ICU
MANAGEMENT & PRACTICE

Key Target Responsible For Triggering Detrimental Effects In Brain Trauma Identified

Researchers studying a type of cell found in the trillions in our brain have made an important discovery as to how it responds to brain injury and disease such as stroke. A University of Bristol team has identified proteins which trigger the processes that underlie how astrocyte cells respond to neurological trauma.

The star-shaped astrocytes, which outnumber neurons in humans, are a type of glial cell that comprise one of two main categories of cell found in the brain along with neurons. The cells, which have branched extensions that reach synapses (the connections between neurons) blood vessels, and neighbouring astrocytes, play a pivotal role in almost all aspects of brain function by supplying physical and nutritional support for neurons. They also contribute to the communication between neurons and the response to injury.

However, the cells are also known to trigger both beneficial and detrimental effects in response to neurological trauma. When the brain is subjected to injury or disease, the cells react in a number of ways, including a change in shape. In severe cases, the altered cells form a scar, which is thought to have beneficial, as well as detrimental effects by allowing prompt repair of the blood-brain barrier, and limiting cell death, but also impairing the regeneration of nerve fibres and the effective incorporation of neuronal grafts - where additional neuronal cells are added to the injured site.

The cells change shape via the regulation of a structural component of the cell called the actin cytoskeleton, which is made up of filaments that shrink and grow to physically manoeuvre parts of the cell. In the lab, the team cultured astrocytes in a dish and were able to make them change shape by chemically or genetically manipulating proteins that control actin, and also by mimicking the environment that the cells would be exposed to during a stroke.

By doing so the team found that very dramatic changes in cell shape were caused by controlling the actin cytoskeleton in the in vitro stroke model. The team also identified additional protein molecules that control this process, suggesting that a complex mechanism is involved.

Dr Jonathan Hanley from the University's School of Biochemistry said: "Our findings are crucial to our understanding of how the brain responds to many disorders that affect millions of people every year. Until now, the details of the actin-based mechanisms that control astrocyte morphology were unknown, so we anticipate that our work will lead to future discoveries about this important process."

Source: University of Bristol via *EurekAlert!*

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