Sugar, a 'sweet' tool to understand brain injuries

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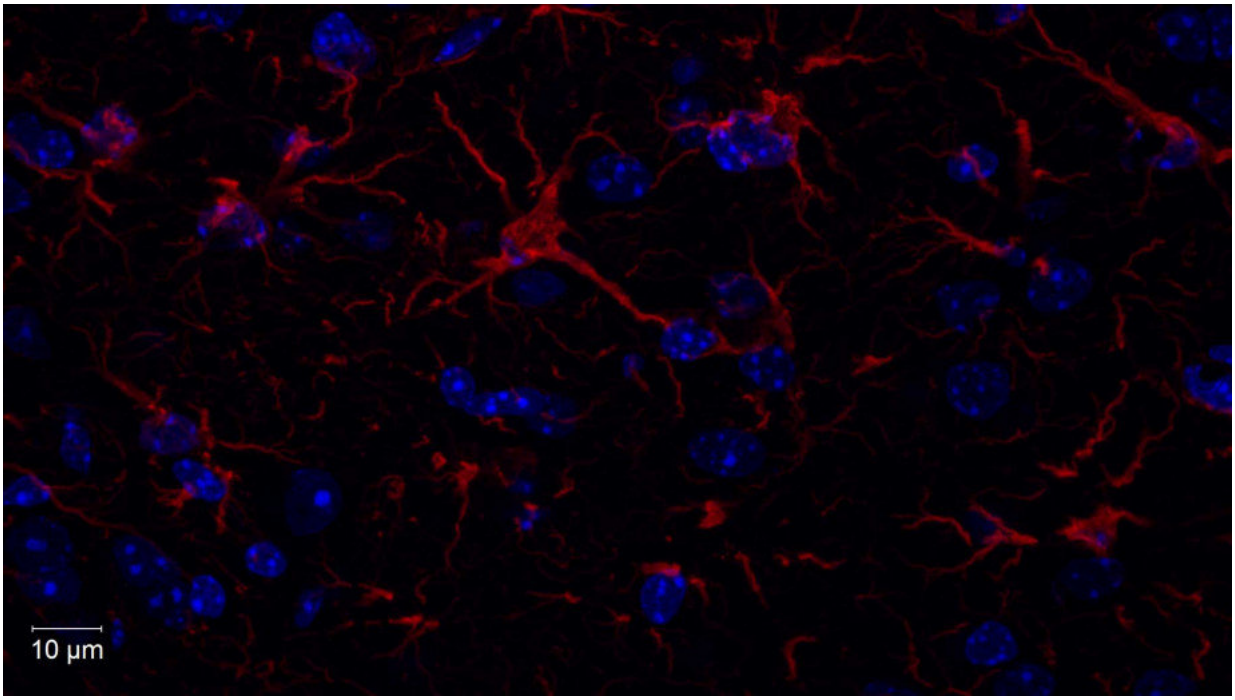

Credit: Australian National University

Australian researchers have developed ground-breaking new technology which could prove crucial in treating brain injuries and have multiple other applications, including testing the success of cancer therapies.

Associate Professor David Nisbet from The Australian National University (ANU) and Dr. Richard Williams from RMIT have

developed a 3-D tool to model brain injury in a laboratory setting. It can even be used to reduce inflammation inside the brain after traumatic injury—a key factor in long-term recovery.

Brain cells cultured outside the body are inflammatory by nature. This makes testing drugs or vaccines outside the body difficult, as this inflammatory environment isn't representative of normal brain tissue.

This research is a way to culture cells that are identical to a healthy, uninjured brain in terms of proteins they produce and their morphology as cells.

"Our tool is programmable, so the user can define the parameters and allow the cells to behave in controllable and specific ways. Importantly, it is a generalisable injury model making it useful in other settings; such as evaluating new treatments for cancer, traumatic brain injury or even drug discovery," said Associate Professor Nisbet.

The breakthrough offers new hope for treating brain damage. Using sugars sourced from seaweed, it allows the immune response to be turned on and off at will, and can even entirely block the pathways that results in inflammation.

"If you're delivering cells or drugs after a stroke they will initially be subjected to extensive inflammation, so you'll want to test your delivery methods in a representative environment," Dr. Nisbet said.

"But then naturally after injury the inflammation will subside, so then we need to turn the immune response off at a precise time. Or in a healthy, uninjured brain you need to completely de-couple the immune response from the experiment, which until now was impossible."

This could also be important in Parkinson's disease, to improve the

survival rate of transplanted stem cells. When stem cells are introduced to an inflammatory environment (also common in Parkinson's sufferers) they become vulnerable, but this technology could help circumvent their exposure to that hostile environment.

"We have validated the system as a 3-D tool used in the lab, but we've also shown we can actually use it to turn off inflammation in an active scar site in the brain. It has a diverse range of applications," Dr. Williams said.

"For the first time ever, we've shown that what we're seeing outside the body is actually relevant to what happens inside the body."

The research has just been published in the scientific journal *Advanced Materials*.

More information: Francesca L. Maclean et al. A Programmed Anti-Inflammatory Nanoscaffold (PAIN) as a 3D Tool to Understand the Brain Injury Response, *Advanced Materials* (2018). DOI: 10.1002/adma.201805209

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