

Researchers identify blood biomarkers that may help diagnose, confirm concussions

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Researchers from the University of California, Irvine, Georgetown University and the University of Rochester have found that specific small molecules in blood plasma may be useful in determining whether

someone has sustained a mild traumatic brain injury (mTBI), commonly known as a concussion. The article, "Plasma metabolomic biomarkers accurately classify acute mild traumatic brain injury from controls," is now online at the *PLOS One*.

Six specific [small molecules](#) from [blood plasma](#) were discovered in a group of college athletes who had been diagnosed with concussions. When these [molecules](#) were assessed, their combined presence accurately predicted whether teammates had sustained an mTBI or not. This suggests that these small molecules, and possibly others, might be clinically relevant biomarkers of mTBI. The same six biomarkers were then tested in a separate group of individuals, without and with mTBI, and the results replicated the athlete findings.

Although the results are encouraging, the authors report limitations to their study and recommend additional investigations related to these and other mTBI biomarkers in blood that will further clarify their utility in clinical management.

"Such blood tests are important in determining not only whether someone has sustained a concussion, which is not currently an easy task, but may eventually prove useful in defining when injured individuals may be eligible to safely return to regular activities," said Massimo S. Fiandaca, MD, the paper's first author, a retired neurosurgeon and co-director of the Georgetown and UCI research groups led by the paper's senior author, Howard J. Federoff, MD, PhD.

An objective [biomarker](#) of mTBI is not yet available to healthcare providers, coaches and trainers, and military commanders and combat medics. Such a diagnostic test might revolutionize the management of civilian and military concussions, including strategies to avoid post-concussive complications and more severe consequences, such as [chronic traumatic encephalopathy](#). Researchers at UCI are helping

advance technologies and therapeutic approaches that may benefit all societies, but are directly relevant to their local populations.

The estimated 40 million individuals worldwide diagnosed with mTBI likely represent a gross underestimation of those actually sustaining such injuries. Clinical practitioners require a relevant and reliable, minimally invasive, objective diagnostic test to determine high versus low probability of mTBI in a timely manner.

Fiandaca said there is a clear need to improve diagnostic capabilities, which could reduce underreporting of mTBI and allow more appropriate care to be delivered to concussed individuals. Falls represent the most common cause associated with mTBI among civilians in the United States and around the world. In the U.S., sport-related mTBI produces up to 3.8 million documented injuries per year. Changes in warfare practices in the last two decades have elevated blast (i.e., explosive) injuries to the primary cause for mTBI in the US active duty military. Between 2000-2016 approximately 82% of all military TBI fell into this category.

Although current technologies for defining the discovered small molecules in today's publication lack the rapid, point-of-care platforms being developed for other measures, the study authors anticipate a growing technological momentum to develop such novel platforms resulting from this and similar investigations.

More information: Massimo S. Fiandaca et al, Plasma metabolomic biomarkers accurately classify acute mild traumatic brain injury from controls, *PLOS ONE* (2018). [DOI: 10.1371/journal.pone.0195318](https://doi.org/10.1371/journal.pone.0195318)

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