

# TRAUMATIC BRAIN INJURY: CHRONIC TRAUMATIC ENCEPHALOPATHY

Lasting Impacts of mTBI

Global EOD Symposium and Exposition 2018

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Together, all the way.®



## What we'll discuss

- Who's impacted?
- TBI
- CTE
- Signs & Symptoms
- Disease progression
- CTE and Alzheimer's
- What you can do?



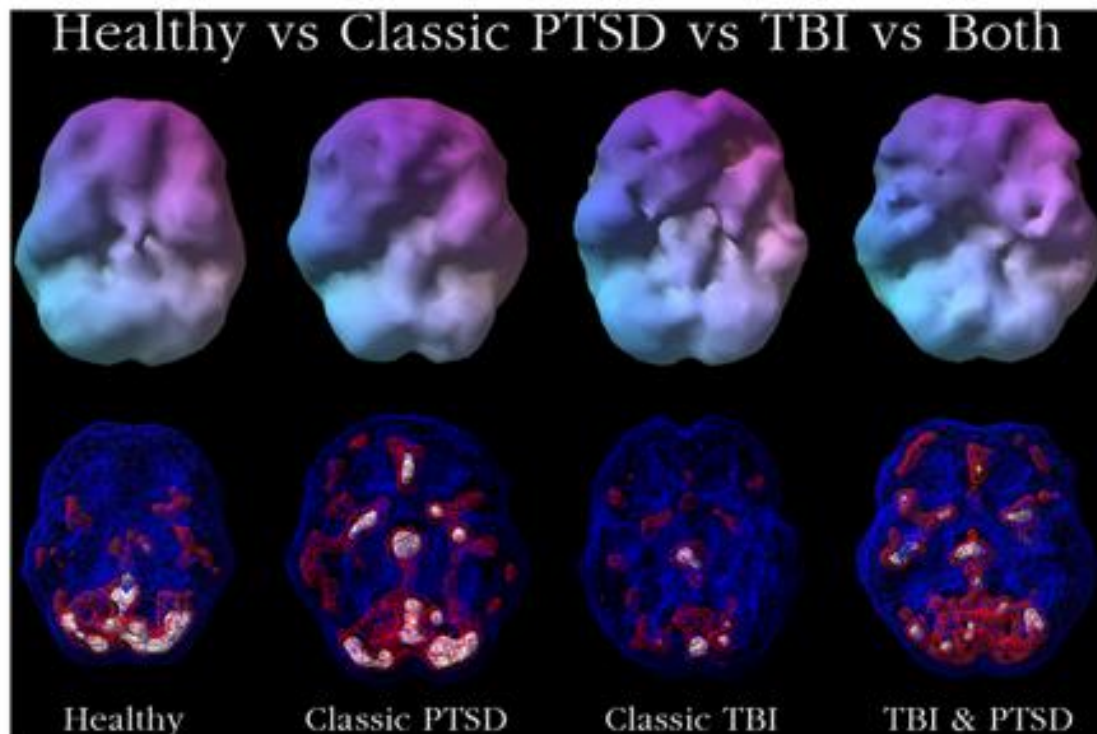
<http://www.businessinsider.com/an-eod-technician-explains-what-life-is-really-like-in-the-field-2012-8#its-not-like-the-movies-1>

# Who's impacted?



# Traumatic Brain Injury --moving on from “concussion”

Fig 3. Brain SPECT Images of Healthy, PTSD, TBI and PTSD Co-morbid with TBI Perfusion Patterns.



Amen DG, Rajl CA, Willeumier K, Taylor D, Tarzwell R, et al. (2015) Functional Neuroimaging Distinguishes Posttraumatic Stress Disorder from Traumatic Brain Injury In Focused and Large Community Datasets. PLOS ONE 10(7): e0129659.  
<https://doi.org/10.1371/journal.pone.0129659>  
<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0129659>

 **PLOS** | ONE  
TENTH ANNIVERSARY



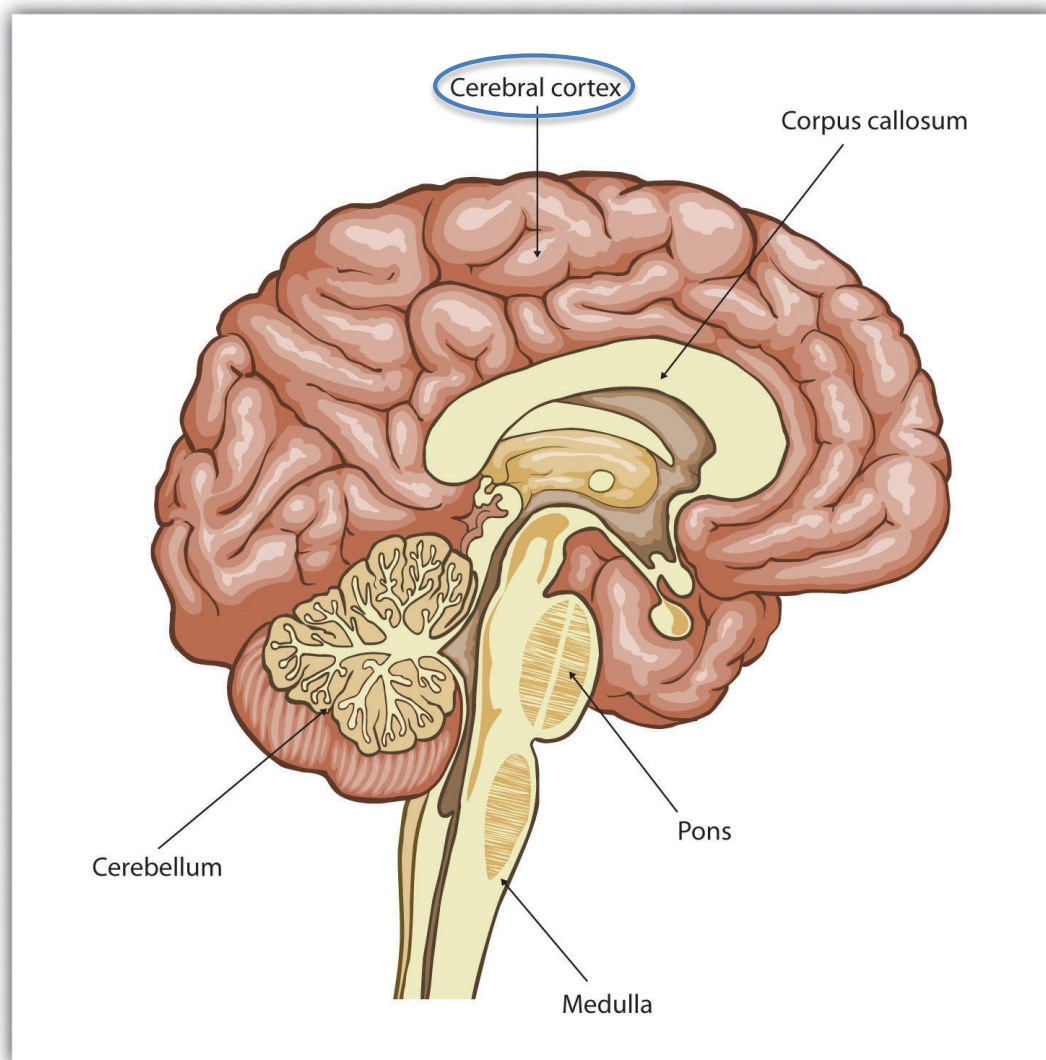
every 15 seconds an American suffers a TBI

Source: CDC, July 2018



## CTE: what is it?

- mTBI
  - Result of repeated sub-concussive injuries
- Invisible wound
- Brain damage
  - Progressive
  - Irreversible
- Diagnosis
  - No clinical test available currently
  - Reliant on symptomology
- Prevalence
  - Unknown
  - Study cohorts are very small & biased
  - No diagnosed cases in women so far



Source: Adapted from Wikia Education. (n.d.). Cerebral cortex. Retrieved from [http://psychology.wikia.com/wiki/Cerebral\\_cortex](http://psychology.wikia.com/wiki/Cerebral_cortex)

# Signs and Symptoms



<https://www.dvidshub.net/image/3699700/eod-not-just-ieds>

- Difficulty thinking
- Impulsive behavior
- Depression or apathy
- Short-term memory loss
- Difficulty planning or carrying out tasks (executive function)
- Emotional instability
- Substance abuse
- Suicidal ideation
  
- 20 – 40 year olds
  - Rapid progression of symptoms
  - Primary symptoms include behavioral changes
- 50 – 70 year olds
  - Slow progression
  - Cognitive deficits and decline
  - Potential overlap with ALZ

Source “CTE: What We Do and Don’t Know (from ‘Concussion 2018: Updates and Controversies Course’), C. Dirk Keene, Hospital for Special Surgery



# Stages of CTE

## Stages Of Disease



**Stage I:** Hot spots of tangled tau pop up in isolated areas of the cortex (black circle).



**Stage II:** Multiple hot spots of tangled tau appear in the cortical sulci, and tau begins to migrate.



**Stage III:** Tau hot spots begin to blend with one another. Tangles appear more diffusely throughout the ridges of the brain. Tau begins to collect in the hippocampus (involved in learning and memory) and amygdala (involved in decision making and emotions).



**Stage IV:** Dense tau tangles cover the brain's cortex and appear in most other regions, including the spinal cord.

**NOTE:** Stages proposed by Ann C. McKee, Boston University, still need to be validated by other research groups. Based on *Brain* 2013, DOI: 10.1093/brain/aww307.

## Signs & Symptoms by Stage<sup>2</sup>

### Stage 1

- ADHD
- Confusion/disorientation
- Dizziness
- Headaches

### Stage 2

- Memory loss
- Social instability
- Impulsive behavior
- Poor judgment

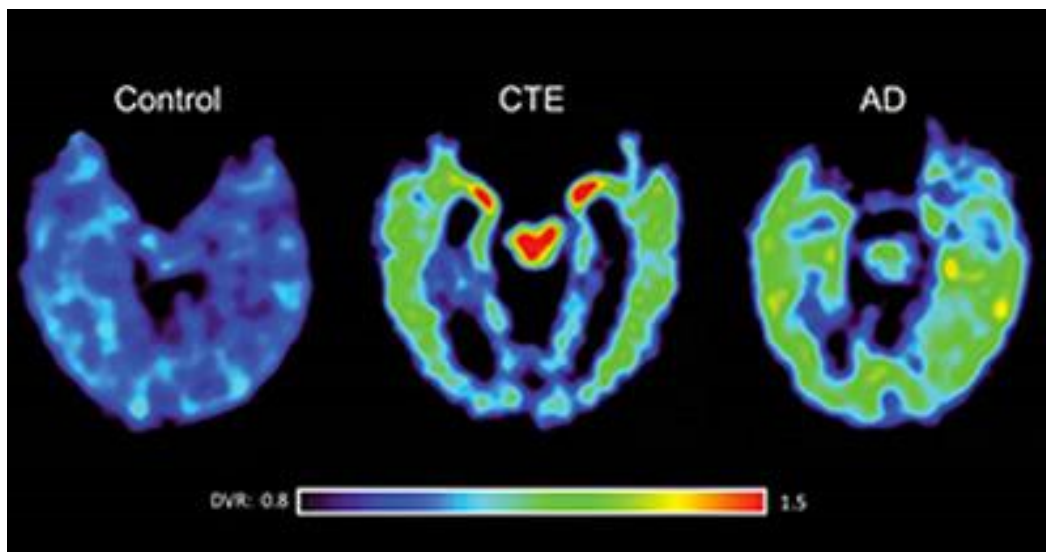
### Stage 3 & 4

- Progressive dementia
- Cognitive disorders
- Movement disorders
- Speech disorders
- Tremors
- Vertigo
- Deafness
- Depression
- Suicidal ideation

1. Photo credit: Ann McKee, MD, Boston University, VA Boston Healthcare

2. McKee et al, *J Neuropathol Exp Neurol.* 68(7): 709–35. doi:10.1097/NEN.0b013e3181a9d503. PMC 2945234 . PMID 19535999

# CTE vs Alzheimer's Disease



Source: Adapted with permission from Dr. Jorge Barrio et al., PNAS

- Can see differences in where brain activates
  - CTE function impaired in the deep sulci of the brain
  - ALZ diffuse functional impairment across all regions of the brain

## CTE & ALZ

- Develop silently over time
- May *not* present during lifetime
- Differential diagnosis post-mortem
- May be co-morbid conditions

## CTE

- Result of repetitive, sub-concussive head trauma
- Development of tau proteins in deep sulci, then expanding throughout brain
- Tau proteins cause functional changes in executive functions of brain

## ALZ

- No association with trauma
- Beta amyloid plaques form between nerve cells
- Tangles of tau protein form inside cells
- Plaques and tangles destroy nerve cells causing dementia and memory loss



## What can you do?

- Engage leadership
- Be a peer – Ask!
- Refer to a reputable center with a team approach
- Partner with organizations
- Work with researchers



<https://www.dvidshub.net/image/3480649/runners-al-udeid-run-5k-memory-fallen-eod-service-members>

# Who else is working on this?



INSTITUTE OF MEDICINE  
OF THE NATIONAL ACADEMIES



THE COLUMBIA  
**LIGHTHOUSE**  
PROJECT  
IDENTIFY RISK. PREVENT SUICIDE.



# Cigna's approach



**Thank you**



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# APPENDIX

## Resources: Professional Help

### Employee Assistance Program (EAP) / Military One Source

- Focus on assessment and referral
- Work /life services often available to assist with psychosocial and redeployment concerns
- Organization and manager support
- Crisis services often available

## Resources: Professional Help

- Contact primary care doctor for assistance
- Connect with outpatient services, therapist or psychiatrist, through insurance or VA.
- Seek emergency room services as appropriate (i.e.: call 911)
- Contact crisis hotline:
  - ❖ National Suicide Prevention Hotline: 1-800-273-TALK
  - ❖ Cigna's Veteran Support Line: 1.855.244.6211
  - ❖ Veterans Crisis Line: 1-800-273-8255





## Resources: Other Supports



- Friends and family
- Peer Support Counselors: *After the Long Walk* <http://www.afterthelongwalk.com/> or 1.888.412.0470
- Community Support Groups – ie: National Alliance for Mental Illness (NAMI)
  - [www.nami.org](http://www.nami.org)
- EOD Warrior Foundation [www.eodwarriorfoundation.org](http://www.eodwarriorfoundation.org)
- National Center for PTSD  
<https://www.ptsd.va.gov/>

## Resources: Self Help

- Exercise regularly
- Abstain from alcohol and drugs
- Mindfulness/ Relaxation
- Take time for enjoyable activities
- Focus on the basics (ie: sleep, healthy eating, etc.)



## Resources: Organizational

### ***Mental Health First Aid***

An 8-hour course that gives people the skills to help someone who is developing a mental health problem or experiencing a mental health crisis. The evidence behind the program demonstrates that it does build mental health literacy, helping the public identify, understand, and respond to signs of mental illness.

<https://www.mentalhealthfirstaid.org>

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