

Soldiers, athletes could have improved outcomes from traumatic brain injury

September 5 2019, by Cynthia Sequin

A traumatic brain injury is often easily suspected and can be confirmed and treated if necessary following an injury using a blood analysis, but scientists are reporting that even one mild blast to the brain can cause very subtle but permanent damage as well. Urine analysis taken within one week of a mild to traumatic brain injury also can provide faster diagnosis and treatment for such injuries.

"We're finding that even a mild blast can cause long-term, life-changing health issues," said Riyi Shi, a professor of neuroscience and biomedical engineering in Purdue University's Department of Basic Medical Sciences. "The individual appears to be fine, and it's difficult to tell if you just look at a person. But the fact is that these types of hits are multiplied over years and often ignored until someone reaches an age when other factors come into play. Identifying and treating these incidents sooner can help mitigate issues later in life."

A study led by Shi reports that checking the <u>urine</u> within seven days following such an <u>injury</u>, even a mild injury with no immediately obvious symptoms, could be less invasive, faster and help reduce the risk of long-term health issues including Parkinson's disease.

"Even at one day post injury, a simple <u>urine analysis</u> can reveal elevations in the neurotoxin acrolein. The presence of this "biomarker" alerts us to the injury, creating an opportunity for intervention," said Shi, who has appointments in Purdue's College of Veterinary Medicine and Weldon School of Biomedical Engineering. "This early detection and



subsequent treatment window could offer tremendous benefits for longterm patient neurological health."

The research paper, titled "Acrolein-mediated Alpha-synuclein Pathology Involvement in the Early Post-injury Pathogenesis of Mild Blast-induced Parkinsonian Neurodegeneration," was published in July in the *Journal of Molecular and Cellular Neuroscience*.

"Most people have heard that traumatic brain injuries are linked to Parkinson's, Alzheimer's and other <u>neurodegenerative diseases</u>, dating back as far as to Muhammad Ali and even earlier," Shi said. "The seriousness of this relationship is readily apparent; however, we want to, for the first time, implement a mechanism or protocol capable of connecting brain injuries to these diseases. We can accomplish this by testing for acrolein, which is well-researched and already recognized as a very important pathological factor in Parkinson's disease. This study establishes a solid link between the two and opens the door for faster treatments utilizing acrolein urine tests during the days following a traumatic episode."

In the research study, a urine analysis tested for an increased elevation of acrolein or oxidative stress within one week following a neurological injury.

"What's important is that urine tests can be performed much easier than blood tests or other more invasive medical procedures currently available," Shi said. "And it has been shown that individuals who experience <u>brain</u> injuries are three times more likely than their agematched peers to develop neurological disease. If we can establish a protocol to routinely test urine following a <u>traumatic brain injury</u>, we can improve treatment options earlier and potentially offer better long-term outcomes."



More than 500,000 people in the U.S. are currently living with Parkinson's disease, and another 50,000 people are diagnosed with this neurodegenerative disorder every year, according to the National Institutes of Health.

The technology is patented through the Purdue Office of Technology Commercialization.

More information: Glen Acosta et al, Acrolein-mediated alphasynuclein pathology involvement in the early post-injury pathogenesis of mild blast-induced Parkinsonian neurodegeneration, *Molecular and Cellular Neuroscience* (2019). DOI: 10.1016/j.mcn.2019.06.004

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