UNL research to power handheld traumatic brain injury diagnostic device

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A handheld tool is under development to diagnose traumatic brain injuries on the spot using technology developed by a University of Nebraska-Lincoln chemist. Such a device could yield critical and in some cases life-saving information to guide triage decisions from the battlefield to the football field.

SFC Fluidics, a Fayetteville, Ark.-based biotechnology company, recently entered into a license agreement with UNL's nonprofit affiliate, NUtech Ventures, to use technology developed by David Hage, professor of chemistry. NUtech is responsible for building partnerships between the University of Nebraska and the private sector.

Hage, a bioanalytical chemist, develops methods to separate and measure specific compounds in complex fluids, and in some cases to do so quite rapidly -- on the order of minutes or even a fraction of a second. He might be looking for a drug in a drop of blood, a pesticide in water or an explosive dissolved in a liquid. In applications seeking to assess the severity of a traumatic brain injury, his methods can measure specific proteins in blood serum that are released by the brain. In other words, the severity of brain injury can be diagnosed with a simple blood test.

"So if you have a test that is fast enough to detect this protein in a few minutes, you can tell pretty quickly if someone with a potential head injury has to go back to the hospital or if they're OK to keep doing what they're doing," Hage said. "Having a fast test for this process would help improve the likelihood of successful treatment and having a good

outcome for the individual."

Both Hage's technology and SFC Fluidics' technologies are microfluidic, meaning they work with very, very tiny amounts of fluid. A microliter droplet, by way of comparison, is about the diameter of a grain of salt.

Hage continues research, meanwhile, to make the test more sensitive to provide more information about the severity of a head injury.

"Detecting whether or not a traumatic brain injury occurred is good," Hage said. "Determining severity is better."

An estimated 1.7 million Americans suffer head injuries each year, resulting in 275,000 hospitalizations and 52,000 deaths, according to the Centers for Disease Control and Prevention. Traumatic brain injuries also are a serious threat for active duty U.S. military personnel who are exposed to blasts in war zones.

SFC Fluidics sought to incorporate Hage's technology because it fits well with the speed and sensitivity demands of traumatic brain injury diagnostics, said Sai Kumar, the company's vice president for research and development.

David Conrad, NUtech Venture's executive director, said the project is exciting because it has the potential to directly improve people's lives.

"This project is a great example of how a university researcher can partner with industry to create real value," Conrad said. "It will take the combination of Dave Hage's innovative approach and SFC Fluidics' platform technology to create the diagnostic device, and the result has

the potential to help a lot of people."

Hage has spent more than two decades designing separation and measurement techniques, many of which are patented, for a wide range of applications. These applications have ranged from new clinical tests to improved methods for forensic testing, drug development and environmental monitoring.

His research has been supported by the National Institutes of Health, the Environmental Protection Agency, the Nebraska EPSCoR program, and Nebraska Center for Nanohybrid Functional Materials, among others.

The Department of Defense supports the development of SFC Fluidics' handheld device.

Clinical trials for the device are expected to begin in spring 2014.

Provided by University of Nebraska-Lincoln