the clinical signs of concussion—have cumulative, long-term effects on brain function and physiology.<sup>13</sup>

Repetitive brain trauma triggers progressive degeneration of the brain tissue, including the build-up of an abnormal protein called tau.<sup>14</sup> Although currently diagnosable only post-mortem, and without any known pharmacological treatments, researchers are working to develop tests to identify CTE in living individuals, which may eventually lead to earlier diagnosis and treatment.<sup>15</sup>

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<sup>8</sup> Aaron J. Carman et al., *Expert Consensus Document: Mind The Gaps—Advancing Research Into Short-Term and Long-Term Neuropsychological Outcomes of Youth Sports-Related Concussions*, NATURE (Apr. 2015), <https://www.nature.com/nrneurol/journal/v11/n4/pdf/nrneurol.2015.30.pdf>.

<sup>9</sup> Jeffrey Norris, *Traumatic Brain Injury Research Advances with \$18.8M NIH Award*, UNIVERSITY OF CALIFORNIA SAN FRANCISCO NEWS CENTER (Oct. 22, 2013),

<sup>10</sup> Paul Myerberg, *Study Indicates Brain Injuries Among College Football Players*, USA TODAY (Mar. 7, 2013), [www.usatoday.com/story/gameon/2013/03/07/study-links-brain-injuries-to-ncaa-football-players-hits-that-do-not-cause-concussions/1970177](http://www.usatoday.com/story/gameon/2013/03/07/study-links-brain-injuries-to-ncaa-football-players-hits-that-do-not-cause-concussions/1970177).

<sup>11</sup> Christine M. Baugh et al., *Chronic Traumatic Encephalopathy: Neurodegeneration Following Repetitive Concussive and Subconcussive Brain Trauma*, BRAIN IMAGING & BEHAVIOR: MTBI SPECIAL ISSUE (2012).

<sup>12</sup> Thomas M. Talavage et al., *Functionally-Detected Cognitive Impairment in High School Football Players Without Clinically-Diagnosed Concussion*, JOURNAL OF NEUROTRAUMA (2013).

<sup>13</sup> Aaron J. Carman et al., *Expert Consensus Document: Mind The Gaps—Advancing Research Into Short-Term and Long-Term Neuropsychological Outcomes of Youth Sports-Related Concussions*, NATURE (Apr. 2015), <https://www.nature.com/nrneurol/journal/v11/n4/pdf/nrneurol.2015.30.pdf>.

<sup>14</sup> Ann C. McKee et al, *The First NINDS/NIBIB Consensus Meeting to Define Neuropathological Criteria for the Diagnosis of Chronic Traumatic Encephalopathy*, ACTA NEUROPATHOLOGICA (2015).

<sup>15</sup> Ken Belson, *New Tests for Brain Trauma Create Hope, and Skepticism*, N.Y. TIMES (Dec. 25, 2013), [www.nytimes.com/2013/12/26/sports/football/new-tests-for-brain-trauma-create-hope-and-skepticism.html](http://www.nytimes.com/2013/12/26/sports/football/new-tests-for-brain-trauma-create-hope-and-skepticism.html).

### III. RECENT RESEARCH AND IMPACT OF LIVING WITH CHRONIC TRAUMATIC ENCEPHALOPATHY (CTE)

Roundtable panelists Dr. Ann McKee, Dr. Robert Stern, and Dr. Chris Nowinski are leading researchers with the Boston University Chronic Traumatic Encephalopathy Center, and have produced dozens of studies investigating the connection between brain injury, in particular subconcussive trauma, and CTE. In July, they published a study examining the brains of 111 deceased NFL players, 53 deceased college players, and 14 high school players. The study showed that of the 111 NFL players, 110 had CTE.<sup>16</sup> Forty-eight of the 53 deceased college football players had CTE, and three deceased individuals who played only high school football also suffered from the disease.<sup>17</sup> Last month, their study examining the influence of the age of first exposure to American football showed that individuals who begin playing tackle football before age 12 are at markedly increased risk of mood and behavior disorders, and issues with executive dysfunction.<sup>18</sup> Finally, Dr. McKee just released a study showing a possible biomarker for CTE which might make it possible to diagnose the disease in living people.<sup>19</sup> Right now, the disease can only be diagnosed through an autopsy after death.

Roundtable panelists Harry Carson, Mike Adamle, and Dr. Eleanor Perfetto have all directly experienced the devastating long-term impacts of brain injury. Mr. Carson, a NFL Hall-of-Fame linebacker, still experiences symptoms of Post-Concussion Syndrome, with which he was diagnosed in 1990. Mr. Adamle, who played for the Bears, Chiefs and Jets before becoming a noted sports journalist, has stated that realizing he had CTE symptoms “shook my world.”<sup>20</sup> And Dr. Perfetto, the widow of former Pittsburgh Steelers and San Diego Chargers guard Ralph Wenzel, witnessed her husband struggle with CTE symptoms for years, and observed the many daily challenges that Mr. Wenzel faced as a result of his brain injury.

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<sup>16</sup> A. McKee, R. Stern, C. Nowinski et al., *Clinicopathological Evaluation of Chronic Traumatic Encephalopathy in Players of American Football*, JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION (July 25, 2017), <https://jamanetwork.com/journals/jama/article-abstract/2645104>.

<sup>17</sup> *Id.*

<sup>18</sup> A. McKee, R. Stern, C. Nowinski et al., *Age of First Exposure to American Football and long-term Neuropsychiatric and Cognitive Outcomes*, NATURE (Sept. 19, 2017), <http://www.nature.com/tp/journal/v7/n9/full/tp2017197a.html?foxtrotcallback=true>.

<sup>19</sup> A. McKee et al., *CCL11 is Increased in the CNS in Chronic Traumatic Encephalopathy but not in Alzheimer’s disease*, PLOS ONE (Sept. 26, 2017), <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185541>.

<sup>20</sup> Phil Thompson, *Mike Adamle on His CTE Symptoms: “It shook my world,”* CHICAGO TRIBUNE (Feb. 8, 2017), <http://www.chicagotribune.com/sports/football/bears/ct-mike-adamle-tv-interview-tuesday-20170208-story.html>.

#### IV. PANELISTS

- **Mike Adamle**, All-American fullback at Northwestern in 1970; Played in the NFL (Bears & Chiefs) for six years; Well-known sports anchor on NBC & for Chicago local stations; Served as co-host of American Gladiators and worked with WWE Raw; Diagnosed with CTE-induced dementia in 2016.
- **Kim Adamle, Ed. S.**, Educational psychologist; Spouse of Mike Adamle and has cared for him throughout his struggles with CTE-induced dementia.
- **Harry Carson**, New York Giants linebacker from 1976–1989; Superbowl XXI champion; 9x Pro Bowler; Inducted into the NFL Hall of Fame in 2006.
- **Ann McKee, MD**, Chief, Neuropathology VA Boston; Director, CTE Center; Professor of Neurology and Pathology, Boston University School of Medicine.
- **Chris Nowinski, Ph.D.**, Founder, Concussion Legacy Foundation; Co-Founder and Outreach, Recruiting & Education Leader, BU CTE Center; Former Harvard All-Ivy Defensive Tackle.
- **Dr. Eleanor Perfetto**, Widow of Ralph Wenzel, who played guard for seven seasons for Pittsburgh Steelers & San Diego Chargers; Senior Vice President of Strategic Initiatives for the National Health Council.
- **Bob Stern, Ph.D.**, Professor of Neurology, Neurosurgery, and Anatomy & Neurobiology Clinical Core Director; BU Alzheimer's Disease and CTE Center Boston University School of Medicine.