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Could a 'Trojan horse' better identify traumatic brain injury?

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Accurately diagnosing traumatic brain injuries and concussions is difficult, as standard CT or MRI scans can't see most changes to the brain caused by these injuries.

Clinicians must rely on patients accurately and candidly describing their symptoms, which many patients – such as soldiers and athletes – are hesitant to do for fear of being removed from action with their unit or team.

Borrowing a tactic used to identify lung infections, University of Virginia School of Medicine researchers have discovered a potential method to identify traumatic brain injuries that uses positron emission tomography scans and the body's immune response to a brain injury.

Backed by funding from the U.S. military's Defense Health Program, the U.Va. researchers – radiologist and neuroscientist Dr. James Stone, and radiology researchers Stuart Berr, Jiang He and Dongfeng Pan – presented their initial findings at the recent Military Health System Research Symposium.

Existing clinical methods for imaging traumatic brain injuries are only able to identify alterations to the brain's structure at a macroscopic level, such as bruising, tissue tears or blood accumulation. However, most changes to the brain that result in traumatic brain injury symptoms are typically only visible microscopically, either at the cellular or molecular level.

"Most people with concussions and TBI will have negative CT and MRI scans," Berr said.

Without imaging that can identify brain injury at the microscopic level, clinicians largely have to diagnose concussions and traumatic brain injury based on patients' description of their symptoms.

To identify traumatic brain injury, U.Va. researchers attached a compound similar to the radioactive tracers used to identify lung infections to the surface of neutrophils, a white blood cell that is part of the immune response to an injury. Previous research has shown that when traumatic brain injury occurs, neutrophils target the injured area of the brain by passing through blood vessels that access cerebral spinal fluid.

The compound hitchhikes on the neutrophils and travels with these cells to sites of injury, allowing researchers to see and identify brain injury on a PET scan. "It's like a Trojan horse kind of approach," Stone said.

"Neutrophils identify early inflammation in TBI, which could one day allow researchers to identify patients that might benefit from therapies targeting TBI-related inflammation," Stone added.

The researchers are planning additional tests to ensure the safety of the compound, followed by clinical trials to examine the effectiveness of this technique for diagnosing traumatic brain injury.

Provided by University of Virginia