RNA Biomarkers for Mild Traumatic Brain Injuries

Published date: July 25, 2018

Technology description

With generous support from Riddell, TGen has developed a noninvasive diagnostic method for mild traumatic brain injury (mTBI) using advanced genomic analyses of circulating DNA and extracellular RNA (exRNA) existing in bodily fluids that can be easily sampled in the field such as blood, urine, and salvia, and bodily fluids that can be further sampled in a clinical setting, such as cerebral spinal fluid. This novel approach to assessing mTBI, a malady undetectable by conventional neuroimaging techniques, measures changes in RNA expression associated with head impact exposure in bodily fluids. This method allows a correlative assessment of exRNAs with the magnitude, location and frequency of head impacts, providing a rapid and objective indication of the risk of developing mTBI or fitness to participate in activities with head impact risks.

Concussion is the most common form of mild traumatic brain injury (mTBI) and has a high incidence in contact sports. Repeated concussions can also significantly threaten the long-term health of an individual. Detecting brain injury and the extent of damage to tissue and cells is challenging. Clinical assessment tools for evaluating a concussed athlete are based primarily on self-reported signs and symptoms, cognitive deficits, and balance impairments. While clinical neuroimaging is the current gold standard for the evaluation of most conditions affecting the central nervous system (CNS) and the only clinical tool offering objective measures to both diagnose and monitor CNS events, it is limited to the visualization of structural changes and offers little information about functional alterations.

The use of exRNA biomarkers to monitor molecular changes in the CNS to determine the severity of injury and risk for secondary injuries would assist clinicians in the timely treatment of head trauma patients. The noninvasive nature for collecting exRNA information from bodily fluids allows for frequent sampling, with the potential to closely monitor pathophysiological mechanisms of traumatic injury. Further, exRNA biomarkers provide objective and sensitive information for diagnosis that does not rely on self-reporting by an individual who is motivated to continue participating in an activity. TGen's data represents the largest, carefully curated, comprehensive characterization of exRNAs found in bodily fluids. Moreover, this data represents the first to monitor head impact information and link it with exRNA changes over time, providing valuable insight to the molecular changes associated with mTBI and the effect on the brain of repeated head impacts that do not result in a diagnosed concussion. Through the identification and use of exRNA as a sensitive indicator of changing pathophysiological conditions underlying temporarily defined brain insults, a targeted test comprising an exRNA panel indicative of brain injury, or response to head impact exposure, can be developed.

Such an exRNA test could be used to monitor head impact exposure in contact athletes, with the goal to not only learn more about sub-concussive injury, but also to provide early objective diagnosis of concussion and recovery.

Institution

The Translational Genomics Research Institute

Inventors

Kendall Jensen
Asst Professor - Neurodegenerative diseases
Neurogenomics Division
Ashish Yeri
Matt Huentelman
Professor/Unit Head
Neurogenomics

联系我们

叶先生

电 话：021-65679356
手 机：13414935137
邮 箱：yeyingsheng@zf-ym.com