



**Gene profiling of nucleus basalis tau containing neurons in chronic traumatic encephalopathy:  
A chronic effects of neurotrauma consortium study**

**Purpose**

To discover the physiology behind chronic traumatic encephalopathy (CTE). Researchers have proposed that the onset of CTE changes gene activity in cells found in a region of the brain known as the nucleus basalis of Meynert (nbM) neurons, which is related to cognitive decline similar to that seen in dementia.

**Participants**

Data was obtained from 17 donated brains of athletes who participated in boxing, football, and hockey. All athletes had acquired repetitive mTBIs during their lifetime.

**How was the study conducted?**

Interviews given to the next of kin collected information about cognitive and behavioral changes that were observed. The pathological evaluation was completed by a neuropathologist blinded to the purpose of the study. In this evaluation, a diagnosis of CTE was given in reference to stages I-IV. Single cell gene profiling was used to evaluate changes in gene expression seen in nbM neurons across the different stages of CTE. Different statistical methods were used to analyze the data.

**Findings**

Results showed age when the sport began and retirement age was correlated with age of onset of gene dysregulation. In addition, specific nbM neurons showed differential altered, dysregulated gene expression across each stage of CTE. Although these alterations are associated with cognitive decline resembling Alzheimer's disease (AD), expression changes were different from those seen in brains plagued by Alzheimer's disease.

**Military Impact**

Understanding the genetic signatures of neuron prone to die in CTE will aid in the search for a treatment for this type of neurodegeneration in Veterans and service members.

*Mufson, E.J., He, B., Ginsberg, S.D., Carper, B.A., Bieler, G.S., Crawford, F., Alvarez, V.E., ... & Perez, S.E. (2018). Gene profiling basalis tau containing neurons in chronic traumatic encephalopathy: A chronic effects of neurotrauma consortium study. Journal of Neurotrauma, 1260-1271.*